While data have demonstrated that resistance exercise without blood flow restriction (BFR) decreases vagal tone up to 30 minutes, the effects of upper- versus lower-body resistance exercise with or without BFR remain unclear.

**METHODS:** Autonomic modulation was assessed in twenty resistance-trained individuals at rest (R30, R60), and during a bout of moderate intensity exercise. We quantified white matter lesions and 2) cognitive function. Results: There were no significant 3-way interactions for any variables. There were no changes for LnTP. There were significant main effects of time (Rest, R30, and R60) on autonomic modulation. An ANOVA was used to evaluate upper- versus lower-body conditions (BFR or without BFR) across power (LnTP), high frequency power (LnHF), and sympathovagal balance (LnLF/LnHF). The LnLF/LnHF ratio was significantly associated with both resting and exercise white matter lesion scores. Conclusion: These data suggest that either upper- or lower-body resistance exercise with or without BFR significantly alters autonomic modulation up to 60 minutes after an acute bout of resistance exercise.

**REFERENCES:**

**PURPOSE:** Observing little-to-no increase in arterial-venous oxygen difference (a-vO_2_diff) following endurance training, some previous investigations have attributed little importance to factors peripheral to the heart, such as maximal mitochondrial oxygen consumption (O_2_max) and convective (Q_2) and diffusive (D_2) muscle oxygen delivery in the trained-induce increase in VO_2_max. As lack of change in a-vO_2_diff does not necessarily indicate a lack of change in peripheral function, the purpose of this study was to determine the combined influences of adaptations peripheral to the heart in the endurance-training-associated increase in VO_2_max.

**METHODS:** Arterial-venous blood draws and Doppler ultrasound during maximal single leg knee extension (KE) exercise were used to quantify Q_2, D_2, a-vO_2_diff and g_2 when free of upstream limitations from the heart in 10 untrained and 10 trained young males. Mitochondrial respiration of muscle biopsied from the vastus lateralis was used to quantify g_2 when free from upstream oxygen supply limitations.

**RESULTS:** In agreement with previous investigations, Q_2 and g_2 VO_2 Max were 20-35% greater in the trained (P<0.05), while a-vO_2_diff was not markedly different (P>0.05, See Figures A-C). Nevertheless, training was associated with a 50-100% increase in VO_2 Max.
increases in $D_O_2$ and $\text{VO}_2\text{max}$, (p<0.05). When plotted as a Wagner diagram (Figure D), it becomes clear that the greater $\text{VO}_2\text{max}$ in the trained is the result of 3 synergistic adaptations: 1. increased $\text{VO}_2\text{max}$, 2. increased $O_2$ diff, and 3. enhanced $D_O_2$, which, together, raise $\text{VO}_2\text{max}$ more than each adaptation would alone.

CONCLUSIONS: Despite minimal changes in $\text{a-vO}_2$, the training-associated increase in $\text{VO}_2\text{max}$ is dependent upon specific peripheral factors within the muscle exhibiting a greater capacity, including mitochondrial respiratory capacity, as well as convective and diffusive muscle oxygen delivery.

The changes in autonomic modulation after high-intensity heavy rope exercise (HI-HRE) are unknown. PURPOSE: To examine the effects of HI-HRE on autonomic modulation in resistance-trained (RT) individuals. METHODS: Twenty-two young, RT individuals (mean±SD: age 23±3yrs; height 1.7±0.1m; weight: 74.3±14.9kg) had their heart rate (HR), mean arterial pressure (MAP), and measures of autonomic modulation collected at rest, and 15 (Rec1), 30 (Rec2) and 60 (Rec3) minutes following HI-HRE. Heart rate variability measurements included the root mean square of successive differences between normal heartbeats (RMSSD) in the time domain, high-frequency power (lnHF) and the ratio of low-frequency to high-frequency power (lnLF/lnHF ratio) in the frequency domain. RMSSD and lnHF are indicative of vagal modulation while the lnLF/lnHF ratio is a measure of sympathovagal balance. The HI-HRE consisted of six, 15-second exercise bouts, using a double wave pattern, separated by 30-seconds of passive recovery; the pace of the exercise was set at 180bpm. A one-way repeated measures analysis of variance was used to analyze the effects of HI-HRE across time (rest, Rec1, Rec2, and Rec3). Significant main effects were analyzed using pairwise comparisons with Bonferroni correction. RESULTS: There was a significant main effect of time (p<0.04) for HR (rest: 63±10bpm; Rec1: 84±10bpm; Rec2: 76±9bpm; Rec3: 70±8bpm), such that it was augmented during all recoveries compared to rest. There was a significant main effect of time (p<0.04) for the RMSSD (rest: 4.2±0.6ms; Rec1: 2.8±0.6ms; Rec2: 3.1±0.6ms; Rec3: 3.6±0.5ms) and the lnHF (rest: 7.4±1ms; Rec1: 7.0±1.1ms; Rec2: 5.5±1.1ms; Rec3: 6.3±0.9ms), such that it was attenuated during all recoveries compared to rest. There was a significant main effect of time (p<0.05) for the lnLF/lnHF ratio (rest: 0.9±0.1; Rec1: 1.2±0.2; Rec2: 1.1±0.2; Rec3: 1.0±0.1), such that it was augmented during all recoveries compared to rest. CONCLUSION: These data demonstrate that high-intensity heavy rope exercise results in significant decreases in vagal modulation for at least 60 minutes.

CONCLUSIONS: Despite minimal changes in $\text{a-vO}_2$, the training-associated increase in $\text{VO}_2\text{max}$ is dependent upon specific peripheral factors within the muscle exhibiting a greater capacity, including mitochondrial respiratory capacity, as well as convective and diffusive muscle oxygen delivery.

The biological factors determining the maximal exercise capacity are typically assessed during whole-body exercise (e.g., double-leg cycling), implicitly assuming that limbs contribute homogeneously to exercise tolerance. However, given the presence of limb dominance, it is possible that the dominant leg may achieve greater peak $\text{O}_2$ uptake ($\text{VO}_2\text{max}$) and be able to sustain greater power outputs during prolonged dynamic exercise compared to the non-dominant leg. PURPOSE: To investigate peak power output (PPO), $\text{VO}_2\text{max}$, and maximal lactate steady-state (MLSS) during double-leg as well as during dominant and non-dominant and counter-weighted single-leg cycling exercise performed with the dominant and non-dominant legs. METHODS: Twelve men (30 ± 5 yrs) during 12 to 14 lab visits performed: (i) a ramp-incremental test to determine PPO, $\text{VO}_2\text{max}$ and maximal $\text{O}_2$ extraction; and (ii) 30-min constant-load tests to determine MLSS. These tests were performed using both legs (DBL), the dominant leg only (SLd), and the non-dominant leg only (SLnd). Exchange variables were measured with a metabolic cart; local de-oxygenation ($[\text{HHb}]$) of the vastus lateralis (VL) was measured using a frequency-extraction; and (ii) 30-min constant-load tests to determine MLSS. These tests were performed using both legs (DBL), the dominant leg only (SLd), and the non-dominant leg only (SLnd). Gas exchange variables were measured with a metabolic cart; local de-oxygenation ($[\text{HHb}]$) of the vastus lateralis (VL) was measured using a frequency-domain NIRS; capillary blood samples were analysed for lactate concentration ([Lac]). RESULTS: PPO for DBL, SLd, and SLnd was different in each condition: 329 ± 38, 181 ± 30, and 168 ± 27 W, respectively (p<0.05). These amplitudes were highly correlated with the $\text{VO}_2\text{max}$ values observed during DBL dominant and non-dominant (r = 0.86 and r = 0.91, respectively), SLd (r = 0.79), and SLnd (r = 0.71) RI tests (p<0.05). The PO at MLSS for DBL, SLd, and SLnd was different in each condition: 183 ± 32, 119 ± 25, and 111 ± 24 W, respectively (p<0.05). The $\text{VO}_2\text{max}$, [Lac], and RPE values during SLd and SLnd were similar (p>0.05) despite this lower PO. CONCLUSIONS: These data indicate a heterogeneous exercise capacity of the exercising limbs that should be considered when evaluating exercise tolerance during double-leg exercise.
A-18 Thematic Poster - Exercise and Cancer

Wednesday, May 29, 2019, 9:30 AM - 11:30 AM
Room: CC-101A

INTRODUCTION: Overweight and obese breast cancer survivors (BCS) are at greater risk of developing type II diabetes (T2D) than non-cancer populations due, in part, from adipose tissue-induced modulations to the adipokines, leptin and adiponectin. Leptin upregulates inflammatory cytokines associated with insulin resistance (IR) while adiponectin inhibits inflammation and regulates glucose uptake. The Leptin/Adiponectin Ratio (LAR) has been used as an indicator for the diagnosis of T2D, due to its ability to measure both inflammatory and glucose abnormalities. In overweight and obese BCS, an elevated LAR induces IR, which contributes to the development of T2D. Exercise may be an effective strategy to reduce the LAR to target the risk of T2D in BCS.OBJECTIVES: The purpose of this study was to determine whether a 16-week aerobic and resistance exercise intervention reduces the LAR in overweight and obese BCS.METHODS: Sedentary, overweight/obese (BMI ≥ 25 kg/m²) BCS (Stage I-III) were randomized to the Exercise (EX; n=50) or Control (CON; n=50) groups. A 16-week aerobic and resistance exercise intervention was provided via a single-breath DLco/DLno method. Post-exercise values were compared to pre-exercise values in order to examine within and between group differences in LAR. RESULTS: On average, women were 53.5±10.4 years old, postmenopausal (60%), Hispanic (55%) with a BMI 33.5±5.5 kg/m². Post-intervention, leptin was significantly reduced (-8.0ng/mL±0.3) in the EX group compared to CON group (+4.8ng/mL±0.5; p=0.001). Adiponectin was significantly increased (+7.5µg/dL±1.0) in EX group compared to CON group (+1ng/mL±0.3; p=0.001). There was a significant increase in LAR in the CON group (P<0.01).CONCLUSION: A 16-week aerobic and resistance exercise intervention is an effective approach to reduce the LAR in overweight and obese BCS. This finding supports the utilization of exercise to reduce the risk of T2D following the completion of cancer treatment in overweight and obese BCS.
Chemotherapy for breast cancer may result in fatigue and reduced quality of life (QOL). While exercise can attenuate adverse chemotherapy effects, improvements relative to baseline may be more likely with exercise performed post-treatment. PURPOSE: To compare the effect of exercise during versus after taxane chemotherapy for breast cancer on fatigue and QOL. METHODS: Women were randomized to supervised aerobic and resistance exercise 3 x/wk for 8-12 wk starting pre-chemotherapy (Immediate Exercise-IE) or 2-3 wk post-chemotherapy (Delayed Exercise-DE). Fatigue and overall QOL functional subscales were evaluated using the Piper Fatigue Scale (0–none, 10–severe) and European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (scored: 0–100, respectively, at: 1) baseline; 2) 2-3 wk post-chemotherapy (pre-chemo); and 3) 10-15 wk post-chemotherapy (follow-up). RESULTS: Overall, n=27 women enrolled and n=26 (IE n=12, DE n=14) completed the intervention (attended >1 session). Attendance was 79±23% for IE and 81±20% for DE. Fatigue did not differ between groups across time, so change within groups was assessed individually. Fatigue increased in DE from baseline to post-chemo (mean diff: +1.7±0.47, p=0.01) and did not decrease with exercise between post-chemo and follow-up (mean diff: -1.1±0.65, p=0.13). Fatigue did not change over time in IE. Overall QOL differed between groups over time (p=0.01), where it was higher in IE versus DE post-chemo (mean diff: +6.2±3.0, p<0.05). No other group differences were found for QOL functional subscales. The overall deterioration in QOL in DE during chemotherapy was a result of reductions in physical function (mean diff: -16.4±5.6, p<0.01), role function (mean diff: -20.0±6.3; p<0.05), social function (mean diff: -16.0±5.8, p=0.01) and cognitive function (mean diff: -10.0±6.3; p<0.05), cognitive function (mean diff: -16.0±5.8, p=0.01) and social function (mean diff: -17.4±7.4, p=0.04). Relative to post-chemo, the DE intervention significantly improved QOL by follow-up (mean diff: +20.2±15.4, p=0.01), such that DE and IE QOL did not differ at follow-up (mean diff: 4.6±3.7, p=0.22). CONCLUSIONS: Exercise during taxane chemotherapy may mitigate treatment-related fatigue and reductions in QOL in women with breast cancer. While exercise after chemotherapy increased overall QOL, fatigue experienced during chemotherapy persisted.
and home-based interventions may help eliminate barriers to physical activity. PURPOSE: To assess feasibility, adherence, and physiological changes following a home-based exercise intervention in men with mCRPC receiving ADT and androgen receptor targeting agents. METHODS: Men with mCRPC (age=71±10, BMI=29.64 kg/m² ± 3.4) completed body composition (DXA), muscular strength, physical function, and cardiopulmonary exercise testing (CPET) before and after a 12-week home-based exercise intervention (with weekly phone contact) using resistance band and wearable technology for tracking walking. Patient reported outcomes were used for the assessment of fatigue (FACT-Fatigue), quality of life (FACT-P) and depression (Hospital Anxiety and Depression Scale). Feasibility (target: 67%) was determined as the % of patients who completed the intervention. Adherence (target: 75%) to the overall program and specific activities was determined as the number completed relative to prescribed. Physiological changes were assessed using paired samples t-tests and adherence rates with a single sample t-test. RESULTS: Fourteen men completed baseline testing and eight completed the intervention (58%), which was lower than the target value. Adherence was reached but did not statistically exceed the target value of 75% for overall (82.7% ± 9.5; p=0.076), walking (80.7% ± 14.2; p=0.326), or resistance training (85.3% ± 12.5; p=0.0072). Core focussed exercises had significantly lower adherence (58% ± 35.7; p=0.001). Training significantly increased leg press maximal strength (10.7% ± 6.7, p=0.023) and peak oxygen consumption (9.7% ± 22.4%, p=0.013). No significant difference occurred in any other variable tested. CONCLUSIONS: Feasibility estimates were lower than expected but the high adherence promoted improvements in strength and cardiorespiratory function during mCRPC treatment but did not translate into functional improvements. These preliminary findings suggest home-based interventions are promising, but limited supervision or advanced disease may limit completion of training protocol.

Traditionally, exercise interventions to improve recovery in prostate cancer patients following prostatectomy were limited to the post-surgical period with exercise protocols focusing on the pelvic floor muscles. However, emerging evidence indicates that a more opportune time to intervene to reduce the adverse effects of surgery and length of hospitalisation is the pre-operative period. PURPOSE: To evaluate the efficacy of exercise undertaken before surgery to enhance pre-surgical physical function and body composition, and improve recovery from surgery. METHODS: Twenty-nine NCAA Division I pitchers participated in this follow-up study. Ultrasound images were obtained of the MJS and UCL on the participant's dominant arm. Purposes were to examine if shoulder joint motion (ERRM, IRRM, ERRM + IRRM) may be associated with increased risk for UCL injury. Ultrasound imaging documented that baseball athletes typically exhibit an increase in shoulder external rotation range of motion (ERRM) during mCRPC treatment but did not translate into functional improvements. These preliminary findings suggest home-based interventions are promising, but limited supervision or advanced disease may limit completion of training protocol.

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throwing arm using a GE LOGIQ q ultrasound unit. Participants were placed supine with a wedge placed underneath their pitching hand to maintain elbow position at 30 degrees. A 3 kg valgus force, as measured by a hand-held dynamometer, was applied 20 cm distal to the medial epicondyle. Ligament thickness measurements were performed at the mid-substance of UCL and at the apex of the trochlea. Imaging evaluations to measure MJS opening were performed from the apex of the trochlea to the apex of the ulna. Standard goniometric procedures were performed with the athlete in a supine position to obtain ERROM, and TRIM values. Three stepwise linear multiple regression analyses were performed to determine if shoulder ROM or UCL thickness measures of the mid-substance and apex of the trochlea could predict MJS. RESULTS: Shoulder joint range of motion were not able to significantly predict MJS (R2 = 0.05, F (2, 5) = 0.53, p = 0.63), UCL thickness at the mid-substance (R2 = 0.43, F (1, 23) = 0.10, p = 0.76), and at apex of the trochlea (R2 = 0.03, p = 0.95). Further supported prior research that shoulder ROM did not predict MJS, and new to this study, UCL thickness measured at two points were unable to predict MJS in asymptomatic baseball pitchers. Further research is recommended to perform multiple imaging sessions throughout the competitive season to further determine predictors of UCL injuries.
Methods: All professional baseball players who underwent isolated ulnar nerve decompression/transposition between 2010-2016 were included. Demographic and performance data (pre and post surgery) for each player was recorded. Performance metrics were then compared between cases and a group of matched controls. Results: Overall 52 players, 83% pitchers (14 underwent prior UCLR) were included. Most surgeries (92%) were anterior subcutaneous transpositions. Overall, 62% of players were able to successfully RTS and 36% returned to the same or a higher level.

There was no significant difference between groups in RTS rate, performance upon RTS, or overall upper or lower extremity injury rates. Conclusion: Anterior subcutaneous transposition is the most common surgery in professional baseball players to address ulnar neuropathy at the elbow. Patients have a 62% rate of RTS, which is lower than expected for this non-reconstruction or repair procedure. For players who successfully RTS, performance compared to matched controls remained the same in most performance metrics. Post-operatively, pitchers with a UCLR prior to ulnar nerve transposition/decompression who had a successful RTS performed the same as matched controls with prior UCLR.

Purpose: To compare performance, return to sport (RTS) rate, and injury rates between professional baseball players with a history of UCLR using an ipsilateral (drive leg) hamstring autograft vs. contralateral (landing leg) hamstring autograft.

Methods: All players between 2010-2015 who underwent UCLR using hamstring autograft were included. Surgical details of their procedure were recorded using operative reports. Players with a hamstring UCLR were compared within group to compare grafts taken from the drive leg vs. landing leg (No relevance relationships reported).

Results: Over all 191 players underwent UCLR using hamstring autograft. The docking technique was more common in the contralateral/landing leg group while the figure-of-8 technique was more common in the ipsilateral/drive leg group (p=0.001). More patients in the ipsilateral/drive leg group underwent concomitant treatment of the ulnar nerve than the contralateral/landing leg group (p=0.001). No difference existed in return to sport (RTS) rates, or timing of RTS between groups. No differences in subsequent ipsilateral or contralateral hamstring injuries between players who underwent UCLR using hamstring from the ipsilateral/drive leg or contralateral/landing leg was seen (p=1.000; p=0.460 respectively). No difference in overall upper or lower extremity injury rates existed between groups.

Conclusion: No difference in RTS rate, performance upon RTS, or subsequent hamstring, lower extremity, or upper extremity injury rates existed between players who underwent UCLR using hamstring autograft from the ipsilateral/drive or contralateral/landing leg.

With the recent decision permitting female soldiers to enter Combat Arms roles, knowledge of sex differences in military load carriage is more operationally relevant. Limited work comparing the effect of heavy carried loads (> 30 kg) in men and women has attributed differences in gait mechanics to sex without matching for anthropometrics that may contribute to differences. PURPOSE: To examine the effect of carrying light to heavy loads on pelvis and trunk range of motion (ROM) between anthropometrically matched male and female soldiers.

METHODS: Four male and four female soldiers were matched on height and body weight (differences < 2.54 cm and 4.54 kg). All participants walked unloaded (BW), and with vest-borne loads of 15, 35 and 55 kg. Each load was carried for 10 min while walking on a level treadmill at 1.3 m/s, with pelvis and trunk segmental angles collected after 5 min. Four mixed model ANOVAs (sex x load) compared trunk and pelvis frontal and transverse plane ROM.

RESULTS: There were sex x load interactions for trunk transverse and frontal plane motion (Table 1). Specifically, as load increased: (A) trunk axial rotation decreased more in females than males (p=0.037), and (B) trunk frontal plane motion increased for males and remained relatively constant for females (p=0.034). Pelvis frontal plane ROM also increased at 55 kg in both sexes relative to carrying no additional load.

CONCLUSIONS: Despite anthropometric matching, preliminary results suggest sex-related differences in trunk frontal plane motion while carrying loads > 35 kg and no sex-related differences in pelvis motion. DISCLAIMER: The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.

Table 1. Pelvis and Trunk Frontal (Y) and Transverse (Z) plane ranges of motion for different loads among male and female soldiers.

<table>
<thead>
<tr>
<th></th>
<th>Sex</th>
<th>BW 15 kg</th>
<th>35 kg</th>
<th>55 kg</th>
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| Pelvis| Frontal | M 6.9 ± 0.3 | 8.4 ± 0.2 | 8.7 ± 1.5 | 9.3 ± 0.7 *
|       | F 8.8 ± 2.2 | 9.7 ± 3.0 | 10.5 ± 3.1 | 11.1 ± 3.9 *
|       | Transverse M 6.3 ± 2.1 | 6.5 ± 2.2 | 7.3 ± 2.8 | 6.3 ± 1.8 *
|       | F 10.8 ± 2.8 | 8.6 ± 1.6 | 8.0 ± 1.8 | 8.1 ± 1.8 *
| Trunk | Frontal | M # 4.9 ± 1.1 | 5.3 ± 0.5 | 6.7 ± 1.0 | 6.2 ± 0.6 *
|       | F # 4.9 ± 1.7 | 4.6 ± 1.7 | 4.2 ± 2.2 A 4.1 ± 1.1 A *
|       | Transverse M 4.4 ± 2.1 | 6.2 ± 0.9 | 7.9 ± 2.7 | 6.1 ± 1.4 *
|       | F 6.0 ± 1.4 | 6.6 ± 1.1 | 5.0 ± 0.8 A 4.4 ± 0.7 *

BW = Bodyweight only; # = sig sex x load interaction
* = sig different from BW; A = sig different from male

Current research on patient satisfaction after a total knee replacement (TKR) lacks an examination of objective assessments with respect to gait biomechanics, strength, and balance abilities.

PURPOSE: To examine associations between patient satisfaction and the gait biomechanics, strength, balance, functional capacities, and survey data.

Abstracts were prepared by the authors and printed as submitted.
**METHODS:** Twenty-four TKR patients participated in overground walking, stair ascent and descent, isokinetic strength, static and dynamic balance, and functional tests. Nine patients were in the dissatisfaction group and fifteen in the satisfied group. Four models of logistic regression analyses were performed to predict patient satisfaction: one for walking, stair ascent, stair descent, and functional/strength survey data. If high correlations ($r \geq 0.7$) existed, variables were selected based on biomechanical and functional importance identified through review of literature concerning TKR patients. Selected kinematic, kinetic, strength, and balance variables along with functional test and survey data scores were input into a logistic regression analysis using SAS (Version 9.4, Cary, NC, USA). Models were evaluated using Akaike’s Information Criterion.

**RESULTS:** The walking model included 1st and 2nd peak vertical ground reaction force (VGRF), knee extension moment, and forgotten joint score ($R^2=0.69$, $AIC=22.73$, $p=0.0026$). The stair ascent model included 2nd peak VGRF, knee extension moment, preferred gait speed, and peak isokinetic knee extension torque ($R^2=0.72$, $AIC=23.85$, $p=0.0013$). The stair descent model included knee extension moment, preferred gait speed, peak isokinetic knee extension torque, and forgotten joint score ($R^2=0.80$, $AIC=20.47$, $p=0.0003$). The functional model was inclusive of WOMAC total scores, stair ascent and chair rise times, and peak isokinetic knee extension torque ($R^2=0.87$, $AIC=19.51$, $p=0.0002$).

**CONCLUSIONS:** The biomechanical models included both VGRF and knee extension moments, indicating their relevance to patient satisfaction. Additionally, preferred gait speed was significant to both stair ascent and descent models. Pain was not included in any models due to a complete separation of data points.

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**Recovery of Hip Biomechanics During Sit to Walk Following Periacetabular Osteotomy: A Case Study**

Cailyn Schroeder1, Linnea Zavala1, Laura Opstedal1, James Becker1. 1Montana State University, Bozeman, MT. 2Build Physio and Performance, PLLC, Bozeman, MT.

(No relevant relationships reported)

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**Recovery of Joint Function During Sit to Walk Following Periacetabular Osteotomy**

Linnea J. Zavala1, Cailyn Schroeder1, James Becker1, Laura Opstedal1. 1Montana State University, Bozeman, MT. 2Build Physio & Performance, PLLC, Bozeman, MT.

(No relevant relationships reported)
baseline was also observed, indicating more use of the surgical leg to move the body through stance than prior to surgery. Understanding these initial recovery patterns may help improve PAO-specific rehabilitation programs.

**Purpose:** The aim of this study was to investigate the impact of diabetes on walking speed in people with knee OA. **Methods:** A cross-sectional analysis of Osteoarthritis Initiative (OAI) data at 96 months follow up was performed for 2122 individuals aged between 53-87 years with knee pain over 30 days. Participants were grouped into knee OA+diabetes or knee OA only. Walking speed was measured using the average speed of two trials of 20 meter walk test. Diabetes and knee pain over 30 days were assessed via a self-reported questionnaire. Walking speed was categorized as either slow walking speed (<1.0 m/s) or normal walking speed (≥1.0 m/s). Knee pain while walking was assessed immediately after each walk test using a numeric rating scale from 0 to 10. Knee pain while walking was categorized as follows: no pain (0), mild pain (1-3), moderate pain (4-6) and severe pain (7-10). Logistic regression analyses were performed at 0.05 alpha level. **Results:** A total of 1848 participants had knee OA only and 274 had knee OA+diabetes. A total of 245 individuals had a walking speed < 1.0 m/s with 26.5% of these individuals having diabetes. A total of 1877 participants had a walking speed ≥ 1.0 m/s with 11.1% of these individuals having diabetes. Logistic regression analyses showed that diabetes was significantly associated with slow walking speed (<1.0 m/s), odds ratio 1.62. 95% confidence interval [1.11, 2.36], p=0.013 after controlling for age, sex, race, body mass index, depression and pain while walking. **Conclusion:** This study found an association between diabetes and slow walking speed in people with knee OA, independent of knee pain. People with diabetes and knee OA are about 1.6 times more likely to have a slow walking speed (<1.0 m/s) than those with OA alone. Previous research has linked slow walking speed to adverse health outcomes. Further research should explore the complex relationships between walking speed, functional ability, and health outcomes in this population.
Exercising in the warm environments increases thermoregulatory demand for skin blood flow, influencing oxygen delivery and oxygen consumption (VO2) systemically and to the active muscle. Near infrared spectroscopy (NIRS) is a non-invasive technique that indirectly assesses local tissue oxygen delivery and VO2 and accounts for systemic oxygen uptake. Limited evidence exists on the relationship between muscle oxygenation and systemic oxygen uptake during combined heat stress and exercise. PURPOSE: To examine the relationship between muscle oxygenation and VO2 at different exercise intensities in the heat. METHODS: Six participants (4 males, 2 females, age:21±1.0 years, height: 173.41± 15.84 cm, weight: 73.14±17.28 kg, VO2max: 46.41±3.53 ml kg⁻¹ min⁻¹) performed a treadmill exercise protocol (30°C, 60% relative humidity) with 10 minutes each at 30%, 40%, 60%, 70%, and 80% of peak velocity (30%: r=0.483, p=0.019; 38.06 ± 0.30 °C, 60% RH) and two clothing conditions (t-shirt and shorts, and Army Combat Uniform). Internal temperature (Tint) was assessed continuously via rectal probe. Independent samples t-tests were utilized to assess differences between the sexes. Data are presented as mean ± SD, significance was set at p<0.05. RESULTS: All differences in this data set were present in the maximum Tint in the third block of exercise (male: 39.23 ± 0.40, female: 38.82 ± 0.15 °C, p<0.028). Environmental and clothing condition data was pooled for this preliminary analysis. No differences were observed in mean temperatures for any blocks of exercise (Block 1 – male: 38.06 ± 0.30°C, female: 38.08 ± 0.39 °C, p=0.542; Block 2 – male: 38.46 ± 0.31°C, female: 38.19 ± 0.31 °C, p=0.941; Block 3 – male: 38.86 ± 0.35 °C, female: 38.27 ± 0.19 °C, p=0.157). Additionally, there were no differences in sweat rate between sexes or blocks of exercise throughout the trials (Block 1 – male: 1.20 ± 0.39Lhr⁻¹, female: 0.58 ± 0.33Lhr⁻¹, p=0.693; Block 2 – male: 1.05 ± 0.20Lhr⁻¹, female: 0.88 ± 0.31Lhr⁻¹, p=0.373; Block 3 – male: 1.14 ± 0.47Lhr⁻¹, female: 0.65 ± 0.35Lhr⁻¹, p=0.410). CONCLUSION: While these preliminary data show only maximum temperature difference in the final block of exercise, additional data is needed to fully elucidate the impact of prolonged exercise heat exposure on both males and females. This investigation aims to help to answer any questions about special military considerations for males and females during prolonged missions or training in the heat.
Heat stress reduces physical work capacity (PWC), which can incur major economic deficits. In the context of climate change, an accurate prediction model for PWC as a function of heat stress severity is urgently required, allowing accurate forecasting of its expected future economic impacts. PURPOSE: Evidence shows that physical work at self-selected intensities is characterised by a largely stable working heart rate (HR) indicating a constant cardiovascular strain. Given that both heat stress and work load affect HR, we developed a constant cardiovascular strain methodology to quantify heat-induced reductions in PWC at a workload between moderate and heavy based on WHO definitions. METHOD: Sixteen young adult male participants (heterogenous in fitness and body characteristics) performed ten experimental trials each consisting of 1-hour of treadmill walking exercise at a HR clamped at 125 b·min⁻¹. The first experimental trial was conducted in a reference environment with no heat stress (15°C, 50% rh). The remaining nine trials were conducted at the same fixed target HR in experimental trial was conducted in a reference environment with no heat stress (15°C, 50% rh). The remaining nine trials were conducted at the same fixed target HR in WBGT ranges of 21 to 41°C (variations in both temperature and humidity). The total kilojoules of energy above resting, generated during treadmill work in each heat-stress experimental trial was defined as the total energy expended during 1 hour of treadmill walking and was expressed relative (%) to that expended during the reference condition, allowing for computation of a new formula to predict PWC changes and its expected future economic impacts.

CONCLUSIONS: We conclude that self-regulated exercise intensity in the heat outdoors at a fixed RPE of somewhat hard is reduced with increasing solar radiation because of greater thermoregulatory strain, perceived thermal stress and SHG. Moreover, solar radiation below 600 W m⁻² might be of benefit to maintain endurance physical performance in the heat.

A-22 Free Communication/Slide - Respiratory
Wednesday, May 29, 2019, 9:30 AM - 11:15 AM
Room: CC-105A

100

101

In trained endurance athletes, the ability to defend arterial oxy-hemoglobin saturation (SaO₂) during high intensity constant-workload exercise in moderate hypoxia depends in part on the ability to increase minute ventilation (V̇ E). Previous data have shown, however, that despite the existence of a substantial amount of ventilatory reserve (V̇ E_dr) in some cyclists, V̇ E surprisingly does not increase during 5km time trials (5kTT) in hypoxia, despite a significant decrease in both SaO₂ and mean power output (Ṗ E) from normoxia. PURPOSE: To determine the effect of reducing the work of breathing (Ẇ E) on V̇ E, breathlessness (RPB), and Ṗ E, during a 5kTT in highly trained cyclists. We hypothesized no change in RPB, while V̇ E would increase with an attenuated decrement in SaO₂ and Ṗ E from normoxia.

METHODS: Fourteen trained male cyclists (V̇ O₂_max = 58.7 ± 4.7 ml·kg⁻¹·min⁻¹) performed a 5kTT under 3 conditions at sea level: ‘CON’ (FiO₂ = 0.21), ‘HYP’ (FiO₂ = 0.16), and ‘HYP+He’ (FiO₂ = 0.16, with balance helium). Esophageal balloons were used to assess Ẇ E in each condition. Inspiratory capacity maneuvers were performed at each km, and flow-volume loop analyses were used to assess the %EEL and V̇ E. The modified Borg scale (0-10) was used to assess RPB at each km.

RESULTS: Ẇ E decreased from HYP to HYP+He by 30 ± 18% (p < 0.01). Despite a substantial V̇ E_dr, CON (52 ± 44 L·min⁻¹) and HYP (124.8 ± 17.9 L·min⁻¹) but increased during HYP+He (139.5 ± 22.0 L·min⁻¹); p < 0.05). While SaO₂ decreased from CON to HYP by 10 ± 1% (p < 0.01), SaO₂, increased by 4 ± 1% from HYP to HYP+He (p < 0.01). Ṗ E decreased from CON to HYP (+14.2%; p < 0.01) and increased from HYP to HYP+He (+5.5%; p < 0.01). When comparing HYP to HYP+He, a significant correlation was observed between SaO₂ and Ṗ E (r = 0.69; p < 0.05) RPB increased from CON (6.0 ± 2.0) to HYP (7.0 ± 2.0; p < 0.05) and was unchanged from HYP to HYP+He (6.6 ± 2.0). CONCLUSIONS: In moderate hypoxia, a low ventilatory reserve does not limit 5km time trial performance, where by design, individuals are free to adjust power output. The ability to utilize ventilatory reserve while remaining below a critical threshold of perceived breathlessness appears conducive to maintaining aerobic exercise performance in moderate hypoxia.
102 May 29 9:45 AM - 10:00 AM
Dysanapsis Ratio as a Predictor of Expiratory Flow Limitation in Endurance Trained Athletes

Joel T. Greenshields1, Benjamin C. Skutnik2, Daniel P. Wilhite2, Robert F. Chapman, FACSM3, Joel M. Stager, FACSM4, Indiana University, Bloomington, IN; 2. Texas Health Presbyterian Hospital, Dallas, TX. (Sponsor: Joel M. Stager, FACSM)

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(Paper relationships reported)

PURPOSE: To investigate whether the dysanapsis ratio (DR) predicts expiratory flow limitation in highly trained athletes, as has been shown in healthy, active men and women. METHODS: Data from 124 highly trained men (age 21.9 ± 3.6 yrs) who performed maximal incremental tests to exhaustion were analyzed. The maximum expiratory flow-volume curve, along with inspiratory capacity maneuvers, were used to determine lung volumes, determine expiratory flows, and to quantify flow limitation. The subjects were partitioned into “flow-limited” (EFL) and “non-flow-limited” (NEFL) groups, where tidal vs. maximal flow-volume overlap >5% qualifies as EFL. Group differences were evaluated using independent T-tests, while logistic regression was used to assess the predictive ability of DR, forced vital capacity (FVC), and VO2max on EFL. RESULTS: 63% of subjects (n = 78) displayed EFL with an average severity of 43.3 ± 21.0%. EFL showed significantly lower FEV1 (45.6 ± 0.6 vs. 49.0 ± 0.6 L, p < .001), FEV/FVC (86.3 ± 7.8 vs. 91.3 ± 5.7 %, p = .001), and FEFF1 (61.2 ± 2.0 vs. 7.8 ± 1.4 L·s−1, p < .001). During AH, saturation decreased to an average of 82 ± 3%, then returned to baseline. Blood oxygen saturation remained stable during sham treatments. MIP did not differ at any point on either day (pre-AH, 90.4 cmH2O +/- 34.3; post-AH, 99.3 cmH2O +/- 25.6; pre-sham, 98.8 cmH2O +/- 21.3; post-sham, 85.2 cmH2O +/- 17.3; X2 = 6.231, p = .01). MIP did not differ at any point on either day (pre-AH, 91.2 cmH2O +/- 25.6; post-AH, 93.3 cmH2O +/- 62.6; pre-sham, 98.3 cmH2O +/- 22.1; post-sham 90 cmH2O +/-25.6; post-sham 85.4 ± 21.1; X2 = 2.4, p = .494) Individually, 3 participants increased MIP after AH, but decreased after sham; the fourth participant increased MIP after AH, but decreased after sham. Conclusion: These pilot study results suggest AH may affect maximal effort respiratory ability in adults with SCI. Although group means did not differ, individual outcomes varied with AH improving one outcome in each participant versus sham. Further research is warranted to examine response variations and to determine the therapeutic potential of AH after SCI. Support: Brooks-PHP Research Collaboration; Center for Respiratory Research and Rehabilitation at the University of Florida.

104 May 29 10:15 AM - 10:30 AM
Effects of Acute Intermittent Hypoxia on Maximal Respiratory Ability after Spinal Cord Injury

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(Paper relationships reported)

After spinal cord injury (SCI), respiratory complications are a leading cause of morbidity and mortality. A novel technique, acute intermittent hypoxia (AIH) triggers spinal motor plasticity, and can increase tidal volume at rest in humans with SCI. Only sparse, inconclusive literature exists about the effects of AIH on maximal effort respiratory maneuvers after SCI. The purpose of this study was to investigate the effects of AIH on maximal effort respiratory ability in adults with SCI. Methods: 4 community-dwelling, adult males with SCI completed a single AH or sham treatment. Breath oxygen saturation was monitored. Maximal inspiratory pressure (MIP) and maximal expiratory pressure (MEP) were recorded prior to and 30 minutes after AH and sham. Pre and post scores for each condition were compared using non-parametric Friedman’s two-way ANOVA by ranks. Results: Baseline breath oxygen saturation averaged 97.1% ± 2.2%. During AH, saturation decreased to an average of 82 ± 3%, then returned to baseline. Breath oxygen saturation remained stable during sham treatments. MIP did not differ at any point on either day (pre-AH, 90.4 cmH2O +/- 34.3; post-AH, 99.3 cmH2O +/- 17.6; pre-sham, 98.8 cmH2O +/- 21.3; post-sham, 85.2 cmH2O +/- 17.3; X2 = 6.231, p = .01). MIP did not differ at any point between sexes. Despite performing the same level of absolute diaphragmatic work PTL matched for absolute diaphragmatic work results in a similar degree of DF. Dysanapsis ratio, a measure of expiratory flow limitation, can clarify potential differences that exist within endurance trained populations. However, results from this analysis show that when controlling for DR and FVC, an increase in DR or FVC significantly decreases the likelihood of EFL in highly trained athletes. CONCLUSIONS: Consistent with previous findings in active subjects, an increase in DR or FVC significantly decreases the likelihood of EFL in highly trained athletes. However, results from this analysis show that when controlling for DR and FVC, an increase in VO2max significantly increases the likelihood of EFL. This relationship was previously found to be non-significant in healthy active individuals and may highlight potential differences that exist between endurance trained populations.

105 May 29 10:30 AM - 10:45 AM
Combined Influences of Inspiratory Loading and Subesybolic Circulatory Occlusion on Blood Pressure Responses

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(Paper relationships reported)

Group IV muscle afferent feedback from the respiratory and locomotor muscle afferents (via inspiratory loading (IL) or subesybolic circulatory occlusion (CUFF), respectively) augments the blood pressure response during exercise. However, it is unknown if the combination of IL and CUFF (IL+CUFF) results in a greater blood pressure response than observed with IL or CUFF. PURPOSE: To compare the blood pressure responses with IL, CUFF and IL+CUFF during exercise in healthy adults. METHODS: Nine adults (6M/3W; 29±6 yrs; BMI: 27±4 kg/m2) were recruited. Participants performed four 10 min cycling exercise bouts at 40% peak oxygen uptake. For each exercise bout, the first 5 min consisted of spontaneous breathing (SB); the second 5 min consisted of voluntary hyperventilation (i.e. breathing frequency of 40 breaths per min with 50% duty cycle) with IL (50% maximum inspiratory pressure), CUFF (80 mmHg), IL+CUFF or no intervention (CTL) in randomized order. Systolic and diastolic blood pressure (SBP and DBP, respectively) were measured using manual sphygmomanometry. MAP was calculated as (SBP+DBP)/3. RESULTS: Compared to SB, MAP and SBP were greater with CTL, IL, CUFF and IL+CUFF (all, p<0.01). During the second 5 min of exercise, there were differences across all conditions in MAP (CTL: 93±11; IL: 100±10; CUFF: 107±10; IL+CUFF: 113±11 mmHg) (all, p<0.01). During the second 5 min of exercise, there were significant differences across all conditions in SBP (all, p<0.01) except IL was not different than CUFF (p<0.09) (CTL: 134±20; IL: 144±20; CUFF: 150±22; IL+CUFF: 150±23 mmHg). During the second 5 min of exercise, there were significant differences across all conditions in DBP (all, p<0.01) except no differences existed between CUFF and IL+CUFF (p>0.15) (CTL: 73±8; IL: 79±8; CUFF: 86±6; IL+CUFF: 89±7 mmHg). CONCLUSIONS: These data demonstrate that combined stimulation of respiratory
and locomotor muscle afferent feedback results in a greater blood pressure response than either alone. These findings have important implications for populations that exhibit exaggerated locomotor and respiratory muscle reflexes (e.g., heart failure).

**PURPOSE:** To test the hypothesis that reactive oxygen species (ROS) and protein kinase B (AKT) are signaling molecules involved in the protective effect of PO2 cycling during reoxygenation in smoking-induced COPD mice. METHODS: To develop COPD symptoms, male C57BL/6 mice were exposed to cigarette smoking for 2 hr per day, five days a week for three consecutive months. The smoking mice were then sacrificed, and their diaphragm was dissected out for muscle function analysis. Each muscle strip was mounted in a contractile chamber treated with 5 cycles of PO2 cycling or with the respective inhibitors for ROS (Tiron, 1 mM; N-acetyl cysteine, NAC, 1 mM; n = 7) or AKT (MK-2206, 50 μM; n = 5) for 30 min before PO2 cycling. Muscle was then switched to hypoxia for 30 min, followed by 15 min of reoxygenation. In the middle of reoxygenation (5-10 min), each muscle strip was electrically stimulated for five min using square-wave electrical pulses (70 Hz, 250-ms train duration, at 30 V) at 37 °C. Muscle force was recorded and end contractile force during the 5-min contraction was normalized by the maximal baseline force of reoxygenation. In the middle of reoxygenation (5-10 min), each muscle strip was cycles of PO2 cycling were normalized by the maximal baseline force of reoxygenation. In the middle of reoxygenation (5-10 min), each muscle strip was cycles of PO2 cycling were normalized by the maximal baseline force of reoxygenation.

**RESULTS:** In smoking-induced COPD mice, we suggest that PO2 cycling can improve the diaphragmatic function during reoxygenation potentially through the intracellular signaling of ROS and AKT.

**CONCLUSIONS:** Inhibition of either ROS or AKT abolished such protective effects on diaphragm (11 ± 2.5% for PO2 cycling vs. 8 ± 1.5% for control, p < 0.05). However, inhibition of either ROS or AKT abolished such protective effects on diaphragm (11 ± 2.5% for PO2 cycling vs. 8 ± 1.5% for control, p < 0.05). However, inhibition of either ROS or AKT abolished such protective effects on diaphragm (11 ± 2.5% for PO2 cycling vs. 8 ± 1.5% for control, p < 0.05). However, inhibition of either ROS or AKT abolished such protective effects on diaphragm (11 ± 2.5% for PO2 cycling vs. 8 ± 1.5% for control, p < 0.05). However, inhibition of either ROS or AKT abolished such protective effects on diaphragm (11 ± 2.5% for PO2 cycling vs. 8 ± 1.5% for control, p < 0.05). However, inhibition of either ROS or AKT abolished such protective effects on diaphragm (11 ± 2.5% for PO2 cycling vs. 8 ± 1.5% for control, p < 0.05). However, inhibition of either ROS or AKT abolished such protective effects on diaphragm.

**Supported by 4-V A grant**

**Conclusions:** These findings have important implications for populations that exhibit exaggerated locomotor and respiratory muscle reflexes (e.g., heart failure).
WEDNESDAY, MAY 29, 2019

### Elbow Pain in an Adolescent Pitcher

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(No relevant relationships reported)

**HPI**

Patient is a 16 year old right-hand dominant male baseball pitcher with past medical history of partial tear of the right UCL and OCD of the right lateral trochlea managed with casting 9 months prior. He presented to our clinic with insidious onset right posterolateral elbow and arm pain 2 months after returning to pitching in summer baseball in May. He described sharp pain in the right lateral elbow with radiation into the posterolateral arm exacerbated with push-ups and bench press. He noticed a painless popping sensation with elbow extension, but denied weakness or sensory changes. The pain was not specifically associated with baseball or pitching and was different from his previous pain.

**PHYSICAL EXAM**

Mild tenderness at right common extensor tendon origin worsened with 5 push-ups and improved with rest. Mild tenderness at right posterolateral triceps border. Slight weakness of the right triceps with pain. Varus and valgus stress caused no pain, but there was asymmetry with minimally increased laxity during valgus stress on the right. Negative extensor wad stress tests including Cozens, middle finger extension and Mills. No pain with flexor-pronator stretching. No pain with resisted pronation or supination.

**DIFFERENTIAL DIAGNOSIS**

1. Triceps tendinitis
2. Lateral epicondylitis
3. Radial nerve irritation
4. OCD radio capitellar joint
5. Intraarticular loose body
6. Stress reaction/stress fracture distal humerus
7. Bony tumor/infection

**TEST AND RESULTS**

Right elbow non-contrast MRI- Bone marrow edema within the olecranon and distal humerus medially as a result of stress reaction from excessive valgus stress. Thickening of the UCL. Healed osteochondral lesion of the right elbow trochlea.

**FINAL DIAGNOSIS**

Valgus overload stress injury to distal humerus

**TREATMENT AND OUTCOMES**

3 months of rest from pitching followed by throwing progression via a pitching rehabilitation program. The program consists of focused strength training (RTC, scapular stabilizers) followed by normalizing throwing mechanics with gradual return to pain free baseball. We discussed with the patient the harmful effects on single sports athletes, particularly pitchers. We recommended he watch his pitch counts closely in the future (he admitted he hadn’t been doing that) and take at least 2 months off of baseball during the year.

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**Medial Elbow Pain - Recreational Athlete**

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(No relevant relationships reported)

**HISTORY:** 22-year female recreational athlete with history of left elbow pain following a fall on outstretched arm during a running/cutting activity. She noted immediate local pain of 7/10 on VAS and swelling of the medial elbow and forearm. She was unable to fully extend the elbow.

**PHYSICAL EXAMINATION:** Edema was noted at the medial elbow, extending into the medial forearm. Palpation of soft tissues, tendon and bony structures revealed significant point tenderness at the medial joint space and at the medial epicondyle. Limited active ROM with extension was noted due to pain. Valgus stress test was positive, with significant discomfort upon moderate loading. Due to significant pain complaints, further physical examination was suspended and clinician progressed to point-of-care ultrasound imaging of the medial elbow complex.

**DIFFERENTIAL DIAGNOSIS:**

1. Medical Collateral ligament sprain
2. Medial Collateral ligament disruption
3. Common Flexor Tendon Pathology
4. Pronator Teres Strain
5. Medial epicondyle avulsion fracture
6. Biceps tendon musculature, including the flexor/pronator group as an active stabilizer against valgus forces.

Patient was symptom-free at 4 months following injury, and ultrasound imaging revealed reduced valgus joint gaping. This case presentation illustrates the utility of ultrasound imaging in diagnosing MCL pathology, especially when physical examination is limited due to patient discomfort, and further illustrates the successful conservative management of a full thickness MCL tear.

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**Acute Bilateral Elbow Pain In a College Volleyball Player**

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(No relevant relationships reported)

**History:** A 19 year old college volleyball player presents to the athletic training room with chief complaint of bilateral elbow stiffness and swelling for one day. Her evaluation in the training room revealed mild decrease in elbow extension bilaterally with pain at terminal elbow extension. She was observed and treated conservatively with NSAIDS, compression wraps, over a two day period. Elbow swelling improved initially then began to track down the forearm. After day 2 of observation she continued to have muscle soreness and swelling. She denied abdominal pain, changes in urine color or decreased urine output. She was sent to the Urgent Care for further evaluation of her symptoms.

**Physical Exam:** Vital signs were normal during training room visits. Initial exam revealed tenderness to palpation over the flexor and extensor masses of the elbow as well as mild swelling. She had a slight decrease in active and passive elbow extension bilaterally and she exhibited pain at terminal elbow extension bilaterally. Flexion was preserved.

**DIFFERENTIAL DIAGNOSIS:**

1) Delayed Onset Muscle Soreness
2) Epicondylitis
3) Valgus Extension Overload
4) Olerucron Stress Fracture
5) Rhabdomylolysis
6) Exertional Compartment Syndrome
7) Olecranon Fissitis

**Tests:** CBC was within normal limits. Electrolytes were within normal limits. Creatinine showed mild elevation. CPK was significantly elevated at 40,000 U/L

**Final Working Diagnosis:** Rhabdomylolysis

**Treatment and Outcomes:** The patient was admitted the hospital for a 4 day period for IV fluids and observation. Over the course of her hospitalization her CK levels were trended and she was released after CK levels were below 5,000 U/L. Her PCP continued to trend Creatinine levels after she was discharged and they continued to trend downwards. Two weeks after discharge she started on a 3 week gradual return protocol and she remained symptom-free. Follow up labs were drawn prior to her first match and showed only mildly elevated CK (230 U/L) with normal creatinine and GFR. She has been participating in matches at full capacity and remains asymptomatic.
Upon multiple attempts to elicit an injury mechanism, there was no single, discrete
for evaluation of a two month history of left mid-thigh tightness, discomfort and bulge.

HISTORY: A 14-year-old adolescent volleyball, baseball, and soccer athlete presents
Mark F. Riederer, C.S. Mott Children’s Hospital/University of Michigan, Ann Arbor,
Atraumatic left thigh mass in an adolescent multisport athlete

MANAGEMENT OF A 58-YEAR OLD CROSSFIT ATHLETE WITH ELBOW PAIN USING MYERS FASCIAL LINES

M. L. Pfieffer, DC, CCS, ATC, Voodoo Chiropractic, Nashville, TN

ABSTRACT

HISTORY: 58 y/o male recreational CrossFit athlete presented with insidious left lateral elbow pain, progressing over several weeks and exacerbated by pull-ups and overhead barbell movements.

CLINICAL EXAMINATION: Patient had mild tenderness over the left lateral epicondyle, as well as moderate tenderness and increased tone in extensor group muscles. Gripping increased left elbow pain. No strength or neurological deficits were noted. MRI’s Test was negative. Coen’s Test was positive for pain over the lateral epicondyle. DIFFERENTIAL DIAGNOSES: 1. Lateral Epicondylitis 2. Radial Tunnel Syndrome TREATMENT & RESULTS: Manual therapy to the forearm extensor group decreased local muscle tension, but had to little to no effect on elbow pain following three visits. Stretching, contour, and rest did not positively impact pain. Referencing the Myers Functional and Arm Lines, treatment of the thoracolumbar junction and right hip region by cupping, dry needling, and spinal adjustment were performed with noticeable improvement noted after the fourth visit. Following another similar treatment, the patient’s condition resolved. FINAL DIAGNOSIS: Elbow pain secondary to fascial restriction along Myers Functional & Arm Lines DISCUSSION: Little has been published regarding the role of fascial lines in diagnosis or treatment of orthopedic injuries. Since local treatment appeared ineffective, looking elsewhere in the biomechanical chain was necessary. Both provocative movements increase lumbar extension if done improperly, creating compensatory dysfunction. Therefore, shoulder & thoracic mobility and core stability were also addressed to prevent future injury. While other factors may have contributed, it appears releasing seemingly unrelated fascial restrictions noticeably impacted the results.

A-24 Clinical Case Slide - Hip and Thigh II

Wednesday, May 29, 2019, 9:30 AM - 11:30 AM
Room: CC-306

Chair: Andrea Stracciolini, FACSM. Children's Hospital Boston, Boston, MA.

Discussant

Angela Smith, FACSM. Nemours Children's Health System, Bryn Moyer, PA.

Discussant

Robert E. Sallis, FACSM. Kaiser Permanente Medical Center, Fontana, CA.

Atraumatic Left Thigh Mass In An Adolescent Multi-sport Athlete

Mark Riederer. C.S. Mott Children's Hospital, Ann Arbor, MI

Atraumatic left thigh mass in an adolescent multisport athlete

Mark F. Riederer, C.S. Mott Children's Hospital/University of Michigan, Ann Arbor, MI

HISTORY: A 14-year-old adolescent volleyball, baseball, and soccer athlete presents for evaluation of a two month history of left mid-thigh tightness, discomfort and bulge. Upon multiple attempts to elicit an injury mechanism, there was no single, discrete

injury that he can recall. He experiences some tightness when running. He denies feeling weak in the hip or knee. He denies any bruising. He can feel a hard mass in the location of his symptoms.

PHYSICAL EXAMINATION: He has a normal gait without limp. There is no visible swelling, bruising or deformities of the left thigh. Approximately over the mid to superior quadriceps there is an area of approximately 4 cm x 3 cm that is slightly indurated, non-tender but the patient reports it is uncomfortable to palpate. There is no fluctuation. There is no limitation or pain with active and passive range of motion at the knee or hip. Hip flexion and knee extension strength are a 4/5 without pain with resistance. The remainder of the physical examination is non-contributory.

DIFFERENTIAL DIAGNOSIS:

1. Quadriceps strain
2. Myositis ossificans
3. Quadriceps hematoma
4. Lipoma
5. Occult tumor

TEST AND RESULTS:

Initial imaging included plain radiographs, which did not show any acute or chronic osseous abnormalities. The soft tissues appear normal. Musculoskeletal ultrasound demonstrated a large hypoechoic defect within the rectus femoris muscle. An MRI showed a full-thickness tear of the indirect muscle of the rectus femoris, with a 1.5 cm craniocaudal gap/retraction of the indirect muscle at the myotendinous unit.

FINAL/WORKING DIAGNOSIS:

Full-thickness tear of the indirect head of the left rectus femoris tendon with retraction of the myotendinous unit

TREATMENT AND OUTCOMES:

Due to the fact that the patient was not very symptomatic, we recommended a trial of non-operative management. This included rest from sports and physical therapy to work on strengthening. Displeased with this plan, the family sought a second opinion from the team physician for a local Division I college volleyball team. In a telephone follow up conversation with the patient’s mother, the team physician also recommended non-operative management.

Thigh Pain In A Multi-sport Youth Athlete

Aloiya R. Earl, Brett C. Bentley, Earl R. Stewart. The University of Alabama, Tuscaloosa, AL

Thigh pain was worse with running and jumping. He did not have nocturnal pain, weight loss, or night sweats. Of note, he had an identical presentation about 8 months prior to his contralateral thigh which was diagnosed as an compression-sided stress fracture of his left femoral neck and treated conservatively. EXAM: Afebrile. Well-appearing. Limping gait. Lumbar spine exam WNL. Bilateral knee exam WNL. Left hip exam WNL. On exam of his right hip, he had tenderness diffusely in his proximal anterior and lateral thigh and over his AIIS. He had full hip ROM but with pain at the extremes of flexion, IR, and ER. Strength of LLE WNL. Strength of RLE limited to 4/5 with hip abduction and hip flexion due to pain. Seated and supine log roll positive for pain. Unable to perform a single-leg hop on his right side. He had pain with bowing of his femur. Neurovascular examination of bilateral LE WNL. DDX: Acute synostosis, stress fracture, Legg-Calve-Perthes disease, SCFE, pathologic fracture RESULTS: XR pelvis 10/10/18: No apparent osseous abnormality. MRI right hip 10/11/18: Edema within the medial femoral neck, most likely stress-related. 10/15/18 CMP, PTH, TSH, Vit D: WNL. FINAL/WORKING DIAGNOSIS: Compression-sided stress reaction of the right femoral neck, which was his second stress injury within 8 months, the first being in his left femoral neck. TREATMENT/OUTCOME: The patient was treated for his second stress injury with conservative management again. He was instructed to be NWB with crutches for 6 weeks, after which he would have a follow up visit and if doing well clinically and radiographically, would progress to partial protected weight bearing and formal PT to transition back to sport. Given his normal lab worpkup, he was also referred to an orthopedic hip specialist to evaluate for possible biomechanical contributions to abnormal stress through the femoral neck or connective tissue disorders. His sports schedule was reviewed. Multi-sport participation was encouraged, but with a 3-month consecutive break during the year.
**HISTORY**
A 78-year-old female triathlete presented to clinic to follow-up on injuries sustained during a cycling accident. Evaluation in the ED on the day of injury showed facial bone fractures and small peripheral parenchymal hematomas in the right frontal and temporal lobes for which she had follow-up scheduled. In clinic two days later, she complained of pain and bruising over her right hip. She was diagnosed with an abrasion and contusion of the right hip and treated with ice and NSAIDs. She returned four weeks later with worsening right hip pain, described as constant, throbbing, non-radiating, and worse with weight-bearing. It was associated with swelling and a tender mass that had developed subacutely over the right hip. She denied fevers or chills.

**PHYSICAL EXAMINATION**
Vitals were normal at both visits. Initial exam of the right hip showed a large abrasion, mild ecchymosis, and tenderness. She had full range of motion without pain or edema. She also had normal balance and gait. Four weeks later, the right hip had a 15 x 17 cm, warm, tender mass over the lateral aspect of the thigh, without erythema. FABER and FADIR were negative, and muscle strength, pulses, and sensation were normal. The abrasion was well-healed. **DIFFERENTIAL DIAGNOSIS**
1. Hematoma
2. Contusion
3. Bursitis
4. Abcess
5. Neoplasms

**TESTS AND RESULTS**
CBC was normal. Radiographs of right hip were negative for fracture or soft tissue abnormalities. MRI of the right lower extremity showed a heterogeneous fluid collection measuring 22 x 4 x 6 cm (H W D, 528 cc) overlying the right hip with small internal foci of hemorrhage/debris, and peripheral rim enhancement without any areas of internal enhancement. **FINAL WORKING DIAGNOSIS**
1. Hamstring Tendinopathy

**TREATMENT AND OUTCOMES**
The patient underwent decompression and irrigation of the lesion. He responded well to physical therapy and was able to slowly reintroduce sport specific activities over the next month without recurrence of pain. His deformity has reduced significantly in size.

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**HISTORY**
A 53-year-old male reports to physical therapy with L posterolateral thigh pain. Three years prior, pt’s spring ligament popped and required surgical reconstruction. During the patient’s surgery, he had a nerve block to the lateral hamstring. Patient completed necessary therapy and attempted to return to exercise. Following attempts at exercising, patient reported sporadic symptoms of leg weakness. Patient has had two normal nerve conduction tests as well as normal MRI of the back, knee, and hip. At initial evaluation, patient is unable to bike or run, and describes symptoms of localized weakness and achiness post-exercise.

**PHYSICAL EXAMINATION**

**DIFFERENTIAL DIAGNOSIS**
1. Distal Peripheral Nerve Entrapment
2. Hamstring Tendinopathy
3. Mechanical Dysfunction

**TESTS AND RESULTS**
Neural Tissue Testing:
- Positive slump test
- Painful arc of motion: Patient had symptoms at 40 degrees short of vertical that dissipate once patient’s leg was lifted to 35 degrees
- Positive straight leg testing
- Reflexes were within functional limits

**FINAL WORKING DIAGNOSIS**
Distal peripheral nerve entrapment of mechanical nature.

**TREATMENT AND OUTCOMES**
- 4 weeks of running/biking
- 36 lbs at 3 weeks
- Return to running at 2 weeks
- 37 lbs at 4 weeks

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**HISTORY**
Patient is a 14 year old male who presented to sports medicine clinic for evaluation of three weeks of right quadriceps pain that began while running during baseball practice. He was initially prescribed physical therapy for a presumed right quadriceps strain but on follow up two months later he continued to have pain with activities as well as a deformity in his right thigh that was growing in size.

**PHYSICAL EXAMINATION**
On exam patient was well appearing, his right quad had no erythema or ecchymosis. He had a palpable mobile mass in the mid-thigh that was nontender to palpation but protruded with resisted knee extension. The remainder of the quadriceps muscle belly was nontender. His lower extremity strength and sensation were preserved.

**DIFFERENTIAL DIAGNOSIS**
1. Quadriceps tear with retraction
2. Normal anatomic variant
3. Fascial herniation
4. Soft tissue mass

**TEST AND RESULTS**
- XRAY Right Femur: No acute fracture
- MRI Right Femur: Contrast: Grade 1 strain of rectus femoris muscle at the myotendinous junction, suggesting intramuscular degloving mechanism.

**FINAL WORKING DIAGNOSIS**
Rectus Femoris intramuscular degloving injury

**TREATMENT AND OUTCOMES**
The patient continued to work with physical therapy and was able to slowly reintroduce sport specific activities over the next month without recurrence of pain. His deformity has reduced significantly in size.
3. Patient about 7 days after surgical intervention, patient advised by surgeon to begin work with physical therapy to wean off crutches and out of brace to work on knee ROM and quadriceps activation.
4. Pathology results pending at this time.

A-25 Clinical Case Slide - Knee I

Wednesday, May 29, 2019, 9:30 AM - 11:10 AM
Room: CC-105B

126 Chair: William W. Dexter, FACSM, Maine Medical Center, Portland, ME.
(No relevant relationships reported)

127 Discussant
Bryan Wiley, Kaiser Permanente, Rancho Cucamonga, CA.
(No relevant relationships reported)

128 Discussant
Beverly C. Land, FACSM, US Army Retired, Fairfax, VA.
(No relevant relationships reported)

129 May 29 9:30 AM - 9:50 AM
Knee Pain - Baseball
(No relevant relationships reported)

HISTORY: A 12-year-old male presents to ER for left knee pain and swelling. Onset of knee pain was 2 months prior and he began to complain of intermittent swelling over the last 3-4 weeks prior to this initial visit. There was no reported history of trauma or injury. Pain worsened with activity and was localized to his anterior knee and medial joint line. NSAIDs and a knee brace did not alleviate his symptoms. He denied any associated knee instability, popping, locking or patellar instability. Neurological signs and symptoms were absent. Review of systems was otherwise negative. PHYSICAL EXAMINATION: Examination revealed a moderate sized left knee effusion with tenderness to palpation around the patella and medial joint line. There was no ecchymosis or erythema. Strength exam was normal. Knee range of motion was decreased in both flexion and extension secondary to swelling. There was pain on patellofemoral grind test with a negative patellar apprehension test. He had a negative Lachman and McMurray test. Anterior and posterior drawer tests were also negative. No ligament laxity was appreciated with varus or valgus stress testing. Examination of the contralateral knee was normal. He was otherwise well appearing with a normal gait. DIFFERENTIAL DIAGNOSIS: 1. ACL tear 2. Menisecus tear 3. Fracture 4. Juvenile idiopathic arthritis
5. Osteochondritis dissecans
6. Eypeumatolysis of the left distal femur with intraosseous and subperiosteal abscesses
7. Osteomyelitis.

TREATMENT AND OUTCOMES:
1. Emergent vascular surgery with ligation of L popliteal artery and repair of transected L popliteal artery with reverse saphenous vein interposition graft.
2. Diagnostic angiogram: Cut-off of popliteal artery at level of knee, unable to cross with stent.
3. Distal femur fracture
4. Lateral collateral ligament rupture
5. Tibial plateau fracture
6. Tibial plateau fracture
7. Distal femur fracture

DIFFERENTIAL DIAGNOSIS:
1. Knee dislocation with vascular compromise and peroneal nerve injury
2. Anterior cruciate ligament tear
3. Posterior cruciate ligament tear and posterolateral corner injury
4. Lateral collateral ligament rupture
5. Menisecus tear
6. Tibial plateau fracture
7. Distal femur fracture

TEST AND RESULTS:
- CRP: 9.8
- CBC: WBC 5.9, Hgb 10.5, Hct 32.2, Platelets 101,000.
- CT angiogram LLE: Popliteal artery severe stenosis at level of tibial plateau. Comminuted medial tibial plateau fracture.

FINAL WORKING DIAGNOSIS:
Left knee dislocation with popliteal artery rupture and left medial tibial plateau fracture.
6. 4 months post-injury, ambulating.
7. 8 months post-injury, referred to peripheral nerve surgery specialist for decompression of L common peroneal nerve at fibular head, and excision of posterior and anterior crural intermuscular septae.

**132** May 29 10:30 AM - 10:50 AM **Postoperative Knee Complication - Soccer**
Kathleen Maguire, Lyle Micheli, FACSM. Boston Children's Hospital, Boston, MA. (Sponsor: Lyle Micheli, FACSM) (No relevant relationships reported)

**History:** 17 year old female status post left ACL reconstruction with hamstring autograft presents one week after surgery with pain and swelling over posteroomedial knee. A blood blister was noted and drained. She started on Keflex to prevent superficial wound infection. The following day she returned in exquisite pain with skin discoloration and formation of a collection over the posteroomedial knee. This was presumed to be an infected hematoma and she was taken to the operating room for a posturgical knee washout.

**Physical Examination:** Examination noted an abscess at the popliteal fossa medially with surrounding erythema. The area over this collection was warm and tender to touch. The patient had no calf pain or swelling.

**Differential Diagnosis:**
1. Hematoma
2. Knee infection, bacterial or fungal
3. DVT
4. Contact dermatitis
5. Hemophagocytic lymphohistiocytosis (HLH)
6. Stil's disease
7. Pyoderma gangrenosum
8. Behcet’s

**Tests and Results:**
1. Single OR tissue culture positive for s. hominis and p. acnes early in hospital course, subsequent OR cultures negative for growth
2. Multiple blood cultures negative for growth
3. OR tissue biopsy shows marked neutrophilic infiltrate and abscess formation, clinically consistent with pyoderma gangrenosum (PG)

**Final Working Diagnosis:** Pyoderma gangrenosum

**Treatment and Outcomes:**
1. Surgery: 19 combined orthopedic and plastic surgery procedures including irrigation and debridement, wound V AC changes, and skin grafting of left knee
2. Infectious Disease (ID): Multiple courses of antibiotics for presumed left knee postoperative infection. Antibiotics discontinued once PG diagnosis was established
3. Hematology: PICC related DVT treated with anticoagulation, anemia managed with transfusions
4. Rheumatology/Dermatology: Due to the patient’s highly elevated inflammatory markers, coagulopathy, anemia, and repeated procedures without significant detectable pathogenic organism, there was concern for an immune-mediated systemic inflammatory response. OR tissue biopsy supported this diagnosis. The patient was started on prednisone and Anakinra and the antibiotics were discontinued
5. She completed her course of anticoagulation, weaned off steroids and immunosuppressive medication and has had no recurrent symptoms

**133** May 29 10:50 AM - 11:10 AM **Unexpected Knee Pain in a Young Field Hockey Player**
Terrence Tsui, John Herbert Stevenson. University of Massachusetts, Worcester, MA. (Sponsor: Pierre Rouzier, FACSM) (No relevant relationships reported)

**HISTORY:** A healthy 12-year-old female field hockey player presented with 2 weeks of left knee pain that began while she was running in a straight line going into a game. She denied trauma to her knee and did not previously have knee pain. She suddenly felt a severe sharp pain localized to her proximal tibia and had trouble ambulating due to pain. She took ibuprofen, iced, and rested for a few days and was able to ambulate with minimal pain afterwards. She tried returning to practice but still had significant pain with running and stairs so was referred to sports medicine clinic by her PMD for further evaluation. Denied knee swelling, buckling, and locking. Denied numbness and tingling in her leg.

**PHYSICAL EXAMINATION:**

Left knee exam: Full ROM, 5/5 strength in knee flexion and extension, negative effusion, TTP immediately medial to the tibial tuberosity and over the medial tibial plateau, negative varus/valgus stress test, negative anterior and posterior drawer test, negative Lachman's test, negative McMurray's test, negative patella facet tenderness, negative grind test.

**DIFFERENTIAL DIAGNOSIS:**

Osgood-Schlatter disease
Pes anserine bursitis
Salter-Harris fracture
Tibial plateau stress fracture
Proximal tibial fracture
Bone contusion

**TESTS AND RESULTS:**

Labs: Vit. D 25-OH level low, normal PTH and TSH levels
Left knee X: No acute fracture or other osseous abnormality detected
Left tibia/fibula: No acute fracture or other osseous abnormality detected
Left knee MRI: Transverse undisplaced fracture of the proximal tibial metaphysis. DEXA scan: WNL

**FINAL WORKING DIAGNOSIS:**

Left knee pain secondary to a transverse undisplaced fracture of the proximal tibial metaphysis.

**TREATMENT AND OUTCOMES:**

Non-weightbearing with crutches for 6 weeks, PT Ice and acetaminophen for pain
Vit. D supplementation

Improvement in pain at 3 week FUV and complete resolution of pain at 6 week FUV Started weight-bearing after 6 week FUV with gradual increase in weight-bearing activities and eventually back to field hockey

**A-26** Rapid Fire Platform - Biomarkers in Sport, Performance and Health

**Chair:** William Byrnes, FACSM. University of Colorado Boulder, Boulder, CO. (No relevant relationships reported)

**134** May 29 9:30 AM - 9:40 AM **Relationship Between Hepcidin, Interleukin-6, And Ferritin In Division-I Cross-country Runners Over A Competitive Season**
Jesse A. Goodrich1, Sewan Kim1, Dillon J. Frisco1, Kimberly Detwiler1, Miguel Rueda1, Sourav Poddar2, William C. Byrnes, FACSM1.1University of Colorado Boulder, Boulder, CO. 2University of Colorado Denver, Denver, CO. (Sponsor: William C. Byrnes, FACSM)

Email: jesse.goodrich@colorado.edu (No relevant relationships reported)

Iron deficiency, which can be assessed by the iron storage protein ferritin (fer) can negatively affect athletic performance. We have previously observed that Division 1 cross country (XC) runners have fer levels that are at the low end of normal ranges despite being iron supplemented. The hormone hepcidin and the cytokine/myokine interleukin-6 (IL6) can both influence iron regulation but have not been evaluated in this population.

**Purpose:** The purpose of this study was to determine how hepcidin and IL6 change over a season in DI XC runners and determine whether changes in these parameters were related to changes in fer, hemoglobin concentration (Hb) or hematocrit (Hct).

**Methods:** 45 athletes (25 female, 20 male) were recruited from the University of Colorado DI XC team in the fall of 2017. Fasted blood samples were collected in October (before NCAA XC championships), January, and March (during the outdoor track season). Blood samples were analyzed for Hb, Hct, fer, IL6 and hepcidin. All runners were provided with oral iron supplements from a certified nutritionist during the season.

**Results:** All biomarkers remained stable across the season except Hb, which was significantly higher in March. In males vs. females, there were no differences in hepcidin (24 ± 11 vs. 21 ± 11 ng/mL; p > 0.05) or IL6 (16 ± 21 vs. 12 ± 24 pg/mL; p > 0.05). When compared to females, males had higher fer (64 ± 33 vs 47 ± 24 ng/mL; p < 0.05) (48 ± 22 vs 44 ± 3%; p < 0.001), and Hb (16.3 ± 0.7 vs 14.8 ± 0.8 g/dL; p < 0.01). After controlling for sex, there was a positive relationship between hepcidin and fer (r = 0.47, p < 0.01); 20% of the variability in fer was explained by hepcidin and 51% was explained by individual variability. There were no relationships between IL6 and hepcidin or IL6 and fer.

**Conclusion:** Despite a consistent iron supplementation regime, hepcidin, IL6 and fer do not seem to systematically change across a season in collegiate runners. As expected, hepcidin and fer were positively related, but there were no relationships between IL6 and other measured parameters. Although fer was at the low end of...
normal for both men and women, all other parameters were normal at all time points, suggesting that the normal range of fer for endurance athletes may be lower than the general population.

Patterns Of Change In Proteomic Markers Of Overreaching In Collegiate Swimmers
Amy M. Knab1, David C. Neiman, FACSM2, Arnaud J. Groen3, Artiom Georgiev,4, Alexander Rakitko5, Ariel E. Blount6, McKenzie Stevens1, Lola Bulovtsova7. 1Queens University of Charlotte, Charlotte, NC. 2Appalachian State University, Boone, NC. 3Proteiq Biosciences, Berlin, Germany. 4Lomonosov Moscow State University, Moscow, Russian Federation. Email: knab@queens.edu

Using global proteomic analysis, a previous study identified a panel of proteins that were linked to FOR and were associated with the acute phase response and innate immune system activation in athletes. PURPOSE: The purpose of this study was to track changes in this panel of proteins in 35 swimmers during the course of their normal training cycles during the 2017-2018 competitive season and then identify relationships between protein expression data, external markers of overreaching (such as training distress scale (TDS)) and acute stress and performance.

RESULTS: Thirty-five NCAA Division II swimmers were recruited to the study (male n=19, female n=16; Age 19.1±1.6 y). Every Monday prior to morning practice, athletes provided a blood sample (via fingerpick) using the Volumetric Absorptive Micro-sampling (VAMS) technology. Athletes also reported TDS, illness, and RPE. PURPOSE: Thirty-five swimmers completed the protocol (body fat, males = 12.6±1.5%, females = 22.6±4.5%; VO₂max, males = 55.8±5.10, females = 48.1±6.7 ml/kg/min). 1) GLMM on each protein taking week numbers as factors showed that protein levels after Bonferroni correction and fake test were significant (p-values <0.05) in selected weeks. In the next step, the weeks were labelled based on objective events or no-events (exams, competitions, exams-completions, baseline, no-events). LDA analysis including TDS, RPE and illness data was performed, and this analysis separated the baseline week significantly (p-value 0.000972) from exam weeks and weeks with both exams and competitions. 3) Adding protein expression data enhanced this separation between these groups of weeks (p-value 2.237e-05). 4) Protein expression data without metadata gave clear separation between these groups of weeks (p-value 1.435e-07). We were also able to use protein expression data to predict the week groups with an accuracy of 69-73%. CONCLUSIONS: Protein expression data shows a separation of baseline, exams and exams + competition time frames indicating a distinct physiologic response to external academic and performance stress. Use of protein expression data, albeit so far to a modest extent, to predict stress levels of the swimmers under these circumstances deserves further study.

The Association Between Sonographic Metrics of Shoulder Injury and Serum Biomarker Profile in Response to a Hand-Cycling Task
Prakash Jayabalani1, Dhiruval Amin2, Hyungtaek Kim3, Julia Fream2, Yen-Sheng Lin4, Jennifer Soot Hoot5. 1Shirley Ryan AbilityLab, Chicago, IL. 2Rosalind Franklin University, Chicago, IL. 3Northwestern Feinberg School of Medicine, Chicago, IL. 4Well Cornell Medicine, New York, NY. Email: pjayabalani@sralab.org

CONCLUSIONS: The mean±SD BDNF and IGF-1 concentrations were 15.20±3.96 ng/ml, 25.0±6.9nmol/l, respectively, while VO₂max was 41.1±8.8ml/kg/min, MVCleg 3394±933N, MVCarm 871±216N, push-ups 28±14reps/min, sit-ups 35±12reps/min and exhaustion. Bilateral maximal isometric leg (MVCleg) and arm extension forces (MVCarm) were measured using dynamometers. Muscular endurance tests consisted of repeated 1-min push-ups and sit-ups, while standing long jump assessed muscular power. RESULTS: The mean±SD BDNF and IGF-1 concentrations were 15.20±3.96 ng/ml, 25.0±6.9nmol/l, respectively, while VO₂max was 41.1±8.8ml/kg/min, MVCleg 3394±933N, MVCarm 871±216N, push-ups 28±14reps/min, sit-ups 35±12reps/min, standing long jump 227±26cm. BDNF and IGF-1 correlated weakly with each other.

POURPOSE: Factors that influence individual susceptibility to brain acceleration forces or poor outcomes in brain injury are not well understood. Characterization of molecular variants in athletes engaging a highly competitive contact environment may provide additional insight into factors that influence the longitudinal follow-up of concussive injury and its trajectory. We examined the metabolic phenotype of collegiate football players entering the 2016 National Football League (NFL) draft. The principal aims were to observe and characterize the molecular status of individual athletes and to quantify the prevalence of athletes with multiple concurrent molecular deficits. These will serve as baseline measures, as concussion incidence and trajectory of this cohort of athletes is followed in their NFL careers. METHODS: Blood samples were taken from 30 elite American collegiate football players seven weeks before the NFL scouting combine, and 15 weeks before entering the NFL draft. RESULTS: Of 74 analytes, results revealed me undesirable values in Omega-3 Index (4.6%), AA:EPA fatty acid ratio (29.12), homocysteine (11.4 mol/L), vitamin D (30 mg/ml), and magnesium (4.1 mg/dL). Using reference ranges optimized for athletic performance, no athlete had 0, 1 or 2 abnormalities in blood values; 10% had 3, 40% had 4, and 50% of athletes had 5 undesirable values. CONCLUSIONS: Molecular deficits in this cohort entering the NFL draft appear to be common. Historical evidence exists showing that the molecular deficits observed in this study have mechanistic correlations with concussion trajectory and outcome. A more thorough examination of molecular features that contribute to poor outcomes in concussion may open the door to precision nutrition and clinical countermeasures, not only in football, but in any sport in which acceleration forces to the brain may be present.

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other (r = -0.146, p = 0.003). Linear regression analysis (adjusted for age, smoking and education) revealed that associations between BDNF and physical fitness were weak for VO2max (r = -0.077, p = 0.006) and muscle fitness (r = -0.077, p = 0.095). This was also the case for IGF-1. CONCLUSIONS: The associations between peripheral BDNF, IGF-1 and physical fitness components were weak or non-existent at rest in the present cross-sectional design. Thus, it seems that only exercise-induced elevated values of BDNF and IGF-1 may associate with each other and physical fitness components. Therefore, their interactions should be investigated in future studies during acute and/or chronic exercises.

CONCLUSIONS

1. Cortisol levels increased (49.3 ± 87.3 nmol. L-1, p = 0.02) indicating energy deficiency, increased aerobic performance (mean ± SD of difference); peak power output

2. Energy intake and exercise energy expenditure to calculate energy availability (EA), included pre- and post-intervention assessment of resting metabolic rate (RMR)

3. Cyclists often block periodize their training in micro and meso periods with high training volumes to prepare for competition. The effect of such periods on surrogate markers for Relative Energy Deficiency in Sport (RED-S) have not yet been properly investigated. PURPOSE: To determine how a mesocycle of four weeks of interval training affects RED-S associated surrogate markers and performance variables in well-trained male cyclists. METHODS: Twenty-two participants (age: 33.5 ± 6.6 years, height: 181.4 ± 5.2 cm, weight: 76.5 ± 7.4 kg, VO2max: 63.5 ± 6.6 mL·kg−1·min−1) were recruited for a four-week interval training protocol, consisting of three high-intensity interval training sessions per week with an accumulated work duration of 32 minutes per session. Unlimited low intensity training was permitted. Protocol included pre- and post-intervention assessment of resting metabolic rate (RMR) (ventilated hood), body composition by dual x-ray absorptiometry, blood samples, energy intake and exercise energy expenditure to calculate energy availability (EA), and aerobic- and anaerobic performance. RESULTS: Four weeks of interval training increased aerobic performance (mean ± SD of difference); peak power output [18.5 ± 12.4 W, (p < 0.001)], VO2max [15.5 ± 2.1 mL·kg−1·min−1, (p = 0.005)], and functional threshold power [170 ± 11.8 W, (p = 0.001)] as well as testosterone levels [1.35 ± 2.13 nmol·L−1, (p = 0.011)]. However, triiodothyronine (T3) [0.12 ± 0.18 nmol·L−1, (p = 0.008)], absolute RMR [-52.2 ± 81.4 kcal per day−1, (p = 0.001)], relative RMR [-0.8 ± 1.2 kcal per kg FFM, (p = 0.01)], and RMR Δ-0.03 ± 0.04, (p = 0.01) decreased, and cortisol levels increased (49.3 ± 87.3 nmol·L−1, p = 0.02) indicating energy deficiency, while no changes were observed in body weight or -composition, EA, or insulin and insulin-like growth factor 1 (IGF-1). CONCLUSION: A successive four weeks of intensified training increased performance and testosterone levels in this group of well-trained male endurance athletes, although surrogate markers of RED-S such as decreased RMR, T3 and increased cortisol levels were observed. These results indicate the complexity, and the methodological challenges of assessing and evaluating RED-S in male athletes.

Salivary Biomarkers in College Female Basketball Players during the Late Competition Season

Kevin J. Finn, FACSM1, Jack Ransone, FACSM2, Michaela Martinez2,1. University of Central Missouri, Warrensburg, MO. 2College of William and Mary, Williamsburg, VA. Email: kfinn@ucmo.edu

Week | Testosterone (pmM) | Cortisol (nmM) | SigA | Health Score | Anxiety | Mood
---|---|---|---|---|---|---
1 | Pre | 247.35 (131.34) | 4.49 (1.33) | NA | 7.76 (1.30) | 2.23 (0.83) | 3.08 (0.90)
Post | 229.26 (153.70) | 5.02 (3.07) | 111.84 (88.89) | 7.20 (1.70) | 2.29 (0.84) | 3.21 (0.80)
2 | Pre | 202.34 (129.75) | 7.41 (8.48) | NA | 8.00 (1.62) | 2.07 (0.92) | 3.29 (0.83)
Post | 230.44 (151.49) | 6.05 (4.04) | 92.31 (54.18) | 7.83 (1.34) | 1.75 (0.62) | 3.45 (0.82)
3 | Pre | 222.37 (165.02) | 5.18 (3.68) | NA | 7.73 (1.67) | 1.87 (0.74) | 3.36 (0.63)
Post | 257.36 (126.07) | 4.43 (1.95) | 81.55 (29.45) | 8.27 (1.27) | 1.55 (0.69) | 3.00 (0.45)

None of the salivary biomarkers were significantly different in pre-post comparisons nor across the three weeks. Changes in health scores, anxiety, or mood were not significantly different. Overall the testosterone showed significant correlations with cortisol (r = 0.51), sigA (p = 0.46), and health score (r = -0.31). In addition, cortisol was significantly related to health score (p = 0.24). Health score showed a negative relationship with anxiety ranking (r = -0.30) while no other relationships were evident. Conclusion: The lack of significance between these variables might indicate that these players did not show indication of stress or lack of recovery during this period of competition.

Salivary IgA as a Predictor of Upper Respiratory Tract Infections in Elite Rugby Union Players

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For athletes to optimise their performance, minimising the risk of injuries and illness is essential to reduce the number of training days missed. Upper Respiratory Tract Infections (URTI) are amongst the most common illnesses reported in athletes. An URTI can result in missed training days, which in turn may lead to performance decrements.

PURPOSE: The purpose of this study was to investigate if salivary Immunoglobulin A (sIgA) is a predictor of URTI in elite Rugby Union players.

METHODS: Nineteen male elite Rugby Union players provided morning saliva swabs and completed an illness log documenting symptoms of URTI, bi-weekly (Monday and Friday) over a 10-week training period. Test re-test reliability of sIgA was completed under controlled conditions prior to the study. Multi-level logistic regression was used to analyse the relationship between sIgA and the binary outcome of presence or absence of an URTI.

RESULTS: The results found that a significant decrease in sIgA ([1.000037 (0.000028) beta (SEI), increased the odds of a player contracting an URTI. A player was at a greater risk of contracting an URTI, within the subsequent 2-week period, if sIgA decreased by 65% or more.

CONCLUSION: The results show that sIgA is a useful predictor for determining the likelihood of players contracting an URTI. These results provide coaches with an objective monitoring marker, to help reduce the risk of players contracting an URTI and missed training days, which may lead to performance decrements. These results may assist the coaches and support staff in making evidenced based decisions, where sIgA decreases by 65% or more, by adjusting individual player training load and implementing appropriate recovery strategies to ensure optimisation of training.
Synchronizing cardiac diastole with foot strike during running may maximize the efficiency with which skeletal muscle promotes venous return of blood to the heart. Recent research has found that diastolic stepping results in a lower heart rate (HR) compared to systolic stepping in elite endurance runners. PURPOSE: To assess HR, metabolic responses, and perceived exertion to running when foot strike occurs during either cardiac systole (CS) or cardiac diastole (CD) in non-endurance trained individuals.

METHODS: Eight non-endurance trained participants (7 males; Age: 25 ± 8 yr; BMI: 23 ± 3.2 kg/m²) performed 2, 5-min bouts of treadmill running at a comfortable pace (5.4 ± 0.5 mph) with foot strike occurring during either CD or CS. Participants wore a chest strap that transmitted accelerometer and HR data to a tablet computer with proprietary software. The software generated an auditory beep that was synced with either 45% (CD) or 100% (CS) of each cardiac cycle. Participants were instructed to match their steps to the beeps during both conditions (CD or CS) which wowed in accordance between trials and blinded to the participants. HR, oxygen consumption (VO₂), O₂-pulse, mean ventilation (VE), and respiratory exchange ratio (RER) were recorded continuously and averaged over the last 3 minutes of each condition. Rating of perceived Exertion (RPE) was recorded during the final minute of each condition. Paired t-tests were used to compare the dependent variables between conditions. An α of 0.05 level was used for statistical significance. RESULTS: HR was significantly lower when foot strike occurred during CD compared with CS (163±0.5 vs. 170.1±4.4 bpm; p < 0.05). Furthermore, there was a trend for O₂-pulse to be greater during CD (16.3±1.5 vs. 15.7±1.4 ml/bat; p = 0.07). VE (73.3±5.4 vs. 74.4±4.4 l/min), VO₂ (35.0±1.3 vs. 35.3±1.2 l/kg/min), and RER (10.5±0.7 vs. 10.3±0.8) were not significantly different between CD and CS, respectively. CONCLUSION: During relatively short, steady-state running conditions, synchronization of foot strike with CD results in a significantly lower HR when compared to CS. This may lead to enhanced cardiac filling, which may be beneficial to running performance in non-endurance trained individuals.
Heart rate variability (HRV) is used to guide endurance training prescription but the optimal body position for daily recordings is unclear. PURPOSE: To assess supine and standing HRV associations with aerobic fitness and submaximal exercise heart rate (HRex) responses to an aerobic interval session. METHODS: Healthy young men (n = 8, age = 23 ± 3 years) performed a graded treadmill test for the determination of maximal oxygen consumption (VO\textsubscript{2max}). Over the subsequent 5 days, post-walking measures of supine and standing natural logarithm of the root mean square of successive RR intervals (LnRMSSD) were averaged to establish baseline. Subjects then performed an interval training session consisting of 7 x 3 min of running at 90% of the velocity attained at VO\textsubscript{2max} (vVO\textsubscript{2max}), with two minutes of walking at 4 km/h between sets. Immediately before and 24 h post-interval session, a submaximal exercise test consisting of 3 min of running at 60, 70, 80, and 90% of vVO\textsubscript{2max} was performed with HRex recorded at the end of each stage. HRV measures were recorded the morning after the interval session for comparison to baseline and changes in HRex. RESULTS: VO\textsubscript{2max} ranged from 32.5 - 54.4 ml·kg⁻¹·min⁻¹. Baseline supine LnRMSSD was significantly associated with V0\textsubscript{2max} (r = 0.77, p < 0.03). No differences in supine (4.26 ± 0.57 vs. 4.30 ± 0.70, p = 0.81) or standing (3.26 ± 0.67 vs. 3.26 ± 0.87, p = 0.98) LnRMSSD were observed between baseline and 1 day post-interval session. However, individual changes in standing LnRMSSD were significantly associated with changes in HRex at 60% vVO\textsubscript{2}(r = -0.71, p < 0.05) where those with a decrease in LnRMSSD relative to baseline demonstrated decreases in HRex and vice versa. Additionally, we observed a large, non-significant relationship between VO\textsubscript{2max} and changes in standing LnRMSSD (r = -0.69, p = 0.056) where those with reduced standing LnRMSSD relative to baseline at 24 h post-interval session tended to have lower VO\textsubscript{2max} and vice versa. CONCLUSIONS: These results indicate that standing HRV may provide a better indication of individual exercise responses whereas supine HRV provides a better indication of aerobic fitness level among healthy women.
restiction (BFR) in healthy adults.

METHODS: Twenty-four participants (men 20.63 ± 0.88 yr) were randomly assigned to three groups: resistance exercise without occlusion cuff pressure (CON), occlusion exercise set at 65% resting systolic blood pressure (BFR-L) and resistance exercise with occlusion cuff pressure set at 130% resting systolic blood pressure (BFR-H). Each subject underwent five bouts of 1-minute 30% 1RM resistance exercise with 2-min interval, 5 times a week for 8 weeks. Left ventricular fractional shortening (FS), left ventricular ejection fraction (LVEF), velocity, stroke volume (SV) resistance index (RI), vascular endothelial growth factor (VEGF), vascular endothelial growth factor receptor (VEGF-R) and interleukin-6 (IL-6) were measured. RESULTS: 1. After 8 weeks, compared with AC in BFR-H group (94.42 ± 20.99), AC in the CON group (106.13 ± 18.86) and BFR-L group (108.08 ± 19.22) significantly increased (p < 0.05). 2. After 8 weeks, SBP was increased in the BFR-L group (106.13 ± 18.86) and in the CON group (6.44 ± 0.305mmHg) and the CON group (4.25 ± 0.251mmHg), and the difference was statistically significant (p < 0.05). 3. After 8-week training, compared with the expression of VEGF-R and IL-6 in the CON group (4.67 ± 0.92mmHg), expression in the BFR-L group (711.12 ± 16.88pg/ml, 7.39 ± 1.51pg/ml) and BFR-H group (703.63 ± 15.49 pg/ml, 11.16 ± 0.82pg/ml) significantly increased (p < 0.05). CONCLUSIONS: BFR is beneficial to the improvement of aortic compliance. BFR-L and BFR-H all can cause reduction of DBP after exercise, which can be related to increased secretion of local VEGF and VEGF-R, causing angiogenesis and reducing peripheral resistance.

### Board #9

**Comparing Total Hemoglobin Mass Between Selected NCAA Division I Athletes And Recreationally Active Students**

Sewan Kim, Jesse A. Goodrich, William C. Byrnes, FACSM, University Colorado Boulder, Boulder, CO. (Sponsor: William C. Byrnes, FACSM)

(no relevant relationships reported)

Total hemoglobin mass (tHb) is linearly related to total body mass, however, whether this relationship is altered by lean tissue mass, training or sex remains controversial.

**PURPOSE:** To investigate if lean mass is a more appropriate determinant of tHb compared to body mass across NCAA DI athletes and controls. We will also determine if this relationship is altered by sex and/or training status.

**METHODS:** Nordic (6F & 6M) and alpine (5M) skiers, football players (7M) and recreationally active student controls (9F & 10M) from the University of Colorado Boulder participated. The optimized carbon monoxide rebreathing procedure was used to determine tHb. Body composition was determined via DEXA. Since female athletes were not present in all groups, statistical analyses were performed for males across all groups and a separate comparison was made between female nordic skiers and control groups.

**RESULTS:** The overall correlations of tHb with body mass or lean tissue mass were significant (R² = 0.73 & R² = 0.88), but the positive relationship was stronger when using lean mass (p<0.001).

For males, body mass and lean tissue mass were greater in football with no significant differences between any other group. Football had a greater tHb compared to control and alpine (1067.5 ± 35.6 pg/kg) and in the CON group (6.37 ± 0.25pg/kg). Exercise immediately after 8 weeks, DBP decreased in the BFR-H group (6.44 ± 0.305mmHg) and the CON group (4.25 ± 0.251mmHg), and the difference was statistically significant (p < 0.05). 3. After 8-week training, compared with the expression of VEGF-R and IL-6 in the CON group (4.67 ± 0.92mmHg), expression in the BFR-L group (711.12 ± 16.88pg/ml, 7.39 ± 1.51pg/ml) and BFR-H group (703.63 ± 15.49 pg/ml, 11.16 ± 0.82pg/ml) significantly increased (p < 0.05).

**CONCLUSION:** Lean tissue mass explains a greater amount of variability in tHb compared to total body mass. In males, to examine the effect of endurance training on tHb, it is more appropriate to normalize by lean mass. Additional research is needed when comparing the effects of endurance training between female groups.

### Board #10

**Observation of Heart Rate Variability Response to Collegiate Esports Tournament**

Gunner B. Rhoden, Silvio P. Valladao, Thomas Andre, Damon Cox. University of Mississippi, Oxford, MS

(no relevant relationships reported)

**OBSERVATION OF HEART RATE VARIABILITY RESPONSE TO COLLEGIATE ESPORTS TOURNAMENT**

G.B. Rhoden, S. Valladao, T.L. Andre, D. Cox. The University of Mississippi, Oxford, MS

Heart rate variability (HRV) derives from the intricate relationship of sympathetic and parasympathetic autonomic regulation of heart rate. HRV has been utilized as a marker of stress and recovery in traditional sports, however, to date no investigations examined the HRV response to esports. **PURPOSE:** To determine the HRV response during a competitive live esports tournament in collegiate club sport competitors.

**METHODS:** Male members of the Ole Miss esports team (n=14; age = 19±1.81 years; BMI = 24.1±5.5; sport mean hours per week = 19.8±11.6) participated in the study during a live esports tournament. A pre- and post-HRV measurement of heart rate variability (HRV) (5-minutes each) measures were collected using a Polar H10 HR monitor with the Elite HRv mobile app while seated. Participants were seated for 5 minutes before obtaining pre- and post-HRV measures. For competition HRV measure, recordings for HRv were obtained immediately prior to their esport matches and ended immediately post while remaining seated. For the statistical analyses, One-Way Analysis of Variance (ANOVA) was used for HRMSD, HRINMSD, and R-R intervals. Tukey's post hoc test were used when necessary. Paired-samples t-test were utilized for LE:HF ratio and HF. Results were considered significant at p ≤ 0.05. Results are reported as mean ± standard deviation.

**RESULTS:** R-R intervals during were significantly lower than pre- and post- (pre: 643.64ms ± 138.54ms; during: 465.71ms ± 68.99ms; post: 516.07ms ± 109.98ms, p < 0.002). HF post competition was significantly decreased compared to pre (325.83ms ± 341.81ms vs. 494.55ms ± 526.84ms; p = 0.046). No significant differences were found for RMSSD (pre: 25.67ms ± 17.48ms; during: 15.50ms ± 12.34ms; post: 23.72ms ± 18.07ms; p = 0.223), ln(RMSSD) (pre: 3.00ms ± 0.77ms; during: 2.51ms ± 0.94ms; p = 0.249), or pre and post LF:HF ratio (pre: 4.47 ± 2.96 vs. post: 5.4 ± 3.0; p = 0.260). Changes in LF:HF ratio were not significant. The first investigation to observe the HRv response to a live sport competition. Future investigations should examine differences between esport games and time durations.

### Board #11

**One-Year Changes in Cardiovascular Risk Markers in Police Officers**

Steven E. Martin, Danielle Kravits, Kory Sealy, Karina Wilson, Jason R. Lytle, Sean T. Stanelle, John S. Green, FACSM, Steven F. Crouse, FACSM, Texas A&M University, College Station, TX. (Sponsor: Steven F. Crouse, FACSM)

(no relevant relationships reported)

**PURPOSE:** The present study retrospectively examined one-year changes in certain traditional and non-traditional cardiovascular disease (CVD) risk markers in police officers (n = 84). Subjects were full time police officers employed by a moderate-to-large municipality. **METHODS:** As a part of their annual physical exam, police officers underwent evaluation of several CVD risk markers including body weight, a graded exercise test (GXT; Bruce protocol), pushups completed in 1 minute, situps completed in 1 minute, handgrip strength, body composition (through DEXA), and fasting bloodwork. Maximal oxygen uptake (VO₂max) was estimated using the Foster equation. Resting systolic blood pressure (SBSP) and resting diastolic blood pressure (DBP) were measured before the start of the GXT protocol. Blood analysis was performed by a College of American Pathologists-acknowledged laboratory. All blood samples were analyzed for total cholesterol (TC), triglycerides (TG), high-density lipoprotein (HDL) cholesterol (HDL-C), low-density lipoprotein (LDL) cholesterol (LDL-C), glucose (GLU), LDL particle number (LDLnum), HDL size (HDLsz), small LDL particle number (sLDLnum), small HDL particle number (sHDLnum), and HDL size (HDLsz). All data were analyzed using paired t-tests (p < 0.05).

**RESULTS:** With respect to the fitness testing variables measured, significant increases were noted in pushups performed (4 pushups) and handgrip strength (4.45 kg) while RDBP was significantly increased (5.5 mg/dL) while LDL-C was significantly reduced (8.4 mg/dL). Non-traditional CVD risk markers were also significantly altered. Increases were noted in LDLnum (309 nmol/L), sLDLnum (347 nmol/L), and HDLnum (6.6 umol/L) while reductions in LDLsz (0.5 mm) and HDLsz (0.5 mm) reduced statistical significance. **CONCLUSIONS:** While beneficial changes were noted in several traditional CVD risk markers, unfavorable alterations occurred in the majority of the non-traditional CVD risk markers measured. In addition, these findings support the need for required health and fitness programs for law enforcement personnel.
active muscle mass, therefore, isometric leg exercise (ILX) (large muscle mass) may have greater potential than isometric handgrip exercise (IHGX) (small muscle mass) to evoke PEH. PURPOSE: To determine the impact of a bout of large (ILX) and small (IHGX) muscle mass isometric exercise on post-exercise blood pressure.

METHODS: Twelve healthy males (23.7 ± 3.5yr) completed 3 experimental visits (1 IHGX, 1 ILX, 1 control (rest no exercise)). Blood pressure (systolic and diastolic); SBP and DBP was assessed at baseline and at 15, 30, 45 and 60 min post-exercise or control with an automated sphygmomanometer. Isometric exercise consisted of 4 alternating 2 min isometric contractions (quadriiceps (ILX) or handgrip (IHGX)) at 30% maximum voluntary contraction. Contractions were separated by 1min of rest. Participants completed each condition on a separate day (order counterbalanced).

RESULTS: SBP was lower than baseline at 15 and 45 min post (p=0.013 and p=0.014 respectively); but this did not differ between the control, IHGX and ILX conditions (p=0.256). Control: baseline 110 ± 7.3 mmHg; average post 106.7 ± 8.6mmHg; IHGX: baseline 110 ± 10.3mmHg, average post 107.4 ± 8.3mmHg; ILX: baseline 113.25 ± 11.7mmHg, average post 111.8 ± 11.2mmHg). DBP did not differ from baseline (Baseline DBP: control 69.17 ± 4.4mmHg, IHGX 68.6 ± 7.9mmHg, ILX 72.3 ± 7.4mmHg) at any time point in any condition (p>0.05) However, DBP 15 min post was higher in the ILX (73.4 ± 8.9mmHg) vs. the IHGX (68.3 ± 7.9mmHg) and Control (68.3 ± 8.6mmHg) conditions.

CONCLUSION: PEH did not occur following a single session of either IHGX or ILX suggesting that this type of exercise may not be a potent stimulus for PEH in this population, even when engaging the larger quadriiceps muscle mass. Further research is required to identify the importance of the duration and intensity of isometric exercise on post-exercise blood pressure. Funded by NSERC.

Advancing age is associated with changes in arterial structure and function that contribute to increased blood pressure, pulse pressure and cardiovascular disease risk. Exercise training beneficially moderates these risks. Peripheral Remodeling through Intermittent Muscular Exercise (PRIME) is a novel training approach, involving peripheral focused low-mass high-repetition exercises that imposes a low cardiorespiratory strain. Initiation of structured exercise with PRIME rather than aerobic training (AT) yields superior benefits in functional ability/capacity, in elderly subjects.

PURPOSE: To determine if PRIME, improves hemodynamic and vascular profiles in subjects >70y who are at risk for losing functional independence. METHODS: Seventy-five subjects (52 F; Age: 76±5y) were tested at baseline and after 4 wk (Phase I) of either PRIME or AT. All subjects were then enrolled in an 8-wk of combined AT and resistance training (RT) (Phase II). The change scores for (1) Blood pressure (Brachial-B and Aortic-A), (2) Vascular Stiffness (Wave Pulse Reflection-PWR, and velocity-PWV and Augmentation Index AIX) and (3) Vascular function (Brachial artery flow-mediated dilation - BAFMD), were analyzed. RESULTS: At the end of Phase II, there was a significant time effect for B and A blood pressures (bSBP= -4.37 ± 11.95, bMAP= -2.77 ± 8.69, bDBP= -2.64 ± 8.66, aSBP= -4.13 ± 11.31, aMAP= -2.42 ± 8.31, and aDBP= -1.97 ± 7.40 mmHg, all p<0.05). There was a significant effect for time for BAFMD from baseline (4.35 ± 2.80%) for both interventions after Phase I and Phase II (2.5 ± 3.12 and 6.08 ± 2.56% respectively, p<0.01). There was a group effect in favor of PRIME at Phase I for bMAP (4.66 ± 10.08 vs. -0.35 ± 9.11 mmHg), bDBP (4.08 ± 8.27 vs. -0.49 ± 7.56 mmHg), aMAP (-4.70 ± 10.08 vs. -0.76 ± 8.60 mmHg), and aDBP (-4.32 ± 7.93 vs -0.89 ± 6.86 mmHg) (all p<0.05). No significant changes were noted in PWR, PWV or AIX.

CONCLUSIONS: These findings confirm that exercise training improves hemodynamic profile and vascular reactive variability in individuals >70y. Interestingly, individuals who followed PRIME showed greater hemodynamic benefits at 4 wks. PRIME may represent a novel approach to achieve hemodynamics benefits in individuals with limited cardiovascular function.

Rugby sevens tournaments involve up to six matches within two days, are often held over consecutive weekends and frequently involve travel to and from international venues. The intense physical demands of competition, short recovery time between tournaments and the added stress of international travel warrant further investigation into recovery status monitoring among elite players. PURPOSE: To retrospectively evaluate heart rate variability and athlete self-report measures of recovery status (ASRM) in response to consecutive domestic and international tournaments among an elite rugby sevens team.

METHODS: Olympic-level players (n = 10 males) recorded post-waking natural logarithm (Ln) of the root mean square of successive R-R interval differences (RMS) and ASRM (subjective ratings of Sleep, Energy, Soreness, Recovery and Mood) throughout a 1-week period prior to the domestic tournament to serve as baseline and daily thereafter until 2-days post-international tournament. Daily LnRMS and ASRM parameters were compared with baseline values. Total distance (TD), high speed distance (>18 km h⁻¹), and session rating of perceived exertion (sRPE) were compared between tournaments. The team advanced to the finals on both occasions. RESULTS: Relative to baseline (4.53 ± 0.40), large and moderate effect size reductions in LnRMS (p = 0.02 - 0.07) were observed across the 4-day tournament. Favorable reductions in LnRMS (p = 0.02 - 0.07) were observed across the daytwo of the international tournament (4.05 ± 0.36) and one day post-international tournament (4.06 ± 0.59), respectively. Travel to the international tournament (1650 km) involved an early departure time, missed flight connection and a 3 a.m. hotel arrival,
which negatively affected ratings of LnSleep (2.09 ± 0.06 vs. 1.82 ± 0.35, P < 0.05) and LnEnergy (2.04 ± 0.08 vs. 1.73 ± 0.23, P < 0.05). No differences in TD (3662 ± 967 vs. 4018 ± 973 mm), HS (641 ± 251 vs. 611 ± 191 mm) or sRPE (602 ± 241 vs. 658 ± 277 au) were observed between tournaments (p >0.05). CONCLUSIONS: Decrements in LnRMSD were observed in response to the internal, but not domestic tournament, despite no differences in match-physical demands. Thus, factors separate from competition alone (e.g., travel-related stress) may impact players’ physiological response to a tournament.

178 Board #16
May 29 9:30 AM - 11:00 AM
The Effects of an Intensive Endurance Training Period on Nocturnal HRV and Endurance Performance
Piia Kaikkonen1, Juha Ahlttainen2. 1Tampere Research Center of Sports Medicine, Tampere, Finland. 2Neuromuscular Research Center, Faculty of Sport and Health Sciences, University of Jyväskylä, Jyväskylä, Finland.

(no relevant relationships reported)

PURPOSE: The optimal balance between training load and recovery is essential for the development of physical performance. In the athletic population, relatively good knowledge usually exists of individual tolerance for training. In recreationally training individuals with less training background, the optimal balance may be more difficult to estimate. The main aim of this study was to find out whether a ten-day intensive endurance training period of the non-athletic population is overreaching, and whether the changes in endurance performance can be detected in nocturnal HRV. METHODS: 13 recreationally endurance trained healthy men (25 ± 3 y, 179 ± 6 cm, 79 ± 14 kg, VO2max 43 ± 6 ml/kg/min) participated in two-week baseline training period with two exercises in a week (PRE, 30 min at 70% of Pmax) and a 10-day intensive training period with nine exercises (INT, 30 min at 70% of Pmax). All the exercises on were performed on a bicycle ergometer. Each exercise included a 5-minute warm-up and cool-down (50%Pmax), Maximal aerobic performance test on a bicycle was carried out before and at the end of both training periods. Nocturnal RR-intervals were measured during three consequent nights at the end of PRE and INT. A mean of all three nights was used in the analysis.

RESULTS: Endurance performance improved during the INT (from 294 ± 41 W to 309 ± 41 W, P = 0.006). No change occurred in VO2max (PRE 45 ± 6, INT 46 ± 4 ml/kg/min). Nocturnal HR (PRE 71 ± 9 bpm, INT 71 ± 9 bpm) or RMSD (PRE 50 ± 14 ms, INT 54 ± 21 ms) did not change. Participants were retrospectively divided to higher (RespH) and lower responders (RespL) according to the change (%) in Pmax during the INT. RespH had lower RMSD at PRE (38 ± 4 ms vs. 31 ± 9 ms, P = 0.019) and INT (40 ± 4 ms vs. 53 ± 11 ms, P = 0.043) when compared to RespL. No difference in nocturnal HR or Pmax at PRE was detected between groups.

CONCLUSIONS: A ten-day intensive training period was not overreaching for the recreationally trained young men, as the improvement in endurance performance was consistent regardless of rate. While further investigation is necessary, this data provides evidence that CTA guidelines for heart rate sampling are minimally influenced if taken at longer periods.

A-38 Free Communication/Poster - Monitoring
Wednesday, May 29, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

The Consumer Technology Association (CTA) has guidelines for heart rate that wearable devices should be evaluated second-by-second. However, many investigations in the literature have reported minute-by-minute evaluations. The Consumer Technology Association (CTA) has guidelines for heart rate response to competition alone (e.g., travel-related stress) may impact players’ physiological response to a tournament.

179 Board #17
May 29 9:30 AM - 11:00 AM
Validity And Reliability Of Heart Rate Devices Compared Second-by-second Versus Minute-by-minute
James W. Navalta, FACSM, Gabriela Guzman, Crystal Maxwell, Jeffrey Montes. University of Nevada, Las Vegas, Las Vegas, NV. Email: james.navalta@unlv.edu

(no relevant relationships reported)

The Consumer Technology Association (CTA) has guidelines for heart rate that wearable devices should be evaluated second-by-second. However, many investigations in the literature have reported minute-by-minute evaluations. PURPOSE: To determine whether the interpretation of validity and reliability of three heart rate sensing bras during exercise would be similar if data were evaluated second-by-second versus minute-by-minute. METHODS: Nine females completed 14-min protocols while wearing the Sensoria Fitness biometric sports bra, the Adidas Smart sports bra, or the Berlei sports bra concurrently with the Polar H7 heart rate monitor (criterion measure). The protocol involved 1-min standing rest on the treadmill, 3-min walking warm up, 5-min run, 5-min walk. Participants rested between bouts until heart rate was within 10 bpm of resting. Validity was determined through three methods: Mean Absolute Percent Error (MAPE), Bland-Altman bias and Limits of Agreement (LOA), and Intraclass Correlations (ICC). Reliability was determined through ICC analysis, and significance was accepted at p < 0.05. RESULTS: MAPE, bias and LOA, and ICC for second-by-second and minute-by-minute evaluations are shown in table 1. The reliability ICC values are shown in table 2.

Table 1. Validity of heart rate sensing bras evaluated each second versus each minute.

<table>
<thead>
<tr>
<th>Device</th>
<th>MAPE (Sec)</th>
<th>MAPE (Min)</th>
<th>Bias (Sec)</th>
<th>Bias (Min)</th>
<th>LOA (Sec)</th>
<th>LOA (Min)</th>
<th>ICC (Sec)</th>
<th>ICC (Min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensoria</td>
<td>1.08</td>
<td>0.98</td>
<td>0.17</td>
<td>-0.07</td>
<td>4.78 to 4.84</td>
<td>3.19 to 3.33</td>
<td>0.996</td>
<td>0.998</td>
</tr>
<tr>
<td>Adidas</td>
<td>3.11</td>
<td>3.04</td>
<td>0.44</td>
<td>-0.10</td>
<td>22.63 to -21.76</td>
<td>25.60 to -25.85</td>
<td>0.902</td>
<td>0.955</td>
</tr>
<tr>
<td>Berlei</td>
<td>1.08</td>
<td>4.81</td>
<td>-0.34</td>
<td>0.40</td>
<td>6.93 to -7.62</td>
<td>21.44 to -20.64</td>
<td>0.989</td>
<td>0.911</td>
</tr>
</tbody>
</table>

Table 2. Reliability of heart rate sensing bras evaluated second-by-second versus minute-by-minute.

<table>
<thead>
<tr>
<th>Device</th>
<th>Reliability ICC (Sec)</th>
<th>Reliability ICC (Min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensoria</td>
<td>0.965</td>
<td>0.956</td>
</tr>
<tr>
<td>Adidas</td>
<td>0.864</td>
<td>0.842</td>
</tr>
<tr>
<td>Berlei</td>
<td>0.961</td>
<td>0.955</td>
</tr>
</tbody>
</table>

CONCLUSIONS: The validity measures of MAPE, Bland-Altman bias and LOA, and ICC appear to be minimally influenced by sampling rate. Reliability measures are consistent regardless of rate. While further investigation is necessary, this data provides evidence that CTA guidelines for heart rate sampling are minimally influenced if taken at longer periods.
PURPOSE: To determine if machine learning approaches could be used to improve impact identification from low frequency data collected from wearable sensors (WS) among national ice-hockey team members.

Methods: 23 members of the U.S. National (NTDP) U18 team consented to procedures approved by EMU Human Subjects Committee. Using previously validated impact events identified from data collected at 100 Hz (Impact Processor, Zephyr MD), we used two neural network approaches, autocoder (AE), neural network that can reconstruct inputs of large data sets and multi-layer perceptron (MLP), a neural network that uses non-linear activation of multiple layers of interconnecting nodes as well as support vector machine (SVM) to attempt to improve the identification of impacts from summary data recorded at 1 Hz. A dataset, selected from 8 players with the highest ice time in one game, was comprised of 86 impacts and 8862 samples were used to train the AE. Variables from 1 Hz data used to train the AE included Activity and Peak resultant acceleration as well as Peak and Min accelerations in the Vertical, Lateral and Sagittal planes. The trained AE was then applied to the validated test set from 8 players for 3 games consisting of 409 impacts and 462138 datapoints. Accuracy was determined by F1 score (F1 = 2 * precision * recall / precision + recall), where precision = true positives / (true positives + false positives) and recall = true positives / (true positives + false negatives).

Results: Using only trained AE, 187 true positives, 3299 false positives and 222 false negatives were identified with an F1 score of 0.96. To improve accuracy, AE was used as filter with MLP for classification, which identified 184 true positives, 225 false negatives and only 26 false negatives resulting in an F1 score of 0.594. Finally, using AE filter and the SVM classifier with class weights produced the best results with 272 true positives, 137 false negatives and only 50 false positives and an F1 score of 0.744.

Conclusion: These data show that using autoencoder programating with additional classification (MLP or SVM) impacts can be identified at 1 Hz with relatively high F1 scores in ice hockey using trunk-worn wearable sensors. Finally, using sensor fusion techniques, it is likely impact identification in ice-hockey could be entirely automated.

Additional analyses examined the influence of position and scholarship standings. In this last study, the accuracy of the AE model was much better for walk-on athletes. Player position did not influence TL parameters with changes in neuromuscular performance variables from the CMJ.

PURPOSE: The purpose of this investigation was twofold: 1) to characterize TL across the pre-season and 2) examine the differences in TL per session and CMJ performance across the 5 weeks of pre-season training in NCAA D1 basketball athletes. Additional analyses examined the influence of position and scholarship standings. METHODS: TL was monitored in 14 male athletes during 22 basketball practice sessions over the course of the pre-season. In addition, weekly CMJs were used as an indicator of neuromuscular fatigue and performance. A 3-way (2 X 2 X 5) Repeated Measures Analysis of Variance with Bonferroni post hoc analysis was used to examine differences in the average TL per session each week and differences in the CMJ variables of Flight Time/Contact Time (FT/CT) and Jump Height (JH) across time and between position (Guard vs. Forward/Center) and academic standings (Scholarship vs. Walk-on). Statistical significance was set at p ≤ 0.05. RESULTS: Player load per minute (PL; PL/min) was significantly higher during Week 1 and Week 2 compared to Week 3 (p < 0.05). No significant differences were observed for average PL, high inertial moment analysis (IMA), or Total Jumps per session across the 5 weeks of pre-season (p > 0.05). A significant group X Time interaction indicated Scholarship athletes had greater PL, PL/min, 2 Dimensional PL, High IMA, and Total Jumps compared to the Walk-on athletes. Player position did not influence TL. No significant
differences were observed in FTCT or JH over the 5 weeks of preseason (p > 0.05) or between groups (p > 0.05). CONCLUSION: The present study characterizes the TL demands in collegiate basketball during the pre-season. The average TL per week did not vary across 5 weeks of training, while differences in intensity (PL/min) were evident. While no differences were observed between position groups, there was a significant difference in TL between scholarship and walk-on athletes.

185 Board #23 May 29 9:30 AM - 11:00 AM
Accuracy of Activity Monitors in Measuring Energy Expenditure and Heart Rate During a Gym-based Routine
Veronika Pribyslavska1, Jennifer L. Caputo2, Dana K. Fuller2, Vaughn W. Barry1. 1Arkansas State University, Jonesboro, AR. 2Middle Tennessee State University, Murfreesboro, TN. 3Middle Tennessee State University, Murfreesboro, TN. Email: vpribyslavska@astate.edu

PURPOSE: Two wrist-worn monitors (FBS and GV) and an armband (SWA) were evaluated in measuring energy expenditure (EE) and heart rate (HR) during a gym-based routine. METHODS: Men (n = 21) and women (n = 16) completed a gym-based routine comprised of 15-min stationary cycling (SC), 15-min treadmill running (TR), and 35-min resistance training (RTR) at self-selected intensities while wearing the monitors. All monitors were compared to a portable metabolic analyzer (OM) for EE. The FBS and GV monitor were compared to a chest HR monitor (PM) for maximal HR (HRmax) and average HR (HRav). RESULTS: Compared to the OM, the FBS and GV produced higher EE estimates while the SWA overestimated EE during TR and underestimated EE for the rest (Table 1). Equivalence testing determined that no monitor was equivalent to the OM, although the SWA yielded the most favorable agreement for whole session as the 90% CI (90% 100.9, 100.5 kcal) overlapped the highest end of the equivalence zone (243.6-517.7 kcal) by only 12.7 kcal. Acceptable measurement error (≤ 20%) for whole session was produced by the SWA and for TR by the SWA and GV, while for RTR the GV had the highest measurement error (Table 1). Significant bias was observed for the FBS and GV during SC (10.1 ± 39.2 kcal and 18.6 ± 33.7 kcal), RTR (57.7 ± 52.7 kcal and 82.0 ± 79.2 kcal), and whole session (83.2 ± 97.3 kcal and 104.4 ± 131.9 kcal). In regards to HRmax and HRAv, both monitors 90% CIs fell in the equivalence zones with the exception of HRAv measured by the FBS for RTR. The GV had an improved accuracy over the FBS as indicated by lower error rates for HRAv (SC: 2.0% vs 5.9%; TR: 2.4% vs 3.1%; and RTR: 2.4% vs 9.5%) and HRAv (SC: 0.8% vs 1.4%; TR: 0.9% vs 1.5%; and RTR: 0.9% vs 7.0%). CONCLUSION: The study protocol simulated real-world conditions to facilitate naturalistic application of the findings. No monitor accurately estimated EE, however, the SWA had the most favorable estimates. The FBS and GV demonstrated comparable performance for both EE and HR estimates.

186 Board #24 May 29 9:30 AM - 11:00 AM
Innovations in Heart Rate Monitoring Devices and Smart Applications: Physical Configuration Matters!
Calixte Aholu, Nicole J. Smith, Catherine G. Jackson, FACSM, David A. Kinnunen. CSU Fresno, Fresno, CA. (Sponsor: Catherine G. Jackson, FACSM)

Bluetooth/Ant+ heart rate monitors and smart device applications have the potential to advance heart rate monitoring in non-clinical settings. New innovative applications allow for heart rate monitoring of multiple users simultaneously; however, preliminary attempts to use a particularly commercially available model in a typical university gymnasium setting revealed consistent issues with signal interruption; thus, the test-retest reliability of the data was limited.

PURPOSE: To reduce the prevalence of signal interruption by determining the best physical configuration of components.

METHODS: A quasi-experimental repeated measures design was utilized to determine the best configuration of the system components. Cluster and ANOVA analyses determined good, better and best configurations. Consecutive beats were used to determine signal interruption and the unit of analysis was the number of signal interruptions per two-minute session. The independent variables were height (1.8m, 3.6m, and 5.4m), angle (60°, 75°, and 90°), and location (left corner, middle, right corner) of the transmitter component. University students, male and female adults ages 19-23 with no apparent health problems, were recruited to participate. RESULTS: The dependent variable was determined to be consistent across devices.

RESULTS: Inspection of the graphs and ANOVA analyses revealed that the best configuration of the system was transmitter device placement at a height of 1.8m (F2, 1,052) = 54.86, p < .001, partial η2 = .09, at a 60°angle (F2, 1,052) = 12.50, p < .001, partial η2 = .02, and in the left corner location (F(2, 1,052) = 24.28, p < .001, partial η2 = .09).

CONCLUSIONS: The height, angle, and location of the transmitter component all played a significant role in reducing the prevalence of signal interruption. It was determined that the best results were found with the lowest height and smallest angle chosen. Therefore, random placement of transmitter height, angle and location will not yield the best heart rate monitoring results.

187 Board #25 May 29 9:30 AM - 11:00 AM
Absolute Validity And Test-retest Reliability Of Step Counts For Fitbit Flex 2 In Pram Walking
Yuling Yuan, Paul Kelly. The University of Edinburgh, Edinburgh, United Kingdom. Email: ncyuanyulin@126.com

PURPOSE: To test the absolute validity and test-retest reliability in two kinds of pram walking settings and help researchers and postnatal women to choose suitable tools for monitoring physical activity levels.

METHODS: 12 participants who were adult women (23.2 ± 0.7 years old) wore Fitbit Flex 2 on both wrists to perform the outdoor protocol: Two rounds of state distance pram walking of two settings (one round for each setting): (1) Both hands pushing setting; (2) One hand pushing setting. The step counts from Fitbit Flex 2 were compare to video recording to assess the absolute validity and LIMIT: The average Mean Absolute Percentage Error (MAPE) of step counts for left and right wrists in both hands pushing setting were -31.3% and 49.1%. In one hand pushing setting, the average MAPE of step counts for wrist of dominant hand was -52.6%, and -5.1% for wrist of non-dominant hand. In both hands pushing setting, the Fitbit Flex 2 had a low correlation (ICC=0.40) for wrist of dominant hands while the correlation of wrist of non-dominant hand was good (ICC=0.85). In one hand pushing setting, the correlations are excellent (ICC=0.99) for wrist of non-dominant hand and moderate for wrist of dominant hand (ICC=0.68).

CONCLUSIONS: The absolute validity of step counts for Fitbit Flex 2 was poor when device applied on the wrists of both hands in both hands pushing setting and dominant hand in one hand pushing setting while the absolute validity was high when the device applied on the wrist of non-dominant hand in one hand pushing setting. The test-retest reliability is excellent to good when the device wore on the wrist of non-dominant hand and moderate to poor on the wrist of dominant hand.

188 Board #26 May 29 9:30 AM - 11:00 AM
Comparisons of Portable Metabolic Sensors During Outdoor Cycling
Katherine Costello, Darrel Woods, Alexander Toulouse, Patrick R. Davis. Sam Houston State University, Huntsville, TX.

Weearable technology has increased in prevalence and in the ability to monitor health related data. Additionally, the ability to record training data through various sensors has become essential in developing highly personalized training programs. Metabolic measurements have typically been confined to laboratory settings, but wearable metabolic metrics make the collection of these metrics in real world conditions possible.

Purpose: The purpose of this study was to compare measurements of VO2 from two different portable metabolic carts, a new consumer focused cart (A) and a research grade cart (B), in outdoor cycling under steady state conditions.

Methods: A total of 10 participants were included in the study. All participants were recreationally trained cyclists who had track racing experience. Participants completed a ramped VO2 max test with lactate sampling from capillary blood at one minute intervals. Lactate threshold (LT) was estimated as the first stage prior to an increase of >1 mmol in lactate concentration. Participants later completed six 10-minute intervals in a pairwise manner at 50, 70, and 85% of their power at LT on an outdoor velodrome.Expired gasses during these intervals were analyzed by two different portable metabolic carts (A&B). Data from approximately 6-9 min of each interval were averaged. Comparisons between the two devices were made using paired t-tests.

Results: The average age of participants was 44.3 ± 3.01 years and VO2 max was 51.56 ± 2.74 ml/kg/min. Cart A was unable to capture enough data when cycling at 50% of LT and therefore no comparisons were possible. There were significant differences (p<0.001) in absolute VO2 (1890.0 ± 245.1 ml/min vs 2672.3 ± 262.0 ml/min) between carts A&B respectively when cycling at 70% of LT. Additionally, there were significant differences (p<0.001) in absolute VO2 (2269.9 ± 368.3 ml/min vs 3069.3 ± 317.5 ml/min) between carts A&B respectively when cycling at 85% of power at LT.

Conclusions: Measurements of VO2 while cycling in an outdoor environment may not be consistent across devices. Supported by FAST Grant from Sam Houston State University.
MEDICINE & SCIENCE IN SPORTS & EXERCISE®

189 Board #27 May 29 9:30 AM - 11:00 AM
Accuracy of an Armband Heart Rate Monitor
Daniel Hagan, John Wygand, FACSM, John Petrizzo, Robert Otto, FACSM. Adelphi University, Garden City, NY. (Sponsor: Robert M. Otto, FACSM)
Email: danielhagan@mail.adelphi.edu
(No relevant relationships reported)

Activity monitors have demonstrated success at facilitating positive physical activity behavior changes in diverse populations by providing self-monitoring, motivation, and timely feedback, yet questions loom due to a paucity of data on the accuracy of arm band heart rate monitors (ABM). Purpose: The purpose of this investigation was to assess the accuracy of the ABM under aerobic exercise conditions. Methods: 15 male and 5 female college-aged Thes (age 20.9 ± 2.2 yrs, body mass 72.8 ± 13.4 kg) engaged in steady state aerobic exercise on a treadmill while wearing the ABM and a hard wire electrocardiograph (ECG), PARR+® and a brief medical screening preceded participation. Resting measures were obtained pre (sitting & standing) and post (sitting) aerobic exercise. The treadmill protocol included 3 minute stages at 1% grade with speeds of 53.6 meters/min, 80.4 meters/min, 107.2 meters/min, 160.8 meters/min, 187.6 meters/min, 214.4 meters/min, and a cool-down at 53.6 meters/min. Results: Statistical analysis by paired t-tests revealed NSD between HR of 74 ±14 & 74 ±14, 98 ± 14 & 98 ± 14, 120 ± 16 & 121 ±19, 156 ± 17 & 156, 175 ± 17 & 176 ± 17, and 187 ± 16 ± 18 ± 16/min at speeds of 80.4, 107.2, 160.8, 187.6, and 214.4 m/min, for ABM & EKG, respectively. Only the 53.6 m/min speed revealed a significant difference in HR of 90 ±13 vs 92 ± 13 for ABM and EKG, respectively. In addition, there was a high correlation and low standard error between the ABM and ECG measures (r = .998, SE = .2), at speeds of 80.4 (r = .981, SE = .59), 107.2 (r = .952, SE = 1.3), 160.8 (r = .99, SE = .7), 187.6 (r = .98, SE = .77), and 214.4 meters/min (r= .965, SE = .38). There was also a high correlation and low standard error. Contrary to all other trials, the 53.6 meters/min trial (r = .992, SE = .38) showed a significant difference at the p<01 level (.004). Conclusion: At all workloads in excess of 53.6 m/min, the ABM provides accurate HR measures, however for the novice exercise enthusiast or the slow paced walker, ABM may be insufficient for accurate HR monitoring.

190 Board #28 May 29 9:30 AM - 11:00 AM
Validation of Garmin Fitness Tracker Biomechanics
Bryson Carrier, Tim Holmes, Lauren Williams, Siri Dahl, Libby Weber, Andrew Creer, Tyler Standifird. Utah Valley University, Orem, UT. (No relevant relationships reported)

Purpose: As fitness trackers become more available, the need for independent validation has become more important to drive accuracy in training decisions and physiologic research. Therefore, the purpose of this study was to find the reliability and accuracy of the data collected from the Garmin fenix 3 HR fitness tracker. Methods: 17 healthy, recreational runners (9 male, 8 female, 28.11 ± 7.38 yrs, 70.26 ± 10.76 kg, 173.77 ± 5.96 cm) performed three running conditions (flat, incline (5%), and decline (-5%)) on an instrumented treadmill used to collect ground reaction force data. Infrared markers were placed on the foot and trunk and tracked with a 16 camera motion capture system. The data was processed using Visual 3D software (5.0, C-Motion, Inc., Germantown, MD,USA) and variables extracted were compared to data collected by the Garmin fenix 3 HR (Garmin Ltd., Olathe KS). Results: Statistical analysis was done via a 2-tailed paired t-test comparing the data taken from the motion capture system and instrumented treadmill to the data collected by the Garmin watch. There were no differences between the Garmin and the treadmill for flat stride length, declined stride length, inclined run cadence, declined run cadence, and inclined ground contact time. Differences (p < 0.05) were observed in inclined stride length, flat run cadence, flat vertical oscillation, inclined vertical oscillation, declined vertical oscillation, flat ground contact time, and declined ground contact time. Conclusion: Overall the Garmin fenix 3 HR fitness tracker was found to be reasonably reliable for certain variables, such as stride length and run cadence, but not reliable for vertical oscillation and ground contact time. Certain considerations should be taken as to the accuracy of the variables when using this data to drive training adaptations.

191 Board #29 May 29 9:30 AM - 11:00 AM
Validation of Garmin Fitness Tracker Metabolic Data (VO2max)
Brayden Jolley, Bryson Carrier, Tyler Standifird, Andrew Creer. Utah Valley University, Orem, UT. (No relevant relationships reported)

Purpose: As fitness trackers become more available, the need for independent validation has become more important to drive accuracy in training decisions and physiologic research. Therefore, the purpose of this study was to determine the accuracy of predicted maximal aerobic fitness assessment (VO2max) from the Garmin fenix 3 HR fitness tracker when compared to a lab based VO2max test. Methods: 6 healthy recreational runners (4 male, 2 female, 25.4 ± 2.5 yrs, 69.0 ± 6.8 kg, 174 ± 5.7 inches, 35.4 ± 29.9 km/wk) participated in two testing sessions; a graded exercise test to exhaustion (GXT) on a treadmill and a 15-minute submaximal outdoor track session. During the treadmill GXT expired gases were collected and analyzed using a metabolic cart, with the highest value being considered VO2max. Heart rate was measured continuously via telemetry, with the highest value recorded as the maximal heart rate (HRmax). Participants then completed a submaximal outdoor run on a track between 48 hrs and 7 days after the lab test. The outdoor run involved maintaining at least 70% of HRmax for 15 minutes while wearing a Garmin fenix 3 HR watch and Garmin HR monitor chest strap. The watch was reset to default settings prior to inserting participant data into the watch for each test. Statistical analysis was done via a 2-tailed paired t-test, comparing the lab and field measures. Results: There was no difference between the treadmill GXT (51.8 ± 7.8 ml/kg/min) and the Garmin estimated value from the outdoor run (53.2 ± 4.1 ml/kg/min) for VO2max. Conclusion: Overall, the Garmin fenix 3 HR fitness tracker was found to provide an accurate estimate of VO2max when compared to an actual GXT. Based on these data it would appear that the Garmin fenix 3 HR watch with chest strap may provide individuals an accurate assessment of their aerobic capacity for simple self-monitoring.

192 Board #30 May 29 9:30 AM - 11:00 AM
Katherine Balfany1, Ming-Sheng (Matthew) Chan2, Robert G. Lockie3, Scott K. Lynn1. 1California State University, Fullerton, Fullerton, CA. 2Athos, Mad Apparel Inc, Redwood City, CA. (Sponsor: Daniela A. Rubin, FACSM)
(No relevant relationships reported)

Purpose: The development in sports performance wearable technology has allowed for the monitoring of an athlete’s internal load via surface electromyography (sEMG) based garments. These garments have been shown to be a valid tool for measuring sEMG in sports settings. However, to conduct valid comparisons of sEMG, current methods often involve referencing data from a particular movement to a maximal voluntary contraction (MVC). MVCs are typically measured using an isokinetic dynamometer (ISO); however, with the application of sEMG in a sports environment utilizing an ISO can be impractical. An alternative is the use of manual muscle testing (MMT), in which manual resistance is applied by a trained practitioner to invoke a MVC. The purpose of this study was to compare sEMG-based garment measurement of MVCs elicited using ISO versus MMT in lower extremity muscles. METHODS: Twelve healthy, physically active participants (7 males, 5 females) were recruited for this study. Participants were fitted with a sEMG-based compression short or legging embedded with sEMG sensors. Following a dynamic warm-up, participants performed, in a randomized order, either ISO or MMT normalization protocols to measure the MVC of the vastus medialis (VM), vastus lateralis (VL), biceps femoris (BF) and gluteus maximus (GM). Data were sampled at 1kHz and band pass filtered, with the peak amplitude of the MVC used for analysis. Paired samples t-tests (p < .05) were used to compare the mean peak amplitudes from each muscle between ISO and MMT protocols. Pearson’s correlations (p < .05) were conducted to evaluate the degree of the relationship of peak amplitudes obtained by the two protocols for each muscle. RESULTS: No significant difference in MVC peaks (p > .05 - .07) were found between any of the muscles when comparing mean peak amplitudes for the ISO and MMT protocols. Significant correlations indicated a positive association between peak amplitudes obtained through ISO and MMT for the VM, RF, and BF (r > .80, p < .001 for all) and for the GM (r = .63, p = .022). CONCLUSIONS: The present data demonstrated that similar sEMG MVC data for the VM, VL, BF, and GM were recorded for the ISO and MMT. This suggests that the use of MMT, when administered by a trained member of staff, could be a practical method for normalizing each of the measured muscles to the MVC in a field environment.

193 Board #31 May 29 9:30 AM - 11:00 AM
NICA Injury Surveillance System: Concussion Risk Factors
Christopher C. Nkoy, Stuart Willick, Daniel Kushner, Masa Teramoto.
(No relevant relationships reported)

Scientific Abstract
Clinical experience highlights the dangers of the sport of mountain biking, with a high volume of contusions, laceration, fractures and concussions. Scientific literature to date has been sparse with regards to injuries in this population. While participation in this sport has strong potential to make high school mountain bike racing a safer sport.
Supported by The Naito Research Grant.

may help explain the differences of cognitive functions for VPT between age groups.

Additionally, the phase pattern in 70s was larger than without VPT (0.094±0.0006 vs. 0.091±0.0007, p<0.05).

PLI of α wave with VPT in age 70s (0.087±0.0011 vs. 0.091±0.0012, p<0.05), whereas PLI of β wave with VPT (0.110±0.0021) (p<0.05). PLI of α wave with VPT in age 70s was less than without (144.2±5.2% reference value). Similarly, VM amplitude during the concentric phase was 70% and 88% greater than without (292.2±171.4% reference value; p<0.05) when compared to the shallow squat (1795±73, 1645±79, 1075±79 dBμ, p<0.05). PLI of θ wave and visual perception tasks (VPT) were tried. Recently, previous studies measured electroencephalograms (EEG) during exercise with wireless electroencephalograph. The evaluation of EEG in elderly during exercise with VPT and comparing results in young may provide a novel insight on prevention of falls. As a countermeasure to fall risk the effect of various types of exercise training and visual perception tasks (VPT) were tried. Recently, previous studies measured electroencephalograms (EEG) during exercise with wireless electroencephalograph. The evaluation of EEG in elderly during exercise with VPT and comparing results in young may provide a novel insight on prevention of falls. PURPOSE: The aim of this study was to examine whether the EEG signals during stepping exercise could be amplified by VPT and aging. We measured EEG during stepping exercise with or without VPT for subjects of ages: 70s, 40s, and 20s. METHODS: 11 males in 70s (73±5 yrs), 10 males in 40s (44±3 yrs), and 10 males in 20s (20±1 yrs) carried out stepping exercise for 5 min with or without VPT. EEG during stepping exercise was measured using a wireless electroencephalograph (EMOTIV EEG headset). We analyzed the averaged power spectral density (PSD) for all electrodes with time frequency analysis, and a phase locking index (PLI) with phase synchronization quantification. Statistical comparisons were made using two-way ANOVA. RESULTS: PSD without VPT in age 70s (1692±77 dBμ) was larger than in 40s (1374±78 dBμ) and 20s (828±78 dBμ) (p<0.05). Moreover, PSD magnitude increased with VPT in all ages (70s: 1795±73, 40s: 1645±79, 20s: 1075±79 dBμ, p<0.05). PLI of α wave with VPT in age 70s (0.087±0.0001 vs. 0.091±0.0002, p<0.05), whereas PLI of β wave with VPT in 70s was larger than without VPT (0.094±0.0006 vs. 0.091±0.0007, p<0.05). CONCLUSIONS: EEG signals in elderly during stepping exercise is larger than in middle age and young, and is enhanced by VPT. Additionally, the phase pattern may help explain the differences of cognitive functions for VPT between age groups. Supported by The Naito Research Grant.

CONCLUSIONS

A-39 Free Communication/Poster - Muscle Dynamics

Wednesday, May 29, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

194 Board #32 May 29 9:30 AM - 11:00 AM EEG Measurement In Elderly People During Stepping Exercise With Visual Perception Tasks Takahide Kato1, Taichi Hayasaka1, Tsukasa Sanuki1, Takashi Kawagoe1, Stanley M. Yamashiro1. 1National Institute of Technology, Toyo College, Toyota, Japan. 2Aichi Medical University, Nagakute, Japan. 3University of Southern California, Los Angeles, CA. (No relevant relationships reported)

The increased risk of falling with aging leads to a recurrent problem in elderly in need of long-term care and may become a major social problem. A reduction in muscular strength and a decline in perceptual function are listed as causes of falls. As a countermeasure to fall risk the effect of various types of exercise training and visual perception tasks (VPT) were tried. Recently, previous studies measured electroencephalograms (EEG) during exercise with wireless electroencephalograph. The evaluation of EEG in elderly during exercise with VPT and comparing results in young may provide a novel insight on prevention of falls. PURPOSE: The aim of this study was to examine whether the EEG signals during stepping exercise could be amplified by VPT and aging. We measured EEG during stepping exercise with or without VPT for subjects of ages: 70s, 40s, and 20s. METHODS: 11 males in 70s (73±5 yrs), 10 males in 40s (44±3 yrs), and 10 males in 20s (20±1 yrs) carried out stepping exercise for 5 min with or without VPT. EEG during stepping exercise was measured using a wireless electroencephalograph (EMOTIV EEG headset). We analyzed the averaged power spectral density (PSD) for all electrodes with time frequency analysis, and a phase locking index (PLI) with phase synchronization quantification. Statistical comparisons were made using two-way ANOVA. RESULTS: PSD without VPT in age 70s (1692±77 dBμ) was larger than in 40s (1374±78 dBμ) and 20s (828±78 dBμ) (p<0.05). Moreover, PSD magnitude increased with VPT in all ages (70s: 1795±73, 40s: 1645±79, 20s: 1075±79 dBμ, p<0.05). PLI of α wave with VPT in age 70s (0.087±0.0001 vs. 0.091±0.0002, p<0.05), whereas PLI of β wave with VPT in 70s was larger than without VPT (0.094±0.0006 vs. 0.091±0.0007, p<0.05). CONCLUSIONS: EEG signals in elderly during stepping exercise is larger than in middle age and young, and is enhanced by VPT. Additionally, the phase pattern may help explain the differences of cognitive functions for VPT between age groups. Supported by The Naito Research Grant.

Squats are a popular closed-chain exercise that benefit strength, power, and balance. Squats are often performed with varying depths and widths. Squat variation may elicit different demands on the neuromuscular system. PURPOSE: This study investigated muscle activation of the vastus lateralis (VL) and vastus medialis (VM) during 9 different squat variations. METHODS: 13 healthy, college-aged adults (6 female, 7 male, mass = 73.5 ± 15.0 kg, height = 1.7 ± 0.09 m) performed body-weight squats at 3 widths (standard (shoulder width), wide (150% of shoulder width), and widest (200% of shoulder width)) and 3 squat depths (shallow (55 degree knee flexion), parallel (90 degree knee flexion), and deep (125 degree knee flexion)). Electromyography (EMG) and marker data were used to determine peak EMG amplitudes during the eccentric and concentric phases of the squat. 243 ANOVAs were used to evaluate the simultaneous effect of squat depth and width on peak EMG amplitude. EMG data were filtered using a root mean square approach and normalized to a 30-degree squat reference position. RESULTS: Generally, muscle activation increased with greater squat depth, but did not change with greater squat width. Specifically, VL amplitude during the concentric phase was 61% and 119% greater during the parallel (232.7 ± 81.5% reference value; p<0.01) and deep squat (315.2 ± 133.3% reference value; p<0.01) when compared to the shallow squat (144.2±5.2% reference value). Similarly, VM amplitude during the concentric phase was 70% and 88% greater than without (262.9 ± 207.6% reference value; p<0.05) and deep squat (292.2 ± 171.4% reference value; p<0.01) when compared to the shallow squat (144.2±5.2% reference value). Surprisingly, there was no statistical difference in EMG amplitude during the eccentric phase or for the depth by width interactions (p > 0.05). CONCLUSIONS: These data support the idea that deep squats can be used to generate increased muscle activity of the lower-extremities. Our data also indicate that increased squat width does not increase muscle activity, although our study only examined muscles primarily used for sagittal-plane movement. Further research is needed to investigate the intertwined relationship between squat depth and width on muscle activation for additional lower-extremity muscles.

195 Board #33 May 29 9:30 AM - 11:00 AM Does Squat Depth and Width Influence Quadriceps Muscle Activation? Matt Denning1, Brad Gardiner1, Tyler Standifird1, Lauren Williams1. 1Brigham Young University - Idaho, Rexburg, ID. 2Weber State University, Ogden, UT. 3Utah Valley University, Orem, UT. (Sponsor: Doug Powell, FACSM) (No relevant relationships reported)

peak power (PP) is decreased in older adults; however,less is clear regarding the determinants of PP, contractile torque and velocity. Furthermore, it is unknown if these measures are affected differently in middle and old age. PURPOSE: To compare PP and its determinants for the knee extensors in young, middle-aged, and older males. METHODS: As part of a larger ongoing investigation, contractile properties of the knee extensors were assessed in healthy, untrained young (YM: n = 8, age = 20.5 ± 1.6 yrs),middle-aged (MM: n = 6, age = 46.0 ± 2.9 yrs) and older (OM: n = 6, age = 69.0 ± 3.10 yrs) males using a Biodesign System 4 dynamometer. Upon completing a familiarization visit, a testing visit involving three maximal voluntary contractions (MVC) was performed. One-way analyses of variance and Games-Howell post hoc tests were used to compare groups. RESULTS: PP was lower in OM compared to YM (50%; p = 0.021), but was similar in MM compared to YM and OM (p > 0.05). Vel was decreased in OM compared to YM (36%; p = 0.007) and MM (24%; p = 0.044), however, no difference was observed between MM and YM. TQ was similar between groups (p = 0.147). CONCLUSION: Our preliminary data indicate that reductions in VEI for the knee extensors occur between middle and old age prior to a decrease in PP, while TQ is maintained in old age. Thus, VEI appears to be more dramatically affected by age, and the age-related decrease in PP may be primarily mediated by impaired velocity capacity.
In muscle fatigue studies, repetitive muscle contractions at a submaximal force level (e.g., 50% of maximum voluntary contraction [MVC]) are frequently used as a fatiguing task such as isometric knee extensions. Contrary to submaximal fatiguing contractions, when MVC is used to induce muscle fatigue, muscle force will decrease despite maximal effort and amplitude and/or frequency of electromyographic (EMG) signals will also change with the development of muscle fatigue. However, it is unclear the effect angle of knee joint on the neuromuscular activation of individual muscles of quadriceps femoris during repetitive knee extension tasks. PURPOSE: We sought of this study was to assess the effect of knee joint angle on the neuromuscular activation pattern of the four individual muscles in the quadriceps femoris during repetitive fatiguing MVCs. METHODS: Fifteen healthy men and women (age, 25 ± 3 years; height, 165 ± 11 cm; weight, 57 ± 10 kg) performed two fatiguing tasks consisting of 40 MVCs at knee joint angles of 80° (flexed) and 140° (extended). Neuromuscular activation of the vastus intermedius (VI), vastus lateralis (VL), vastus medialis (VM) and rectus femoris (RF) was recorded using surface electrodes, and median frequency (MF) and root mean square (RMS) of EMG signals (normalized by pre-test MVCs) were calculated. RESULTS: MVCs significantly decreased from the 10th to the 40th repetition at both knee joint angles. The MFs of VI and VM in the flexed knee joint angle and that of RF at the flexed knee joint angle were significantly decreased after the 10th repetition. There were no significant changes in normalized EMG amplitude in any muscles specific to knee angle. Stepwise regression analysis revealed predictive synergistic action may take place in RF, VM, and VI in the flexed joint angle and between RF and VM at the extended knee joint angle. CONCLUSION: These results suggest that neuromuscular activation of RF and VM is independent, but activation of VI and VL is dependent, upon knee joint angle, which may, in part, explain joint angle-specific muscle fatigue.

When comparing when cycling and inclined treadmill running in well-trained cyclists, two groups have emerged in prior research: 1) cyclists with equally high LTVO2 while cycling and running uphill (HLT) and 2) cyclists with lower cycling LTVO2 (LLT) but high running LTVO2 (closely matching those of the HLT cyclists). The physiological and biomechanical differences between HLT and LLT cyclists have yet to be completely described. PURPOSE: To determine differences in absolute/relative joint powers and knee extensor muscle activation between HLT and LLT cyclists. METHODS: Sixteen well-trained endurance athletes completed cycling and running VO2max and cycling and running lactate threshold (LTVO2) testing, and were separated into two groups based on cycling LTVO2 (HLT: n=8) and (LLT: n=8). Hip, knee, and ankle absolute and relative joint powers (the percent contribution to total joint powers) and electromyography (EMG) assessed muscle activation of the knee extensors (vastus lateralis (VL), vastus medialis (VM), and rectus femoris (RF)) were compared between groups during submaximal cycling (60-90% VO2max). RESULTS: VO2max was similar in the two groups when cycling (HLT: 4.57 ± 0.17 vs LLT: 4.42 ± 0.15 L/min) and running (HLT: 4.47 ± 0.13 vs LLT: 4.49 ± 0.16 L/min). HLT cyclists had higher LTVO2 while cycling compared with the LLT group (HLT: 7.08 ± 0.21 vs LLT: 6.10 ± 0.15 L/min); however, no differences in running LTVO2 were found (HLT: 3.73 ± 0.18 vs LLT: 3.71 ± 0.13 L/min) (p=0.05). Blood lactate concentration increased with work rate and was lower in the HLT group at 80 and 90% of VO2max compared with the LLT group (p=0.05). There were no differences between groups in absolute joint specific power across work rates (p=0.05). However, relative hip contribution was significantly greater in the HLT group at 90% VO2max compared to the LLT group (p=0.05). Furthermore, VM EMG activity was higher in the LLT group at 60 and 70% VO2max (p=0.05); yet there were no between group differences in VI or RF activation (p=0.05). CONCLUSION: HLT cyclists have a greater relative hip contribution during submaximal cycling power and reduced stress on a knee extensor muscle (i.e. lower VM activation) compared to LLT cyclists.

Transcranial direct current stimulation (tDCS) is a non-invasive brain stimulation technique and has been known to reliably alter motor cortical excitability. Anodal stimulation increases cortical excitability and cathodal stimulation inhibits cortical excitability. However, the effects of tDCS on counter-movement jump (CMJ) is currently unknown. PURPOSE: The aim of this study was to investigate the effects of tDCS on CMJ performance in healthy men. METHODS: A double-blinded crossover design was used. Fourteen male subjects (age: 22 ± 2 yrs, height:174.43 ± 5.74 cm, weight: 68.66 ± 9.47 kg) received three time stimulations, each time an anodal tDCS (a-tDCS) or sham-tDCS. The electrodes are placed over primary motor cortex (M1) bilaterally and the opposite electrodes pair over the ipsilateral shoulders. Each stimulation lasted 20 min, 48-72 hours apart and current was set at 2mA. Participants were required to get anthropometric measurements and familiar with CMJ in advance. Then, completed five CMJ tests before and after each stimulation, with one minute recovery interval between each test. The best three of the five CMJ in each moment was selected for analysis. Two-way (condition x time) ANOVA with repeated measures were used for CMJ height, flight time, and initial velocity. RESULTS: There was a significant interaction between condition and time for CMJ height (F(2,26) = 7.948, p < 0.001), flight time (F(2,26) = 8.282, p < 0.001), and initial velocity (F(2,26) = 8.375, p < 0.001). There were no significant main effects for condition or moment for any of the outcome measures (p > 0.05). Post-hoc analysis showed that there were no significant differences between conditions both on pre- and post-stimulation moments (p > 0.05). However, post a-tDCS performance was significantly superior to pre a-tDCS for CMJ height, flight time and initial velocity (p < 0.001 for all). There were no significant pre-post changes in both c-tDCS and sham-tDCS conditions (p > 0.05 for all). CONCLUSION: Our findings demonstrates that anodal tDCS may be a valuable tool to enhance vertical jumping ability, which is very important for human sport performance.
It has been proposed in the literature that muscle damage may temporarily and negatively affect proprioceptive capacity, which can be tested through the ability to replicate angles, while muscle damage can be verified by quantifying creatinine kinase (CK) in the bloodstream.

**PURPOSE:** To verify the relationship between muscle damage and sense of position in the isokinetic dynamometer, in knee extensions, after an eccentric exercise protocol.

**METHODS:** ten male college students (age: 20.6 ± 1.8 years, body mass: 75.0 ± 11.7 kg, height: 177.4 ± 6.9 cm), with no prior experience with resistance exercises, were submitted to an eccentric exercise protocol, in the isokinetic dynamometer, for induction of muscle damage composed of two phases: 1st phase: 10 sets of 10 repetitions with 30 seconds of rest (100 eccentric contractions) - Speed = 30 °/s. There was a 5 minute break between the phases. 2nd phase: 11 sets of 10 repetitions and 30 seconds of rest (110 eccentric contractions) - Speed = 180 °/s. To evaluate the muscle damage was used the values of CK peak found in the post-tests shortly after exercise, 24h, 48h, 72h and 96h. To verify the sense of position, the subjects, blindfolded, should find the angle of 60° in the right knee on the isokinetic dynamometer. Was used a subtraction of the target value (60°) by the angle performed by the subjects on the day of CK peak. The normality of the sample was verified using the Shapiro-Wilk test and Pearson’s correlation was assessed between peak CK and significance level of 5%.

**RESULTS:** There was a significant correlation (p = 0.014) between CK and knee position sense, with r = 0.742 classified as strong (Devore, 2006).

**CONCLUSIONS:** the induction of muscle damage caused by eccentric exercise significantly influences the subjects’ proprioception, since the higher the CK values, the greater the angular discrepancies between the expected value and the one performed by the subjects.

In a triathlon event, people use various strategies and equipment for enhancing their triathlon performance in each exercise mode (i.e., swim, bike, run). During the swimming portion of a race, triathletes will typically wear a wetsuit that is categorized as either full sleeve or sleeveless. Anecdotally, triathletes may select a sleeveless wetsuit because the full sleeve may increase shoulder movement resistance. **Purpose:** The purpose of this study was to investigate shoulder muscle activity influenced by wetsuit design. **Methods:** Seven subjects (5 male and 2 female, age: 45.7 ± 8.0 yrs, height: 174.8 ± 10.5cm, mass: 70.1 ± 4.9 kg) participated in the experiment. Muscle activity of the Anterior Deltoid (AD) and Posterior Deltoid (PD) was measured (2000 Hz) by means of the raw unfiltered EMG data which were reduced by removing any zero offset, full wave rectifying the signal, and calculating the average EMG across the 5 stroke cycles. Components.

**RESULTS:** 1. Significantly higher shoulder muscle activity was recorded during the full-sleeve wetsuit (FSW) condition compared to the sleeveless wetsuit (SLW) condition and the no wetsuit (NWS) condition. 2. The greatest muscle activity was recorded among the full-sleeve wetsuit (FSW) condition compared to the sleeveless wetsuit (SLW) condition and the no wetsuit (NWS) condition. 3. Shoulder muscle activity was significantly different among conditions (p<0.05) with FSW being shorter than NWS both AD and PD were not different among all wetsuit conditions (p>0.05). However, muscle activity of

**Conclusion:** Muscle activity of the Anterior Deltoid (AD) and Posterior Deltoid (PD) was measured (2000 Hz) as well as the time to complete the five cycles. Data analysis was performed using the Shapiro-Wilk test and Pearson’s correlation was assessed between peak CK and significance level of 5%.

**RESULTS:** There was a significant correlation (p = 0.014) between CK and knee position sense, with r = 0.742 classified as strong (Devore, 2006).

**CONCLUSIONS:** the induction of muscle damage caused by eccentric exercise significantly influences the subjects’ proprioception, since the higher the CK values, the greater the angular discrepancies between the expected value and the one performed by the subjects.

The shoulder joint is naturally instable because of anatomic structure, and depends of passive and active elements, ligaments and muscle, respectively, for proper stability. The bench press, upper body exercise, is one of three exercises of Powerlifting (PL), based on maximum strength. The strength balance between dominant (D) and non-dominant (ND) upper limbs is fundamental to develop a good lift and joint safety. Therefore, not only major muscles are important as pectoral major, but also stability muscles as rotator cuff for shoulder external rotation.

**PURPOSE:** To compare, in recreational powerlifters, relative peak torque generation between dominant and non-dominant arms, in external and internal rotation at 60°/s and 180°/s concentric action velocity for external (ER) and internal rotation (IR) in shoulder joint. **METHODS:** Participants, nine powerlifters (height: 1.73±0.06cm; weight: 84.1±13.0kg; bench press 1 repetition maximum: 116.4±19.1kg; PL minimal experience: 2 years). The muscle group strength for ER and IR were assessed bilateral by Biodex System 4Pro isokinetic dynamometer. The participants were in a seated position, 45° shoulder abduction, 60°/s and 180°/s concentric mode was adopted for lever velocity for ER and IR in shoulder joint. Dominant and non-dominant sides peak torque normalized to body weight (PT/BW; Nm/kg) were compared with paired student’s t-test. **RESULTS:** Significant difference (p=0.02) was found at the PT/BW for the ER movements between the dominant (47.8±5.8 Nm/kg) and non-dominant (44.3±6.1 Nm/kg) sides at the velocity of 60°/s, but there was no significant difference between sides in IR (p=0.15; D=71.7±6.3 Nm/kg, ND=66.1±12N.m/kg) and at 180°/s for ER (p=0.24; D=48.5±5.3 Nm/kg, ND=45.7±1.8 Nm/kg) and IR (p=0.24; D=68.7±15.5 Nm/kg, ND=64.6±8.6 Nm/kg). **CONCLUSION:** For recreational powerlifters, there is only difference between dominant and non-dominant arms in ER movement at 60°/s, which suggests a necessity of unilateral exercises for a better balance between sides. Supported by CNPq scholarship.
Previous studies have reported that decreases in muscle size and quality of the vastus lateralis (VL) may contribute to the lower vertical jump power observed in old compared to young males. However, we are aware of no previous studies that have examined the contribution of VL muscle size and quality to age-related power differences in females, nor have there been any studies that examined these differences between young, middle, and older age groups. PURPOSE: To determine the effects of age on vertical jump power and muscle size (cross-sectional area (CSA) and quality (echo intensity [EI]) of the VL in young, middle-aged, and old females.

METHODS: Twenty-six young (age = 22 ± 2 yr; height = 163 ± 7 cm; mass = 61 ± 8 kg), 30 middle-aged (36 ± 5 yr; 164 ± 7 cm; 62 ± 11 kg), and 23 old (71 ± 5 yr; 161 ± 5 cm; 59 ± 10 kg) females underwent two diagnostic ultrasound assessments followed by three countermovement vertical jumps (CMJs). Peak power output (Pmax; W) was measured during the CMJs using a portable force plate. VL CSA (cm²) and EI (AU) were measured on the right leg using a portable B-mode ultrasound imaging device and linear-array probes. One-way ANOVA and post-hoc analyses were used to compare Pmax, CSA, and EI between age groups. Pearson product-moment correlation coefficients (r) were used to examine the relationships between Pmax and CSA and EI.

RESULTS: Higher Pmax and CSA values were observed for the young (Pmax = 2257.40 ± 438.42 W; CSA = 20.59 ± 4.23 cm²) compared to the old (Pmax = 1098.55 ± 242.10 W; CSA = 10.69 ± 2.47 cm²) and middle-aged (Pmax = 1958.20 ± 341.87 W; CSA = 16.84 ± 4.24 cm²) and the middle-aged compared to the old (P = 0.001 - 0.003). EI values for the young (104.29 ± 16.86 AU) and middle-aged (107.71 ± 17.30 AU) were lower than the old (128.35 ± 14.99 AU) (P < 0.001), but they were not different from each other (P = 0.720). There was a significant positive relationship between Pmax and CSA (r = 0.836; P < 0.001) and a significant negative relationship between Pmax and EI (r = -0.442; P < 0.001). These findings demonstrated that vertical jump power and muscle size and quality decrease with age. The significant relationships observed between Pmax and CSA and EI perhaps suggest that these age-related declines in VL muscle size and quality may play an important role in the lower vertical jump power observed in middle-aged and older adults.

PURPOSE: To compare rapid contractile parameters of the knee extensors in middle-aged and older males, and examine correlates of 5-chair rise (5CR) performance. METHODS: As part of a larger ongoing investigation, twelve healthy untrained, middle-aged (n = 6, age = 46 ± 2.90 yrs) and older (n = 6, age = 69 ± 3.10 yrs) males completed a familiarization visit followed by one testing visit. Using a Biodex System 4 dynamometer, participants performed three maximal voluntary isometric contractions of the right knee extensors followed by three maximal isometric contractions at 40% of isometric peak torque. Participants were instructed to “kick out as hard and fast as possible” prior to each contraction. The torque and velocity signals were acquired and the power curve was derived from multiplying torque and velocity. RVD and RPD were obtained from isometric contractions, as the linear slope of the velocity- and power-time curve, respectively. RTD was calculated for the first 50 ms of the isometric torque-time curve. In addition, 5CR, the time to rise 5 times from a chair as quickly as possible was recorded. Groups were compared with independent samples t-tests, while Pearson correlation coefficients were used to examine relationships between age, RVD, RPD, and RTD.

RESULTS: RVD (32.15%; p = 0.004) and RPD (35.27%; p = 0.003) were decreased in older males, but not RTD (p = 0.497). In addition, only RVD was correlated with 5CR (r = -0.588; p = 0.044). CONCLUSIONS: While preliminary, these data suggest that dynamic, rapid contractile measures are preferentially affected by age as compared to RTD, and only RVD was related to 5CR performance.
METHODS: Nine male elite Brazilian handball athletes [21.4 ± 2.1 years; 90.3 ± 10 kg; 187.5 ± 5 cm; 10.5 ± 4.2 body fat; 9.7 ± 1.8 years of training experience; 1.81 ± 0.23 of Relative 1RM back squat (kg/kg); 15 hours of weekly training volume] were recruited into the study. The experimental sessions were performed seven days apart in a counterbalanced order. The athletes were required to complete either a CR protocol or a control protocol (CMJs only). Athletes completed a standardized warm-up consisting of 5 min of light-intensity cycling, static stretching exercises, and three consecutive CMJs. After a 3 min rest period, athletes performed baseline CMJs test. The CR protocol was consisted of three sets of 5 repetitions at 85% of 1RM with 3 minutes of rest between sets. Back squat was loaded with 85% of 1RM combining 55% and 40% of 1RM using weight-plate and 29.7± 2.04% of the athlete’s 1RM in fully erect position (starting position) with elastic band resistance. During control session, the same warm-up routine was included so that the only difference between the PAP and control protocol was the absence of a potentiating stimulus.

RESULTS: One-way repeated measures ANOVA indicated a significant effect of time in CMJ performance within CR condition (p<0.01, n² = 0.39). The vertical jump height was significantly greater (6.5%, ES = 0.85) at 2-min as compared to baseline.

CONCLUSIONS: The combination of free weight and elastic bands during heavy squat exercise seems to be effective to create a post-activation potentiation effect to enhance acute neuromuscular performance at 2 min after preconditioning stimulus.

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**Knee Extensor Torque Is Increased By Far-Infrared Emitting Fabric**

Manoel Silva1, Antonio C. Morares1, João Barbieri2, Renato Barroso1, Gabriel Figueiredo1, Leonardo Motta1, Rômulo Bertuzzi2, Arthur Gáspari2, 1University of Campinas, Campinas, Brazil. 2University of São Paulo, São Paulo, Brazil. (No relevant relationships reported)

Far-infrared (FIR) emitting materials can increase the availability of nitric oxide and calcium in cell culture, and delay fatigue during ex-vivo skeletal muscle contractions. However, FIR effects on humans’ neuromuscular performance remains unknown. **Purpose:** To verify the effects of FIR emitting fabric on knee extensors torque and electromyography activity. **Methods:** Fourteen healthy strength trained men (24.3 ± 4 years; 82.8 ± 11.3 kg; 176.3 ± 2.6 cm, 7.3 ± 2.9 years of training experience) participated in one familiarization and two experimental sessions. Experimental sessions occurred two weeks apart and after 96 hours of continuous FIR or Placebo fabric usage, in a randomized, crossover, double-blind, placebo-controlled design study. Isometric and dynamic torques were assessed using isokinetic dynamometer. The best result out of 3 maximum ballistic knee extension contractions (MBC) was recorded pre- and post-dynamic test. Dynamic test was composed by 30 maximum repetitions of knee flexion and extension at 180°/s. Peak torque (PT) of each repetition, recorded pre- and post-dynamic test. Dynamic test was composed by 30 maximum ballistic knee extension contractions (MBC) was recorded pre- and post-dynamic test. Dynamic test was composed by 30 maximum repetitions of knee flexion and extension at 180°. Peak torque (PT) of each repetition, total work (TW) and fatigue index (FI) of knee extensors were recorded. The mean RMS was calculated from electromyography activity records of superficial quadriceps muscles. Mean quadriceps temperature was assessed pre-protocol with a thermal camera. Results: See Table. FIR fabric increased pre and post MBC and trend to increase TW. RMS at isometric and dynamic tests, FI, and quadriceps temperature did not change. Additionally, FIR fabric demonstrated higher values of PT at 8th, 12th to 14th and 17th repetitions (all p < 0.05). Conclusion: FIR emitting fabric is effective to increase isometric and dynamic neuromuscular performance. Further, the absence of changes in electromyography activity and increased performance in single MBC, lead us to suggest that FIR effects are related to muscle contractile machinery improvements.

**INTRODUCTION:** Improvements in immunosenesence have been reported to be associated with regular exercise and physical activity. Multiple investigations have elucidated the effectiveness of aerobic exercise on the attenuation of biological markers of systemic inflammation. However, few studies have evaluated the impacts of resistance training on inflammation, and even fewer have examined the effects of resistance training on salivary biomarkers of inflammation. **PURPOSE:** To evaluate the impacts of 5 weeks of bench press-only training on salivary biomarkers of inflammation in trained college-age males (N = 23). Pre and post analyses of salivary biomarkers (IL-1β, IL-6, TNFα, CRP, and Testosterone) were conducted. Five weeks of either standard bench press (n = 12) or leg drive focused bench press (n = 11) was completed. **RESULTS:** No significant (p > 0.05) main effects between groups were observed. Within groups measures did reveal that testosterone significantly decreased by 17.0% in the standard bench press group from pre to post (p = 0.02). **CONCLUSIONS:** Five weeks of bench press training did not alter pre-training levels of inflammation measured in saliva. Subjects were required to be currently training and have completed a minimum of 6 months of resistance training (including bench press) prior to starting this study. Since the bench press was the only training exercise, the intensity of training administered may not have been sufficient to elicit notable alterations in overall inflammatory status in this sample.

**RESULTS:**

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Data are mean ± standard deviation. p-values are paired T-test (p<0.05).
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Evidence Of A Ceiling Effect For Training Volume In Muscle Hypertrophy And Strength In Trained Men

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(No relevant relationships reported)

Purpose: To compare the effects of different resistance training (RT) volumes on muscle performance and hypertrophy in trained men.

Methods: The study involved 37 volunteers that performed RT for 24 weeks and were divided into groups that performed five (G5), 10 (G10), 15 (G15) and 20 (G20) sets per muscle group per week. Ten repetition maximum (10RM) tests were performed for the bench press, lat pull-down, 45° leg press, and stiff legged deadlift. Muscle thickness (MT) was measured using ultrasound at biceps brachii, triceps brachii, pectoralis major, quadriceps femoris and gluteus maximus. All measurements were performed at the beginning (pre) and after 12 (mid) and 24 weeks (post) of training.

Results: All groups showed significant increases in all 10RM tests and MT measures after 12 and 24 weeks of TR (p < 0.05). There were no differences in any 10RM test between G5 and G10 (p = 0.05) after 12 and 24 weeks. G5 and G10 showed significantly greater increases of 10RM than G15 and G20 for bench press, lat pull-down and stiff legged deadlift, both at 12 and 24 weeks. There were no group by time interaction for any MT measure.

Conclusions: Five to 10 sets per week might be sufficient for bringing about optimal gains in muscle size and strength in trained men over a 24-week period. There appears to be a deleterious effect for higher volumes (≥15 sets per week), especially after 12 weeks of training. These results bring evidence of an inverted “U” shaped curve for the dose response curve for muscle strength, with a possible deleterious effect after exceeding a certain training volume. Whilst the same trend was noted for muscle hypertrophy, the results did not reach significance. Therefore, using low volume RT programs might be an interesting alternative for personal trainers, strength coaches and medical practitioners to increase muscle size and strength in trained men.

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Effects Of An 8-week Mixed-methods Strength Training On Maximal Strength Of Weightlifting Athletes.

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(No relevant relationships reported)

The maximal strength training implies the greatest possible activation of the central nervous system, improving inter and intramuscular coordination and causing considerable benefits recognized by the international scientific community. It is well known that the pyramidal training can give powerful performance results thanks to a progressive increase in the load. However, there are different traditional methods to strength training and all have already been successfully tested. PURPOSE: This randomized controlled trial study design with experimenter blinding aimed to compare the effect of a 8-week period of a Mixed Methods Strength Training (MST) or Pyramidal Training (PT) on maximal strength performance in weightlifting athletes. METHODS: Study participants (20 men, age: 23.9 ± 2.05 years, body mass: 75.6 ± 9.45 kg, height: 1.77 ± 0.05 m, body mass index: 24.09 ± 2.46 kg/m²) were assigned to the MST group (n = 10) performed strength training with maximal loads (80-95% of 1RM, 3-min rest) for two sessions per week interspersed with a pyramidal training session (90-sec rest), and PT group (n = 10) performed pyramidal training alone (90-sec rest) for three sessions per week. Both groups trained for 8 weeks using a 3:1 loading structure. Measures pre-intervention and post-intervention included one-repetition maximum [1-RM] bench press, barbell deadlifts, lat pull-down, and standing barbell military press. Repeated-measures ANOVA and a paired t-test were used to assess differences in outcome variables across conditions (p < 0.05). RESULTS: The MST group showed significantly greater improvements than PT in bench press (13.1 ± 0.91 vs. 3.7 ± 0.47 kg, p < 0.0001), barbell deadlifts (19.3 ± 1.27 vs. 5.3 ± 0.97 kg, p < 0.0001), lat pull-down (17.2 ± 1.72 vs. 2.8 ± 0.7 kg, p < 0.0001), and standing barbell military press (13.1 ± 1.54 vs. 1.9 ± 0.59 kg, p < 0.0001). CONCLUSIONS: These findings suggest that a Mixed-Methods Strength Training characterized by two sessions with maximal loads interspersed with a pyramidal training session may be more effective than the pyramidal training alone for enhancing the maximal strength in weightlifting athletes. It could therefore be considered a valid and motivating alternative to the traditional strength training methods.

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Temporary Increasing in Muscle Thickness and Upper Arm Circumference Immediately After Resistance Exercise

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(No relevant relationships reported)

Temporary increasing in muscle thickness and upper arm circumference immediately after resistance exercise are strongly affected by reactive hyperemia, which is different from muscle hypertrophy induced by resistance exercise. This study is necessary for determining condition of measuring muscle cross sectional area as a muscle hypertrophic effect induced by resistance exercise. Furthermore, this is useful for bodybuilding and physique contexts where muscle volume affects results. PURPOSE: The purpose of this study was to investigate the duration of temporary increasing in muscle thickness and upper arm circumference induced by resistance exercise in the triceps brachii of resistance-trained and untrained subjects.

METHODS: Four kinds of resistance exercises were performed on 28 healthy adult males (26 ± 3 yrs), resistance-trained (n = 14) and untrained (n = 14). The extraculcular water content, muscle thickness, upper arm circumference, oxygenated hemoglobin (oxy-Hb) were examined before exercise, within 5-minute, 30-minute, and 60-minute after exercise. Two-way analysis of variance was used to confirm acute effects. RESULTS: The extraculcular water content of upper arm (+0.22 L), triceps brachii muscle thickness (+3 mm), upper arm circumference (+2 cm) increased only in the resistance-trained subjects 5-minute after exercise compared with before exercise. However, there was no difference between before exercise and 30-minute after exercise values. The oxy-Hb increased immediately after exercise in both resistance-trained (+42 %) and untrained subjects (+39 %), but no significant difference was observed between resistance-trained and untrained subjects. CONCLUSION: Temporary increasing in muscle thickness and upper arm circumference within 5minute after resistance exercise was a response occurred only in the resistance-trained subjects, and it was confirmed that the response disappeared within 30-minute.

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The Effect Of Strength Training On Physical Performance In Adolescent Female Soccer Players

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(No relevant relationships reported)

Strength training (ST) is amongst the most frequently used strategies to improve soccer performance and it has been used to obtain significant increases in the levels of maximum strength and muscle hypertrophy. Therefore, using appropriate ST programs could enhance several explosive actions that are crucial to the outcome of the game. ST is a method that has shown to be effective in male soccer players but the scarce studies of ST on female soccer players must also be pointed out. PURPOSE: To examine the effects of ST on physical performance after a 12-week training period in adolescent female soccer players. METHODS: 37 adolescent female soccer players from Spanish soccer team (age: 16.1±1.1 years; height: 159.7±7.1 cm; body mass: 55.5±7.1 kg) were randomly assigned to an experimental (EG; n = 19) or a control group (CG; n = 18). All players underwent a regular soccer training 3 times per week. Participants in the EG received ST program (12 weeks, 2 times per week, 20 min per session). The ST program included lower limb strength and core muscle. The players were tested at the beginning and the end of the intervention on bilateral countermovement jump (CMJ) test, unilateral CMJ test, 40m sprint, 180º COD test and V-cut test. Paired t-test was conducted to detect significant differences between the pre and post-tests in both groups. Statistical significant was inferred from p<0.05. RESULTS: EG made significantly greater improvements than CG did on CMJ (EG pre 23.5±3.9cm vs post 25.6±3.6cm, p<0.01; GC pre 23.3±3.7cm vs post 23.9±4.3cm), right CMJ (EG pre 12.9±1.9cm vs post 14.3±2.4cm, p<0.05; GC pre 12.1±1.7cm vs post 13.1±2.6cm), 40m sprint (EG pre 6.51±0.26s vs post 6.24±0.25s, p<0.01; GC pre 6.24±0.21s vs post 6.29±0.25s), left 180º COD (EG pre 2.96±0.18s vs post 2.89±0.18s, p<0.05; GC pre 2.93±0.15s vs post 2.91±0.11s) and V-cut (EG pre 8.05±0.38s vs post 7.81±0.27s, p<0.01; GC pre 7.98±0.38s vs post 7.97±0.39s). CONCLUSIONS: Twelve weeks ST could improve bilateral and unilateral muscular power, speed and
chronically improve or retard the aging effects on cognitions in older adults. Two weeks of supervised resistance training resulted in EXP and CON self-selecting loads that promote strength gain. 

To determine the acute effect of RT on cognitive performance in healthy Hispanic older adults. Lack of evidence on the acute effects of resistance training (RT) on cognitions in older adults (Mean age = 65.3 ± 3.7 yr.) recruited from a University extension program. Participants were randomly assigned to one of three possible groups (n = 15 in each group): a) High-intensity RT: 3 sets, 8 repetitions at 70% 1-RM, 2-min rest between sets (G1), b) Low-intensity RT: 4 sets, 14 repetitions at 30% 1-RM, 2-min rest between sets (G2), or c) Inactive control (G3). Before and after the experimental intervention, participants completed a comprehensive battery of cognitive tests assessing processing speed, visuospatial processing, executive function and cognitive control, working memory and immediate memory. Following a familiarization phase to RT exercises, participants in G1 and G2 performed 1-RM needed to define the exercise intensity. The intervention session consisted of the cognitive battery tests and five-minute warm-up on a stationary bicycle, followed by the exercise training protocol (knee extension, chest press, knee flexion, seated row, leg press, biceps curl). Immediately after finishing, the cognitive post-test was applied. The control group remained seated on a chair for 30-min and then performed the post-test. A two-way (group x measurement) ANCOVA was carried out using education level as a covariate. Average concentric velocity (ACV) during barbell exercises varies inversely as a function of load and can be used for determining training loads. It is unclear if ACV differs between variations of similar lifts such as the conventional deadlift (CD) and sumo deadlift (SD) or between the front squat (FS) and back squat (BS). The board provides information on the effectiveness and safety of RT, and highlights the need for more research on acute effects of RT on cognitive performance in older adults. 

Does the Physiological Tremor Identify the Intensity of Resistance Exercise? To our knowledge, this is the first study to suggest the physiological tremor could be an index of the intensity of resistance exercise.
Many resistance training exercises incorporate both eccentric and concentric phases of muscle contraction. Through the stretch-shortening cycle, the velocity and magnitude in which the eccentric phase is completed directly affects performance during the concentric phase. PURPOSE: Therefore, the purpose of this research was to investigate the effects of eccentric phase duration on concentric outcomes at 60% and 80% of one-repetition maximum (1RM) in the back squach and bench press. METHODS: Sixteen resistance-trained males (Age: 23.25 ±2.57 yrs; Height: 171.82±7.48cm, Body Mass: 81.96±12.16kg) completed four laboratory visits as follows: Day 1- 1RM testing; Day 2- establishment of normative eccentric durations; Days 3 and 4- randomized fast (0.75 times) or slow (2.00 times) eccentric duration conditions, which were controlled by visual and auditory metronomes. Outcome measures assessed during the concentric phase were: average concentric velocity (ACV), peak concentric velocity (PCV), rating of perceived exertion (RPE), range of motion (ROM), and barbell path. A one-way ANOVA and Pearson’s Product Moment correlations were used for analysis with significance set at p<0.05. RESULTS: Eccentric duration was significantly and inversely correlated with average concentric velocity (ACV) at 60% (r = -0.408) and 80% (r = -0.477) of 1RM squat and at 100% (r = -0.604) of 1RM bench press. At 60% of 1RM squat, both fast and slow eccentric conditions produced greater (p<0.001) peak concentric velocity (PCV) than normative duration with fast also producing greater PCV than slow (p<0.044). Eccentric duration had no impact on RPE, ROM, or barbell path. CONCLUSIONS: Therefore, our results show that well-trained athletes performing a deliberately faster eccentric phase may enhance squat and bench press performance. However, caution should be used when interpreting these results as athletes who already perform a fast eccentric duration may not benefit from deliberately increasing eccentric velocity.

Capturing a true assessment of power in upper body motions is problematic owing to difficulty reproducing a testing environment that matches kinematic profiles performed in sport. New technology permits more accurate reflections of three-dimensional power in isotonic environments. PURPOSE: To quantify power ratios of single-arm push and pull exercises across various loads. METHODS: 64 subjects performed a total of 1,145 sets on Protests (Boston Biomotion, Inc.): 570 sets of single-arm horizontal presses and 575 sets of single-arm horizontal rows. All subjects performed both exercises. Three-dimensional magnetic resistance was applied at 5, 10, 15, and 25lb. ANOVA tested the subjects’ kinematic profile across loads. RESULTS: On average, across all sets, maximum power per set was 175.2 ± 103.0 for presses and 183.6 ± 108.3 for pulls. For mean power throughout a set, subjects achieved 159.5 ± 96.3 for presses and 168.2 ± 102.5 for pulls. The different loads had significant differences for maximum (p<0.001) and mean (p<0.001) power; the higher the load, the higher the value in each measurement. At 5lb load, maximum power (presses and pulls combined) was 31.7 ± 10.8. At a 25lb load, it was 366.4 ± 96.0. Similarly, for mean power, at 5lb, subjects achieved 26.8 ± 10.2 while at 25lb, it was 335 ± 92.0. Dominant and non-dominant arms were similar in maximum (p=0.497) and mean power (p=0.530) although overall, pulling was stronger than pushing. Across all sets and loads, push-to-pull ratio was 0.95:1 for both maximum and mean power. This ratio changes at different loads. For peak power, at 5lb, the push-to-pull ratio was 1.22:1. At 10lb, it was 0.99:1. At 15lb, it was 0.98:1. At 20lb, it was 0.95:1. At 25lb, it was 0.94:1. For mean power, the same pattern, though slightly more extreme, was found. CONCLUSIONS: Numerous investigations have quantified ideal force ratios of the knee while similar assessments of the upper limbs have received relatively little attention. New technology provides a systematic approach to measure strength ratios of the shoulder and elbow in three-dimensional space. In this context, strength ratios change with load; push power exceeds pull power at low loads whereas the inverse is true at higher loads. These strength ratios may be considered for sport application and recognition of risk for upper limb injury.

To determine the appropriate load for resistance training (RT), exercise professionals (EPs) commonly have clients complete one repetition maximum testing (1RM). Then, submaximal loads can be easily calculated for RT sessions. A higher load (approximately 80% 1RM) is chosen if lower repetitions (reps) are desired (≈ 10 reps) and a lower load (approximately 60% 1RM) is chosen if higher reps are desired (≈ 20 reps). However, the number of reps generated (at both low and high loads) varies quite dramatically in standard populations. It is important to determine if there are strong relationships between the number of reps generated at lower and higher loads. The hypothesis is that individuals tend to perform similarly at different loads (i.e. generate above average average reps at both loads or below average reps at both loads). However, this topic has not been thoroughly studied. PURPOSE: Determine correlations between RT reps achieved at 60% 1RM load and 80% 1RM load. This will help us understand if the number of reps generated at lower loads predicts the number or reps generated at higher loads. METHODS: Participants were 19 college-aged (25 ± 4.3 years) females with a minimum of 2 months RT experience. Three exercise sessions were completed under the supervision of certified EPs. For session one, 1RM testing was completed. For session two and three, participants completed as many reps as possible for 60% 1RM or 80% 1RM (load and order was randomized) for 8 cam-mediated variable resistance training exercises. For all 8 exercises, Pearson correlation was used to assess the strength of the relationship between the two loads. RESULTS: The reps generated at 60% 1RM and 80% 1RM and correlations between the two were determined for the following 8 exercises: bench press (R=0.83 ±0.42 reps; r = 0.51), leg press (17.9±5.0 reps to 37.3±15.9 reps; r = 0.63), shoulder press (7.8±2.5 reps to 13.6±3.5 reps; r = 0.59), pull-down (10.3±2.1 reps to 24.1±8.3 reps; r = 0.05), knee extension (11.4±4.7 reps to 17.3±5.8 reps; r = 0.71), knee flexion (12.4±4.5 reps to 23.4±6.7 reps; r = 0.74), elbow extension (12.5±5.0 reps to 23.0±10.3 reps; r = 0.63), and
elbow flexion (9.9±5.4 reps to 17.3±6.4 reps; r = 0.86). CONCLUSIONS: EPs should understand that correlations between repetitions achieved at different loads tend to be moderate.

Board #62 May 29 11:00 AM - 12:30 PM
Prioritization of Resistance Training In NCAA Division I Track and Field Athletes
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PURPOSE: Resistance training is a powerful systemic stimulus known to improve a multitude of physiological variables. These include but are not limited to musculoskeletal strength, power, muscle mass, bone mass, and connective tissue. The sport of track and field is composed of many different events that focus on strength, power, and muscular endurance. Therefore resistance training is typically a vital part of athletic preparation for track and field athletes. The purpose of this study was to investigate specific manipulations of the acute program variables within the off-season resistance training program. METHODS: 34 NCAA Division I track and field student-athletes men participated in 12 week mesocycle of a non-linear periodized training program between the months of September and December. Groups were separated by needs of their athletic event and thus, performance primary goals (Group 1 (Power) n=12, age: 20±1.10, body mass: 87.8±13.3 kg; Group 2 (Local Muscular Endurance) n=12, age: 21.1±1.10, body mass: 82.9±10.4 kg; Group 3 (General Strength): n=10, age: 18.9±0.8, body mass: 80.4±8.1 kg). The training groups prioritized resistance loads and volume for development of power, local muscular endurance, and general strength, respectively. Performance variables were assessed at the beginning and end of this training program and consisted of counter movement vertical jump with arm swing, 1-repetition-maximum in the barbell bench press, and barbell back squat. RESULTS: The primary findings of this investigation are Group 1 saw significant (p≤0.05) statistical increases in vertical jump (4.1±1.1 cm), and back squat maximum (13.1±3.6 kg). Group 2 saw significant (p≤0.05) statistical increases in bench press maximum (14.2±0.5 kg), and back squat maximum (15.5±0.6 kg). Group 3 saw significant (p≤0.05) statistical increases in vertical jump (4.7±0.7 cm) and maximum back squat (20.0±5.0 kg). CONCLUSIONS: Our data indicate that the prioritization of strength within a 12 week mesocycle in the off-season training program had the best effect on the performance variables that were needed by each group. It appears that multiple stressors of the academic school year and athletic preparation are better mediated with a type of non-linear flexible program for competitive NCAA Division I track and field athletes.

Board #63 May 29 11:00 AM - 12:30 PM
Optimal Load Based on Body Mass: A Pilot Study with The Hang Power Clean
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A key factor for success in sports is the athletes’ capacity of producing mechanical power output. Implementation of weighting derivatives such as the hang power clean (HPC) in training programs have been utilized and substantial increases in muscle power are reached when the athletes train at the load in which they produce the peak power output, also defined as the optimal load. The optimal load is commonly determined as a relative percentage of the maximum weight one can lift a single time during a specific exercise, defined as the 1-repetition maximum (1RM) for that exercise. Given the disadvantages of 1RM tests utilization such as risk of injuries and excessive economical time expenditure of time, it has become clear the need for alternative strategies for the optimal load identification. PURPOSE: To estimate the optimal load of the HPC from body mass (BM) percentages. METHODS: Nine healthy young men (age: 21.3±1.8, height: 174.6±6.8 cm, weight: 80.6±6.2 kg, 1RM HPC: 90.8±9.6 kg, 1RM to weight ratio: 1.13 ± 0.07) participated in this study. Subjects performed a 1RM in the HPC in the first session and during the second session the peak power was calculated across loads of 30, 40, 50, 60, 70, 80, and 90% of their BM in the HPC in a randomized order. RESULTS: Our results showed significant differences among the power output and the percentages of the BM. Briefly, power output at 30% of the BM was similar in relation to 40% and 50% of the BM, whilst significantly lower than 60%, 70%, 80% and 90% of the BM. For 40% of the BM, it was observed similar result in relation to 50% of the BM, whilst results significantly lower than 60%, 70%, 80% and 90% of the BM. For 50% of the BM, similar result it was observed only 60% of the BM, while lower power output it was observed in comparison to 70%, 80% and 90% of the BM. For 60% of the BM, lower power output was observed when compared to 70%, 80% and 90% of the BM. Finally, no significant differences were observed between 70% and 80% and 90% of the BM, as well as 80% and 90% of the BM. CONCLUSIONS: Our results indicate that the optimal load based on BM for HPC exercise occurs at 70%, 80% and 90% of the BM.

Board #64 May 29 11:00 AM - 12:30 PM
Comparing Relative Attempt Progressions Of Elite Male And Female Raw Powerlifters
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PURPOSE: In powerlifting, each lifter is given 3 attempts to contest the barbell squat (BS), bench press (BP), and deadlift (DL). The summation of the best valid attempt for each discipline constitutes a powerlifting total (PT). However, little information is available regarding selection strategies to maximize PT. Therefore, the purpose of this study was to determine and compare the magnitude of load progression from one attempt to the next for each lift between elite raw male and female powerlifters. METHODS: Data used in this study was retrieved from the International Powerlifting Federation (IPF) online database for all Classic World Championships from 2012-2018. Males (n=65) and females (n=41) from all weight classes who completed 9 out of 9 lifts successfully were included in the analysis. A Welch’s t-test was used to compare relative attempt progressions (percent increase from attempt 1 to 2 and to 3 between males and females for all lifts with alpha level set at p≤0.05). RESULTS: Relative attempt progression was similar between females (6.08±2.11%) and males (5.59±1.80%) from attempt 1 and 2 on BS and from attempt 2 to 3 on DL (females: 4.33±2.01%; males: 3.75±1.84%). However, relative attempt progression was greater for females compared to males between attempt 1 and 2 on BP (6.50±2.10% vs 5.35±2.12%; p<0.005) and DL (6.76±4.19% vs 5.40±2.28%, p<0.03), and between attempt 2 and 3 on BP (4.28±1.74% vs 2.85±1.24%; p<0.001) and BS (4.04±1.89% vs 3.31±1.43%, p<0.03), respectively. CONCLUSIONS: These data indicate that successful elite male powerlifters are on average more conservative with their attempt progressions for each lift than females. This may be due to differences in opening attempt selection or perceived effort during subsequent attempts between males and females. Importantly, these findings provide general attempt progression guidelines for coaches working with elite raw (i.e., classic) male and female powerlifters.

A-41 Free Communication/Poster - Biomechanics of Resistance Training
Wednesday, May 29, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

Board #65 May 29 11:00 AM - 12:30 PM
Validity of the Two-Point Method for Estimating Squat and Bench Press One Repetition Maximums
Brandon W. Snyder, Dylan S. Zangakis, Gavin L. Moir, Shawn N. Munford, Shala E. Davis, FACSM. 1East Stroudsburg University, East Stroudsburg, PA. (Sponsor: Shala Davis, FACSM) (No relevant relationships reported)

PURPOSE: To assess the validity of the two-point method for estimating one repetition maximums (1RM) in the squat and bench press exercises with varied pairs of loads. METHODS: Thirteen resistance-trained men (age: 21.7±0.4 years; height 1.74±0.07 m; mass: 82.9±9.3 kg; 1-repetition maximum (1RM) back squat: 149.9±20.7 kg; 1RM bench press: 114.8±18.5 kg) performed three trials of squat and bench press using the following percentages of 1RM: 20, 30, 40, 50, 60, 70, 80, 90%. The order of the loads was counterbalanced across the participants. The mean vertical velocity of the barbell during the concentric phase of each repetition was recorded using a 3-D motion analysis system (Vicon; 200 Hz). Varied loading pairs (20% & 80%, 30% & 70%, 40% & 60%) were selected and regressions were created to estimate 1RMs. Analysis of variance was used to compare differences between the measured and estimated 1RMs for the squat and bench press. RESULTS: No significant differences were found (p>0.05) between estimated and measured 1RMs despite large range of mean differences in the squat (MD: 6.45 kg-27.47kg) and back squat (MD: 1.09 kg). However, relative attempt progression was greater for females compared to males between attempt 1 and 2 on BP (6.50±2.10% vs 5.35±2.12%; p<0.005) and DL (6.76±4.19% vs 5.40±2.28%, p<0.03), and between attempt 2 and 3 on BP (4.28±1.74% vs 2.85±1.24%; p<0.001) and BS (4.04±1.89% vs 3.31±1.43%, p<0.03), respectively. CONCLUSIONS: These data indicate that successful elite male powerlifters are on average more conservative with their attempt progressions for each lift than females. This may be due to differences in opening attempt selection or perceived effort during subsequent attempts between males and females. Importantly, these findings provide general attempt progression guidelines for coaches working with elite raw (i.e., classic) male and female powerlifters.

Abstracts were prepared by the authors and printed as submitted.
The squat is a common and versatile exercise in both the rehabilitation and sports performance settings. Sagittal plane trunk and shank orientations have been theorized to modulate extensor moments at the hip and knee during squatting. For example, increasing trunk inclination is thought to increase the extensor moment at the hip and decrease the extensor moment at the knee, while increasing shank inclination has been theorized to increase the knee extensor moment and decrease the hip extensor moment. Although the influence of sagittal plane tibia and trunk orientations on hip and knee extensor moments have been established in computational models, experimental validation in human subjects is lacking. Purpose: To determine the influence of sagittal plane trunk and shank orientations on hip and knee extensor moments during the lowering phase of a barbell back squat. Methods: Kinematic and kinetic data were obtained from 8 male and 8 female participants during the execution of 8 different squat conditions in which the tibia and trunk orientations were manipulated. Foot position, bar position, bar load, and stance width were controlled across subjects. The search of non-invasive and easy-to-monitor variables is essential to improve the athlete performance. The assessment of neuromuscular characteristics, such as velocity, with a linear position transducer (LTP), allows training optimization and just like heart rate variability (HRV) guaranties an adequate athlete monitoring. The autonomic nervous system (ANS) and Sympathetic nervous system (SNS) exert an influence on skeletal muscle functions. However, there are no studies that correlate the activity of SNS with current technologies such as LTP to calculate several neuromuscular performance variables. Otherwise, the results of HRV assessment could be related to a TLP strength test performance. PURPOSE: The aim of this study is to find correlations between HRV variables and TLC variables during a half squat movement in young female soccer players. METHODS: Thirteen professional female soccer players were tested (Age 20.7 years ±2.6, Weight 60.9 kg ±6.4), we analyzed HRV during standing, we also evaluated the velocity of a half squat movement with a LTP, during a maximal strength test, statistical analyses were performed to determine associations.

RESULTS: Associations were found between Stress index during standing position and Mean acceleration to Maximal velocity (m/s²) (R²=0.3151 P=0.0381), Mean velocity (R²=0.3284 P=0.0322), Propulsive mean velocity (R²=0.3189 P=0.0334).

CONCLUSIONS: Stress Index (SI) is a variable that reflects sympathetic activation and suggest automatic reactivity to stress situations indicating an adequate response to confront the demands presented by the sport. Thus, an abnormal sympathetic predominance could result in chronic fatigue which would evolve a SI higher elevation, giving the index greater value. According to our findings the SI during standing position correlated with velocity and acceleration variables during half squat, this suggests that adequate sympathetic reactivity could contribute to the improvement of neuromuscular variables. We hypothesized that SI could be a simple non-invasive way to measure sympathetic reactivity in sports, being part in assessment and monitoring of performance. We also suggest that interventions aimed to improve sympathetic reactivity could improve neuromuscular performance.
Reliability of Barbell Velocities Recorded from the GymAware Device during Squat and Bench Press Exercises
Shawn N. Munford, Dylan S. Zangakis, Gavin L. Moir, Brandon W. Snyder, Shala E. Davis, FACSM. East Stroudsburg University, East Stroudsburg, PA. (Sponsor: Shala E Davis, FACSM)

Purpose: To assess the reliability of velocities recorded with the GymAware linear position transducer (LTP) during the squat and bench press exercises. Methods: Thirteen resistance-trained men (age: 21.7±0.4 years; height 1.74±0.07 m; mass: 82.9±9.5 kg; 1-repetition maximum (1RM) back squat: 149.9±20.7 kg; bench 1RM: 114.8±18.5 kg) performed three trials of squat and bench press using the following percentages of 1RM: 20, 30, 40, 50, 60, 70, 80%. The order of the loads was counterbalanced across the participants. The mean vertical velocity of the barbell during the concentric phase of each repetition was recorded using a 3-D motion analysis system (Vicon; 200 Hz) and the GymAware LTP. Reliability of the GymAware was determined using intraclass correlations (ICC) and coefficients of variance (CV%). Results: The GymAware showed high intersession reliability for both exercises with ICCs ranging from good to excellent (squat: 0.71-0.91; bench press: 0.83-0.91). CV% showed precision in the recorded velocities during both exercises (squat: 3.6%-5.8%; bench press: 4.9%-7.4%). Conclusion: The GymAware LTP shows high intersession reliability for recorded velocities during the squat and bench press exercises.

Pre-stretch augmentation (PAI) and reactive strength (RSI) indices have been used to assess the stretch-shortening cycle (SSC) contribution to vertical jumping. SSC activation is also a part of many upper extremity (UE) activities, however quantification of SSC contribution to UE function largely remains unknown. Furthermore, based on differences in UE muscle-tendon properties, the SSC effect is likely different between men and women.

Methods: To compare UE PAI and RSI indices between men and women. Results: Methods: 20 men (26±2.4 years) and 17 women (21±4.2±6 years) with ~6 months of UE resistance training completed 3 bench press trials using 2 sets, pure concentric (PC) and rebound (RB) (no pause between eccentric the concentric phases), using 75% of their one repetition maximum. Participants were instructed to complete the concentric phase as quickly as possible. Concentric phase vertical average force (AF) and power (AP) were computed from barbell kinematic data and used to calculate PAI [(RB-PC)/PC*100] and RSI (RB-PC). Independent t tests, adjusted for unequal variances, were conducted to compare indexes between sexes.

Results: Except for one man and one woman, participants demonstrated greater AF and AP during the RB bench press compared to PC bench press. Men (49-38) had significantly higher (P<.001, d=2.3) than women (27±1.7). There was no significant (P=.068, d=64) sex difference for AP PAI. Men (AF:3.9±2.9, AP:129.0±56.7) demonstrated significantly higher RSI for both AF (P<.001, d=1.5) and AP (P<.001, d=2.3) than women (AF:76±34, AP:29.6±18.1).

Conclusions: Except for two participants, as expected, preceding the concentric phase with SSC resulted in greater average force and power production. With the exception of AP PAI, SSC augmentation was greater for the men. Consistent with the RSI reflecting the AP/AF difference between RB and PC bench press styles, the sex comparison effects sizes were larger for the RSI than the PAI, which expresses the difference relative to the PC. Further research is needed to determine the extent to which UE muscle-tendon properties explain the sex differences identified.
underwent the stretching routine and post-tests as previously described. The following measures were made during each test: ROM, thermal sensation (TS), thermal comfort (TC), electromyography (EMG), and the Hoffman reflex (HR). A two-way RM ANOVA detected differences between time (Pre vs. Post), condition (CONTROL vs. M vs. P), and any interaction, with post-hoc testing used to indicate directionality (α=0.05).

RESULTS: Menthol significantly improved AADF ROM by 2.67 degrees compared to P (p<0.001), coinciding with significantly cooler sensations (p<0.01) and a loss of thermal comfort (p<0.05) with menthol. Similarly, menthol improved WBLT ROM by 2.98 degrees compared to P (p<0.01), coinciding with a significant loss of thermal comfort (p<0.05) with menthol.

CONCLUSION: Menthol appears to improve active joint range of motion during stretches that are held to a maximal tolerable tension. This suggests that one’s perception of tension per se, rather than actual muscle tension, may be more important in determining maximal active joint ROM. It is not clear whether menthol achieves this by specifically reducing one’s perception of muscle tension during a maximal stretch, or whether other sensory inputs arising from menthol i.e. TS, TC, divert attention from it.

A-42 Free Communication/Poster - Cycling
Wednesday, May 29, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

Previous research on the link between saddle pressure, rider comfort and urological disorders have focused predominantly on saddle design, bicycle setup and workload. Yet, the effect of chamois design on saddle pressure and perceived comfort during cycling in both men and women remains unresolved.

PURPOSE: In this study we investigated the effects of chamois design on perceived comfort and peak saddle pressure during seated sub-maximal cycling in men and women.

METHODS: Eighteen subjects (9 M; 9 F) participated in two separate protocols, one laboratory- and one field-based. The laboratory protocol required the participants to ride at 2.5 W.kg⁻¹ for 5 minutes using either a new (A) or old (B) chamois design. Saddle pressure was captured for 30 seconds during each trial. At the conclusion of each trial, subjects were asked to rate the chamois on seven different comfort categories (Overall Comfort, Genital Sensation, Genital Comfort, Sit Bone Comfort, Buttocks Comfort, Stability on the Saddle, Off Saddle Comfort). The field protocol required subjects to complete one week of regular cycling training in each chamois design and were asked to complete the same comfort questionnaire at the end of each week. A repeated measures, two-way ANOVA was performed to test for main and interaction effects (Chamois x Sex) on saddle pressure and each comfort category for both the laboratory and field study.

RESULTS: The laboratory protocol resulted in a significantly main effect of chamois design on ‘Overall Comfort’ (A>B, p<0.05). The field protocol also resulted in a significant main effect of chamois design on ‘Overall Comfort’ (A>B, p<0.05) as well as ‘Buttocks Comfort’ (A>B, p<0.05). Peak saddle pressures were significantly higher in Chamois B than Chamois A (B=24.5±3.54 vs. A=23.06±3.53 psi, p<0.05).

There was a significant main effect of Sex on Genital Sensation and Genital Comfort (Males>Females, p<0.05) under both laboratory and field conditions.

CONCLUSIONS: Chamois design is an important factor that affects both peak saddle pressure and perceived comfort for males and females during cycling. Innovation of future chamois designs should focus on providing individualized comfort for males and females. Further research is needed to investigate the possible link between chamois design and the development of urological disorders.

237 Board #75 May 29 11:00 AM - 12:30 PM
Effect Of Chamois Design on Rider Comfort And Saddle Pressure During Sub-Maximal Cycling
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238 Board #76 May 29 11:00 AM - 12:30 PM
Effects of Bicycle Crank Length on Gross Efficiency, Power, and Joint Kinematics During Cycling Ergometry
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PURPOSE: To determine the effects of six different crank lengths (150, 165, 170, 172.5, 175, and 180 mm) on gross efficiency, maximum power, optimal pedaling rate (cadence at maximum power), and joint kinematics of the hip and knee.

METHODS: Elite level cyclists (n = 18) participated in two visits to the Cal Poly Cycling Lab. The purpose of the first lab session was to measure VO₂ peak (60.6 ± 7.6 mL·min⁻¹·kg⁻¹), participant characteristics (28.2 ± 5.3 yrs; 175.6 ± 7.4 cm; 70.5 ± 5.3 kg; 255 ± 105 km/week), and complete familiarization trials with four different crank lengths. These practice trials consisted of 4 seconds seated maximal sprints on the participant’s original crank length (170, 172.5, or 175 mm) and three other crank lengths (150, 165, and 180 mm). The second test session was a single-blind randomized crossover design with the six different crank lengths. After a 5 minute warm up, participants performed a 3 minute steady state effort at 65% VO₂ peak and 90 rpm. This was followed by two maximum effort 4 second seated sprints with 90 seconds rest prior to each sprint. Participants rested for 5 minutes before the next crank length trial. RESULTS: During steady state cycling, shorter cranks had a higher gross efficiency (150 mm: 22.1% compared to longer cranks (180 mm: 21.6%), (p < 0.001). No significant differences were found between crank lengths for maximum power output during the 4 second sprints. There was an increase in optimal pedaling rate between 150 mm cranks (130 rpm) and all other lengths (180 mm: 120 rpm) (p < 0.001). 150 mm cranks have a significantly smaller hip (45°) and knee (67°) range of motion than all other cranks measured (180 mm: hip 51°, knee 75°) (p < 0.001). CONCLUSIONS: Shorter cranks resulted in a significantly higher gross efficiency, smaller knee and hip range of motion, and a higher optimal pedaling rate.
Cycling is one of the most popular exercises for knee osteoarthritis (OA) or to total knee replacement (TKR) rehabilitation. It is known for reduced loading to lower extremity joints compared to walking. One way to fit a bicycle to an individual is adjusting saddle height. There have been limited studies on effects of saddle height on frontal-plane knee joint loading.

**Purpose:** To determine the effects of saddle height and workrate on the knee joint biomechanics. **Methods:** Fourteen experienced cyclists (age 50-70 years) were recruited from bicycle shops and clubs. Subjects participated in a single testing session that included six test conditions of three saddle heights at two workrates. Saddle heights were set at 20°, 30°, and 40° of knee flexion while the crank was at the bottom position. Workrate was electronically controlled at 80 and 120 watts. Three-dimensional kinematic (240 Hz, Vicon) and pedal force reaction (1200 Hz, Customized instrumented pedal) data were recorded for five successful cycles in each condition. Joint kinematics and kinetics were calculated and compared using a 3x2 ANOVA and paired t-tests with a Bonferroni correction. **Results:** There were no significant interactions or saddle height main effect for peak knee abduction moment. There was a significant effect of saddle height on knee extension ROM, peak knee extension moment, and peak knee flexion moment (all \( p < 0.012 \)). The post hoc comparisons showed that the knee extension ROM was different from one another between 20°, 30°, and 40° saddle heights (80.1° vs. 73.7° vs. 67.6°, respectively). The peak knee extension moment for 20° saddle height (19.9 Nm) was different from 30° and 40° saddle heights (22.6 Nm and 23.6 Nm, respectively). Additionally, the peak ankle flexion moment was different between all three saddle heights (33.4 Nm vs. -23.4 Nm vs. -18.9 Nm). There was a significant workrate main effect on knee extension ROM, peak knee extension moment, and peak ankle abduction moment (all \( p < 0.008 \)).

**Conclusions:** Although decreased saddle height increased the knee extension moment, the knee abduction moment was not affected. These results suggest that saddle height adjustment could be a potential and safe method to modulate knee joint loading without concern of impacting frontal-plane knee loading in rehabilitation for patients with knee OA or TKR.

Rolling resistance represents a key resistance force to overcome during cycling. This resistance force is calculated as the product of the coefficient of rolling resistance (Crr) and rider-bike system weight. Crr is influenced by a number of factors including tire pressure. Typically, Crr is measured in a laboratory situation but more recently, bike-and-rider system weight. Crr is influenced by a number of factors including tire and air temperature, for example. Processing algorithms are used to generate Crr. Although decreased saddle height increased the knee extension moment, the knee abduction moment was not affected. These results suggest that saddle height adjustment could be a potential and safe method to modulate knee joint loading without concern of impacting frontal-plane knee loading in rehabilitation for patients with knee OA or TKR.

**Purpose:** To determine if a bike-mounted aerodynamic sensor can detect changes in wheel rolling resistance during cycling with different tire pressures outdoors. **Methods:** A cyclist rode a road bike (combined mass 80.45 kg) equipped with an aerodynamic sensor to measure Crr (Aerolab). The bike-mounted sensor measures a number of parameters such as wind speed, global position system (GPS) data, cycling power, and air temperature, for example. Processing algorithms are used to generate Crr. For this experiment, tire pressure was manipulated in a manner that changes in Crr were expected. Specifically, three tire pressures were tested: 100, 70, and 40 PSI. Tire pressure was measured using a custom made valve system connected to a digital pressure gauge (Ashcroft Digital Gauge, 0.05% terminal point accuracy, 0-200 PSI range). The rider completed 2 trials per pressure condition with each trial consisting of a coast-down test. The rider reached a target velocity and then stopped pedaling. Data were recorded for at least 60 seconds for each trial. The rider maintained the same ride position for each trial. Data were processed using custom software to yield Crr per trial using an iterative algorithm that calculates Crr multiple times using different sections of data with corrections for air temperature. The research team member processing data was not aware of the conditions. Crr values were normalized such that the Crr during the 100 psi condition was set to 100%. **Results** Relative Crr values were 100±2.7% at 100 psi, 95.7±1.8% at 70 psi, and 119.6±1.7% at 40 psi. **Conclusions** Using a bike-mounted aerodynamic sensor, changes in rolling resistance were detected when tire pressure was manipulated. However, confounding factors that could influence the calculation of Crr include the influence of subtle changes in rider position, yaw angle, and tire temperature, for example.
for either muscle was influenced by wetsuit condition (p < 0.05). PD EMG patterns were moderately correlated between conditions (NWS-FSW NWS-SLW FSW-SLW: r = 0.66±0.16, 0.65±0.16, 0.62±0.20) whereas strength of AD correlations were weak (r = 0.37±0.33, 0.42±0.19, 0.39±0.21). Conclusion: Muscle activity patterns of PD were more strongly similar than AD between swimming without a wetsuit then with a wetsuit as well as between wetsuit conditions. The weaker AD correlations between conditions may be influenced by horizontal position due to buoyancy force and/or possible resistance to shoulder movements of the wetsuit.

### Board #82
May 29 9:30 AM - 11:00 AM
**Comparison Of Torques And Positions Of The Half And Full Golf Swing - A Pilot Study**
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**PURPOSE:** A concern for healthcare workers is how to advise individuals wishing to return to golf following lower extremity (LE) injury or surgery. A common recommendation is to use a half swing, however, it is not known whether this truly reduces the motion or muscular torque for the LE. The purpose of this study was to examine the peak torques and positions of the hip during a half swing versus a full golf.

**METHODS:** Five recreational golfers with handicaps ≤ 20, both male and female participated. Participants completed 10 full swings and 10 half swings. A 10-camera motion analysis system, with force plates, was used to record swing data. Data was reduced using a 3-D modeling program and standard inverse dynamics were used to determine internal net joint torques. Peak torques are presented as Nm%BW*Ht and peak position in degrees. Differences were considered significant at the .05 level of probability.

**RESULTS:** Subjects average age was 33 ± 7.15 years, height = 165.5 ± 6 cm, and weight = 85.4 ± 20.4 kg. Maximum vertebral motion was 13.5° for thoracic extension, 10.3° for lumbar extension, 20.9° for hip flexion, and 23.5° for knee flexion. The 2.10° difference for the full vs. half swing was found to be significant (p < 0.05). Conclusion: Our findings showed a great deal of variability in the amount of movement at the joint both for the full and half swing, thus this may be a source of concern for clinicians. In addition, while some of the hip joint torques were reduced with the half swing, some of the torques were still much higher than previously reported torques for walking and activities of daily living.

### Board #83
May 29 9:30 AM - 11:00 AM
**Comparison Of Single-Leg Hopping Parameters Across Different Artificial Turf Systems And Natural Turfgrass**
Brandi E. Decoux, Christopher M. Wilburn, Nicholas H. Moore, Wendi H. Weimar. 
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**PURPOSE:** This study compared leg spring parameters during single-leg hopping on different modern sports turfs, including three artificial turf systems with different structural components and a natural turfgrass surface. **METHODS:** Seven participants (ages 19-30 yrs; height = 1.79 ± 0.08 m; mass = 75.9 ± 10.1 kg) were recruited for this study. Each participant participated for three trials of single-leg hopping in place on each of the four surfaces at a self-selected pace. Kinematics were collected using the Vicon MX5 system. The last 30s of each trial was used to determine internal net joint torques. Peak torques are presented as Nm%BW*Ht and peak position in degrees. Differences were considered significant at the .05 level of probability.

**RESULTS:** Subjects average age was 33 ± 17.83 years, height = 1.79 ± 0.08 m; mass = 75.9 ± 10.1 kg) were recruited for this study. Each participant participated for three trials of single-leg hopping in place on each of the four surfaces at a self-selected pace. Kinematics were collected using the Vicon MX5 system. The last 30s of each trial was used to determine internal net joint torques. Peak torques are presented as Nm%BW*Ht and peak position in degrees. Differences were considered significant at the .05 level of probability.

**CONCLUSIONS:** The major finding of this study that using a half swing does reduce the amount of internal torque around the hip, as compared to a full swing. Interestingly, the changes in peak position of the hip joint and the torques do not appear to be consistent. Our findings showed a great deal of variability in the amount of movement at the joint both for the full and half swing, thus this may be a source of concern for clinicians. In addition, while some of the hip joint torques were reduced with the half swing, some of the torques were still much higher than previously reported torques for walking and activities of daily living.

### Board #84
May 29 9:30 AM - 11:00 AM
**Injuries In Lower Legs Related To The Unipodal Dynamic Stabilization**
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**PURPOSE:** The instability of the knee and ankle joints are the main risk factors for injuries of the musculoskeletal system and soft tissues when they are subjected to high training loads, as is the case of the military in initial training. The lower train is subjected to accelerations, decelerations, changes of direction and jumps that involve high loads that must support the most distal and intermediate joints in order to absorb the impacts. The measurement of stability is routinely used to measure the risk factors of injury to the ankles and knee, being the most frequent in military training. **METHODS:** To determine the risk of lower train injury in Colombian military personnel by analyzing the dynamic stability. **RESULTS:** The total number of subjects, 41 presented lesions in the lower limbs during follow-up, corresponding to 33.1%. The logistic regression model developed to determine the risk factors associated with injuries in lower limbs, presented a significance of the model of P = 0.017, with a probability of success of 70%. The variables: Body mass index (OR 1.001, 95% CI 0.843 - 1.181), gender (OR 2.709, 95% CI 1.15 - 6.37), the difference of the right-left stabilisation time (OR 0.66, 95% CI 1.33 - 32.14), the percentage of asymmetry of the stabilization time (OR 1.021, 95% CI 0.999 - 1.043), the percentage of asymmetry of the peak force (OR 1.015, 95% CI 0.977 - 1.055), are those that best predict the model. **CONCLUSIONS:** The stabilization time is a strong predictor of risk factors for lower train injuries. Likewise, gender and dominance of the lower limb are determining factors in the development of injuries under military training. Based on the results, it is considered a tool that can help to measure the risk factors in the military population in training and the controls throughout their training.
CONCLUSION: At maximal speeds, an increase in system adaptability was observed compared to preferred running, however, this increase was not transferrable to desired performance improvement immediately or after. An increase in complexity during perturbed running and not hopping may be due to dissimilarities in task difficulty and constraint type experienced by the runners.

RESULTS: (environment) repeated measures ANOVA (α=0.05). Points. A VG, RMS, and movement time were each analyzed using a 2 (jump type) x 2 (environment) repeated measures ANOVA (α=0.05). RESULTS: EMG (AVG or RMS) was not influenced by the interaction of environment and jump type (p>0.05); nor was EMG (AVG or RMS) performed two plyometric exercises (countermovement jump (CMJ), drop jump (DJ)) while in two different environments (on land, in shallow water). A water proof electromyography (EMG) system (Cometa Miniwave Infinity, 2000 Hz) was used to record the signals of the muscle activity. Each sensor measured EMG as well as accelerations (3 dimensions). Four muscles (rectus femoris (RF), bicep femoris (BF), gastrocnemius (GA) and tibialis anterior (TA)) were used to capture EMG data. DJ trials were initiated from a 30.5 cm platform and order of conditions was always land followed by water. Depth of water was set to no go higher than xyphoid process level and no lower than the navel while standing. DATA ANALYSIS: Resultant acceleration was calculated for each sensor with a composite score calculated as the sum of the resultant acceleration for all sensors. This signal contained a peak upon initiating movement and a peak upon landing to end the movement. These peaks were identified, and EMG data were extracted 0.25 s before and after these discrete events to represent beginning and ending of analysis. Average (AVG), root mean square (RMS) and movement time were each calculated between the two extraction points. AVG, RMS, and movement time were each analyzed using a 2 (jump type) x 2 (environment) repeated measures ANOVA (p<0.05). RESULTS: EMG (AVG or RMS) was not influenced by the interaction of environment and jump type (p>0.05); nor was there a main effect for jump type or environment for any muscle that was measured (p>0.05). However, BF AVG was different for jumps regardless of environment (p<0.05).

CONCLUSION: Muscle activity magnitudes appears to not be influenced between environments for CMJ and DJ for any of the four muscles measured.
leading to the findings of reference values of the asymmetries in the Colombian military population. Particularly, the eccentric deceleration TDF was used as a reference marker to evaluate injury risk factors and neuromuscular performance in Colombian military.

252 Board #90 May 29 9:30 AM - 11:00 AM
Gender Differences Between Muscle Activation during Star Excursion Balance Test on Stable Versus Unstable Surfaces
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(No relevant relationships reported)

Anterior (A), postero medial (PM), and posterolateral (PL) directions of Star Excursion Balance Test (SEBT) are used for rehabilitation. Adding unstable surface to the task has been reported to change electromyographic (EMG) activity. Studies have also reported differences in EMG between males and females. PURPOSE: To compare EMG of lower extremity (LE) muscles between males and females during SEBT on stable and unstable surfaces. METHODS: Surface EMG was collected on 10 male and 10 female healthy adults for gluteus maximus, gluteus medius (GMD), medial hamstring, biceps femoris (BF), vastus medialis (VM), rectus femoris (RF), vastus lateralis (VL), anterior tibialis (AT), and medial gastrocnemius (MG) on the stance leg during SEBT. Unstable surface was introduced using TherabandTM stability trainer. Independent t test assessed the difference in EMG between males and females for each direction and each muscle during SEBT for both stable and unstable. Paired t tests were run separately for males and females to determine difference in each direction for each muscle between stable and unstable surface with a 0.05. EMG were reported as the percentage of the maximal voluntary isometric contraction (%MVIC). RESULTS: Females showed significantly higher EMG than males for AT in PL direction (63.14 vs 47.12 %MVIC; P<0.01) and PM (64.15 vs 47.14 %MVIC; P<0.02) directions on the unstable surface and MG in PM (44.17 vs 25.17 %MVIC; P=0.02) direction on stable surface and A (62.23 vs 37.20 %MVIC; P=0.02), PL (76.29 vs 45.25 %MVIC; P=0.02), and PM (58.26 vs 36.20 %MVIC; P=0.04) directions on unstable surface. EMG was higher for unstable surface in females for VM, RF, and VL in the A direction (p=0.05) and MG in all three directions (p<0.05) and in males for GMD, VM, RF, VL in the A direction (p=0.05) and BF and MG in the PM direction (p<0.05). CONCLUSION: Females produced higher muscle activation than males for ankle muscles. Adding unstable surface increased LE muscle activation during SEBT. Due to gender differences and surface variability in EMG during SEBT clinicians could consider incorporating both stable and unstable surfaces during rehabilitation especially for women to reduce ankle injuries.

253 Board #91 May 29 9:30 AM - 11:00 AM
Influence of Turf Surface on Change of Direction Parameters
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(No relevant relationships reported)

The surface over which people complete sports tasks can influence body posture and performance outcomes. PURPOSE: This study compared time to complete a change of direction agility drill and stopping strategies during this drill on different modern sports turfs, including three different artificial turf systems (AS1, AS2, AS3) and a natural grass surface (NS). METHODS: Six participants (ages 19-30 yrs; height ~1.79 ± 0.08 m; mass ~ 75.9 ± 10.1 kg) were recruited and provided voluntary consent. Each participant performed three trials of a 5-10-5 agility drill on each of the four surfaces, as quickly as possible. A FilRight® timing tool was used to collect the performance measure of time to complete the task. The segment positions were collected using the Xsens MTN system. All data was collected during participants’ single sacrum, heel and ground (SHAng) was determined through Visual3D for the plant leg. RESULTS: The data from three trials for each participant, for each surface, was included in the statistical analysis. The repeated measures ANOVA for each variable yielded significant differences between surfaces. Pairwise comparisons indicated that change of direction time on AS1 (4.70 ± 0.14 s) was significantly less than on AS2 (4.83 ± 0.28 s; p=0.007) and AS3 (4.83 ± 0.30 s; p<0.001). In addition, SHAng 5 on NS (39.0 ± 4.7 deg) was significantly larger than on all artificial surfaces (AS1: 35.1 ± 3.8 deg; p=0.014; AS2: 34.9 ± 2.5 deg; p=0.002; AS3: 35.4 ± 3.6 deg; p=0.019). Last, SHAng 10 on NS (38.5 ± 4.5 deg) was significantly larger than on all artificial surfaces (AS1: 35.7 ± 2.9 deg; p=0.024; AS2: 35.7 ± 2.4 deg; p=0.022; AS3: 36.1 ± 2.5 deg; p=0.028). CONCLUSION: This project indicates that these participants adopted a different stopping strategy on the natural surface than the artificial surfaces. To mitigate the lower resistance to shear forces offered by natural grass, the participants adopted a more upright body position, presumably increasing the normal force as well as the friction utilized at the foot-to-ground interface. Assuming adequate friction is maintained, a smaller SHAng and thus lower body position will provide for an increase in propulsive forces resulting in a faster change in direction and better performance outcome.

254 Board #92 May 29 9:30 AM - 11:00 AM
Kinetic Strategies during Single-Leg Hopping in Individuals With and Without Chronic Ankle Instability
Hoishi Sagawa1, Adam E. Jagodinsky1, Mohammed Zamani1, Christopher Wilburn2, Wendi H. Weimar1. Illinois State University, Normal, IL; Auburn University, Auburn, AL. (Sponsor: David Thomas, FACSM)
(No relevant relationships reported)

Adaptability of the motor system indicates successful management of chronic ankle instability (CAI). Research shows that individuals who do not exhibit residual symptoms following an ankle sprain (i.e. copers) exhibit greater adaptability during walking compared to individuals with CAI. However, questions remain surrounding systemic differences exhibited by coper groups, particularly when higher movement demands are imposed on the system. Analysis of load acceptance patterns during single-leg hopping could provide an indication of the systemic movement adaptations between the groups during higher demands of movement tasks. PURPOSE: Examine percent contribution (%C) to support moment (MS) during single-leg hop in healthy coper, and CAI groups. METHODS: 48 individuals (16 Copers, 16 CAI) were recruited in the study. Participants performed 15 trials of single-leg hopping. Position data were collected using a motion capture system, and reaction forces were obtained from force platforms. Joint kinetics were calculated using inverse dynamics, and the MS was calculated as the sum of the ankle (A), knee (K), and H moments in the sagittal plane. The % of the A, K, and H moment to MS was calculated at 15 percent of stance phase. A one-way ANOVA was conducted to test group effects for each dependent measure.
RESULTS: No significant differences in %C to MS were found between the healthy (A 81.87±18.37%; K 23.81±16.90%; H 2.22±27.19%), coper (A 73.78±23.33%; K 28.28±21.65%; H 1.65±33.17%), and CAI groups (A 83.76±17.91%; K 16.48±12.58%; H 0.78±19.71%) during the initial loading phase of single-leg hopping. CONCLUSION: Copers did not exhibit distinct kinetic patterns during single-leg hopping. This finding suggests that adaptation of movement is less likely to occur with higher demands of movement tasks following ankle injury. It is also possible that low amplitude COM displacement associated with the hopping task may not have placed adequate constraint on the subjects to elicit adaptive strategies. More research is needed to explore how individual joint kinetic adaptations contribute to dynamic tasks across groups.

255 Board #93 May 29 9:30 AM - 11:00 AM
Biomechanics of Pitching: Horizontal Abduction Predicts Power; Power Predicts Strikeouts and Wins

Traditional strength training for pitchers focuses on compound lifts, predominantly of the lower extremity, to increase pitching power. Though widely employed, this approach has not been sufficiently validated. PURPOSE: To evaluate both predictors and consequences of increased mechanical power in collegiate pitching. METHODS: 10 pitchers from a D1 baseball program underwent 4 days of assessment separated by at least 3 days of rest: 1) Squat max was performed and recorded, 2) Sparta force plate (Sparta Science, USA) captured load, explode, and drive. 3) Proteus (Boston Biomotion, USA) measured power and endurance in 10 movements: Left and right core rotation, internal and external rotation, shoulder flexion and extension, elbow flexion and extension, and horizontal abduction and adduction. 4) Proteus recorded throwing mechanics via 5 sets of pitches (4 reps per set) at varying loads of magnetic resistance, ranging from 1-5lbs. For all movements, Proteus calculated and exported power and endurance in 3D space. Linear regressions identified predictors of pitching power and the effect of power on pitching performance. Owing to the small sample and novel technology, trends (p<0.08) were considered. RESULTS: Mean pitching endurance did not significantly predict strikeouts or wins. Mean pitching power predicted greater win percentage (R=0.734; p=0.024), total strikeouts (R=0.662; p=0.052), and strikeouts per game (R=0.656; p=0.055). No associations were found between Sparta data or squat max and win percentage or strikeouts. Pitching power had no relationship with Sparta data, squat max, height, weight, class year, or arm length. The strongest predictors of pitching power were horizontal abduction endurance, the dominant arm (R=4.981; p=0.002) and non-dominant arm (R=0.934; p=0.002). Strikeouts per game was related to win percentage (R=0.680; p=0.044).
CONCLUSION: Power was the most important predictor of on-field pitching performance. It was unrelated to anthropometric variables and showed no association with minor differences in maturation (e.g., freshman to sophomore). There was also
The Landing Error Scoring System (LESS) is a protocol designed to assess ACL injury risk, and the LESS-RMC (Rocky Mountain Consortium) is a modified version of the LESS designed to be a more objective approach to scoring, and an easier tool to implement for the rater. PURPOSE: The purpose of this study was to determine the relationship between the LESS and LESS-RMC and develop an injury risk stratification for the LESS-RMC. METHODS: One hundred seventy-eight youth female soccer athletes (14.1 ± 1.5 y, 77.3 ± 33.2 in, 107.6 ± 27.2 lbs), performed three drop-jumps from a height of 30 cm. Front and side views of the landing were recorded with digital video cameras. Movement quality was rated by one researcher evaluating 17 components of the landing with the LESS and a modified, 11 component version of the LESS (LESS-RMC). Each system had a maximum of 17 landing errors and the rater was considered an expert after training with the LESS and LESS-RMC protocols. To accomplish the objectification of the LESS items, cut-off points were defined more explicitly for line items: symmetry in feet, joint displacement, and overall impression. These changes, combined with a differentiating score of knee valgus severity/medial knee position (MKP) and its contribution to a new line item, overall asymmetry, added a new component to the LESS-RMC approach to scoring movement quality and assessing injury risk. A one-way ANOVA was used to contrast the number of landing errors determined from the LESS and LESS-RMC. A linear regression was used to determine the relationship between the two scoring system and a LESS value of 5 was used as input to calculate a predicted risk stratification for the LESS-RMC. The alpha level was set at p = 0.05.

RESULTS: The number of identified landing errors captured with the LESS-RMC (6.9 ± 2.2) was statistically greater than the LESS (5.6 ± 2.1) (p < 0.001). A significant linear relationship was found between the LESS and LESS-RMC (R = 0.811, Adj R2 = 0.656, SEE = 1.59, p<0.001). A LESS-RMC cut-off score for the stratification of low and high knee injury risk was calculated to be 6.79.

CONCLUSIONS: The bi-lateral assessment of MKP and overall asymmetry were significant variables that contributed to higher risk stratification scores with the LESS-RMC.
**NON, 6.2 ± 1.9, p<0.001** landing errors lower when MKP was lower for the DOM leg; whereas landing errors were 1.2 ± 0.6 (dMKP; s, DOM, 6.0 ± 2.1; NON, 4.8 ± 2.5, p<0.001) and 2.9 ± 0.9 (dMKP; s, DOM, 6.0 ± 1.9; NON, 3.1 ± 2.1, p<0.001) higher when MKP was higher.

**CONCLUSIONS:** The asymmetry in MKP influenced the LESS scores by 1 to 3 landing errors and has the potential to miss-classify an athlete’s injury risk stratification.

**260 Board #98 May 29 9:30 AM - 11:00 AM The Effect of Direct Head Impact in Judo on Internal of Cervical Spine**

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**PURPOSE:** Judo is one of the popular combat sports, which is played worldwide and organized even in the Olympic Games. Serious neck injuries, however, have been occasionally noted in judo trainings and/or competitions. Since the pattern and severity of neck injuries largely depend on the kinematic motion of the thrown player, it is essential to investigate the mechanisms of neck injury from biomechanical viewpoint in various different throwing techniques. Thus, the aim of this study was to evaluate a predictive indicator of cervical spine injury, neck injury criterion (Nij) with direct head impact by Judo throwing techniques using an anthropomorphic test device (ATD).

**METHODS:** Two male judo experts (thrower) repeatedly threw the ATD for 5 times by Seoi-nage (Seoi), Osoto-gari (Osoto) and Ouchi-gari (Ouchi) techniques to make ATD’s head hit directly to the mat. A 6-axis load cell (force transducer), mounted in the ATD’s cervical spine, assessed neck axial force and bending moment in each trial.

**RESULTS:*** In all trials, the largest neck loads were observed at the phase of the head impact where the neck injury criterion (Nij) values varied from 0.63 to 1.60 (mean ± std), 0.54 to 0.58 (Osoto) and 0.19 to 0.29 (Ouchi). The average Nij value in Seoi (1.03±0.19, mean±SE) trials was significantly higher than those in Osoto (0.56±0.01) and Ouchi (0.24±0.02) trials (p<0.05, respectively). In three out of five tests, Nij value in Seoi trial exceeded 1.0 implying the real human tolerance limit for neck loading. However, in other two trials (Osoto and Ouchi), Nij values were less than 1.0.

**CONCLUSIONS:** When thrown forward, the judo player might be accompanied with a direct contact of parietal and/or frontal regions of the head to the mat and suffered from neck injuries. Judo throwing technique, Seoi, has higher risk of serious neck injuries than the other techniques thrown backward including Osoto and Ouchi.

**Mixed martial arts (MMA) has become increasing popular in recent years, with some Pay-Per-View events gaining more than 1.6mil viewers (mmafighting.com). However, with its ever-growing popularity, little is known about kinetics involved with certain maneuvers.**

**RESULTS:** Dancers showed significantly higher sway during quiet stance, (2) peak net ankle joint moments, and (3) the average root mean square (RMS) muscle activity (sMVC) of the gastrocnemius and the tibialis anterior muscles between the shoe conditions. RESULTS: Dancers showed significantly higher sway area in the “dead” pointe shoes during both relevé (1461±115 mm² vs. 94±58 mm², p<0.05) and arabesque (191±159 mm² vs. 112±48 mm², p<0.05). Dancers showed significantly higher tibialis anterior activation during arabesque in “dead” pointe shoes (39±15% vs. 33±7%, p<0.05). No significant differences were observed in muscle activation during arabesque for tibialis anterior during relevé and for gastrocnemius during relevé and arabesque (p>0.05).

**CONCLUSION:** Overall, we found that the biomechanical profiles presented by the dancers when wearing “dead” pointe shoes have been previously linked to increased risk for ankle instability, lateral ankle sprains, and earlier onset of muscle fatigue. Understanding how pointe shoe biomechanics changes over time may inform dancers, educator, researchers, clinicians, and pointe shoe designers how extended training in “dead” pointe shoes may potentially harm dancers’ health.

**261 Board #99 May 29 9:30 AM - 11:00 AM Comparison of Maximal Forces Produced During Different Chokehold Techniques**

Andrew Craig-Jones1, Damon McCune1, Duncan French2, Kyle Larimer1, David Chuang3, John Mercer, FACSM1.

**Purpose:** Joint kinetics for various sport movements, including overhand throwing. In order to apply this technique efficiently, it is important to understand segmental contributions to whole-body center of mass movement both proximal and distal to whole-body center of mass (CoM) movement. **Purpose:** Evaluate segmental contribution to the estimation of whole-body CoM movement both proximal and distal to the throwing elbow. **METHODS:** Three right-handed, male club baseball players performed forty trials of sub-maximal overhand throwing. Position data for each trial were acquired using a 3-d optical motion capture system and infrared reflective markers placed according to standard body segment parameter recommendations. From position data, segmental and whole-body CoM were computed for body mass positioned proximal and distal to the throwing elbow. **RESULTS:** Dancers showed significantly higher sway area in “dead” pointe shoes during both relevé (1461±115 mm² vs. 94±58 mm², p<0.05) and arabesque (191±159 mm² vs. 112±48 mm², p<0.05). Dancers showed significantly higher tibialis anterior activation during arabesque in “dead” pointe shoes (39±15% vs. 33±7%, p<0.05). No significant differences were observed in muscle activation during arabesque for tibialis anterior during relevé and for gastrocnemius during relevé and arabesque (p>0.05).

**CONCLUSION:** Overall, we found that the biomechanical profiles presented by the dancers when wearing “dead” pointe shoes have been previously linked to increased risk for ankle instability, lateral ankle sprains, and earlier onset of muscle fatigue. Understanding how pointe shoe biomechanics changes over time may inform dancers, educator, researchers, clinicians, and pointe shoe designers how extended training in “dead” pointe shoes may potentially harm dancers’ health.

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**Recent advancements in wearable technology have allowed kinematic data collection in field-based settings, improving the ecological validity of research investigations. The wrench notation and quaternion algebra inverse dynamics technique does not require the integration of force platform data, therefore may allow field-based computation of joint kinetics for various sport movements, including throwing. In order to apply this technique efficiently, it is important to understand segmental contributions to whole-body center of mass (CoM) movement. **Purpose:** Evaluate segmental contribution to the estimation of whole-body CoM movement both proximal and distal to the throwing elbow. **Methods:** Three right-handed, male club baseball players performed forty trials of sub-maximal overhand throwing. Position data for each trial were acquired using a 3-d optical motion capture system and infrared reflective markers placed according to standard body segment parameter recommendations. From position data, segmental and whole-body CoM were computed for body mass positioned proximal and distal to the throwing elbow. Root Mean Squared Error (RMSE) values were computed using time-series position data between each segment CoM and whole-body CoM. Two one-way ANOVAs were performed on RMSE values in the x (direction of throw), y (perpendicular to the thrower), and z (vertical) directions. To evaluate the movement of mass proximal to the throwing elbow, twelve segments were included as levels within a single segment factor. **Results:** Main effects of segment were observed for RMSE in the x, y, and z directions (p < 0.001 - 0.001). Trunk RMSE in the x, y, and z directions (x: 40.5 ± 7.4 mm; y: 28.9 ± 5.2 mm; z: 9.5 ± 4.0 mm) was significantly different from the other conditions for the thoracic spine 

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lower versus all other segments proximal to the throwing elbow (p = 0.001 - 0.006).

Right forearm RMSE in the x, y, and z directions (x: 28.9 ± 3.3 mm, y: 22.6 ± 2.3 mm, z: 31.7 ± 1.6 mm) was significantly lower versus the right hand (p < 0.001 - 0.005).

CONCLUSION: During an overhand throwing task, the results suggest that CoM movement of the trunk and throwing forearm pattern closely with the movement of whole-body CoM located proximal and distal to the throwing elbow.

Ankle Bracing Effects on Contributions to the Support Moment During Hopping
Carlos Santillian, Illinois State University, Normal, IL. (Sponsor: Dale Brown, FACSM)

Ankle Bracing Effects on Contributions to the Support Moment During Hopping
Carlos Santillan, Adam E. Jagodinsky, Mohammed Zaman, Christopher Wilburn, Wendi H. Weimar Illinois State University, Normal, IL; Auburn University, Auburn, AL.

INTRODUCTION: Ankle bracing is commonly implemented to prevent ankle sprain injuries. However, research shows ankle bracing can alter joint kinetics adopted during a variety of dynamic tasks. Analysis of the support moment (Ms) characteristics in response to bracing could provide insight into possible global motor strategies adopted when an ankle brace is applied. PURPOSE: Examine bracing effects on lower extremity contributions to the Ms during hopping. METHODS: 16 healthy individuals participated in the study. Participants performed 15 trials of single-leg hopping during no brace (NB) and brace (B) conditions. Position data were collected using a motion capture system, and reaction forces were obtained from force platforms. Joint kinetics were calculated using inverse dynamics, and the MS was calculated as the sum of ankle, knee, and hip moments in the sagittal plane. Data from the stance phase of hopping was extracted and time normalized to 0-100% stance phase. The percentage contribution (%C) of ankle, knee, and hip (H) moments to Ms was calculated at 15, 30, 45, 60, and 75 percent of stance phase. Comparisons of percentage contribution between conditions were made at each time point using paired-samples t-tests. RESULTS: Analysis revealed that for K_15, %C was significantly lower during B (34.0 ± 9.1%) compared to NB (40.9 ± 11.2%). Additionally, for K_30, %C was significantly lower during B (34.0 ± 9.1%) compared to NB (40.9 ± 11.2%). No other significant differences for the study were observed. CONCLUSION: Bracing significantly decreased the contribution of the knee to the Ms during single-leg hopping. Changes in the knee contribution to the Ms suggests that ankle bracing invokes adaptations to motor control strategies during the landing phase of single-leg hopping.

PURPOSE: This investigation examined the test-retest reliability of a markerless motion capture system (MCS) for six performance (PERF) scoring scales using a performance motion analysis protocol (PMA) across multiple visits. METHODS: Healthy, recreationally active men (n = 11; ±SD, age: 23.0 ± 2.6 yrs, height: 180.3 ± 4.8 cm, weight: 80.4 ± 7.3 kg) were screened once a week for 4 weeks using the PMA protocol, consisting of 19 motions. These include shoulder ranges of motions, trunk rotation, five types of squatting motions, single leg balances, and six types of vertical jumps and depth jumps. A three-dimensional markerless MCS using the DARI Motion Software (Scientific Analytics, Lincoln, NE) was used to analyze the kinetic and kinematic data, from which 192 variables were calculated to determine the PERF scores. The PERF scores evaluated included Composite, Power, Functional Strength, Dysfunction, Vulnerability, and Exercise Readiness. One-way repeated measures ANOVAs (performance scores x visit) were determined to compare performance scores. RESULTS: Results are shown in the Table. Excellent test-retest reliability was observed for composite, power, functional strength, and exercise readiness scores (ICCs > 0.8) across all 4 visits. The vulnerability scores displayed fair test-retest reliability, while the dysfunction score exhibited poor reliability. No significant differences were observed for any performance scores on any visits. CONCLUSION: These results indicated excellent reliability for all PERF scores except vulnerability and dysfunction scores. It is possible that the vulnerability and dysfunction scales require several visits to establish a consistent baseline and may require 1-2 familiarization visits. Further study is needed to determine the magnitude of change for any score that is meaningful.

Table 1.

Identification of Risk Factors Associated with Groin Injury in an Upright Standing Position
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PURPOSE: To explore the relation between low hip Add and Abd torque ratio and hip Int and Ext rotations, performed in upright position, in college students. METHODS: Fourteen college students participated in the study. Eight males (21.1 ± 1.1 yrs, 81.1 ± 11 kg, 176±5 cm) and Six females (22.1±2 yrs, 62±5 kg, 163±6 cm). Data were collected in two different sessions. Hip isokinetic maximal Add and Abd torques were captured using isokinetic dynamometer at two speeds, 30°/s and 60°/s. Participants performed five trials of continuous Add and Abd at each speed and the averages of the highest
three peaks and their corresponding angles were calculated. Add and Abd torque ratios were calculated and the data were categorized as high risk (HR), if ratio was <1, or low risk (LR), if ratio was >1. Hip 3D IAT and Ext rotations were captured using 3D cameras at 240 Hz. Participants performed three separate trials of maximal Int and Ext rotations using sliding disk and highest lower leg Int and Ext rotations were analyzed. T-tests assuming unequal variance were performed. RESULTS: Mean Add and Abd torque ratios were 0.72±0.13 in HR group and 1.30±0.19 in LR group. Peak add torque was observed in the HR group (48.15 Nm vs. 86.27 Nm, p<0.01). No significant difference was observed in peak Abd torque between the groups (67.19 Nm vs. 66.18 Nm, p>0.05). Hip Ext rotations were lower in the HR group, however not significant (17.7° vs. 20.9°, p=0.07), same was observed for hip Ext rotations (13.5° vs. 15.4°, p=0.08). The total hip Int and Ext range of motion was significantly lower in the HR group (30.9° vs. 34.1°, p<0.05). CONCLUSION: Decrease in hip Int and Ext range of motion was related to lower hip Add and Abd peak torque ratio. Future research should further investigate the association between these variables in athletes to better predict and prevent groin injuries.

A-44 Free Communication/Poster - Team Sports

Wednesday, May 29, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

268 Board #106 May 29 9:30 AM - 11:00 AM Effects Of Stroboscopic Vision On Reactive Strength Index Scores in Female NCAA Division I Volleyball Players.
Talin Louder, Melissa Kroll, Jordan Preuss, Jake Rosburg, Lara Boman. The University of South Dakota, Vermillion, SD.
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(No relevant relationships reported)

It is believed that ACL injury risk is multifaceted and includes structural, biomechanical, and cognitive factors. Recently, it is observed that overreliance on exteroception (visual stimuli) following ACL rehabilitation may increase the risk of re-rupture. There may be utility in using stroboscopic vision as an enhancement to plyometric movements and neuromuscular ACL-prevention programs. PURPOSE: To evaluate the effects of stroboscopic vision on Reactive Strength Index (RSI) scores in female NCAA Division I volleyball players. METHODS: Thirteen female NCAA Division I volleyball players performed three trials of depth jumping across five conditions: (1) 0.38 m - no visual restriction, (2) 0.53 m - no visual restriction, (3) 0.69 m - no visual restriction, (4) 0.38 m - high-frequency stroboscopic vision (H-f), and (5) 0.38 m - low-frequency stroboscopic vision (L-f). For all trials, the RSI, rebound jump height (RJH; m), and ground contact time (GCT; s) were computed. To evaluate the statistical significance of results, a Multivariate General Linear Model Analysis of Variance (GLM ANOVA) was performed using RSI, RJH (m), and GCT (s) as dependent measures. The five depth jump conditions were included as levels within a single condition factor. Statistical significance was set at an alpha level of 0.05. RESULTS: Main effects of depth jump condition were observed for RSI and GCT (s) (p<0.01), but not for RJH (m) (p>0.05). Post-hoc comparisons revealed that RSI scores were lower for stroboscopic conditions (H-f: 0.75 ± 0.16; L-f: 0.72 ± 0.16) versus no visual restriction (0.80 ± 0.17; 0.53 m: 0.79 ± 0.17; 0.69 m: 0.79 ± 0.16). Post-hoc comparisons revealed that RSI scores were lower for stroboscopic conditions (H-f: 0.47 ± 0.07 s; L-f: 0.49 ± 0.07 s) versus no visual restriction (0.38 m: 0.46 ± 0.07 s; 0.53 m: 0.45 ± 0.07 s; 0.69 m: 0.45 ± 0.07 s). CONCLUSION: Integrating stroboscopic vision into the depth jump movement reduced RSI scores in a sample of female NCAA Division I volleyball players, which was attributable to longer GCTs (s). The results suggest that adding stroboscopic vision to plyometric movements may increase the difficulty of the task from either a cognitive or biophysical perspective.

269 Board #107 May 29 9:30 AM - 11:00 AM Women’s Collegiate Volleyball Players Exhibit Kinetic Asymmetries during Sport-Specific Tasks
Jenna D. Smith, Kevin R. Ford, FACSM, Audrey E. Westbrook, Rachel A. Kordonowy, Jeffrey B. Taylor. High Point University, High Point, NC. (Sponsor: Kevin R. Ford, FACSM)
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(No relevant relationships reported)

Women’s volleyball demands frequent lateral movements and vertical jumps. Repetitive lateral movements in the same direction could lead to biomechanical asymmetries and a potential increased risk of lower extremity injury. PURPOSE: To identify and analyze biomechanical asymmetries in collegiate women’s volleyball players during sport-specific lateral and vertical jumping tasks.

METHODS: Nineteen female collegiate volleyball players were analyzed using standard 3D motion capture techniques during a drop vertical jump (DVJ) from a 30-cm box and a reactive jump (REACT) task. For the REACT, participants began in an athletic stance awaiting a directional cue on a screen placed in front of them. Once directed, participants were instructed to jump laterally and then vertically as high and as fast as possible to mimic a volleyball block. Repeated measures MANOVA models were used to identify asymmetries in kinematic and kinetic measures in the DVJ and REACT task (α=0.05). Paired t-tests identified asymmetries in reaction time during the REACT task. Limb symmetry indices (LSI) were calculated for significant findings. RESULTS: Significant kinetic asymmetries were identified for both the DVJ (p<0.01) and REACT (p<0.003) tasks, but no kinematic asymmetries were found in either task (p>0.05). During the DVJ, participants exhibited asymmetrical knee abduction (LSI=94%, p<0.03), ankle dorsiflexion (LSI=94%, p<0.03), and ankle inversion (LSI=30%, p<0.001) external joint moments and vertical ground reaction forces (LSI=93%, p<0.04). During the REACT task, participants exhibited asymmetrical ankle dorsiflexion (LSI=85%, p<0.03), and ankle inversion (LSI=73%, p<0.001) external joint moments. There were no differences in reaction times between the two trials (p>0.05).

CONCLUSIONS: Collegiate women’s volleyball players exhibit significant asymmetry in the knee and ankle during jumping and landing tasks. Interestingly, asymmetries were identified in kinetic variables but not kinematic variables. These findings indicate that screening, injury prevention and rehabilitation practices cannot solely rely on visual observation to identify lower extremity asymmetry in this athletic population.
how knee confidence and age influences these screening tools in female soccer athletes. **PURPOSE:** The aim of this study was to investigate the effects of age and knee confidence on ACL injury risk classification in female youth soccer players. **METHODS:** 178 healthy female youth soccer players (ht: 1.63±0.07m, mass: 48.8±4.9kg, age: 14±1.1yrs) participated in this study. Participants were asked to jump from a 30cm box a distance 50% of their height where they immediately performed a maximum vertical jump and landing upon initial ground contact. Two HD cameras were used to record (60 Hz) this motion in the frontal and sagittal planes. The video of the task was then used to assess the participant’s ACL injury risk by evaluating these landings using the LESS and LESS-RMC procedures. Knee confidence was evaluated by using a 5-point Likert scale in response to an item asking “How much do you trust your knee” from the knee-related quality of life subscale in the KOOS knee questionnaire. The participants were classified as confident if they answered “completely” and not confident for all other responses. Two-way ANOVAs were used to investigate the effects of age group (11-12, 13-14, 15-16 and 17-18 y) and knee confidence on the LESS and LESS-RMC scores. **RESULTS:** There was a statistically significant main effect of age on the LESS score, [F(3, 167) = 2.667, p = 0.049]. Post-hoc tests revealed that the age group of 11-12 years displayed significantly higher LESS scores (6.43±2.14) than the 17-18 group (4.49±2.11) (p = 0.029). There was no significant main effect for knee confidence (p = 0.501). **CONCLUSION:** The results reveal that female soccer players in the 11-12 age range are at a greater risk of ACL injury than the 17-18 age range. Further research should be conducted to examine the mechanical contribution to this risk and methods to reduce injury risk across age ranges.

**272 Board #110 May 29 9:30 AM - 11:00 AM Lower Extremity Force Production And Postural Stability Changes With Age In Young Male Soccer Players**

Frantsiek Zahalka1, Tomas Maly1, Kevin R. Ford, FACSM2, Dai Sugimoto1, Lucia Malá1, Tomas Gyrč1, Veronika Mikesová1.

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(No relevant relationships reported)

Optimizing lower extremity force production is key for elite soccer players (SP). Additionally, improved postural stability (PS) is generally associated with a decreased risk of injury. However, it is not well understood, in elite youth SP, how force production during explosive movements and PS during quite stance differ among typical age categories.

**PURPOSE:** To compare lower extremity force production and PS performance in different age categories in youth SP.

**METHODS:** A total of 73 elite youth SP from four age categories (U12: n = 18, U13: n = 20, U14: n = 16, U15: n = 19) were tested using a force platform (KISTLER AG, Switzerland) during different types of jumps (countermovement jump free arms (CMJFA), countermovement jump, squat (SJ) and depth jump (DJ)). PS was assessed on a pressure platform (RS SCAN, Belgium) during narrow standing, with (NSW) and without (NSN) visual control, and single limb stance on preferred (SLSP) and non-preferred leg (SLSN). We calculated: jump height (JH), maximum force, force asymmetry between legs (F∆), absolute (FI) and relative force impulses and total center of pressure distance. Statistical analyses (p<0.05) consisted of MANOVA, Bonferroni’s post-hoc test and partial eta square (ηp2).

**RESULTS:** A significant age effect was found on JH in all jump tests (CMJFA: F15,69 = 13.92, p = 0.00, CMF: F15,69 = 14.44, p = 0.00, SJ: F15,69 = 19.82, p = 0.00, DJ: F15,69 = 19.04, p = 0.00.) and PS performance (NSN: F3,69 = 3.93, p = 0.01, FLN: F6,69 = 7.88, p = 0.00, FLN: F6,69 = 3.22, p = 0.03, SLSP: F15,69 = 7.78, p = 0.00.). Older players (U15) had a higher percentage in CMJFA (JH = 37.59 ± 5.32 cm) and force impulse (FI = 166.26 ± 32.42 Ns) compared to younger players (U12: JH = 30.36 ± 2.63 cm, FI = 111.89 ± 25.14 Ns). Age had non-significant effects on F∆ (p>0.05). Decreased postural control (NSN) was found in U15 players (204.58 ± 64.83 mm) compared to U14 (140.25 ± 35.01 mm). Older players (U15) had a lower performance in SLSP (1956.06 ± 822.70 mm) compared to older players (U13 = 1437.30 ± 370.13 mm, U14 = 1157.94 ± 316.85 mm, U15 = 1304.05 ± 404.12 mm).

**CONCLUSIONS:** Explosiveness and PS are different by ages in youth elite SP. The results indicate that CMJFA and CMJ had different neuromuscular strategies compared to SJQ and DJ. Findings of this study are beneficial to develop age and training program in youth SP.

**273 Board #111 May 29 9:30 AM - 11:00 AM Evaluation Of A Novel Acl Injury Prevention Technique:can Martial Arts Fall Training (break-falling And Rolling) Alter The Lower Extremity At-risk Biomechanics In Soccer Athletes?**

Karen M. Myrick1, Zobian John Edward Franklin1, Conor Kasabo1, Thomas Martin1, Michael Golden1, Darin Reisler2, Richard Feinn2, Juan Garbalosa1, Quinpiac University, Hamden, CT. 2 Custom Nervo Solutions, West Hartford, CT. Plus One Defense Systems, West Hartford, CT. Email: karen.myrick@quinnipiac.edu

(No relevant relationships reported)

**Purpose** We propose that by introducing martial arts fall training (specifically break-falling and rolling), the neuroapathies in these athletes will be trained to recognize and avoid at risk postures by having an alternative response. Given the absence of research utilizing martial arts falling techniques in other sports, this study aims to compare lower extremity biomechanics and risk factors in soccer athletes with fall training compared to those without.

**Methods:** 5 youth premier soccer athletes between the ages of 9 and 16 were recruited for participation. Subjects were randomly divided into a control group and an intervention group. All subjects continued their usual soccer training. The intervention group completed a twice weekly 10-week training program in addition to their usual training, taught by a karate and aikido expert at the level of 3rd degree black belt. At baseline and after the 10 week program was completed, all subjects underwent a biomechanical evaluation that measured hip and knee movement position in frontal, transverse, and sagittal planes at 4 different time points during a drop fall. A mixed factorial ANOVA model was used to determine the effects of the intervention training on the kinematic variables of interest. The between subjects’ factor was treatment group (intervention and control) and the within subjects factor was time point (pre-intervention and post-intervention). The test of the interaction between group and time point was used to determine if the intervention produced change in the variables of interest. The alpha level of significance for this study is set at the 0.05 level.

**Summary of Results:** There was a significant decrease in knee flexion in the sagittal plane at initial contact when comparing pre and post-intervention (-4.802 degrees, P <0.001). There was also a significant decrease in knee flexion in the sagittal plane at heel strike 33ms (-7.384 degrees, P<0.001). There was no significant change in any of the other motion points examined.

**Conclusion:** There was a statistically significant change in body mechanics when comparing pre and post-break falling intervention. Prior research has shown that neuromuscular programs decrease ACL injury rates when they are started at an early age and continued with strength training.

**274 Board #112 May 29 9:30 AM - 11:00 AM Isokinetic Strength and Strain Asymmetries of Lower Extremities in Professional Soccer Players**

Tomas Maly1, Frantsiek Zahalka1, Kevin R. Ford, FACSM2, Dai Sugimoto1, Lucia Malá1, David Bužnovský1, Mikulas Hank1, Egon Kunzmann1, Charles University, FPES, Prague, Czech Republic. 2 High Point University, High Point, NC. 3 Harvard Medical School, Boston, MA. (Sponsor: Kevin R. Ford, FACSM)

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(No relevant relationships reported)

Muscle strength (MS) is an important component of physical fitness in soccer players (SP). Side-to-side differences may be developed due to the unilateral nature of certain soccer skills and movement patterns. Constant loading on one side of the body over time may lead to strength asymmetry and imbalances in tissue adaptation.

**PURPOSE:** To investigate isokinetic strength asymmetry (SA) and magnitude in professional male SP.

**METHODS:** Professional male SP from the first division of Czech Republic (n = 148, age 25±14.8 years) volunteered to participate in the study. SP performed isokinetic strength testing (Humac Norm, Cybex, USA) concentrically at angular velocities of 60, 180 and 300°/s. The peak muscle torque of knee extenders (PTJ) and flexors (PTF) in both legs, hamstrings and quadriceps strength ratio of muscle torque for both preferred and non-preferred extremities (H-Qp and H-Qn respectively), bilateral ratio between the exerted strength of knee extenders (Q) and flexors (H) were calculated. Mixed-design RM ANOVA, Bonferroni’s post hoc tests and partial eta square (ηp2) were used for statistical assessment.

**RESULTS:** Knee flexors showed significantly higher SA (H/ Q=9.77±0.40%) compared to the extensors (Q=7.24±0.40%) (F1,294=20.49, p=0.00, ηp2=0.07). Greater hamstrings and quadriceps strength ratio was found in preferred leg (H-Qp = 59.89%) compared to non-preferred (H-Qn = 58.010.63%) (F1,294=4.01, p=0.04, ηp2=0.01). Contraction velocity speed did not have a significant difference on SA (p>0.05).

**MS** of knee extensors reached the highest value at the lowest velocity for both legs (PTJ = 2.94±0.36 N m kg−1). Exerted MS significantly decreased with...
increasing velocity in both: extensors ($F_{\text{ex}}$=$4218.92$, $p=0.00$, $\eta^2=0.94$) and flexors ($F_{\text{flx}}$=2932.69, $p=0.00$, $\eta^2=0.91$). At the highest velocity (300°·s⁻¹), MS achieved ~55% (PT $\text{E}_{\text{MS}}$=2932.69, $p=0.00$, $\eta^2=0.94$) and flexors

CONCLUSIONS: Greater SA was found in knee flexion (EH) rather than knee extension (Q-Q) in a group of professional male SP. Also, greater hamstrings and quadriceps strength ratio was found in preferred leg (H:Qp) compared to non-preferred leg (H:Qn). The findings of this study will be useful in the design of injury prevention and performance enhancement programs.

275 Board #113  May 29 9:30 AM - 11:00 AM
Effect of Previous Groin Pain on Sagittal Plane Joint Moments During Soccer Instep Kicks
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(No relevant relationships reported)

Previous groin pain is common in male soccer players, often results in re-injury,¹² has been linked to maximal instep kicks.¹³ Research has shown aberrant kinematics during the instep kick in players with previous groin pain.¹²

PURPOSE: To quantify differences in sagittal plane joint moments during maximal instep kicks between players with and without previous groin pain.

METHODS: Data were collected from 12 experienced male soccer players who reported non-specific groin pain in the last 12 months, and 11 controls who each performed six maximal instep kicks. A 10-camera Qualisys motion capture system (500 Hz) and two Bertec force platforms (2000Hz) collected data that were then processed using standard software (Visual 3D). Bilateral normalized joint moments of the hip, knee, and ankle were quantified at stance limb plant (PL), swing limb peak knee flexion (PKF) and at ball contact (BC). The foot speed of the swing limb at impact was considered an indicator of kicking performance. The two-tailed alpha level was set to 0.05 and Cohen’s d was used to quantify the magnitude of differences between groups.

RESULTS: A moderate difference in foot velocity existed between the groups (C: 15.5 m s⁻¹, PGP 14.8 m s⁻¹, $p=0.087, D=0.77$). Differences in stance limb joint moments were evident throughout the kick, while the swing limb only displayed differences at BC (Figure 1).

CONCLUSION: The PGP group often utilized lower sagittal plane joint moments about the hip, knee, and ankle of the stance limb but without evidence of a matching decrease in foot velocity at BC. This suggests that compensations occurred elsewhere in the kinetic chain to make up for the reduced joint moments. The stance hip flexion moment in the PGP group at PL is atypical and further supports the presence of aberrant motor patterns.

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276 Board #114  May 29 9:30 AM - 11:00 AM
Using Isokinetic Strength Assessment to Predict Performance and Prevent Injuries in Indian Cricket Fast Bowlers
(No relevant relationships reported)

Cricket is the most commonly played & followed sport in India. It demands a high level of performance from the fast bowler. The fast bowling action involves a run up, leap and landing onto the lower limbs, followed by ball release. The large ground reaction forces generated during landing put fast bowlers at high risk of lower limb and lumbar spine injury. Precise dynamic coordination of lower body segments is needed to absorb these forces and transfer the energy via the core to the upper limb to propel the ball at faster speeds. Thus, knowledge of lower quadrant strength can be very useful for injury prevention and better performance in fast bowlers. Dynamic Knee Strength in the front limb is critical during the lead phase of bowling for optimal performance. There is a lack of literature in this subject in Indian fast bowlers despite the popularity of the sport.

PURPOSE: To evaluate the Isokinetic knee strength, determine the relevant asymmetries and strength imbalances & their relationship with performance and injury risk in Cricket Fast Bowlers.

METHODS: 42 male Indian State Level fast bowlers underwent Isokinetic knee strength testing. Quadriceps concentric (Qconc), Quadriceps eccentric (Qecc), Hamstring concentric (Hconc) & Hamstring eccentric (Hecc) Peak Torques normalized to body weight (PT/BW) were obtained. Bilateral Strength Asymmetries (BSA) and Dynamic Control Ratios (Hmcr) were evaluated. Vertical Jump Height (VJ) & Standing Broad Jump (SBJ) distance were used as indicators of jumping performance. Descriptive statistical analysis of data & Pearson correlation was done to obtain relationship between Isokinetic parameters & jump performance. RESULTS: A significant correlation was found between Qconc Strength and VJ ($r=0.67$, $p=0.04$) & SBJ ($r=0.39$, $p=0.04$). 67% of bowlers had significant Qconc strength asymmetry, 40% had poor Hamstrings DCR & 19% had poor Quadriceps DCR on the front limb.

CONCLUSION: A significant proportion of fast bowlers have unfavorable strength asymmetry & DCR and thus are at risk of injury. Improving Dynamic Knee Strength through plyometric training could help optimize performance and reduce injury risk.

277 Board #115  May 29 9:30 AM - 11:00 AM
Biceps and Triceps Contribute to Pitching Performance in College Baseball
Maria R. Acosta¹, J. Mark Van Ness¹, William P. Lydon¹, Brian G. Graham¹, Alexis C. King², Courtney D. Jensen³
¹University of the Pacific, Stockton, CA. ²University of Illinois at Urbana-Champaign, Champaign, IL.
(No relevant relationships reported)

Training for pitching traditionally focuses on core and leg work, but there may be justification for isolated arm muscle training to enhance performance. PURPOSE: To evaluate the influence of biceps and triceps function during pitching. METHODS: Pitchers (n=10) from a Division-1 collegiate team were recruited. Throwing mechanics and isolated arm movements were assessed using Proteus technology (Boston Biomotion Inc). A single set of biceps and triceps movements (with 12 and 10 lbs respective resistance) and biomechanical assessment of a throwing movement were collected. All movements completed on Proteus result in seven variables: power, explosiveness, braking, consistency, endurance, velocity, and range of motion (ROM). Pearson correlation coefficients were employed to analyze relationships between the Proteus variables for biceps curls and triceps extensions, throw mechanics, and statistics from in-game performances from the 2017 season. RESULTS: The strongest relationship among all comparisons was biceps curl endurance and ERA ($r=0.59$, $p=0.001$). The biceps curl ROM was also weakly related to throwing power ($r=0.49$, $p=0.076$). Throwing power corresponded with positive trends for biceps curl power ($r=0.41$, $p=0.089$), explosiveness ($r=0.425$, $p=0.060$), velocity ($r=0.417$, $p=0.085$), and ROM ($r=0.429$, $p=0.075$). A strong positive relationship was observed between throw endurance and biceps curl braking ($r=0.535$, $p=0.022$) and a positive trend between biceps curl ROM and throw velocity ($r=0.429$, $p=0.075$). Triceps extensions corresponded closely with throwing mechanics and in-game statistics; trends were found between triceps explosiveness and strikeouts per nine innings ($r=0.728$, $p=0.064$) and Proteus throw velocity ($r=0.462$, $p=0.053$). Throw endurance was related to triceps extension braking ($r=0.496$, $p=0.037$) and it displayed a trend with triceps extension endurance ($r=0.435$, $p=0.071$). CONCLUSIONS: New technology permits advanced biomechanical analysis of baseball pitching. Preliminary testing reveals the importance of arm conditioning for a pitcher’s ability to maintain power output. As more players are tested, we may further our understanding of the role of biceps and triceps function in throwing mechanics.

278 Board #116  May 29 9:30 AM - 11:00 AM
Biomechanical Predictors of Fastball Velocity in Collegiate Pitching
Samson J. Abernathy¹, William P. Lydon¹, J. Mark VanNess¹, J.P. Wong¹, Alexis C. King², Courtney D. Jensen³
¹University of the Pacific, Stockton, CA. ²University of Illinois at Urbana-Champaign, Champaign, IL.
(No relevant relationships reported)

Recent pitching analyses indicate development programs should emphasize ball speed to optimize performance on the mound. Proper training is likely to increase velocity, but pitch delivery involves complex motions in all cardinal planes. Until recently, accurate analyses were encumbered by technological limitations. For example, isokinetic torque assessment measures fundamentally different phenomena from isometric pitch delivery. New technology permits more accurate analysis.

PURPOSE: To evaluate kinematic predictors of fastball velocity in collegiate
pitchers. METHODS: We tested all pitchers (n=10) from a private D1 baseball team in the West Coast Conference. Velocity was recorded as the mean speed of the three fastest in-game throws. We used Proxites (Boston Motion, USA) to conduct three-dimensional isotonic assessments of pitching form, dominant and non-dominant core rotation, dominant arm internal and external shoulder rotation, and anterior flexion and extension of the dominant shoulder. Proteus software calculated power, explosiveness, velocity, and endurance. Non-mechanical predictors of fastball velocity were class year, height, weight, and limb lengths. Simple linear regressions quantified mechanical predictors of fastball velocity and the effect of fastball velocity on in-game pitching performance. RESULTS: Pitchers with a higher fastball speed had more appearances (r=0.763; p=0.028), pitched more innings (r=0.715; p=0.046), had more wins per appearance (r=0.524; p=0.183), and more total strikeouts in the season (r=0.829; p=0.011) but not per appearance (r=0.566; p=0.143) or per inning (r=0.074; p=0.861). Anthropometric variables were unrelated to fastball velocity. Internal rotation explosiveness (p=0.031) and endurance (p=0.030) of the dominant arm predicted fastball velocity. For each additional point of endurance, fastball speed increased 0.7 mph (p=0.030); for each additional 10 points of explosiveness, fastball velocity increased 0.4 mph (p=0.031). There was a positive relationship associated with explosiveness in straight-arm anterior shoulder Raise (r=0.898; p=0.015); trends were found in the non-dominant arm. CONCLUSION: Increased fastball velocity may be facilitated by training internal shoulder rotation and shoulder flexion.

Match Acceleration and Deceleration Patterns in Female Collegiate Soccer Players

Jessica L. Trapp, Matthew F. Moran, Julie K. Nolan, Alicia B. Stannard. Sacred Heart University, Fairfield, CT. Email: jessica.trapp15@gmail.com (No relevant relationships reported)

Non-contact anterior cruciate ligament (ACL) sprains are becoming increasingly problematic for athletes, especially females. Running performance factors like acceleration and deceleration are often underestimated when examining fatigue in soccer players, but may be useful for prophylactic training to counter dysfunctional lower body mechanics under fatigued conditions. Currently no study exists that characterizes these factors in match play in female collegiate soccer players.

PURPOSE: To describe match acceleration and deceleration patterns in female collegiate soccer players and compare positional influence. METHODS: 24 female NCAA Division I soccer players (11 defenders, 5 midfielders, 8 strikers) underwent global positioning system (GPS, 10Hz) monitoring throughout a 16-game competitive season. A custom written Matlab script processed GPS data and computed the amount of low (<1 m/s², <-1m/s²) and high (>2 m/s², <-2 m/s²) acceleration-efforts (AE) and deceleration-efforts (DE), distance covered per effort, and starting speed of efforts. A Kruskal-Wallis H test and two separate paired t-tests were used to compare variables by position and by halves of matches, respectively. A significance level of p < 0.05 was used for all analyses.

RESULTS: Strikers performed more high-intensity AE (1st half: 0.97 efforts/min; 2nd half: 1.07 efforts/min) and DE (1st half: 1.15 efforts/min; 2nd half: 1.24 efforts/min) when compared to defenders (AE: 0.76 efforts/min; 0.73 efforts/min; DE: 0.89 efforts/min; 0.87 efforts/min) (p = 0.00, p = 0.00, p = 0.00, p = 0.00), and midfielders (AE: 0.73 efforts/min; 0.86 efforts/min; DE: 0.91 efforts/min; 0.80 efforts/min) (p = 0.00, p = 0.00, p = 0.00, p = 0.00). Significant decreases occurred in the second half across all matches in distance covered in low-intensity AE (1.9 ± 0.2 m, p = 0.01) and low-intensity DE (0.9 ± 0.1 m, p = 0.01), and starting speed in low-intensity AE (6.9 ± 0.3 m/s, p = 0.01) and DE (3.9 ± 0.2 m/s, p = 0.00). CONCLUSION: Strikers performed more high-intensity AE and DE than other positions, and may be at greater risk of lower body injury. Transient decreases in AE and DE occurred between halves of match play, and may relate to an increased risk of lower body injury in female soccer players.

Topical Group #103

The Kick Motion Analysis Of Adolescent Male Soccer Player With Osgood-schlatter Disease

Seira Takei1, Michiyo Tojima2, Shuji Taketomi1, Suguru Torii1.
1Graduate School of Medicine, The University of Tokyo, Tokyo, Japan. 2Tokyo International University, Saitama, Japan.
Email: saranaga0330@hotmail.com (No relevant relationships reported)

Osgood-Schlatter disease (OSD) is an epiphyseal disease of tibial tubercle by repeated traction of patellar tendon, especially on epiphyseal or apophyseal stage. OSD is associated with sports that involve kicking, and running, but none have analyzed the kick motion of adolescent soccer players who experienced the OSD.

PURPOSE: The purpose of this study was to compare the kick motion in adolescent soccer players with and without OSD using three-dimensional motion analysis system.

METHODS: We enrolled 112 adolescent soccer players (13 ± 1 years old) All players went through the medical examination including the ultrasonography of tibial tubercle, and the soccer tightness of lower limbs. We included only whose tibial tubercle stage was epiphyseal or apophyseal stage for this study and made two groups: presence of OSD on kicking leg (OSD group; n = 10) and absence of OSD or any other injuries (NP group; n = 50).

We measured real-time kick motion using a three-dimensional motion analysis system (Qualisys track manager, Qualisys AB, Sweden). We placed 65 spherical markers on each anatomical landmark and calculated the angle of the lumbar spine, pelvis, hips, knees and ankles. We collected data for the following six events of kicking leg: foot contact (FC), toe off (TO), max hip extension (HE), max knee flexion (KF), ball impact (BI), and max hip flexion (HF). We used unpaired t-test to compare all the factors we measured between OSD group and NP group.

RESULTS: The anthropometric index, muscle tightness, ball speed of OSD group were not different from NP group. In HF, the supporting leg’s ankle flexion angle in OSD group was smaller in OSD group (4.9 ± 3.7° vs. 18.9 ± 5.0°, p = 0.024). In KF, the hip abduction angle of the kicking leg was smaller (24.5 ± 5.9° vs. 28.6 ± 5.1°, p = 0.001) in OSD group. In HF, the lateral bending angle of pelvis toward the supporting side was significantly smaller in OSD group (-2.6 ± 1.6° vs. 7.4 ± 1.1°, p = 0.037). In HF, supporting leg’s ankle was more dorsal flexion (0.4 ± 1.9° vs. -14.1 ± 14.5°, p = 0.010), more valgus (26.3 ± 12.4° vs. 11.5 ± 11.1°, p = 0.000) compared to NP group.

CONCLUSION: OSD group had smaller dorsal flexion angle of supporting leg before and after BI. They also had smaller hip abduction angle of kicking leg before BI, and lateral bending angle of pelvis toward the supporting leg side was smaller after BI.
an alternative model, proposed here, based on only 4 of the 7 evaluated in its original form. The choice of the four items considered the fact that they are movements that more directly evaluate balance and lower limb movement pattern, which are more related to musculoskeletal injuries in soccer.

METHODS: The sample was selected from 33 under 17 players of a Brazilian soccer team. The evaluation of the functional movement pattern was performed by 2 evaluators and when there was conflict in the athletes’ score, a third evaluator was called for the final decision. The evaluations were all made in the preseason. As predicted by the method, each one of the 7 analyzed items were rated with 1 (worst), 2 or 3 (best). The items evaluated were: deep squat (1), hurdle step (2), in-line lunge (3), active straight-leg raise (4), shoulder mobility stability (7). The complete index (T7) is what is normally used in this type of work. What we have suggested is T4, in which evaluations 1, 2, 3 and 4 come in.

Summary of Results: In 31 athletes selected, 7 had some type of skeletal muscle injury throughout the season (22.58% of the total). Through the analysis of effect size (Hedge’s g) it can be verified that when the injured athletes are compared with the complete index T7 in relation to the proposed T4, the effect size is 0.854, which can be considered a significant difference, in a clinical way. Regarding those who were not injured, the power of explanation is even greater, with an ES of -1.104. The most relevant finding of the present study was when comparing the predictive power of T7 and T4 to predict injuries. While the T7 ES stood at 0.276, the T4 ES stood at 2.698.

Effect Size (ES) ES (hedges g) IC 95%
ES T7Injury x ES T4Injury 0.854 0.757 0.950
ES T7Notinjury x ES T4Notinjury -1.104 -1.150 -1.059
ES T7Injury x ES T7Notinjury 0.276 0.214 0.338
ES T4Injury X ES T4Notinjury 2.698 2.632 2.764

Conclusion: The present study showed that FMS can be used for the prediction of musculoskeletal injuries in soccer players.

A-45 Free Communication/Poster - Rehabilitation & Disability

Wednesday, May 29, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

283 Board #121 May 29 11:00 AM - 12:30 PM
Different Exercise Regimens On Rehabilitation Of Patients With Stable Coronary Heart Disease
Chen Liang1, Can Gao1, Jiunhong Zhang2, Qun Ye1, Lindan Zhai1, Fenguang Zhao2. National Institute of Sports Medicine, Beijing, China. 1Beijing University of Chinese Medicine, Beijing, China.
Email: lclc3@163.com
(No relevant relationships reported)

PURPOSE: To investigate the efficacy and safety of different exercise regimens in the rehabilitation of patients with stable coronary heart disease.

METHODS: This study was a randomized controlled trial to screen 112 patients with stable coronary heart disease who were admitted to General Administration of Sport of China Sports Medical Science Institute from March 2017 to June 2018. They were divided into three groups: ART group (37 cases) and traditional Chinese medicine training group 12 weeks (TCMT group 2, 37 cases) and control group (CON group, 39 cases). We analyzed the baseline parameters of all participants and the 12-week exercise test parameters and related physical and body parameters.

RESULTS: After 12 weeks of intervention, VO2, VO2/Kg, METS, VO2/HR, SV, peak grip strength and flexibility parameters of ART group and TCMT group were significantly higher than those of the control group (P<0.05). Resting heart rate (RHR) of TCMT Group was significantly lower than CON group, but there was no significant difference between groups ART and CON (P>0.05). VE/VO2 of TCMT group was significantly higher than that of CON group. Body mass index (BMI) of ART group was significantly lower than that of TCMT group and CON group, and BMI of TCMT group was significantly smaller than that of ART group, but there was no difference between TCMT group and CON group for BMI and Body fat mass (BFM).

CONCLUSIONS: Both ART and TCMT can improve the cardiopulmonary aerobic exercise capacity and physical fitness of patients with stable coronary heart disease. Although the degree of improvement is different, they all have certain curative effect on the rehabilitation of patients with stable coronary heart disease and the application is safe

PULMONARY HEALTH IN NON-AMBULATORY STROKE SURVIVORS, Pilot Data
Abdulfattah Al Alqahtani, Ramzi Alajam, Sarah Eickmeyer, Wen Liu. University of Kansas Medical Center, Kansas City, KS.
Email: aalqahtani@kumc.edu
(No relevant relationships reported)

PURPOSE: Most of rehabilitation interventions in stroke rehabilitation have focused on improving the impaired sensorimotor function. However, up to 75% of stroke survivors are prone to have cardiovascular disease, which is the main cause of death in people after stroke. Diabetes mellitus is one of the major risk factors for developing cardiovascular diseases. Stroke survivors are prone to have diabetes mellitus due to increased fat tissue in their affected limbs. In addition, lung function is compromised in stroke survivors, which may cause fatigue and exercise intolerance. Furthermore, past studies of aerobic exercise have involved only stroke survivors who could walk independently. Stroke survivors who were unable to walk were not included in previous research investigating changes in risk factors of cardiovascular diseases and lung function from walking exercise interventions. In this project, we examined the effect of aerobic walking exercise on blood glycemic control and lung function in non-ambulatory stroke survivors using a treadmill, body weight support system, and a gait training device.

METHODS: In this on-going project, we have completed a low intensity walking exercise program (30 minutes/session; three sessions/week for eight weeks) in 5 ischemic stroke survivors (4 males, mean age 63.8±14.8 years). Before and after the intervention, a glycated hemoglobin (HbA1c) was measured using A1CNow+™ Systems, and vital capacity (VC) and forced vital capacity (FVC) were measured using a spirometer according to the guideline from American Thoracic Society/European Respiratory Society.

RESULTS: HbA1c decreased from 5.7±1.0% to 5.4±0.2% from before to after the intervention. Pre- and post-intervention VC increased from 2.69±1.01 L to 2.85±0.82 L; FVC increased from 2.65±1.08 L to 2.72±0.97 L, respectively.

CONCLUSIONS: The results are promising and suggest that the low intensity aerobic walking exercise may improve lung function by using VC and FVC. This is an ongoing study; we anticipate recruiting 20 study participants for the study.

285 Board #123 May 29 11:00 AM - 12:30 PM
Effects Of Intra-Dialytic Exercises On Physical Fitness And Health Related Quality Of Life (HRQOL).
Aashish Contractor, Jaini Patel. Sir H.N. Reliance Foundation Hospital, Mumbai, India.
Email: aashish.contractor@rfhospital.org
(No relevant relationships reported)

PURPOSE: Patients undergoing dialysis have low levels of physical activity compared to their age matched healthy sedentary adults (Kidney International, Vol. 57 (2000), 2564-2570). It is observed that there is continuous decline in physical function and associated increased mortality and morbidity, in these patients. In 2016, the American College of Sports Medicine stated that intra-dialytic exercise is medicine for haemodialysis patients. Exercise during haemodialysis has been shown to benefit muscle strength and bone demineralization, reducing cardiovascular risk, diabetes mellitus is one of the major risk factors for developing cardiovascular diseases. Exercise during haemodialysis has higher adherence compared to out-patient exercise in a rehabilitation center. Therefore, this study was conducted to see the effects of intra-dialytic exercise on fitness and quality of life.

METHODS: Before enrolling the patients (N=50), a general history was taken. Physical fitness was assessed by 6-minute walk test with telemetry ECG monitoring and health-related quality of life assessment was done using DSI Scale (Dialysis symptom index). Patients were given breathing exercises and gait training device.

RESULTS: In this project, we have completed a low intensity walking exercise program (30 minutes/session; three sessions/week for eight weeks) in 5 ischemic stroke survivors (4 males, mean age 63.8±14.8 years). Before and after the intervention, a glycated hemoglobin (HbA1c) was measured using A1CNow+™ Systems, and vital capacity (VC) and forced vital capacity (FVC) were measured using a spirometer according to the guideline from American Thoracic Society/European Respiratory Society.

CONCLUSIONS: The results are promising and suggest that the low intensity aerobic walking exercise may improve lung function by increasing VC and FVC. This is an ongoing study; we anticipate recruiting 20 study participants for the study.
Diabetes is a high prevalent comorbid condition in patients with peripheral arterial disease (PAD). Previous studies showed that diabetes impair physical function in PAD patients. However, whether cardiovascular function is also affected by diabetes is unknown.

**PURPOSE:** To compare walking capacity and cardiovascular function in PAD patients with and without diabetes. A total of 80 patients (n=41 non-diabetic and n=39 diabetic) with PAD were recruited. Six-minute walk test (total walking capacity), 4-meter test, walking impairment questionnaire (WIQ) and the walking estimated limitation calculated by history (WELCH) were used to assess walking capacity. Cardiovascular function was assessed by blood pressure, arterial stiffness, heart rate variability and flow-mediated dilation. Mann-Whitney U test were performed, and data are presented in median and interquartile range. **RESULTS:** Diabetic PAD patients presented lower total walking capacity (308 ± 120 m vs. 370 ± 125 m, p<0.025), WIQ distance score (10.2 ± 30.8 vs. 20.0 ± 0.02), WIQ speed score (17 ± 21 vs. 28 ± 27, p=0.001), WIQ stairs score (21.42 ± 42.42, p=0.024), WELCH total score (20.36 ± 40.42, p=0.006) compared to non-diabetic PAD patients. In addition, diabetic PAD patients had lower SDNN (22 ± 21 vs. 29 ± 36, p=0.030), and a trend to have lower RMRSSD (1.3 ± 19.9 ± 32, p=0.061), and PNN50 (0.4 ± 3.7 vs. 1.6 ± 21.0, p=0.072). The remaining variables were similar between PAD patients with and without diabetes.

**CONCLUSION:** Diabetes impairs walking capacity and cardiac autonomic modulation in patients with PAD. Therefore, interventions to improve these parameters should be emphasized in diabetic PAD patients. Supported by FAPESP (#2016/16425-9) and CNPq (#10508/2017-7).

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**Board #126 May 29 11:00 AM - 12:30 PM Evaluation of a Community Based Cardiac Rehabilitation Programme**

Joanne Regan-Moirarty1, Maire McCallion2, Aza Yossell1, Eimear Donlon3, Audrey Collery2, Brona Furlong2, Niall Moynan1. 1Institute of Technology Sligo, Sligo, Ireland. 2Sligo University Hospital, Sligo, Ireland. 3Dublin City University, Dublin, Ireland.

Email: regan.joanne@itsligo.ie

(No relevant relationships reported)

The transition from hospital-based (phase II) to community-based (phase III) cardiac rehabilitation (CR) is an important step in the long-term maintenance of positive health behavioural change.

**PURPOSE:** To evaluate the effect of participation in a phase III, community-based CR (CBCR) programme on selected fitness indices in comparison to a control group that received usual care advice and to explore participant experiences and perceived benefits in transitioning from hospital-based phase II CR to CBCR.

**METHODS:** Following completion of phase-II CR, 95 individuals were referred to a 10-week CBCR exercise programme (intervention). A total of 22 (73% male) participants were unable to attend CBCR classes and were assigned to the control group. The remaining 73 (67% male) were assigned to the CBCR exercise program. Aerobic fitness (GMWT), functional upper (hand grip) and lower (timed sit to stand) limb strength, flexibility (sit and reach test) and body composition (waist & hip girth and BMI) were measured pre and post the intervention. All participants from the intervention group were invited to attend a focus group on completion and a thematic analysis was conducted.

**RESULTS:** A total of 51 participants (69% male) completed the 10-week program (70% compliance). There was a significant improvement (p<0.05) in the timed sit to stand (26.5±7.21 vs 21.4±5.65sec), GMWT (505±66.6 vs 534±71.9m),) and waist circumference difference compared to controls (8 ±9 vs 16 ±15.3±3.7cm) in the intervention group. There was no significant change in any of the fitness indices in the control group. The focus groups were attended by 20 participants (60% male). The main themes included the strong sense of need for CBCR programmes and the reassurance provided by the link between the hospital and community provider. Physical, psychological and social benefits were described including moving from fear to confidence in their ability to exercise.

**CONCLUSION:** Participation in a 10-week CBCR programme resulted in improved lower limb strength, aerobic fitness and waist circumference with maintenance of all other measured fitness components. Participants self-reported an increased ability and motivation to undertake exercise. This study provides an important insight into the experience and benefits, both perceived and actual, in the early transition to CBCR.
Chronic kidney disease (CKD) is associated with skeletal muscle loss and neuromuscular dysfunction, resulting in reduced physical performance. Inertial flywheel resistance exercise (RE) has been shown to be an effective training option for improving neuromuscular outcomes in healthy adults. However, evidence supporting its application in patients with CKD is limited. PURPOSE: To determine the effects of inertial flywheel RE on neuromuscular measures and physical function in Veterans with CKD predialysis. METHODS: Two adult men with stage 3 or 4 CKD (age: 70±7 yrs; eGFR: 41.5±19.5 mL/min/1.73 m²; weight: 111.3±16 kg; height: 178.2±9.9 cm) were enrolled to perform 12-weeks of inertial flywheel RE for the squat movement (3 sets x 12 repetitions). RE emphasized maximizing power output and was progressed by manipulating inertial load and contraction velocity. Knee extensor peak isometric and isokinetic torque (180°/s) and rate of torque development (RTD) were measured using a dynamometer. Muscle thickness (MT) and echo intensity (EI) of the rectus femoris and vastus lateralis muscles were determined via B-mode diagnostic ultrasound. Physical function was assessed as time to complete five chair stands (STS-5).

RESULTS: Both subjects improved similarly after RE, thus data are presented as Mean ± SD. Peak isometric and isokinetic torque increased from 106.7±8.5 to 122.4±9.7 ft-lbs (+14.7%) and 67.5±3.2 to 80.9±8.4 ft-lbs (+19.9%). RTD at time intervals of 50, 100, 200, and 300 ms increased after RE from 0.14±0.13 to 0.49±0.46 ft-lbs/s (+255.4%), 0.19±0.17 to 0.41±0.34 ft-lbs/s (+119.7%), 0.19±0.13 to 0.27 ft-lbs/s (+44.3%), and 0.18±0.09 to 0.24±0.06 ft-lbs/s (+32.3%), respectively. STS-5 was reduced from 16.2±3.3 to 13.5±2.8 s (+14.6%). No changes were observed in MT or EI. CONCLUSIONS: Our initial findings support the notion that inertial flywheel RE is safe and feasible in these Veterans with CKD predialysis. Improvements were observed in peak isometric and isokinetic knee extensor torque, RTD, and STS-5. Lack of change in MT and EI suggest increases in torque generation may have, in part, been due to neurological adaptations. Larger-scale studies are required to determine the potential efficacy of inertial flywheel RE for enhancing neuromuscular health and physical function in persons with CKD.

### Board #129 May 29 11:00 AM - 12:30 PM

**Cardiovascular Rehabilitation: New Indications For Old Entities.**

Jared M. Gollie, Michael O. Harris-Love, Samir S. Patel, Marc R. Blackman. Veterans Affairs Medical Center; The George Washington University, Washington, DC. (Sponsor: Peter F. Kokkinos, FACSM) (No relevant relationships reported)

**PURPOSE:** The consensus director, working together with two coordinators, and 35 editors, completed the task force of medical doctors with relevant experience in CR. The consensus director, working together with two coordinators, and 35 editors, completed the task force of medical doctors with relevant experience in CR. The consensus director, working together with two coordinators, and 35 editors, completed the task force of medical doctors with relevant experience in CR. The consensus director, working together with two coordinators, and 35 editors, completed the task force of medical doctors with relevant experience in CR. 2) It focuses on the value it will have on three pathologies previously not sufficiently considered. 3) It also inferred the value it will generate when inducing the registry during its implementation, since there is not data enough in Argentina in this regard. 4) It proposes the integration and interaction of the different regions of the country in the same, which will stimulate the valuable integral contribution of the community of specialists in cardiology of Argentina. 5) It should be noted that at the last meeting of the ASC, in October 2018, 10,000 attendees were registered.

**Inclusion criteria**

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**Exclusion criteria**

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**Cool down**

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**Conclusion:** 1) The valuable contribution that will constitute the consensus on CR next to be published by the ASC stands out. 2) It focuses on the value it will have on three pathologies previously not sufficiently considered. 3) It also inferred the value it will generate when inducing the registry during its implementation, since there is not data enough in Argentina in this regard. 4) It proposes the integration and interaction of the different regions of the country in the same, which will stimulate the valuable integral contribution of the community of specialists in cardiology of Argentina. 5) It should be noted that at the last meeting of the ASC, in October 2018, 10,000 attendees were registered.

**Conclusion:**

- 1) The valuable contribution that will constitute the consensus on CR next to be published by the ASC stands out.
- 2) It focuses on the value it will have on three pathologies previously not sufficiently considered.
- 3) It also inferred the value it will generate when inducing the registry during its implementation, since there is not data enough in Argentina in this regard.
- 4) It proposes the integration and interaction of the different regions of the country in the same, which will stimulate the valuable integral contribution of the community of specialists in cardiology of Argentina.
- 5) It should be noted that at the last meeting of the ASC, in October 2018, 10,000 attendees were registered.
Evidence suggests that treadmill (TM) HIT can be safe and effective as a rehabilitation tool in persons with stroke. However, translation to overground walking can be limited and no studies have tested overground (OG) HIT. PURPOSE: To compare training speeds and HR responses for TM HIT and OG HIT in persons with chronic stroke. METHODS: Ten subjects (mean ± SD) 59.8 ± 6.8 years old and 2.4 ± 1.7 years post stroke with comparing gait speed of 0.41 ± 0.35 m/s and fast gait speed of 0.56 ± 0.56 m/s/participated and passed a symptom-limited GXT. Subjects performed 12 sessions of HIT over 4 weeks, alternating short and long interval HIT sessions. Both HIT protocols included 10 minutes of overground (OG1), then 20 minutes of treadmill HIT, followed by another 10 minutes of overground HIT (OG2). Short interval HIT involved 30s bursts at maximum speed and 30-60s rest periods. Long interval HIT involved 4-min bursts at ~90% of peak heart rate (HRPeak) from the GXT and 3-min recovery periods at ~70% HRpeak. Variables recorded included gait training speeds and mean and max heart rate. OG1 and OG2 data were combined to control for warm up and cardiovascular drift effects. Mixed effects models were used to compare TM and OG exercise responses, while accounting for repeated measures from the same participant.

RESULTS: All participants completed 12 sessions and no serious adverse events occurred. With the short interval protocol, OG HIT elicited significantly slower gait training speeds than TM HIT (0.75 vs 0.90 m/s, p<0.0001), with lower mean HR (78.4 vs 82.9 %HRpeak, p=0.0001) and max HR (92.7 vs. 97 %HRpeak, p<0.0001). With the long interval protocol, OG HIT elicited significantly faster gait training speeds than TM HIT (0.66 vs. 0.51 m/s, p<0.0001) with similar mean HR (81.2 vs 81.9 %HRpeak, p=0.10) and lower max HR (92.7 vs 95.8 %HRpeak, p=0.0001).

CONCLUSIONS: OG HIT appears to be reasonably feasible and safe in chronic stroke. Mean OG HIT speeds were 34% and 18% faster than baseline fastest gait speed and OG exercise responses, while accounting for repeated measures from the same participant.

Individuals with Down syndrome (DS) exhibit reduced peak aerobic capacity (VO2peak) compared to those without DS. Lower VO2peak is partly due to impaired autonomic function, resulting in lower peak heart rate, thus altering cardiac output (CO). Autonomic dysfunction may also impact stroke volume (SV), further affecting CO. SV can be determined during exercise by measuring blood flow velocity in the ascending aorta with continuous wave (CW) Doppler echocardiography. It is unknown whether individuals with DS will tolerate the method or if it is feasible due to their specific physical features and gait abnormalities. PURPOSE: To determine the feasibility of SV measurement during exercise using CW Doppler in adults with and without DS. METHODS: Adults with DS (n=6, 25 ± 2 yrs, 31.7 ± 4.6 kg/m2, 24.2 ± 4.2 ml/kg/min) and without DS (n=5, 26 ± 4 yrs, 24.9 ± 4.8 kg/m2, 32.5 ± 6.4 ml/kg/min) performed a maximal incremental treadmill test to assess VO2peak Images were obtained at rest and every 2 min, until 8 min, of the treadmill test. Success rate of CW Doppler was expressed as a percent of acquired images vs total potential images. The method was feasible if success rate was ≥80%, and if obtained values for SV indexed to body surface area (SVI) were physiologically plausible. RESULTS: Resting measures were equally feasible with both groups at 100% success rate. As exercise progressed, the ability to obtain clear images was compromised, however, feasibility remained ≥80% in both groups. Further, percent change of SVI from rest to 8 min was within expected range (DS: 24.4%, Control: 22.7%). CONCLUSIONS: This pilot data indicates that SV measures during exercise with CW Doppler are feasible in adults with DS similar to that in controls, even with the DS-specific physical characteristics and gait pattern. Future research with more subjects should compare the SVI and CO with increasing exercise intensity between groups to better understand what limits exercise capacity in persons with DS.
Stroke has become one of the major causes of disability and mortality worldwide. There is increasing evidence that exercise training is associated with reduced risk of stroke. However, the effects of exercise training on protection of brain damage and subsequent motor and vestibular functions have not been fully understood.

PURPOSE: To determine the effects of exercise training prior to brain ischemia on protection against brain damage and subsequent motor and vestibular functions following transient cerebral ischemia/reperfusion injury in rats.

METHODS: Male Sprague-Dawley rats were either endurance exercise trained (N=10, ET; treadmill running at 16 m/min, 0° incline, 60 mins/day, 5 day/week, 4 weeks), resistance exercise trained (N=10, RT; climbing vertical ladder start load at 75% bodyweight with an additional 15% bodyweight added every 2 sets of climb until exhaustion, 10 sets/day, 5 day/week, 4 weeks) or remained sedentary (N=20) for 4 weeks. Brain ischemia induced by transient middle cerebral artery occlusion (MCAO) or sham surgery (sham) were then performed on these rats, which results in four groups: sham, MCAO, ET+MCAO, and RT+MCAO. 24 hours after the induction of brain ischemia, motor and vestibular functions were evaluated by various scoring methods. Ischemic infarct volume was measured by triphenyltetrazolium chloride (TTC) staining. One-way ANOVA followed by post-hoc Bonferroni test were used for data analysis.

RESULTS: Rats in both ET+MCAO and RT+MCAO group significantly reduced cerebral infarct volumes when compared to those in MCAO group (31.97±8.65% vs. 37.85±10.45% and 33.13±7.82% vs. 37.85±10.45%, respectively p < 0.05). Consistently, the coordinated locomotor function and vestibular function were also significantly improved in ET+MCAO group (2.33±0.52 vs. 3.40±0.89, 1.77±0.97 vs. 2.56±1.23) and RT+MCAO group (2.40±0.55 vs. 3.40±0.89, 1.78±1.09 vs. 2.56±1.23) in comparison to MCAO group (p <0.05), while the rats in the sham group did not exhibit any cerebral injury and functional impairment. There were no difference between the two exercise training groups.

CONCLUSIONS: Exercise preconditioning prior to brain ischemia induction effectively reduced cerebral infarct volumes and protected against the decline in motor and vestibular functions in a rat model of brain ischemia.
INTRODUCTION: Obesity is a significant health problem that can compound health-related morbidities in aging adults. While substantial research has elucidated many of the metabolic consequences of obesity, much less is known about the effects of adipose tissue (fat) deposition on skeletal muscle function. Some evidence exists to suggest obesity may interfere with muscle force production, but this is an understudied area of research. PURPOSE: To quantify in vivo the amount and distribution of fat and lean muscle tissue in the quadriceps muscles of healthy older adults. METHODS: The dominant legs of 8 healthy, sedentary adults (71 ± 4 yrs, mean ± SD; 4 men; BMI: 25.1 ± 3.3 kg/m²) were evaluated using a 3 tesla magnetic resonance system. Axial slices (5 mm thick) were acquired for the entire thigh, and each image in which all 4 quadriceps muscles were visible was analyzed to determine fat and muscle volumes (cm³), and fat fractions (fat/total*100%). The location (% muscle length) of peak muscle volume and fat fraction, as well as the deviation from the line of best fit (2nd order polynomial) of these variables were calculated as measures of tissue distribution and heterogeneity. RESULTS: Several resting phosphorus metabolites were related with muscle size and function in older adults. In particular, a phosphodiester peak (PDE2), considered a marker of membrane integrity, was negatively associated with skeletal muscle mass index (r = -0.38, p < 0.01), muscle volume (r = -0.37, p < 0.01), and peak power (r = -0.38, p < 0.01). PDE2 was elevated in sarcopenic patients in comparison to non-sarcopenic controls (2.48 ± 0.11 mM vs. 1.92 ± 0.08 mM, p < 0.01). ATPmax was not different between sarcopenic and non-sarcopenic individuals. At the cellular level, PDE2 was negatively correlated to myofiber area (r = -0.51, p = 0.03) but not fiber type proportion. CONCLUSION: Elevated resting PDE2 levels in muscle were associated with lower muscle mass and strength in older sarcopenic adults. While ATPmax was not related to the sarcopenic phenotype, our results reveal that resting in vivo phosphorus metabolite profiles may be a viable cellular marker of muscle quality in older adults. Supported by NIH Grants K01 AG04437 and R01 AG021961.

Abstracts were prepared by the authors and printed as submitted.
Limited data exists examining age-related changes in the passive mechanical properties of the musculoskeletal unit. PURPOSE: To examine the influence of age on maximum range of motion (MROM), peak passive torque ($\text{PT}_{\text{pass max}}$), and the dissipative coefficient (DC). METHODS: Twenty-one young (20.3 ± 2.4 yrs) and 14 older (69 ± 3.1 yrs) men completed MROM and isometric strength (for EMG normalization) assessment of the plantarflexors, following ultrasonography of the gastrocnemii. Muscle cross-sectional area (CSA) and subcutaneous fat corrected echo intensity (EI) of the gastrocnemii were determined as the sum and average of both muscles, respectively. Participants were seated in a calibrated dynamometer, with their leg fully extended and ankle and foot held in a custom steel foot plate. MROM assessments were performed by dorsiflexing the ankle at 5°/s from 10° of plantarflexion to the participants maximally tolerated ROM. $\text{PT}_{\text{pass max}}$, loading, and unloading, and the DC were calculated during the initial 80% of MROM. Independent samples t-tests were used to examine group differences. A Pearson’s correlation coefficient was used to determine the relationship between $\text{PT}_{\text{pass max}}$, and MROM. Analyses of covariance (ANCOVAs) were used to determine age-related differences in loading and unloading, while controlling for MROM. Additional ANCOVAs were used to determine the age-related difference in DC, while controlling for CSA and EI, respectively. An alpha level of 0.05 was used to determine statistical significance. RESULTS: The $\text{PT}_{\text{pass max}}$, MROM, and unloading ($P \leq 0.046$) were greater in the younger men, whereas the DC and EI ($P \leq 0.024$) were greater in the older men. When accounting for MROM, unloading ($P = 0.044$) remained significantly different between groups, while there was no difference between groups for loading ($P = 0.223$). When accounting for CSA, differences between groups for the DC remained ($P = 0.028$), while there was no longer difference between groups when accounting for EI ($P = 0.120$). $\text{PT}_{\text{pass max}}$ was also strongly related to MROM ($r = 0.755$, $P < 0.001$). Mean EMG amplitude values across muscles was 1.61% MVC. CONCLUSIONS: Older men exhibited lower MROM and greater DC, which may be explained by an altered stretch tolerance and qualitative changes (i.e. non-contractile tissue accumulation) in aged skeletal muscle, respectively.

### Background
Adipose-derived mesenchymal stem cell (MSC)-lyse injection effectively decreases body weight and improves glucose tolerance in mice on a high-fat diet. Purpose: To determine whether lifelong injection of MSC can minimize age-dependent decline in physical vitality and increase longevity in naturally aging rats. Methods: Rats were sex-balanced and randomly assigned into the vehicle-injected group (N = 46) and the MSC lyase injected group (N = 46). We measured body composition by dual energy X-ray absorptiometry (DEXA), spontaneous locomotor activity, and longevity in rats maintained on a normal diet and received an intermittent treatment of human adipose-derived MSC lyase (3 times a week, 11 times a month given every second month), starting at 12 months of age until natural death. Although our data agreed with previous observation on fat loss and marginally improved insulin resistance index subservient to long-term MSC lyase treatments, there was a shortened average lifespan, a longer inactive time, and a greater bone loss with a relative increase in lean mass compared with the vehicle-injected counterparts. Conclusion: Tissue renewal in multicellular systems requires regeneration after destruction. The results of the study implicate that simply enhancing regenerative signals from MSC does not beneficial and appear to be harmful for physical vitality and longevity.

### S58 Vol. 51 No. 5 Supplement

#### Abstract 304

**Board #142**

**May 29 11:00 AM - 12:30 PM**

**Longevity and Physical Vitality during Aging Altered by Adipose-derived Mesenchymal Stem Cell-Lysate Injection**

Chia-Hua Kuo, FACSM. University of Taipei, Taipei, Taiwan. Email: kouchiahua@gmail.com

(No relevant relationships reported)

**Purpose:** To examine the influence of age on maximum range of motion (MROM), peak passive torque ($\text{PT}_{\text{pass max}}$), and the dissipative coefficient (DC). **Methods:** Twenty-one young (20.3 ± 2.4 yrs) and 14 older (69 ± 3.1 yrs) men completed MROM and isometric strength (for EMG normalization) assessment of the plantarflexors, following ultrasonography of the gastrocnemii. Muscle cross-sectional area (CSA) and subcutaneous fat corrected echo intensity (EI) of the gastrocnemii were determined as the sum and average of both muscles, respectively. Participants were seated in a calibrated dynamometer, with their leg fully extended and ankle and foot held in a custom steel foot plate. MROM assessments were performed by dorsiflexing the ankle at 5°/s from 10° of plantarflexion to the participants maximally tolerated ROM. $\text{PT}_{\text{pass max}}$, loading, and unloading, and the DC were calculated during the initial 80% of MROM. Independent samples t-tests were used to examine group differences. A Pearson’s correlation coefficient was used to determine the relationship between $\text{PT}_{\text{pass max}}$, and MROM. Analyses of covariance (ANCOVAs) were used to determine age-related differences in loading and unloading, while controlling for MROM. Additional ANCOVAs were used to determine the age-related difference in DC, while controlling for CSA and EI, respectively. An alpha level of 0.05 was used to determine statistical significance. **Results:** The $\text{PT}_{\text{pass max}}$, MROM, and unloading ($P \leq 0.046$) were greater in the younger men, whereas the DC and EI ($P \leq 0.024$) were greater in the older men. When accounting for MROM, unloading ($P = 0.044$) remained significantly different between groups, while there was no difference between groups for loading ($P = 0.223$). When accounting for CSA, differences between groups for the DC remained ($P = 0.028$), while there was no longer difference between groups when accounting for EI ($P = 0.120$). $\text{PT}_{\text{pass max}}$ was also strongly related to MROM ($r = 0.755$, $P < 0.001$). Mean EMG amplitude values across muscles was 1.61% MVC. **Conclusions:** Older men exhibited lower MROM and greater DC, which may be explained by an altered stretch tolerance and qualitative changes (i.e. non-contractile tissue accumulation) in aged skeletal muscle, respectively.

#### Abstract 305

**Board #143**

**May 29 11:00 AM - 12:30 PM**

**Aging Alters NAD+, Sirtuins and Targeted Protein Levels and Acetylation in the Mouse**

Dongwook Yeo1, Choughun Kang2, Li Li Ji, FACSM3, 1University of Minnesota Twin Cities, Minneapolis, MN. 2Inha University, Incheon, Korea. 3University of Minnesota, Minneapolis, MN. Email: yeowxc039@umn.edu

(No relevant relationships reported)

Sufficient intracellular NAD+ is required for mitochondrial function and skeletal muscle health during aging. Sirtuins (SIRTs), the major NAD+–consuming enzymes, regulate mitochondrial function via deacetylating transcription factors and enzymes such as PGC-1α and GCN5, whereas Poly[ADP-ribose] polymerase 1 (PARP-1), the competing enzyme with SIRTs for consuming NAD+, is activated by DNA damages during aging, leading to depletion of cellular NAD+. Lowered NAD+ may dysregulate SIRTs and induce hyperacetylation of its target proteins. Thus, it is important to know how aging impacts on NAD+ pool and its consuming enzyme levels in the skeletal muscle. **Purpose:** To investigate the effect of aging on NAD+ and protein levels of SIRTs, PPAR-1, GCN5, and PGC-1α as well as protein acetylation (AC) in muscle. **Methods:** C57BL/6J mice at the age of 6 mo (young, Y; N = 8), 12 mo (middle; M; N = 8), and 24 mo (old; O; N = 8) were used. Quadriceps (Q), gastrocnemius (G), and heart (H) muscles were collected for colorimetric assay and Western blotting to quantify NAD+ and proteins levels of various enzymes. **Results:** Aging decreased nuclear NAD+ by 60 and 50% (p < 0.05) in the G, and by 60 and 70% (p < 0.05) in the Q of M and O, respectively. SIRT1 in G and Q increased by 3.1-fold (p < 0.05) and 1.4-fold (p < 0.05) with aging, whereas aging had no effect on SIRT1 in H. SIRT3 increased 1.3 (p < 0.05), 2.2 (p < 0.05), and 1.5-fold (p < 0.05), respectively, in G, Q, and H of O. SIRT2 was increased by ~4.8-fold (p < 0.01) in G and Q of both M and O, but not in H. Aging increased SIRT6 by ~2.4-fold (p < 0.01) in G and Q, whereas the level was decreased by 50% in H. PGC-1α was increased in G of M (1.7-fold, p < 0.01) and H of O (2.2-fold, p < 0.01) vs. Y. GCN5 decreased 30% in the Q of O (p < 0.05), but increased by 2.6 and 2.9-fold (p < 0.01) in the H of M and O, respectively. Aging increased PARP-1 by 80% in G of M (p < 0.05) and H of O (p < 0.01), but increased by 40% in Q of O vs. Y. Cleaved PARP-1 and AC were increased in all muscles with aging (p < 0.01). **Conclusion:** Aging decreased NAD+ pool, whereas SIRTs, GCN5, PPAR-1, and AC were increased with aging. Decreased level of NAD+ and increased levels of NAD+-consuming enzymes in aged muscles may intensify the competition among enzymes for utilizing NAD+, which can contribute to age-associated mitochondrial dysfunction and muscle atrophy.
CONCLUSIONS: A reduction in satellite cell has been reported to contribute to muscle loss with aging. Exercise presents a powerful strategy to stimulate satellite cells, however, to what extent various forms of exercise stimulate skeletal muscle satellite cells in older adults is less understood. The purposes of this study were to (1) examine relationships of satellite cell density, capillary density, and VO2peak in older adults, and 2) identify changes in satellite cell density following two different intensities of aerobic exercise.

METHODS: In a counter-balanced, cross-over design, six older adults (4M, 2F; 67±2y; BMI: 26.6±2.0 kg/m²) completed an acute bout of high-intensity interval training (HIIT; ten, 1-min intervals, 85-95% heart rate max, 1-min rest between intervals) and moderate intensity continuous cycling (MOD; 30-min, 60-65% VO2peak), separated by ~1 week. Muscle biopsies (vastus lateralis) were obtained before exercise and 24h after each exercise bout. Immunofluorescence was used to identify myosin heavy chain (MHC), satellite cells, capillaries, and cardiomyocytes. RESULTS: A significant relationship between capillary density and satellite cell density (P<0.018; R2=0.785), capillary density and VO2peak (P=0.016; R2=0.750), and satellite cells/MHC I fiber and VO2peak (P=0.026; R2=0.730), and satellite cells/MHC II fiber and VO2peak (P=0.002; R2=0.833) at baseline. Total satellite cells/fiber and fiber type-specific satellite cells/fiber were unchanged in response to acute MOD or HIIT (P>0.05) and no differences were observed between exercise trials (P>0.05).

CONCLUSIONS: These data reveal positive relationships between capillaries and satellite cell density in skeletal muscle of older adults. Further, while no changes in satellite cell density were observed 24h following acute MOD or HIIT, our preliminary findings suggest an association between satellite cell density and VO2peak in older adults. Thus, future research is needed to examine whether these exercise strategies differentially impact changes in proliferation or differentiation of satellite cells in older adults, and to what extent capillary density may be related to chronic adaptations in satellite cell density and VO2peak.

Rheumatoid arthritis (RA) is the most common type of chronic inflammatory disease in adults and often is associated with bone health problems. It is estimated that poor bone health may occur in 50% of patients. PURPOSE: First, to explore bone health among sedentary patients diagnosed with RA. Secondly, to explore the relationship among regional bone mineral density (BMD) with age, weight, and height.

METHOD: Twenty-one sedentary participants with diagnosed RA whose mean age was 59.43±18.3yrs, height was 172.5±7.4 cm, and weight averaged 66.67±9.07 kg. Dual energy x-ray absorptiometry (DXA) was used to measure bone health. Linear regression was used to explore relationships among age, height, weight, and BMD in RA patients.

RESULTS: BMD of the FN and L1-L4 averaged 0.12±1.29 SD and 0.38±1.57 SD, respectively. Mean Z-scores were 0.72±1.43 for TB, 0.38±1.57 for LV, and 0.12±1.29 for the FN. In the FN region 25% of patients had Z-scores below -1 SD and 5% were below -2 SD. In the LS 20% has Z-scores below -1 SD and 45% were below 0 SD. Additionally, no significant relationships were observed among BMD, age, weight, and height. CONCLUSION: These findings suggest that a great range of variability in bone health exists in RA patients. Furthermore, healthcare professionals should monitor bone health in the RA population and future interventions should explore the effects of tailored exercise programming to simultaneously improve bone health and well-being.

CONCLUSIONS: A novel finding emerges from our data confirms that poor bone health may occur in in 50% of patients. PURPOSE: First, to explore bone health among sedentary patients diagnosed with RA. Secondly, to explore the relationship among regional bone mineral density (BMD) with age, weight, and height.

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The main complaint of patients with benign joint hypermobility syndrome (BJHS) is chronic musculoskeletal pain (MSP) that may affect their daily activities, leading to a decreased quality of life. While some studies support an association between generalized joint hypermobility (GJH) and MSP in children and adolescents, there is no published study yet looking into a correlation of GJH and MSP in a college-aged population in the US. PURPOSE: To determine whether young adults with generalized joint hypermobility are more likely to suffer from chronic musculoskeletal pain. METHODS: Undergraduate students studied the general structure of joints and range of motion, including joint hypermobility, before completing a survey that included questions about chronic musculoskeletal pain and the severity of pain. They worked in groups to evaluate each other’s joints for hypermobility under supervision by the research team. RESULTS: Overall, 20.8% of 634 participants showed GJH based on a cutoff Beighton score of ≥4. Women had statistically significant higher rates of GJH (23.9%) than men (12.2%) (Wald Test, DF = 1, Chi-square = 10.049, P = 0.0015; odds ratio female to male: 0.44). Ninety-four of 650 participants (14.4%) recalled chronic joint pain. The most commonly named joints were knee (n = 59), shoulder (n = 17), hip (n = 14), ankle (n = 9), and elbow (n = 7). Male and female participants with GJH reported higher rates of chronic joint pain than participants without GJH. There was, however, no significant difference (Pearson Chi-square Test, Chi-square = 1.386, p = 0.5001; n = 650). The prevalence of chronic neck/back pain in our study was 20.8%. Participants with GJH reported higher rates of chronic back neck pain, yet, the difference was not statistically significant (Pearson Chi-square Test, Chi-square = 3.850, p = 0.1459, n = 650). The average pain intensity on a scale from 0 to 10 was more or less the same for both types of chronic pain (4.5 for chronic joint pain, 4.2 for chronic neck/back pain) and for respondents with and without GJH. The ranges for the reported pain intensity as well as the standard deviations for all averages were also very similar. CONCLUSION: Young adults with GJH are not reporting higher rates of chronic pain in joints, the neck or the back nor do they suffer from more severe pain than their peers without GJH.

**A-49**

**Free Communication/Poster - Physiologic Applications in Skeletal Muscle**

**Wednesday, May 29, 2019, 7:30 AM - 12:30 PM**

**Room: CC-Hall WA2**

**Board #150**

**May 29 11:00 AM - 12:30 PM**

**Association between Muscle Carnosine Content and Changes in Muscle Cytokines following Lower-Body Resistance Exercise**

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**Purpose:** To determine whether young adults with generalized joint hypermobility are more likely to suffer from chronic musculoskeletal pain. METHODS: Undergraduate students studied the general structure of joints and range of motion, including joint hypermobility, before completing a survey that included questions about chronic musculoskeletal pain and the severity of pain. They worked in groups to evaluate each other’s joints for hypermobility under supervision by the research team. RESULTS: Overall, 20.8% of 634 participants showed GJH based on a cutoff Beighton score of ≥4. Women had statistically significant higher rates of GJH (23.9%) than men (12.2%) (Wald Test, DF = 1, Chi-square = 10.049, P = 0.0015; odds ratio female to male: 0.44). Ninety-four of 650 participants (14.4%) recalled chronic joint pain. The most commonly named joints were knee (n = 59), shoulder (n = 17), hip (n = 14), ankle (n = 9), and elbow (n = 7). Male and female participants with GJH reported higher rates of chronic joint pain than participants without GJH. There was, however, no significant difference (Pearson Chi-square Test, Chi-square = 1.386, p = 0.5001; n = 650). The prevalence of chronic neck/back pain in our study was 20.8%. Participants with GJH reported higher rates of chronic back neck pain, yet, the difference was not statistically significant (Pearson Chi-square Test, Chi-square = 3.850, p = 0.1459, n = 650). The average pain intensity on a scale from 0 to 10 was more or less the same for both types of chronic pain (4.5 for chronic joint pain, 4.2 for chronic neck/back pain) and for respondents with and without GJH. The ranges for the reported pain intensity as well as the standard deviations for all averages were also very similar. CONCLUSION: Young adults with GJH are not reporting higher rates of chronic pain in joints, the neck or the back nor do they suffer from more severe pain than their peers without GJH.

**Board #149**

**May 29 11:00 AM - 12:30 PM**

**Correlation between Generalized Joint Hypermobility and Chronic Musculoskeletal Pain in College Students**

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(No relevant relationships reported)

**CONCLUSION:** The reported pain intensity as well as the standard deviations for all averages were also very similar. There was, however, no significant difference (Pearson Chi-square Test, Chi-square = 1.386, p = 0.5001, n = 650). The prevalence of chronic neck/back pain in our study was 20.8%. Participants with GJH reported higher rates of chronic back neck pain, yet, the difference was not statistically significant (Pearson Chi-square Test, Chi-square = 3.850, p = 0.1459, n = 650). The average pain intensity on a scale from 0 to 10 was more or less the same for both types of chronic pain (4.5 for chronic joint pain, 4.2 for chronic neck/back pain) and for respondents with and without GJH. The ranges for the reported pain intensity as well as the standard deviations for all averages were also very similar. CONCLUSION: Young adults with GJH are not reporting higher rates of chronic pain in joints, the neck or the back nor do they suffer from more severe pain than their peers without GJH.
Power development is imperative for dynamic sport athletes. Cluster sets (CLU) are an effective method to allay the progressive decrement in power output normally observed in a traditional (TRD) resistance exercise strategy. CLU configurations incorporate a brief in-between set rest period to preserve velocity and power. Despite favorable performance, we previously established that TRD configurations elicit higher myofibrillar protein synthesis (MPS) rates when compared to CLU. However, it remains unclear if hallmark readouts related to mTORC1-signaling underlie this observation.

**PURPOSE:** To elucidate anabolic signaling mechanisms driving differential MPS rates observed between CLU and TRD paradigms of the barbell back squat in trained men and women.

**METHODS:** In randomized crossover design, 8 resistance-trained adults (7M, 1F; 23 ± 4 y; 73 ± 3 kg; 1RM squat 192 ± 27 kg) performed an acute bout of either CLU (4 sets x (2 x 5) repetitions, 30s intra-set rest, 90s inter-set rest) or TRD (4 sets x 10 repetitions, 120s inter-set rest) barbell back squats at -70% 1RM. Volume load and total rest were matched between bouts. Participants ingested 20g of whey protein immediately before and after exercise. Muscle biopsies were collected at rest and at 0, 2, and 5 h post-exercise during primed-continuous L-(ring-13C)phenylalanine infusions. Total and phosphorylated states of targeted proteins were assessed through immunoblotting. Data was normalized to an internal loading control.

**RESULTS:** The phosphorylation of focal adhesion kinase (FAK) was doubled with TRD, but not significantly different, from CLU (TRD 2.1 ± 0.9-fold increase from baseline; CLU 1.3 ± 0.9-fold; p=0.05). Downstream targets of mTORC1 also showed no differences in phosphorylation between paradigms (4E-BP1: TRD 1.6 ± 0.3-fold, CLU 0.4 ± 0.2-fold; p70S6K: TRD 1.5 ± 0.4-fold, CLU 0.9 ± 0.4-fold). Similarly, there was no difference in AMPK phosphorylation between conditions (TRD 1.3 ± 0.9-fold; CLU 0.9 ± 0.7-fold).

**CONCLUSION:** Our data demonstrated that changes in protein phosphorylation as noted by various readouts within the mTORC1 pathway do not underpin the greater post-exercise muscle protein synthetic response with TRD versus CLU-style in resistance trained men and women.

Previous studies have reported that a prior bout of damaging exercise with one limb attenuated the magnitude of muscle damage in the subsequent damaging exercise with the contralateral limb, a phenomenon called contralateral repeated bout effect (CL-RBE). To our knowledge, these studies involved either exclusively men or a mixture of both sexes.

**PURPOSE:** To determine whether contralateral repeated bout effect of elbow flexors exists in women. **METHODS:** Twelve healthy women (20.9 ± 2.5 yrs) performed two bouts of 45 maximal eccentric contractions (ECC) of elbow flexors separated by 14 days. The isokinetic muscle strength (60°/sec) was measured pre-exercise, immediately post-exercise, and at 24 and 48 h post-exercise. Limb girth, range of motion (ROM), and muscle soreness were measured pre-exercise, and at 24 and 48 h post-exercise. Surface Electromyography (EMG) was recorded during both exercise bouts from the biceps brachii muscle. Data of all variables were analyzed using two-way repeated measures ANOVA (Bout x Time) except that of median frequency of EMG which was analyzed via paired t-test.

**RESULTS:** The isokinetic strength was significantly reduced after the eccentric exercise for both bout 1 (+19.3 ± 17.4%, P < 0.01) and bout 2 (+15.3 ± 15.2%, P < 0.01). Significant main effects of time were also observed for muscle soreness and ROM. Limb girth did not change significantly after either exercise bout. There were no significant differences between bouts for all the measured variables.

**CONCLUSION:** The CL-RBE of elbow flexors was not evident in healthy young women, which is probably because the magnitude of the muscle damage induced by the first exercise bout was not sufficient to induce protective adaptation for the contralateral arm in the second bout.
the 2,000 m ergometer test and VO2max (Pearson r = 0.432; p < 0.04). Exercise reduced HbO2 (p = 0.0063) and increased Hb (p=0.0038) compared to baseline in the VL with HbO2 remaining significant (p = 0.0677). No changes were observed during exercise in the PFC except for an increase in Hb (p < 0.0001). The magnitude of change in VL tissue oxygenation (HbO2) was correlated with the time to complete the time trial with a faster time relating to a greater reduction in VL HbO2. Similarly, the magnitude of change in VL deoxygenated hemoglobin (Hb) trended towards a greater increase in concentration with a faster time trial (Pearson r = -0.4422, p = 0.11). A Levene's test verified equality of variances in step length %CV of both legs (p = 0.84).

CONCLUSION: Exercise during a 2,000 m rowing time trial resulted in decreased HbO2 and increased Hb levels in the VL compared to baseline which was correlated with performance on the time trial. Total hemoglobin was found to increase in the PFC which may represent increased fatigue that occurs due to the maximal nature of the time trial.

Declines in skeletal muscle functions are associated with aging which affects daily activities and quality of life. Fall risk and fall-related injuries are related to muscle fatigability among older adults. Purpose: Measure calf muscle endurance and fatigability in older adults. We hypothesize that calf fatigability will be associated with reduced calf muscle endurance. METHODS: Ten participants ages 55-80 years volunteered for the study. Skeletal muscle endurance was measured on the calf muscle of the participant’s right leg at 2Hz, 4Hz and 6Hz using previously established protocol. Selected gait measurements (stride length, left/right ratio step length, %CV of step length, stride width) were recorded on three trials at self-selected speed on a 20foot gait mat (Protokinetics Zeno walkway). Pearsons r was used to test the relationship between the selected gait variables and endurance index at 6Hz. ANOVA Levine’s test of covariance was used to test the difference in the variance in step length of both legs. Significance was accepted at 0.05 alpha level Results: Muscle endurance at 6Hz (0.75±0.21%) varied from 0.3% to 1.0% Stride length (145cm±11cm) varied from 127.4cm to 168.5cm and step length (1cm±0.06cm) varied from 64.6cm to 82.7cm. There was a positive correlation between endurance index and stride length (r = 0.68, p<0.02) and the right/left ratio step length (r = 0.72, p = 0.01) but there was no significant relationship between endurance index and stride width (r = 0.43, p = 0.11). A Levine’s test verified equality of variances in step length %CV of both legs (p = 0.84). CONCLUSION: Muscle endurance in the calf was associated with some selected gait parameters which have been shown to predict increase fall risk among older adults.

Previous literature has shown that force exerted by muscle is closely related to its size, length (i.e. joint angle) and pennation angle (PA). For a mono-articular muscle such as the vastus lateralis (VL), its ability to produce maximal force is dependent on the joint angle of the knee. However, since the VL shares a joint action with a bi-articular muscle, the rectus femoris (RF), it’s possible that its performance may also be affected by the angle of the hip (i.e. the RF contribution to knee extension is hip angle dependent, which may influence VL performance as well). It is unknown how the pennation angle of the VL during contraction differs between maximal multi- and single-joint exercises, such as the isometric squat (SQ) and knee extension (KE), and whether those changes are dependent on the rate of the force production.

PURPOSE: To examine the pennation angle of the VL during slow and rapid maximal force production of the isometric SQ and KE exercises. METHODS: Fifteen lower-body resistance trained males (mean ± SD age 23 ± 4 yrs and BMI 24.6 ± 1.4 kg/m²) performed two maximal voluntary contractions (MVC) for both SQ and KE exercises. The first MVC (MVCR) was used to elicit peak force, with no instructions on the rate, while the second MVC (MVCEL) was used to elicit rapid force production. RESULTS: A two way [MVCR speed (slow vs. rapid) × exercise (SQ vs. KE)] repeated measures ANOVA indicated no significant differences in pennation angle of the VL between slow vs. rapid MVCs of the squat (mean MVCR = 16.19 ± 3.18°, MVCEL = 16.13 ± 3.26°) and knee extension exercises (mean MVCR = 16.21 ± 2.23°, MVCEL = 16.08 ± 2.34°), nor were there any differences between the exercises (p > 0.05 for all analyses). CONCLUSION: When knee angle is controlled for, the pennation angle of the VL during isometric squats and knee extensions do not differ. Furthermore, neither the rate of force, nor the slightly different hip angles had an effect.

We have previously shown that human primary myotubes retain in vivo characteristics of their donors. Electrical pulse stimulation (EPS) has recently been used as an exercise mimic in a cell culture model, and could be beneficial to understanding underlying molecular mechanisms of exercise.

Purpose: To determine if EPS induced adaptations on mitochondria and lipid content is dependent on the donor population and the duration of EPS applied.

Methods: Human primary skeletal muscle myotubes were cultured from four endurance trained athletes (23 ± 1 yrs and BMI 24.4 ± 0.9 kg/m²) and five lean healthy Caucasian donors (23 ± 1.9 yrs and BMI 24 ± 0.6 kg/m²). EPS was applied to pooled culture-reach donor and lean donor groups for 24 hours or 48 hours using biphasic pulses (1 Hz for 2 ms; 30V) and were harvested after stimulation. Control cells were maintained simultaneously and harvested alongside EPS treated cells. Lipid and Mitochondrial content were measured by fluorescent histochemical techniques, and quantified using Image J software.

Results: Myotubes cultured from athletes had a significantly greater lipid (35.68 ± 5.78 vs 5.01 ± 0.08 AU; p<0.0001) and mitochondrial content (108.3 ± 18.9 vs 6.9 ± 0.87 AU; p=0.03) content compared to lean donors at baseline. Lipid and mitochondrial content were significantly greater in lean after 24 hours (both p<0.05), but not after 48 hours (both p>0.05) of EPS compared to control of EPS (Lipid: control 0.0 ± 0.0; 24hr. 0.0 ± 0.0; 48hr. 0.0 ± 0.0; Mitochondria: Control 6.9 ± 0.7, 24hr. 14.4 ± 14.4, 48hr. 89.5 ± 12.4 AU). Lipid content did not change in myotubes cultured from athletes with EPS after 24 hours (p=0.8) or 48 hours (p=0.4) (Control 35.68 ± 0.51 AU, 24 hr. 35.43 ± 5.12 AU, 48 hr. 25.95 ± 2.6 AU) whereas mitochondrial content was significantly greater after 24 hours EPS (p=0.0004) but not after 48 hours (p=0.08) of EPS (control 108.3 ± 18.9 AU, 24 hr. 239.1 ± 25 AU, 48 hr. 125 ± 15.3 AU).

Conclusions: Primary human skeletal muscle cells cultured from athlete donors have a higher lipid and mitochondrial content compared to lean, healthy donors. EPS induced increases in lipid and mitochondrial content depends on the physical fitness of the population being studied. 24 hours of EPS stimulation seems to result in greater mitochondrial content compared to 48 hours of stimulation.

Effects Of Rate Of Force Production On Vastus Lateralis Pennation Angle During Isometric Squats And Knee Extensions

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Contusions are a common sports injury, often resulting in acute skeletal muscle contractile dysfunction. Whole-body heat shock is reported to attenuate skeletal muscle atrophy in animal models. The purpose of this study was to test the hypothesis that whole-body heat shock attenuates contusion-induced skeletal muscle contractile dysfunction. METHODS: Male mice (14.4 ± 1.4 mo) were randomized to either the heat shock contusion group (HSC; n=5), the normal body temperature contusion group (NTC; n=4), or sham (n=3). Under anesthesia, the in vivo torque-frequency relationship (Hz-300Hz) of the anterior tibia crural muscle group was measured in all mice. Body temperature was then raised to 41°C (HSC) or maintained at 37°C (NTC and sham) for 30 min and then all mice were allowed to recover consciousness. Twenty-four hours later all mice were anesthetized again and a single contusion (HSC and NTC) was delivered via the instrumented mass-drop technique (14.1 g steel ball was dropped through a tube from an 115 cm onto an impactor directly striking the tibialis anterior) or no contusion (sham); all mice were then allowed to recover. Following 5 days of normal cage activity (5-d recovery), in vivo torque-frequency relationships were measured in all mice. Data were analyzed using a factorial ANOVA with an a priori level of significance of 0.05. Fisher’s LSD pair-wise comparisons were made post-hoc. RESULTS: There was a significant group-time-frequency interaction (F=1.791, p=0.034). Within group pairwise comparison pre to 5-d recovery sham did not differ (p=0.529), HSC fully recovered (p=0.899), and NTC did not recover (p=0.001) muscle contractile function. Within group comparison pre to 5-d

Board #159 May 29 11:00 AM - 12:30 PM Electrical Pulse Stimulation Induced Increase In Lipid And Mitochondria Depends On Donor's Physical Activity Level

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(No relevant relationships reported)

Board #160 May 29 11:00 AM - 12:30 PM Whole-body Heat Shock Accelerates Recovery from a Single Blunt Trauma Contusionin Mice

Josh S. Godwin, Ben Klatt, Haley Brownlee, Alan R. Needle, Kevin Zwestlout, R. Andrew Shanely. Appalachian State University, Boone, NC. (Sponsor: David C. Nieman, FACSM)

(No relevant relationships reported)
at 40Hz (submaximal stimulation) and 250Hz (maximal stimulation) found sham did not differ (p=0.765; p=0.912, respectively), HSC recovered (p=0.786; p=0.602, respectively), and NTC did not recover at either frequency (p=0.011; p=0.006, respectively). CONCLUSION: Whole body heat shock treatment prior to a single blunt trauma contusion accelerates the rate of recovery of in-vitro skeletal muscle contractile function within the 5-d recovery period. Funding: This work was partially supported by an Appalachian State University GRAM award.

323 Board #161 May 29 11:00 AM - 12:30 PM The Effect of 10%O<sub>2</sub> Microenvironment and Electric Pulse Stimulation on Glucose and Lipid Metabolism Li Songbo<sup>1</sup>, Sun Jingquan<sup>2</sup>, Wang Yang<sup>1</sup>, Yan Lu<sup>1</sup>, Wang Yi<sup>1</sup>, Beijing Sport University, Beijing, China. <sup>1</sup>Sichuan University, Sichuan, China. Email: 951sb@163.com

PURPOSE: There is currently no successful cell contraction model in vitro. Electrical pulse stimulation (EPS) can induce muscle cell contraction. 10%O<sub>2</sub> microenvironment is closer to the human skeletal muscle environment. In this study, EPS was applied to myotubes to test the changes of the metabolism of glucose and lipid, and to establish a successful cell contraction model in a 10%O<sub>2</sub> microenvironment.

METHODS: After seven days of differentiation in 5% CO<sub>2</sub> (20%O<sub>2</sub>), the myoblast cell line C2C12 were transferred into the 10%O<sub>2</sub> incubator. After adaptation in the hypoxic incubator for 24h, the myotube cell line was successfully established. The myotubes were subjected to 140s to 1min of electrical pulse stimulation according to the EPS protocol, were association with the frequency increases from 1 Hz to 2 Hz in the EPS protocol, were association with the frequency increases from 1 Hz to 2 Hz in the EPS protocol. 10%O<sub>2</sub> microenvironment significantly increased the protein level of PGC-1α, and the synergistic effect of hypoxia and EPS was more significantly. 10%O<sub>2</sub> microenvironment significantly decreased the content of MyHCIIc, MyHClIIB and MyHCIIx in myotubes. EPS significantly decreased the content of MyHCIIc and MyHCIIx but significantly increased the content of MyHCIIa in myotubes. 10%O<sub>2</sub> microenvironment significantly decreased the mRNA level of GLT1 and GLUT4. However, in stimulated myotubes, the mRNA level of GLUT1 was significantly elevated, but the RNA level of GLUT4 was decreased. Meanwhile, 10%O<sub>2</sub> microenvironment significantly decreases the mRNA level of MCAD, CPT1B, GLUT1, GLUT4, PDH, LDH and GAPDH.

RESULTS: Both 10%O<sub>2</sub> microenvironment and EPS significantly increased the protein level of PGC-1α, and the synergistic effect of hypoxia and EPS was more significantly.

CONCLUSIONS: The current study revealed that PA

324 Board #162 May 29 11:00 AM - 12:30 PM Assessment Of Quadriceps Femoris Pennation Angle And Force Production Asymmetry In College-Aged Males Ashley N. Fox, Daniel J. Blackwood, Daniel J. Larson, Christopher D. Black, FACSIM, Rebecca D. Larson. University of Oklahoma, Norman, OK. Email: ashfox@ou.edu

PURPOSE: The current study examined asymmetry in pennation angle (PA) and force production (FP) in the quadriceps femoris (QF) muscle group in college aged males. METHODS: Thirty-eight college-aged males (22.97±2.58 yrs., 180.22±6.90 cm, 88.62±14.88 kg) were recruited to participate in this study. All measurements were taken in random order on both legs. PA’s were measured using B-mode ultrasound. Three images were captured and analyzed for each muscle of the QF: the vastus medialis (VM), vastus lateralis (VL), rectus femoris (RF) and vastus intermedius (VI). QP FP was measured on serum GDF8 and insulin and gastrocnemius MSTN, IGF1 and P70S6K proteins, muscle mass index. Continuous exercise and high-intensity intermittent exercise had similar effects on serum GDF8, insulin, and similar effects on the proteins of MSTN, IGF1 and P70S6K in the gastrocnemius muscle, but the effects of three exercise modes on serum GDF8 and insulin and gastrocnemius MSTN, IGF1 and P70S6K proteins, leading exercise is different from sustained exercise and High intensity intermittent exercise.

325 Board #163 May 29 11:00 AM - 12:30 PM Comparison Of Effects Of Different Exercise Modes On Gastrocnemius Of Obese Rats Xiujuan liu, Nianyun zhang, Lei sheng. Nanjing Sports Institute, Nanjing, China. Email: 59684540@qq.com

CONCLUSION: This study revealed that PA in the QF muscles: 

Lower-limb amputees often exhibit an increased atrophy of remaining skeletal musculature as compared to the non-amputated side. This difference in lean mass may present variations in the contribution of physical effort between the affected and unaffected musculature. While most literature has focused mainly on microprocessor-controlled prosthetics, few investigations have examined mechanical (i.e., un-powered) prosthetics during daily activity tasks. PURPOSE: The purpose was to examine the electromyographical activity of the lower limb musculature of the amputated versus non-amputated side in a unilateral trans-femoral amputee. METHODS: A total of 193 Japanese university freshmen women (ages 18-25 years) volunteered to participate in this study. A stepwise multiple-regression analysis (method of increasing and decreasing the variables, criterion was set at p<0.05) was performed to SMI and 17 variable factors (body mass index, % body fat, waist-hip ratio, girth (mid-thigh and lower-leg), muscle thickness (anterior and posterior mid-thigh and posterior lower-leg), handgrip, knee extension, standing long jump, vertical jump, sit-to-stand test, side step test, multi-stage 20-m shuttle run test, two-step test, sit and reach). RESULTS: Twelve of 17 variables was correlated (P<0.05) with SMI. There was excellent relationship between mid-thigh girth and SMI (r=0.81, P<0.001). The prediction equations were highly correlated with SMI \( R^2 = 0.64 \) for step 1 [SMI = 0.11 x thigh girth (cm) + 0.71] and \( R^2 = 0.90 \) for step 7 [SMI = 0.02 x thigh girth (cm) - 0.07 x body fat (%)] + 0.22 x BMI (kg/m²) + 0.02 x handgrip (kg) + 0.04 x lower leg girth + 0.01 x side step + 0.14, P<0.05). CONCLUSIONS: Our results indicated that the SMI could be evaluated by the field-based simplified methods, especially for the mid-thigh girth measurement, which may be a major determinant to maintain an active life for healthy young women.

ACSM May 28 – June 1, 2019
Orlando, Florida
Performing uncustomed eccentric (ecc) exercise leads to temporary muscle damage, initiating a prophylactic response to minimize injury from a subsequent bout (i.e., the repeated-bout effect; RBE). Few studies have investigated sex-related differences to ecc maximal voluntary contractions (MVCs). There is indirect evidence to suggest females may have greater muscle damage following ecc MVCs. If true, this could induce a larger RBE for females than males; however, the RBE has not been compared between the sexes. PURPOSE: To compare the magnitude of the RBE for females and males. METHODS: To date, data from two bouts of ecc MVCs have been collected from 15 healthy young participants (22.7±2.8y; 6 females). The fatigue/damage protocol involved 200 ecc MVCs of the dorsiflexors (60% from a neutral ankle position to 30° of plantar flexion; 4 sets of 50 reps; 2s rest between reps and 1min rest between sets). Isometric (ISO) MVC torque and the ratio of ISO torque responses to low vs. high frequencies of electrical stimulation (10:100Hz) were compared before and after 2, 3, and 5min, as well as 2, 4, and 7d the fatigue/damage protocol. The fatigue/damage protocol and recovery visits were repeated four weeks later. RESULTS: After bout 1, ISO MVC torque decreased 27.2±10.9% (females) and 25.1±14.8% (males) at 2min post-fatigue. At 2d, ISO MVC torque was 91.0±8.3% and 90.0±11.9% control for females and males, respectively. The 10:100Hz ratio decreased markedly in acute recovery (5min: 53.5±13.6% and 40.4±10.4% for females and males, respectively) but returned to 94.7±16.3% and 88.8±10.6% control at 2d. After bout 2, ISO MVC torque was impaired by 10.4±13.3% (females) and 23.1±17.7% (males) at 2min post-fatigue, and restored to 91.3±8.1% and 96.3±6.0% control (females and males, respectively) at 2d. The decrease in the 10:100Hz ratio at 5min post-fatigue was 41.8±15.0% and 35.7±12.3% for females and males, respectively. At 2d, the ratio was 92.1±12.5% (females) and 94.7±8.8% (males) of control. CONCLUSIONS: Our preliminary results suggest that an initial bout of ecc MVCs may cause greater fatigue or damage for females than males. After bout 2, acute decreases in ISO MVC torque and 10:100Hz ratio appear to be attenuated more for females than males, which may suggest a greater RBE for females.

Supported by NSERC, CFI, and BCKDF

Red spinach extract (RSE) offers a rich source of dietary nitrates and evidence suggests that it may positively impact exercise performance. PURPOSE: The purpose of this investigation was to examine the effects of short-term red RSE supplementation on cycling time trial performance. METHODS: Seventeen recreationally active men (n=9, 22.2±3.8 y) and women (n=8, 22.8±3.5 y) underwent two testing sessions administered in a randomized, counterbalanced, double-blind fashion. Participants were assigned to supplement daily with 1 gram of RSE or placebo (PL) for seven days prior to each testing session. During each testing session, an additional serving was provided 1 hour prior to completing a 4-km cycling time trial test. Performance variables (time-to-completion, average power, relative power, cadence, and average speed) and subjective measures (perceived exertion and muscle fatigue) were assessed during each testing session. Heart rate, systolic blood pressure, and diastolic blood pressure (DBP) were also assessed around exercise. RESULTS: Compared to PL, RSE supplementation significantly improved (p<0.05, η2=0.24) 4-km completion time (404.6±24.6 vs. 410.6±31.3 s), relative power (2.53±0.44 vs. 2.46±0.40 W kg⁻¹), and average speed (33.5±2.2 vs. 35.3±2.5 km hr⁻¹). Additionally, a trial × time interaction was observed for DBP (F=4.5, p<0.02, n=0.22) where DBP was lower following the RSE trial compared to the PL trial (66.1±6.1 vs. 70.1±5.0 mmHg). No other differences were observed between trials. CONCLUSION: In conclusion, RSE...
supplementation significantly reduced time-to-completion and increased measures of power and speed during a 4-km cycling time trial. RSE also appeared to lower DBP following the cycling time trial, without altering participants’ perceived exertion or subjective measures of muscle fatigue. Supported by a grant from American Health Foods, Inc.

### Board #173
**May 29 9:30 AM - 11:00 AM**
**The Probiotic Streptococcus Salivarius M18 Increases Plasma Nitrite But Does Not Alter Blood Pressure**
Mia C. Burleigh, University of the West of Scotland, Blantyre, Scotland.
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Some species of bacteria in the mouth can reduce nitrate (NO₃⁻) from the diet to nitrite (NO₂⁻) which can be later converted to nitric oxide (NO). Increased levels of NO can reduce blood pressure (BP) and improve exercise performance. The bacteriocin- producing probiotic Streptococcus salivarius M18 (S.salivarius M18) can inhibit pathogenic oral bacteria but it is unclear whether an alteration to the oral microbiome will influence circulating levels of NO metabolites and BP. **PURPOSE:** To determine the effects of S.salivarius M18 supplementation on BP, plasma and saliva [NO₃⁻], [NO₂⁻] and [NO₃⁻] [NO₂⁻]. **Methods:** Eight healthy males (age 32 ± 8 y, body mass 80 ± 11 kg) completed 2 x 14 day supplementation phases in a randomized order at least 14 days apart. In one phase, participants consumed probiotic lozenges (2.5 billion colony-forming units/dose) once per day and in the other they ingested water (placebo). Samples of unstimulated saliva and venous blood were collected, and BP was measured before and after each phase. Samples of saliva were later analysed for [NO₃⁻] and [NO₂⁻] using chemiluminescence. The change (A) in each outcome from pre- to post-supplementation was compared between phases using paired t-tests. **Results:** Plasma NO₃⁻ increased from baseline (173 ± 38 nM) following probiotic supplementation (Δ50.24 ± 51.23 nM, P = 0.04) in comparison to the placebo phase (Δ8.77 ± 61.51 nM). There were no significant changes in systolic BP (probiotic Δ0 ± 3 mmHg; placebo Δ1 ± 4 mmHg, P = 0.51). Diastolic BP and salivary NO metabolites were also unaffected (all P > 0.05). **Conclusions:** Supplementation with S.salivarius M18 increased plasma NO₃⁻, a key marker of NO availability, potentially by altering the abundance or activity of NO₂⁻ reducing bacteria in the mouth. Despite this, S.salivarius M18 did not lower BP in healthy participants. Further research is therefore required to determine the therapeutic and ergogenic potential of probiotic supplementation. Supported by a grant from the Hannah Dairy Research Foundation
METHODS: 12 male, physically active participants were randomized in a double-blind fashion to placebo (PL) (n=6, 23 ± 2 yrs) or creatine (CM) (n=6, 21 ± 2 yrs) groups. Subjects received 0.3 g/kg/day of creatine monohydrate or placebo in gelatin capsules for 7 days. Ultrasoundography of the carotid artery, applanation tonometry, submaximal exercise tests (10 minute treadmill activity at 3.7 mph and 9% incline), and lower leg pain (analog visual scale and pain test alometer) assessments were conducted at baseline and on day 7 of the study period. RESULTS: There were no significant differences between PL and CM in carotid femoral pulse wave velocity (CF PWV) (4.60 ± 10.42 vs. -2.71 ± 21.20 % change), β-stiffness index (5.81 ± 26.3 vs. 1.65 ± 141.35 % change), central pulse pressure (CPP) (-1.73 ± 16.31 vs. 6.05 ± 24.61 % change), and arterial compliance (AC) (19.79 ± 37.50 vs. 12.48 ± 53.89 % change) (all P > 0.05). There were no significant changes in SmO2 (7.5 ± 20.42 vs. 29.94 ± 36.13 % change) and peak pain (-4.5 ± 29.87 vs. -12.3 ± 30.62) between PL and CM, respectively (all P > 0.05). Finally, there were also no significant differences in body weight (0.3 ± 0.19 vs. 0.2 ± 0.19 % change), fat mass (-3.3 ± 0.49 vs. -0.23 ± 0.17 % change), and fat free mass (1.12 ± 0.98 vs. 0.23 ± 0.00 % change) between PL and CM, respectively (all P > 0.05). CONCLUSIONS: Using a randomly controlled, double-blind trial with validated measurements of AS and SmO2, acute creatine supplementation does not appear to impact vascular compliance or oxygen saturation in skeletal muscle in young, otherwise healthy males.

339 Board #179 May 29 9:30 AM - 11:00 AM Exhaustive Resistance Exercise Alters Serum Creatine and Guanidinoacetic Acid in Active Men Zoran S. Milosevic1, Patrik Dril1, Saad Al Fazzazi2, Valdemar Stajer1, Nebojsa Maksimovic1, Sergej M. Ostojic1. 1University of Novi Sad, Novi Sad, Serbia. 2University of Granada, Granada, Spain.

PURPOSE: To evaluate a 24-hour post-exercise response in serum guanidinoacetic acid (GAA), creatine and creatinine in young active men subjected to a single session of exhaustive resistance exercise and matched it with exercise-induced changes in serum cortisol, interleukin 6 (IL-6), creatine kinase (CK), and lactate dehydrogenase (LDH).

METHODS: Twelve healthy active men (age 22.7 ± 0.8 years; weight 79.8 ± 7.3 kg; height 182.4 ± 4.9 cm; weekly exercise 5.1 ± 1.6 hours) were subjected to a single session of bench press exercise until volitional exhaustion, with venous blood sampled before, immediately after exercise (~2 min), and after 15 min, 60 min and 24 h after the end of exercise. RESULTS: Baseline values for serum GAA, creatine and creatinine were 2.2 ± 0.5 µmol/L, 18.9 ± 3.6 µmol/L and 72.4 ± 6.0 µmol/L, respectively. Serum GAA significantly dropped for 9.6 ± 7.3 % immediately after bench press exercise (95% CI, 5.0 to 14.2; P < 0.001), while both creatine and creatinine increased immediately after the test for 5.0 ± 2.5 % (95% CI, 3.4 to 6.6; P < 0.001) and 11.9 ± 4.3 % (95% CI, 9.2 to 14.6; P < 0.001), respectively. GAA and creatine levels recovered to the baseline values after 24 hours post-exercise, yet creatinine remained significantly higher at 24-hour period as compared to the baseline values for 2.5 ± 2.3 % (95% CI, 1.0 to 4.0; P < 0.002). CONCLUSIONS: A single session of exhaustive resistance exercise induces transient alterations in biomarkers of creatine metabolism with serum creatinine outlined as a most persistent marker of exhaustion. Exercise-induced changes in creatine metabolism poorly corresponds to perturbations in inflammation and muscle fatigue biomarkers following exercise. This project was partly supported by the Serbian Ministry of Education, Science and Technological Development (175037 and 179011), the Provincial Secretariat for Higher Education and Scientific Research (142-451-2473 and 114-451-710) and the Faculty of Sport and Physical Education, University of Novi Sad (2018 Annual Award).

340 Board #178 May 29 9:30 AM - 11:00 AM The Effect of Creatine Supplementation on Muscle Oxygen Saturation and Arterial Stiffness Tim Werner, Salisbury University, Salisbury, MD. Email: tjwerner@salisbury.edu

There is a void in our knowledge on the impact of exercise, in particular creatine monohydrate supplementation, on arterial stiffness (AS) in the major elastic arteries. This study also examined the effects of creatine supplementation on skeletal muscle oxygen saturation (SmO2) in the lower leg. Data have indicated that creatine supplementation can result in an increase in lower leg intramuscle compartment pressure at rest and post exercise. Although the increased pressures seen during these studies were not pathological, this and additional factors associated with creatine supplementation could possibly effect SmO2 during exercise and recovery. PURPOSE: To determine the effects of acute creatine monohydrate supplementation on AS and SmO2.

CONCLUSIONS: We conclude that 2 g/kg·day during 28 days of oral CM supplementation improved results in some cognitions tasks in elderly woman.
Supported by Cenegenics®

RESULTS: There were significant group × time interactions for muscular strength (p < 0.01), physical function (p < 0.05), and RMR (p < 0.01). There were significant increases in muscular strength; lat pull-down (+22%), seated row (+45%), biceps curl (+36%), leg press (+54%), and calf raise (+43%) (p < 0.01) in FRT with no detectable changes in CON. In addition, there were great improvements in physical function; five-stand chair (+22%) and 30-sec chair stand (+22%) in FRT (p < 0.05) with no changes observed in CON. RMR significantly increased in FRT (+6%, p < 0.05), while remarkably decreased in CON (+6%, p < 0.05). CONCLUSION: Twelve-weeks of n-3 administration with progressive RT greatly improved muscular strength and physical function as well as appears to reverse the age-induced decline in RMR in healthy older adults.

Supported by New Mexico State University.

343 Board #181 May 29 9:30 AM - 11:00 AM
Effects Of A Single Dose Multi-ingredient Pre-workout Supplement On Aerobic And Anaerobic Performance In Men
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PURPOSE: To assess the effects of a single dose of a multi-ingredient pre-workout supplement (MIPS) on aerobic and repeated anaerobic performance tests. METHODS: Eight college-aged men were recruited to participate in a randomized, double-blind, placebo-controlled, crossover study. All participants were tested within the same week separated by 48 hours and were provided either the placebo (PLA) or the MIPS on each day. As per the manufacturer’s instructions, the participants waited 25 minutes to begin the tests, following consumption of the drink. Aerobic exercise performance was assessed using the Modified Astrand Treadmill Protocol, during which maximal oxygen consumption (VO2max) and maximal aerobic exercise time were determined. Following this test, participants were provided a 20-minute seated rest period. After the rest period, participants completed a short warm-up which consisted of 2 minutes of cycling at 50 RPMs against a light resistance, followed by 3, 10-second sprints, to determine the max RPMs. After the warm-up, participants completed the repeated anaerobic power test, which consisted of 10, 6-second sprints, with 45 seconds of active rest in between each sprint. For each sprint, a resistance of 7.5% of the participant’s body mass was applied at 90% of their max RPM. Peak power (PP) was determined for each sprint and the percent decline in PP from the first to the last sprint was calculated. VO2max, exercise time and the percent decline in PP for the sprints were analyzed using a dependent t-test. The peak power of the 10 sprints were analyzed using 2x10 ANOVA. The alpha level was set to p < 0.05. RESULTS: There was no significant difference between the PLA and MIPS for VO2max. However, there was a significant difference in treadmill time (p < 0.005) with MIPS (10.4±1.6 min) performing better than PLA (10.0±1.6 min). There were no significant differences between the PLA and MIPS when analyzing peak power during the 10 sprints or percent decline in PP. CONCLUSIONS: A single dose of this MIPS improved maximal aerobic exercise time despite no changes in VO2max. However, this MIPS did not improve performance during a repeated anaerobic power test. Study supported by Cenegenics®

344 Board #182 May 29 9:30 AM - 11:00 AM
Antioxidants Supplementation Hamper Muscle Growth after 10 Weeks Strength Training
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No relevant relationships reported

Strength Training (ST) is recommended for increased muscular mass. It has been suggested that reactive oxygen species (ROS) produced by a ST session may play a positive role in the hypertrophic process. However, there is some evidence that chronic antioxidant supplementation may indeed reduce ROS and play a negative role in protein synthesis. Few studies have investigated the effects of ST combined with antioxidants supplementation on muscle hypertrophy. However, results are still controversial. PURPOSE: To investigate the effects of ST combined with Vitamin C and E supplementation on muscle thickness (MT). METHODS: Thirty-three untrained women (22.9±2.5 years, 57.7±8.4 kg, 1.60±0.6 m) were allocated into three groups: Vitamin (VG, n=12), Placebo (PG, n=11) and Control (CG, n=10). Participants of VG and PG underwent lower-body (lunge and deadlift exercises) periodized ST, twice a week for 10 weeks. VG group was supplemented with vitamins C (1g/day) and E (400IU/day) during the training period, and PG ingested placebo pills and CG did not perform training or supplementation. Muscle thickness (MT) of the quadriceps femoris of the dominant limb was analyzed by ultrasonography. RESULTS: Both VG (+ 11.6%, p < 0.05) and PG groups (+ 17.1%, p < .05) presented increased values of MT after 10 weeks of ST. However, there was no difference between the VG and PG groups, only the PG presented a significant gain of MT when compared to CG (17.1% vs 2.0%; p < .05). CONCLUSIONS: The results of this investigation suggest that chronic antioxidants supplementation may mitigate improvements in muscle hypertrophy, after 10 weeks of ST in untrained young women.

345 Board #183 May 29 9:30 AM - 11:00 AM
Combination Polyphenol and MSM Supplementation Alters Post Half Marathon Systemic Inflammatory Response
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No relevant relationships reported

Individuals participating in prolonged endurance performances and associated training experience regular inflammation and muscle soreness. Natural products with known anti-inflammatory and/or oxidative stress blocking effects represent attractive options to traditional NSAID treatments. PURPOSE: To investigate the effect of combined curcumin (500-1000 mg/d; Longvita), pomegranate extract (500-1000 mg/d; Pomella), and methylnaltrexone (500-1000 mg/d; OptiMSM) supplementation for 30-days on inflammation-associated RNA, protein inflammatory biomarkers, and biomarkers of oxidative stress. METHODS: All protocols were approved by the University IRB committee and participants gave written informed consent. Subjects supplemented with the combination supplement (N=5) or placebo (N=5) for 30-d prior to the half marathon race. Venous blood samples were collected for RNA (PAxgene tube) or serum (evacuated separator tube) for cytokine receptors, and methylnaltrexone (500-1000 mg/d; OptiMSM) supplementation for 30-days on inflammation-associated RNA, protein inflammatory biomarkers, and biomarkers of oxidative stress. TA and AGE were measured using enzymatic assays (Cell Biolabs, Aviva Systems Biology). Fold change from pre was calculated for the various outcome variables to allow for better comparison and model creation. RESULTS: Fold changes in RNA and proteins exhibited a trend toward reduced inflammation while showcasing an increased ability of soluble cytokine receptors to sequester inflammation with supplementation post-race. Reduced oxidative stress (via TA and AGE) was observed post-race with the supplement compared to placebo. CONCLUSIONS: These data support the notion that the combined use of curcumin, pomegranate and MSM prior to and after a half marathon race may result in reduced systemic inflammation and oxidative stress. More research is needed in order to understand how to use these effects to improve the effectiveness of a long-term training program.

346 Board #184 May 29 9:30 AM - 11:00 AM
Acute Fermented Soy Supplementation Improves 20-km Time Trial Performance through Improvements in Power and Speed
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No relevant relationships reported

INTRODUCTION: Isoflavones, a chemical class of phytoestrogens, are found in soybeans and soy products and may have biological functions similar to estradiol. After binding with ER, or perhaps independently of estrogen receptors, isoflavones may augment vascular endothelial relaxation, contributing to improved skeletal muscle blood flow. PURPOSE: To determine if acute fermented soy supplement influences 20-km time trial cycling performance and cardiac hemodynamics compared to a placebo. METHODS: Subjects included twenty-five recreationally trained cyclists and triathletes (31 ± 8 years; 177.3 ± 5.9 cm, 78.3 ± 8.5 kg; VO2peak: 55.1 ± 8.4 mL kg-1min-1 (4.3 ± 0.7 L·min-1)) at 315 ± 42 W). Each subject completed a VO2peak assessment, familiarization, and two 20-km time trials in randomized order following ingestion of a fermented soy extract supplement or placebo. The fermented soy extract consisted of 30 g powdered supplement in 16 fl. ounces of water. The placebo consisted of the same quantities of organic cocoa powder and water. Each trial
consistent of 60 min of rest, 30 min of steady-state exercise at 55% $W_{\text{max}}$, and a self-paced 20-km time trial. Heart rate, stroke volume, and cardiac output were measured continuously using impedance cardiography software continuously recorded power output, speed, cadence, and time to completion. RESULTS: Soy supplementation elicited a faster time to completion ($0.22 \pm 0.10$ min; $p<0.05$), lower average heart rate ($5 \pm 1$ bpm), and significantly greater power ($6.8 \pm 2.5$ W) and speed ($0.42 \pm 0.16$ km/hr) during the last 5 km of the time trial compared to placebo. Analysis of the results by relative fitness level ($< 60 \geq 60$ kg/m$^2$) indicated that soy supplementation resulted in lower values of cardiac output ($1.6 \pm 0.8$ L/min), stroke volume ($5.4 \pm 3.1$ ml beat$^{-1}$), and heart rate ($5 \pm 3$ bpm) in those with higher levels of fitness.

CONCLUSIONS: Ingestion of a fermented soy extract supplement improved sprint-distance performance through improvements in both power and speed. For those with great aerobic fitness, soy supplementation may help to decrease cardiac demand alongside performance improvement.

POURPOSE: To investigate the effects of 14 days of spirulina supplementation on oxidative stress responses of climbers at high altitude. Spirulina is a source of antioxidants, which can protect against oxidative damage.

METHODS: Eighteen apparently healthy men and women mountaineers (age 24.87±5.5yr, height 170.7±15.34cm, weight 75.92±17.21kg) volunteered to participate in a one group pre-test-posttest study design. All participants completed two winter ascents to the summit (4,000meters) a week before as well as 14 days after spirulina supplementation (3g/day). Blood samples (4cc) were collected at pre-climbing and summit prior to and following supplementation under the same conditions. Participants were instructed to maintain their diet and avoid using antioxidant-containing products throughout the study. Blood samples were analyzed to measure oxidative stress markers such as malondialdehyde (MDA), superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), and total antioxidant capacity (TAC). All data were expressed as the mean ± SEM. Statistical comparisons were performed using t-test ($p < 0.05$ were considered to be statistically significant).

RESULTS: Results indicated that resting MDA at pre-climb were significantly reduced following supplementation (3.37±0.017U vs. 2.89±0.14 U; $p=0.036$); however, significant increases occurred in SOD resting values (132.8±6.39U vs. 139.9±10.61 U; $p=0.011$) after supplementation. The TAC values were significantly higher at the summit compared to pre-climb values in pre-supplementation (10.87±0.30U vs. 10.52±0.32U); conversely, TAC values were significantly lower at the summit compared to pre-climb values after the supplementation (12.09±0.36U vs. 12.98±0.48U) ($p=0.047$). Spirulina Supplementation did not significantly change resting GPx and CAT levels as well as the responses of MDA, SOD, GPx and CAT in high altitude ($p>0.05$).

CONCLUSION: Spirulina supplementation for a 14-day period reduced the oxidative stress in participants during pre-climbing phase and increased the total antioxidant capacity. However, there were no significant changes in the variables at high altitude. It appears that 3g/day of spirulina cannot completely cope with oxidative stress in hypoxic condition.

However, its effects have not been studied in exercise-trained individuals. We hypothesized that acute consumption of huperzine-A would improve cognitive function during exercise, which may be beneficial for exercise performance.

METHODS: From January to April, 2018, 15 exercise-trained individuals (women and men, BMI 23.5±1.4 kg/m$^2$, age 30±4.36 years) were studied in a double blind randomized-sequence cross-over study, in which they underwent tests for cognitive function (digit span, verbal/word fluency, and Stroop), neuromuscular performance (sharpened Romberg and dart throwing), and exercise performance (estimated aerobic capacity, hand-grip strength, vertical jump, and push-up) after acute ingestion of huperzine-A (200 mcg) or placebo. A 7- to 10-day washout period separated the subsequent trials.

RESULTS: No measures of cognitive function differed between placebo and huperzine-A trials (all $p>0.296$). Heart rates (157±4 vs. 158±4 bpm; $p=0.518$) and ratings of perceived exertion (13.7±0.56 vs. 13.0±0.61; $p=0.582$) did not differ between placebo and huperzine-A trials, respectively. Ratings of subjective difficulty post-exercise (0-10 scale) were significantly higher (5.7±0.38 vs. 6.8±0.38; $p<0.002$) in the huperzine-A trial than the placebo trial. No differences were observed for neuromuscular or exercise performance measures between both groups (all $p>0.497$).

CONCLUSION: Huperzine-A does not enhance cognitive function during exercise despite it being marketed as a cognitive enhancer. Because of its inability to enhance cognitive function, its inclusion in pre-workout supplements warrants reconsideration. Other more practical and effective strategies should be considered.

POURPOSE: To investigate whether acute consumption of MC following a bout of strenuous exercise is equally as effective as consuming MC pre and post exercise on markers of recovery.

METHODS: Healthy resistance-trained males (n=10, age, height, mass: 25.30±8.08 years, 179.81±10.84 cm, 90.95±18.04 kg) and females (n=8, age, height, mass: 25.63±3.85 years, 165.89±3.46 cm, 70.98±8.54 kg) were randomized into two groups that consumed 30 mL of MC twice per day for three days following exercise (no load, NPL) or six consecutive days following exercise (pre-load, PL). Participants completed a squatting exercise protocol designed to induce muscle damage and reported to the lab immediately post-exercise, 24, 48 and 72-h later to assess recovery indices including: serum creatine kinase (CK), the Adapted Brief Assessment of Mood (BAM+) survey, pressure-pain threshold (PPT), countermovement jump height (CMJ) and the Wingate anaerobic test (WAST).

RESULTS: Serum CK peaked at 24-h in the NPL and PL group (45.16±25.39, 35.96±29.67 mm, respectively) ($p=0.05$). PPT of the vastus medialis muscle was lowest at 48-h in the NPL and PL group (5.99±1.34, 5.36±0.84 kg-force, respectively) ($p=0.05$). CMJ performance was lowest at 24-h in the NPL and PL group compared to baseline (94.28±5.29, 88.94±11.74%, respectively) ($p<0.05$). No differences were found between the NPL and PL groups for all recovery indices.

CONCLUSIONS: These results suggest no additional benefits of a pre-load strategy when using MC as a post-exercise recovery aid following high-intensity exercise, muscle-damaging exercise. These findings could have implications for dosage strategies currently used by athletes.
PURPOSE: Recent studies suggest that the anabolic effect of ecdysterone (a naturally occurring steroid hormone present in some supplements claimed to enhance physical performance) is mediated by estrogen receptor (ER) binding. In comparison to the prohibited anabolic agents (e.g. metandienone and others) ecdysterone revealed to be even more effective in a recent study performed in rats. However, scientific studies on humans are very rarely accessible. Thus, our project aimed at investigating the effects of ecdysterone containing supplements on human athletic performance.

METHODS: A ten-week intervention study in young man has been conducted including regular resistance training for all volunteers. Different doses of ecdysterone containing supplements have been administered during the study to evaluate the performance enhancing effect. Analysis of blood and urine samples for ecdysterone and potential biomarkers of performance enhancement have been conducted. To ensure the specificity of the measured effects a comprehensive screening for prohibited compounds was also performed. Furthermore, the administered supplements have been tested for the absence of anabolic steroid contaminations prior to administration.

RESULTS: Used ecdysterone supplements displayed anabolic activity in C2C12 cells. Dose dependent administration of Ecdysterone supplements to human volunteers results in detectable ectysterone concentrations in serum. Effects on endocrine parameters were detectable. Serum IGF1 concentrations increased in comparison to the control group while thyroxin (T4) concentrations decreased. Significantly higher parameters were detectable. Serum IGF1 concentrations increased in comparison to the control group while thyroxin (T4) concentrations decreased. Significantly higher parameters were detectable.

CONCLUSIONS: These data underline the effectivity of an ecdysterone supplementation with respect to sports performance. Our results strongly suggest to include ecdysterone in the list of prohibited substances and methods, in the class S1.2 “other anabolic agents”.

Citrus Active Substances Improve Elite Weightlifters’ Aerobic Exercise And Resilience

Citrus Active Substances Improve Elite Weightlifters’ Aerobic Exercise And Resilience Authors: Meng Liu*, Qiyang Chen*, Bingqiang Li*, Chunjie Qi*, Huangze Zhang*, Shaung Wu*, Guangning Kou*, Zhigui Zhou*

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PURPOSE: Citrus active substances can extend aerobic exercise time in mice. The objective of this study was to determine whether citrus bioactive substances could improve aerobic exercise and resilience of athletes.

METHODS: Weightlifters (male = 6; female = 5) took citrus bioactive substance (200mg/d) orally for 5 weeks, blood sampling before intervention, and then collected once every 6 days, and the fasting sampling was proceeding from 7:00 to 8:00 am. Athlete-related biochemical indexes and indicators were detected and analyzed.

RESULTS: Citrus active substances could maintain the number of athletes leucocytes. After 5 weeks, the testosterone contents of male and female athletes decreased and then increased during intervention time, increasing the testosterone content (more than 1.5 times) of male athletes with low initial testosterone levels. The cortisol concentrations of all athletes significantly lower than that before non intervention. Serum ferritin content rose during intervention time. The erythrocyte number of male athletes decreased and the amount of increased compared the initial state, while hemoglobin/ret blood cells showed an increasing trend. In terms of fatigue index, the male athlete’s blood urea level fell, while that of the female athlete escalated; male athletes’ uric acid content decreased, female athletes increased greatly in the early stage.

CONCLUSION: Our findings showed that the citrus bioactive substance diminished serum cortisol levels and increased the testosterone/cortisol ratio, thus helping the recovery of the athlete’s body. The increase in the amount of hemoglobin carried by athletes in red blood cells increases the rate of oxygen transport. In general, athletes can use citrus bioactive substances as a supplement to enhance physical recovery and exercise capacity.

Repetitive exercise on consecutive days is a key component of many long-term training plans. This type of training results in muscle inflammation and soreness that limits the capacity to sustain exercise at a high intensity. Several dietary polyphenols have the capacity to manage inflammation and thus supplementation may be an effective component of a long-term training plan. PURPOSE: The purpose of this study was to investigate the effect of combined oral supplementation with curcumin and boswellia serrata prior to and following three consecutive days of intense interval exercise. METHODS: All protocols were approved by the University IRB committee and participants gave written informed consent. Participants were supplemented with either combined active (N=10; 95% full spectrum curcumin=400 mg/d and 90% boswella serrata extract standardized for AKBA=100 mg/d) or placebo (rice flour; N=7) for 7-d prior to and immediately following each exercise session. Each exercise day consisted of 45-min of interval exercise (ladder climbing, cycling, and downhill running). Subjective muscle soreness and muscle strength were evaluated using a visual analog scale and isokinetic dynamometer respectively. Venous blood samples were collected for serum prior to and 1-h after each of the three exercise days and 24-h after the final exercise day. Samples were analyzed in duplicate using separate head-
based assays to measure cytokines and myokines (Milliplex; Millipore-Sigma). Sample analysis was performed on a multiplex analyzer (Luminex LX200). RESULTS: Active resulted in trends towards reduced muscle soreness and improved muscle strength compared to placebo. Active was also associated with transient reductions in serum creatine kinase, MIP-1j, and IL-6. CONCLUSIONS: These data support the notion that combined supplementation with curcumin and boswellia serrata may represent an effective means to manage systemic inflammation during consecutive days of training. More research is needed to understand how curcumin and boswellia serrata may be able to manage inflammation in other exercise models.

354 Board #192 May 29 9:30 AM - 11:00 AM Curcumin Supplementation Alters Inflammatory Cytokines Following Exercise
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Reported Relationships: B.K. McFarlin: Industry contracted research; Research Grant to UNT.

Nutritional supplementation is often misused as a component of a holistic approach to muscle recovery following exercise. Supplementation that reduces post exercise inflammation or muscle soreness might improve recovery time. Purpose: The phase 1 purpose was to evaluate different doses of a curcumin supplement following a bout of eccentric leg exercise. Phase 2 purpose was to determine if the effective curcumin dose from phase 1, could alter inflammation in an open-label, field-based model. Methods: We consented self-reported healthy men and women to participate in the two phases of the study. In phase one, we tested a dose response for curcumin (Longvida) by comparing three doses (200, 400, & 1000 mg/d) to a placebo. In phase two, we evaluated the validity of curcumin (1000 mg) supplemented combined with another polyphenol (pomegranate extract; Pomella; 1000 mg/d) endurance exercise model (half-marathon performance). Venous blood samples and analyzed for inflammatory cytokines (IL-1j, IL-6, IL-8, and TNF-a) using a bead-based multiplex assay and an automated analyzer. Creatine kinase was analyzed using an enzymatic assay on a biochemistry analyzer (ChemoWell T). Results: The 400 and 1000 mg doses were associated with a reduction in inflammatory cytokines and CK at 24 & 48-h after injury. Only the 1000 mg dose was associated with a reduction in subjective muscle soreness. The 200 mg dose responded in a similar manner as placebo (i.e. no reduction in muscle soreness or inflammation). When curcumin (1000 mg) was combined with pomegranate extract (1000 mg) in half-marathon runners, we found a reduction in inflammation cytokines at 24-h post-race compared to pre-race. Conclusions: The key findings of this study suggest that the effectiveness of an oral curcumin supplement is dose-dependent and also activity-dependent. The combination of curcumin with pomegranate extract appeared to be more effective than curcumin alone at altering inflammation. More research is needed to identify how to incorporate curcumin and pomegranate supplementation into long-term exercise program.

355 Board #193 May 29 9:30 AM - 11:00 AM Effect Of New Zealand Blackcurrant Extract On Recovery From Exercise Induced Muscle Damage Following Half Marathon Running
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New Zealand blackcurrant (NZBC) is a rich source of polyphenols, namely anthocyanins, which improve blood flow and display anti-inflammatory and anti-oxidant properties that may improve recovery from exercise-induced muscle damage (EIMD). Limited evidence is available as to whether a polyphenol supplement can aid recovery in the days following a half-marathon event. Purpose: To determine whether NZBC extract would accelerate recovery after a half-marathon race. Methods: Following a double blind, independent groups design, 20 (8 women) recreational runners (mean ± SD: age 30 ± 6 years, height 1.73 ± 0.74 m, body mass 68.5 ± 9.8 kg) were randomized to receive a single dose of curcumin (1000 mg) or a visually matched placebo for 7 days (washout 14 days). On day 7, participants ran 60 minutes at 65%VO2max in hot ambient conditions (34°C and 40% relative humidity). eHSP72, eHSP90α, and eHSP32 were measured in EDTA plasma at rest and 20 and 60 minutes after exercise. Results: Post exercise eHSP72 concentrations were elevated after the placebo [by 1.98 nmol/L (95% CI: 0.65 - 3.33 nmol/L)] and NZBC trials [by 1.59 nmol/L (95% CI: 0.03 - 3.15 nmol/L)] and remained elevated 60 minutes after exercise [Placebo: by 0.68 nmol/L (95% CI: -0.07 - 1.46 nmol/L); NZBC: by 0.51 nmol/L (95% CI: -0.37 - 1.40 nmol/L)]. Basal eHSP90α concentrations were increased following NZBC supplementation [by 5.60 nmol/L (1.85 - 9.51 nmol/L), trial x time interaction, F = 3.37, p = 0.046, mp = 0.25], and were elevated at 20 and 60 minutes post exercise in both conditions. Similarly, basal eHSP32 was elevated after NZBC supplementation [by 3.93 nmol/L (95% CI: 0.37 - 7.42 nmol/L), trial x time interaction F = 5.62, p = 0.01, mp = 0.34], but were not altered at 20 or 60 minutes after heat stress in either condition. Conclusion: We present moderate evidence to support that 7 days of NZBC extract supplementation increases basal eHSP32 and eHSP90α, with no effect on eHSP72 before or after exercise. Further research is required to determine the functional relevance of these increases. Acknowledgement: We thank Health Currancy Ltd (UK) and CurraNZ (NZ) for supplements.

356 Board #194 May 29 9:30 AM - 11:00 AM New Zealand Blackcurrant Extract Increases Circulating Hsp32 And Hsp90a But Doesn’t Affect Circulating Hsp72
Ben J. Lee1, Tessa R. Flood1, Ania M. Hiles2, Ella F. Walker1, Lucy Wheeler1, Kimberly M. Ashdown1, Mark ET Willems1, Matthew R. Kuennen2.1 University of Chester, Chester, United Kingdom. 2High Point University, High Point, NC.

Email: b.lee@chi.ac.uk (No relevant relationships reported)

Extracellular heat shock protein 72 (eHSP72) acts as an inflammatory molecule, inducing cytokine production in immune cells, whereas HSP90α is implicit in recovery and adaptation to cellular stress. Heme oxygenase-1 (eHSP32) protects the vasculature and suppresses inflammation. Each are elevated following exertional heat stress. Polyphenols are proposed to have anti-inflammatory properties, so may affect eHSP responses to exercise. Purpose: To determine the effects of 7-days supplementation with New Zealand blackcurrant (NZBC) extract on eHSP72, eHSP90α, and eHSP32 before and after exertional heat stress. Methods: In a randomized double-blind design, 12 men (Age: 28±6 years, stature: 1.81±0.07 m, mass: 80.5±9.8 kg, VO2max: 55±6.6 L·min⁻¹) completed 2 trials. Participants ingested 2x300 mg day⁻¹ capsules of CurraNZ™ (each containing 105 mg anthocyanin) or a visually matched placebo for 7 days (washout 14 days). On day 7, participants ran 60 minutes at 65%VO2max in hot ambient conditions (34°C and 40% relative humidity). eHSP72, eHSP90α, and eHSP32 were measured in EDTA plasma at rest and 20 and 60 minutes after exercise. Results: Post exercise eHSP72 concentrations were elevated after the placebo [by 1.98 nmol/L (95% CI: 0.65 - 3.33 nmol/L)] and NZBC trials [by 1.59 nmol/L (95% CI: 0.03 - 3.15 nmol/L)] and remained elevated 60 minutes after exercise [Placebo: by 0.68 nmol/L (95% CI: -0.07 - 1.46 nmol/L); NZBC: by 0.51 nmol/L (95% CI: -0.37 - 1.40 nmol/L)]. Basal eHSP90α concentrations were increased following NZBC supplementation [by 5.60 nmol/L (1.85 - 9.51 nmol/L), trial x time interaction, F = 3.37, p = 0.046, mp = 0.25], and were elevated at 20 and 60 minutes post exercise in both conditions. Similarly, basal eHSP32 was elevated after NZBC supplementation [by 3.93 nmol/L (95% CI: 0.37 - 7.42 nmol/L), trial x time interaction F = 5.62, p = 0.01, mp = 0.34], but were not altered at 20 or 60 minutes after heat stress in either condition. Conclusion: We present moderate evidence to support that 7 days of NZBC extract supplementation increases basal eHSP32 and eHSP90α, with no effect on eHSP72 before or after exercise. Further research is required to determine the functional relevance of these increases. Acknowledgement: We thank Health Currancy Ltd (UK) and CurraNZ (NZ) for supplements.

357 Board #195 May 29 9:30 AM - 11:00 AM Does Supplementation With Pedicoccus Acidilactici Probiotics Alter Inflammatory Response To Exercise On Consecutive Days?
John H. Curtis, Ashael A. Davis, Elizabeth A. Tanner, Melody A. Gary, Jakob L. Vingren, FACSM, Brian K. McFarlin, FACSM. University of North Texas, Denton, TX. (Sponsor: Brian McFarlin, FACSM)

Email: john.curtis@unt.edu (No relevant relationships reported)

Oral supplementation with probiotics has been reported to treat a variety of common gastrointestinal conditions (i.e. IBS, IBD, etc.); however, probiotics have not been studied for potential sport nutrition applications. Management of post-exercise inflammation, particularly on consecutive days poses a unique challenge to the body and effects future training and performance. PURPOSE: The purpose of this study was to investigate if a novel plant based, non-spore forming high temperature (up to 85°C) and acid resistant probiotic strain (Pedicoccus acidilactici; NRRL B-50517) may alter post-exercise inflammation. METHODS: Subjects were consented for participation using a University IRB approved informed consent form. Subjects were supplemented with either probiotic condition (Pedicoccus acidilactici; NRRL B-50517, 8 billion cfu per day; N=6) or placebo condition (maltodextrin; N=5) for 14 days prior to two consecutive days of 45-min of intense, interval exercise (intervals of ladder climbing, cycling, and downhill running). Subjective muscle soreness and muscle strength were measured using a 100 mm visual analog scale (VAS) and isokinetic knee extension and flexion strength (Biodex System 3). Results: The study was completed in 17 days by 14 subjects. (NO relevant relationships reported)
evaluated using a visual analog scale and isokinetic dynamometer respectively. Venous blood samples were collected prior to exercise and 48-h after the final exercise day. Samples were analyzed in duplicate using specific assays to measure cytokines and myokines (Milliplex®; Millipore-Sigma). Sample prep were analyzed using a multiple analyzer (Lumex LX2000). RESULTS: There were trends toward reduced MIP-1a, MIP-1β, and IL-8 in probiotic compared to placebo during recovery from exercise. There were no obvious trends in any additional outcome measures. CONCLUSIONS: The current study indicates that probiotics may be useful for managing the trafficking of monocytes and other phagocytes during exercise-induced inflammatory responses. More research is needed to determine if a more extensive exercise model may be capable of eliciting probiotic associated improvements in post-exercise inflammation.

Prolonged endurance exercise provides a unique model for investigating skeletal muscle damage through the combined effects of oxidative stress and eccentric muscle contraction on differential gene expression with nutritional interventions known to blunt inflammation. Dietary polyphenols (i.e. curcumin, pomegranate, etc.) have been shown to reduce exercise-induced inflammation associated mRNA and protein expression with fewer side effects than NSAIDs. PURPOSE: To investigate the effect of a combined curcumin (500-1000 mg/d) and Longvida® and pomegranate extract (500-1000 mg/d) (Pomella) supplement for 30-days on mRNA expression following a half marathon race. METHODS: All protocols were approved by the University IRB committee and participants gave written informed consent. Participants supplemented for 30-days prior to running a half marathon race with either the active (N=6) or control (N=6) supplement. Venous blood samples were collected in PAXgene RNA tubes 24-h following a familiarization session, 21 untrained males (n = 11) and females (n = 10) visited the laboratory on three occasions to receive placebo, open-label placebo, and control treatments in a randomized, counter-balanced manner. All visits involved a pretest, 15-minute intervention period, and posttest. All visits were made possible by the research design. In this way the impact of the placebo effect was made possible by the research design. In this way the impact of the placebo effect could be effectively measured. METHODS: 22 athletes were selected for the experiment. Methods: The tests were performed in 2 days with a 7-hour interval between one and the other. All tests were performed at the same time of the day. The load of the test was adjusted by the weight of the athlete to work with the same load relative to the weight (watt / kg). The load was kept fixed throughout the test and the test ended after exhaustion and voluntary request of the athlete. During the evaluation, the heart rate was continuously measured and the subjective perception of effort (Borg scale) was measured every minute by minute. In the first day 10x10/100FUC and placebo(PL) (PL = 13 40,46 ± 7,79years, 72,67 ±10,20Kg) PR consumed during 30 days a sachet: Twenty seven marathonists were double-blind randomly assigned to a fund of 10x10/100FUC + Bifidobacterium Lactis (10x10/100FUC + maltodextrin 5g/day) while PL received a sachet with maltodextrin 5g/day. GSI were evaluated before the supplementation period (B) and one day before the race (1D) by questionnaire. Blinded Mood Scale (BRUMS) was applied at the B, immediately after the race (AR) and one hour after the race (1H). The data were analyzed in SPSS version25® using ANOVA two way with repeated measures, “group” and “time” as factors, and Tukey’s post-hoc test (p< 0.05). Results were expressed as means ± standard deviation (SD). RESULTS: GSI were not different after the supplementation period or between groups. According to BRUMS, PL group showed significant increase of depression (B: 0.23±0.43; AR:1.30±0.21; 1H:0.10), anger (B:0.0±AR:6.61 ±1.51;1H:5.33±1.33), fatigue (B:0.69±1.54; AR:12.15±0.98; 1H:7.30±0.75), tension (B:1.46±2.06; AR:6.38±0.65; 1H:3.84±0.37) and mental confusion (B:0.53±0.77 ;AR:4.46±0.51; H:2.92±0.27) and decrease of vigor (B:10.30±2.25; AR:20.91; 1H:6.76±3.90) when compared with B, AR, and 1H. Probio group showed significant increase of anger (B: 0.21±0.42; AR:1.21±0.89; 1H:0.14±0.36), fatigue (B:1.0±8.7; AR: -2.8±1.43; 1H:0.71±0.72), tension (B:0.92±1.20; AR:1.42±0.64; 1H:0.71±1.13) and mental confusion (B:28.0±4.6; AR:42.0±5.1; H:10.42±0.64) when compared B, AR and 1H. Between groups, for all mood parameters, PL showed significant increase at AR and 1H compared to PR (p<0.05). CONCLUSION: Lactobacillus Acidophilus and Bifidobacterium Lactis (10x10/100FUC/day) consumption did not seem to have effect on GIS, but it plays a positive role on mood affects in order to attenuating the increase of negative affects and maintaining the vigor state which may influence sport performance. Financial Support: CNPq, CAPES/PROEX.
In the second encounter, the athlete did the test without any capsule. He was informed that the goal was to compare how much the supplement, offered in the first encounter, would lead to better performance.

**Summary of Results:** Overall, in the supplement test (which was placebo) there was an average increase of 9.66% in performance, measured by a longer time to exhaustion. This result was obtained with all 22 athletes. In the case of elite athletes, the result was lower, showing an increase of 4.39%, on average. In the case of amateur athletes, the increase was 22.87%.

The fact that the increased impact of the placebo effect was greater in amateur athletes seems quite reasonable and may be explained by their greater susceptibility to placebo. In the case of elite athletes, the impact of the placebo effect was smaller, but can be considered as important from a practical point of view, since a performance increase of 4.39% is a professional athlete, seems to be something fantastic.

**Conclusion:** The present study showed that the placebo effect is important to be considered even in the case of elite athletes. The way the study was designed allowed a more reliable measurement of the real dimension of the placebo effect.

### Table 1: Common dietary supplements, perceived benefits and adverse reactions among SQT students (top 3 responses reported as % of Students)

<table>
<thead>
<tr>
<th>Supplement Category</th>
<th>Purpose of Use*</th>
<th>Adverse Reactions</th>
<th>Perceived Benefits*</th>
<th>Impact*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whey</td>
<td>Increase muscle mass, strength, recovery 88% Supplement diet Improve health 23% Improve performance 23%</td>
<td>None 98% Bloating, gas, lactose intolerance 2%</td>
<td>No benefit 40% Improved recovery 41% Increase muscle mass/ strength 34%</td>
<td>Beneficial 85% Neither harmful or beneficial 15%</td>
</tr>
<tr>
<td>Multivitamin &amp; Mineral Supplement</td>
<td>Improve cognitive function 50% Improve performance 15% Increase muscle mass, strength, recovery 6%</td>
<td>None 99% Upset stomach 1%</td>
<td>No benefit 74% Stayed healthy/ Improved immunity 14% Better energy/ feel better 8%</td>
<td>Beneficial 63% Neither harmful or beneficial 36% N/A 1%</td>
</tr>
<tr>
<td>Energy Drinks</td>
<td>Improve 35% Tastes Good 8%</td>
<td>None 85% Jitter/ Shaky 7% Increased heart rate 3%</td>
<td>Awake/Alert 48% More energy 31% No benefit 23%</td>
<td>Beneficial 62% Neither Harmful/ Beneficial 19% Harmful 17%</td>
</tr>
</tbody>
</table>

*Subjects were allowed to select more than 1 response. CONCLUSION: SQT students reported taking WP was beneficial (75%) in increasing muscle mass/strength and improving performance. MVM supplements had the lowest reported adverse reactions and was beneficial in maintaining/improving health.

### Abstracts were prepared by the authors and printed as submitted.
PURPOSE: Disuse condition results in impaired capillary network of skeletal muscle. Capillary regression appears to be an adaptation to a reduction in blood flow to the skeletal muscles caused by a decrease in oxidative demand. Increased blood flow leads to angiogenesis via increases in angiogenic factors in skeletal muscles. A probiotic strain of lactobacillus affects autonomic nerve activity has been reported. The purpose of the present study was to investigate the angiogenesis of enterococcus faecium strain R30 (R0) supplementation on the capillary regression and fatigue of skeletal muscle under disuse condition. METHODS: Thirty-six male Sprague-Dawley rats were assigned randomly either to a control, control with R30 supplementation, hindlimb unloaded or hindlimb unloaded with R30 supplementation group for 14 days. The three-dimensional capillary network of soleus muscle was visualized using a confocal laser scanning technique, and the capillary volume and diameter were measured. The angiogenic factors, VEGF and E Nos, were also determined. Furthermore, the tensions during muscle isometric contraction in planar muscles was generated by successive electrical stimulations were measured in vivo. RESULTS: The capillary volume and diameter in disuse muscle were lower than those in control. R30 supplementation attenuated the decrease of capillary volume and diameter in disuse muscle. In addition, the decreased expression levels of VEGF and eNOS in R30 supplemented muscle were attenuated. In addition, the resistance to fatigue (isometric tension expressed relative to the initial value) was significantly higher in the R30 supplementation group than the hindlimb unloaded group CONCLUSION: These data suggest that R30 supplementation may be an effective treatment to counter the detrimental effects of chronic disuse in muscle activities on the microcirculation and endurance in skeletal muscle.

Circulating microRNAs (ci-miRNA) may facilitate intercellular communication as well as fine-tune phenotype adaptations to exercise through post-transcriptional regulation. Ci-miRNA levels are sensitive to acute aerobic exercise, yet much less is known about the influence of high-intensity interval type exercise. Further, almost nothing is known about the impact of post-exercise nutrition (carbohydrate and/or protein) on ci-miRNA levels. PURPOSE: To examine the effects of high-intensity interval cycling and different post-exercise nutrition treatments on select ci-miRNA levels.

METHODS: Eight recreationally active males (age 22 ± 2 years; VO2max 50 ± 4 mL/kg/min) completed 3 trials, each consisting of 4 sets of 3 min-intervals (90% Wmax) flanked by 30-sec Wingate intervals. Placebo (PLA; water), carbohydrate (CHO; 65 g), and carbohydrate (65 g) + protein (20 g) (PR0) beverages (600 mL) to which ci-miRNA was simultaneously administered following exercise. Serum levels of 9 miRNA (miR-1, -21, -126, -146a, -150, -210, -221, -222, and -486) were measured pre-exercise (Pre), immediately post (Post-0), Post-1hr, and Post-4hr. miRNA levels were expressed as fold changes relative to baseline and analyzed with repeated measures ANOVAs. RESULTS: With the exception of a 1.3-fold increase (p<0.05) in miR-486 there was no main effect of time for any of the target ci-miRNA from Pre to Post-0 (i.e. prior to any nutritional intervention). There was a main effect of time for ci-miRNA-150 from Pre to Post-1hr (0.6 fold-change, p<0.05) and from Pre to Post-4hr (0.7 fold-change, p<0.05), but again with no nutritional effect. Other differences, across time or between treatments, were detected. CONCLUSION: In general, high-intensity cycling had a subtle impact on serum levels of miRNA. However, miRNA associated with skeletal muscle (miRNA-1 and -486) and cardiac physiology (miRNA-1 and -150) were affected by exercise. Post-exercise nutrition had no consequences on any of the targets except for miR-486, the extent to which this miRNA reflects intracellular miRNA activity is poorly understood and future work should investigate how nutrition may influence intracellular miRNA levels.

Exercise transiently increases several leukocyte populations in peripheral blood in an intensity-dependent manner, with numbers returning to baseline or lower during recovery. This mobilization of immune cells is explained in part by sympathetic activity and the release of stress hormones (catecholamines and cortisol). The literature examining immune responses to exercise has by and large failed to control for the presence of a warm-up prior to the experimental bout. Gradually increasing exercise intensity over a period of minutes may reduce the stress of the exercise bout and thus may influence the immune response to a given exercise protocol. PURPOSE: To compare the mobilization of leukocyte subpopulations following a bout of high intensity aerobic exercise with and without a dynamic pre-exercise warm-up.

METHODS: 8 physically active adults (4 women, 27±4 years) cycled 30 minutes at 80% heart rate maximum with and without warm-up in a randomized, counter-balanced order. Warm-up was provided immediately prior to the exercise, and involved increasing mean wattage by 10% each minute for 10 minutes starting at 10% of desired exercise intensity. Blood collected pre-, post- and 1-hour post-exercise was analyzed by flow cytometry to characterize cell populations. Differences in cell concentrations across time points and conditions were assessed by maximum likelihood linear mixed models. RESULTS: Exercise transiently increased lymphocyte concentration in blood, and the number and proportion of late differentiated CD8 T cells (main effects of time; p<0.001). Inclusion of warm-up diminished these post-exercise increases in lymphocytes (pre- to post- change with warm-up: 45±19 cells/microliter, representing a 17% increase; change with no warm-up: 93±11 cells/microliter, a 42% increase; p<0.05) and in late differentiated CD8 T cells (pre- to post- change with warm-up: 1±5 cells/microliter representing a 2% increase; change with no warm-up: 10±4 cells/microliter, a 46% increase; p<0.05).

CONCLUSIONS: Inclusion of a dynamic warm-up prior to vigorous aerobic exercise lessens the exercise-induced mobilization of lymphocytes and late differentiated T cells. Athletes should include a dynamic warm-up to reduce immune perturbations during high intensity exercise.

Natural killer (NK) cells are the most responsive lymphocytes during acute exercise, with increased concentrations. After exercise, NK cell levels drop below their resting level if the exercise intensity was high, but values usually recover within 1-3 hours. NK cells may be divided into CD56 bright and CD56 dim subgroups. The CD56 bright subset is the major population, representing about 80% of NK cells. Smaller subpopulations were recently studied for cell developments and diseases. We previously reported that exercise decreased the expression of Fcγ-receptor III (CD16); however, it is not yet understood how exercise affects these small subsets.

PURPOSE: To clarify the effect of acute exercise on the mobilization and expression of CD16 on six different NK cell subsets.

METHODS: Healthy male students (n=6, 22.8±0.8 years old) exercised on a cycle ergometer for 30 min at intensities corresponding to the individual’s onset of blood lactate accumulation (70-85% maximum oxygen consumption). Venous blood samples were collected at rest (PRE), just before the end of exercise (END), 30 (POST 30), 60 (POST 60), 120 (POST 120), and 180 (POST 180) min after exercise. Cell counts and proportions of total lymphocytes expressing CD16, CD56 bright and CD56 dim were determined. CD16 expressions of these subsets were also examined by flow cytometry. ANOVA was used for statistical analyses.
RESULTS: Exercise induced changes in NK cell concentration in CD56+ (R5, R=0.04; R4, p<0.01) and CD56- (R6, p<0.01) subsets. However significant changes between time points were only found in R5. In this subset, NK cell counts increased from PRE (356±151 cells/μL) to END (1182±159 cells/μL, p<0.01) and decreased under the PRE-level at POST 30 (108±27 cells/μL, p=0.01) and POST 60 (106±70 cells/μL, p<0.01). There were no changes in CD56- (R1, R2) subsets. These cell mobilizations were reflected in proportions to the total lymphocyte count.

CONCLUSIONS: These results suggest that the influence of acute exercise on NK cell mobilization and CD16 expression are clear in subset R5, but not in R1 and R2.

369 Board #207 May 29 9:30 AM - 11:00 AM Tumor Necrosis Factor-alpha, TNFR, And STNFR Relationships to Body Temperature Elliott Arroyo1, Brittany N. Followay2, Jeremiah A. Vaughan1, Joseph A. Laudato3, Brandon M. Gibson2, Ellen L. Glickman, FACSM4, Adam R. Jajtner1. 1Kent State University, Kent, OH. 2Ripon College, Ripon, WI. 3Bemidji State University, Bemidji, MN. (Sponsor: Ellen L. Glickman, FACSM) (No relevant relationships reported)

PURPOSE: To examine the TNF-α, TNFR, and STNFR relationships to body temperature in response to the heat. METHODS: 12 recreationally active men (24.4±3.1 yrs; 181±0.8 cm; 81.5±8.0 kg; 47.2±4.8 mg/kg•min-1) completed an exercise protocol under four conditions: 23°C/45%RH; 23°C/70%RH; 35°C/20%; and 35°C/45%RH. The protocol consisted of a 60-minute cycling trial at 60% VO2 max. Active monocytes were measured via flow cytometry (n=8). Participant’s rectal (Tre) and skin temperatures at 5 locations: Chest, Triceps, Forearm, Thigh and Calf were monitored continuously. Total skin temperature (Tskin) and whole body temperature (Twb) were calculated using weighted averages. The Area Under the Curve with respect to increase in TNF-α was then calculated for Tskin and Twb. Data were analyzed as Pearson Product Moment Correlations between AUC for Tskin and Twb with TNF-α, TNFR, and STNFR. The time spent above specific critical temperatures for Tskin (35.5, 38.0, 38.5 and 39.0°C) and Twb (35.0, 36.0, 37.0 and 38.0°C) were related to TNF-α, TNFR, and STNFR using stepwise linear regression. RESULTS: Tskin was correlated with the change in STNFR1 from T1 to T3 (p=0.048) and with the change in STNFR2 from T1 to T3 (p=0.340; p=0.028). Twb was related to both the change in STNFR1 from T1 to T2 (p=0.321; p=0.038) and from T1 to T3 (p=0.302; p=0.039); with the change in STNFR2 from T1 to T3 (p=0.430; p=0.004); and with the change in TNF-α from T1 to T2 (p=0.357; p=0.020). Time spent with Tskin above 38.5°C was related to the change in STNFR1 from both T1 to T2 (p=0.001) and from T1 to T3 (p=0.773; p<0.001); and to the change in TNF-α from T1 to T2 (p=0.426; p=0.005) and from T1 to T3 (p=0.415; p=0.006). CONCLUSIONS: Changes in circulating levels of TNF-α, STNFR1, and STNFR2 are influenced by body temperature. Classical monocyte expression of TNFR1 and TNFR2 do not appear to be influenced by rectal or whole body temperature. This investigation was partially funded by Kent State University Research Council.

370 Board #208 May 29 9:30 AM - 11:00 AM Monocyte Adhesion Molecule Expression Following an Acute Bout of Moderate Intensity Cycling Natalie J. Bohnke, Lindsay M. LaFratta, Lauren N. Pedersen, Anson M. Blanks, Virginia L. Mihalick, Morgan B. Senter, R. Lee Franco. Virginia Commonwealth University, Richmond, VA. (No relevant relationships reported)

Monocyte adhesion to the endothelium is a key step in the development of atherosclerosis. It is well established that higher CV fitness is associated with a reduced risk for CV disease. PURPOSE: To investigate the impact of fitness on monocyte surface receptor expression of CD11c and VLA4 following an acute bout of exercise. METHODS: 9 fit (VO2 peak; males: ≥45 mLO2/kg•min; females: ≥35 mLO2/kg•min) and 13 unfit (VO2 peak; males: <40 mLO2/kg•min; females: <30 mLO2/kg•min) subjects performed 30 min of moderate intensity (60% VO2 peak) cycling. Blood samples were obtained pre-exercise, immediately, and 1 h post-exercise. Monocytes were stained with antibodies against CD14, CD16, VLA4, and CD11c and were analyzed via flow cytometry. A mixed between-within repeated measures ANOVA was used to determine the impact of fitness on monocyte surface receptor expression of CD11c and VLA4 following a submaximal bout of exercise. RESULTS: There were no significant between-subjects main effect for groups in either of the monocyte subsets (p>0.083). A main effect for time was significant in VLA4 (p=0.004) and CD11c (p=0.014) expression in non-classical and classical monocytes, respectively. A profile plot suggested that VLA4 was increased 1 h post-exercise and CD11c was reduced immediately post-exercise. CONCLUSIONS: Monocyte receptor expression does not appear to be impacted by physical fitness in young, apparently healthy adults. Nevertheless, an acute bout of cycling altered the expression level of monocyte adhesion molecules to varying degrees depending on the specific monocyte subset.

371 Board #209 May 29 9:30 AM - 11:00 AM Aerobic Capacity And LPS-induced iNOS mRNA Expression In Leukocytes Of Healthy College-aged Males Tiffany M. Zuniga1, Aaron L. Slusher2, Ryan S. Garten3, Edmund O. Acevedo, FACSM1. 1The University of Arizona, Tucson, AZ. 2University of Michigan, Ann Arbor, MI. 3Virginia Commonwealth University, Richmond, VA. (Sponsor: Dr. Edmund O. Acevedo, FACSM) (No relevant relationships reported)

PURPOSE: Inducible nitric oxide synthase (iNOS) is an enzyme expressed in leukocytes that supports innate immune function. While iNOS expression is low-to-undetectable in leukocytes under normal resting conditions, LPS-stimulated overexpression of iNOS increases indices of pro-inflammation, oxidative stress, and apoptosis. Aerobic exercise is a known anti-inflammatory mechanism shown to regulate iNOS expression. Therefore, this study examined the relationship between LPS-induced iNOS mRNA expression and indices of pro-inflammation, oxidative stress, and apoptosis in isolated leukocytes of aceribically fit (AF) and unfit (UF) males.

METHODS: iNOS mRNA expression and TNF-α, MDA, and p53 concentrations were measured in leukocytes obtained immediately post a 3-hour LPS stimulated and unstimulated whole blood.

RESULTS: iNOS mRNA expression and TNF-α concentrations remained unaltered following LPS stimulation in AF and UF subjects (p=0.146). However, LPS stimulation significantly lowered MDA concentrations to a greater extent in UF compared to AF subjects (p=0.001), whereas LPS stimulation increased TNF-α and lowered p53 to a similar extent in both groups (p=0.002). Interestingly, change in relative iNOS mRNA expression was not associated with the percent change (control vs. LPS stimulation) in the concentrations of TNF-α, MDA, and p53.

CONCLUSIONS: Findings suggest that although aerobic fitness did not alter iNOS mRNA expression following LPS stimulation and may not directly impact indices of pro-inflammation or the pro-apoptotic marker p53 in healthy, young males, fitness may impact LPS-induced oxidative stress.

Abstracts were prepared by the authors and printed as submitted.
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MEDICINE & SCIENCE IN SPORTS & EXERCISE®

Board #211 May 29 9:30 AM - 11:00 AM

Changes In Salivary Antimicrobial Protein Concentrations In Response To Maximal Exercise In Collegiate Swimmers

Bailey Theall,1 Connor Kuremsky,1 Eunhan Cho1, Haoyan Wang1, Katelyn Hardin1, Jack Marucci2, Shelly Mullennix1, Brian Harrell2, Brian Irving, FACSshort, Neil Johannsen1, Guillaume Spielmann1.1Louisiana State University, Baton Rouge, LA. 2Baton Rouge General Sports Medicine, Baton Rouge, LA.

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(No relevant relationships reported)

Salivary Antimicrobial Proteins (sAMPs) play a central role in innate immune responses by exerting their antibacterial and antiviral properties. Acute psychological and physiological stressors reduce sAMP concentrations, and increase the risk of upper respiratory tract infections (URTIs). However, the impact of sustained stressors on sAMPs and their relation to URTI symptoms is unknown. Purpose: To characterize the impact of acute bouts of exercise on sAMPs and symptoms of URTI in collegiate swimmers over a 6-month period. Methods: Salivary samples were collected from sixteen NCAA Dit1 swimmers (8 M; 8 F; 19.8 ± 0.7 yrs) before and after exhaustive in-pool swims at 2 time points (V: immediately post-season 1 and V: early season 2). An additional V: mid-off season 1 timepoint was collected in a subset of 10 swimmers. Azurocidin and secretory leukocyte protease inhibitor (SLPI) sAMPs were measured by ELISA, and self-reported measures of stress were collected to assess sleep quality (PSQI) and symptoms of URTI (WURRS-21). Linear mixed models were used to determine the effects of exercise, season timepoint, and their interaction on sAMP concentrations and secretion rates (p=0.05). Pearson’s correlation coefficients were used to determine linear correlations between resting sAMP concentrations and secretion rates with stress measures. Results: Post-exercise SLPI levels were elevated 8 fold at V, and 3 fold at V, when compared to resting values (p=0.05); however, resting SLPI concentrations and secretion rates remained unchanged during the season (p=0.05). Acute exercise was associated with increased Azurocidins concentrations, with the greatest post-exercise increase seen at V (p=0.03). Resting salivary Azurocidins concentrations and secretion rates were positively associated with sleep quality (r=-0.42, p<0.04 and r=-0.49, p=0.02 respectively), while salivary SLPI concentrations were not. Furthermore, resting Azurocidins concentrations were associated with self-reported symptoms of URTI (r=0.52, p=0.03) during all 3 visits. Conclusion: Oral innate immunity in collegiate swimmers is directly impacted by acute maximal exercise over a season. Greater sleep quality appears to promote salivary Azurocidin concentration and oral innate immune health, which could in turn protect athletes against URTIs.

Board #212 May 29 9:30 AM - 11:00 AM

Acute And Chronic Anti-Inflammatory Responses During A Season Training In Young Swimmers

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(No relevant relationships reported)

It is well established that prolonged intense exercise training suppresses aspects of immune function and a perturbation in balance between pro- and anti-inflammatory cytokines may induce chronic, low-level systemic inflammation. Although swimming exercise training is demanding, however it is not clear whether it can promote changes in inflammatory responses. PURPOSE: This study investigated the acute and chronic effects of a full season swimming training on serum interleukin (IL-4) and IL-1 receptor antagonist (IL-1ra), both at rest and after a maximal exercise bout. METHODS: Twelve well-trained male swimmers (14.08±1.0 yrs) were recruited. Measurements were carried out at the beginning of the training season (T1) and pre- and post the taper of each of the two competitive periods (i.e., T2, T3 for the first macrocycle, and T4, T5 for the second macrocycle, respectively). At each of the above time points, blood samples were collected pre- and post maximal, 40min swimming training. Serum IL-1ra and IL-4 levels were measured by ELISA. Adjustment for exercise-induced plasma volume changes was performed before all data analyses. Two-way ANOVA with repeated measures was used for statistics. RESULTS: Significant pre-post testing differences for IL-1ra (p<0.001) between T1 and T2 (171.51±11.85 vs 187.66±19.89 pg/ml, IL-4: 0.08±0.03 vs 0.09±0.03 pg/ml) and a decrease from T2 to T3 (IL-1ra: 230.76±75.56 vs 171.51±11.85 pg/ml, IL-4: 0.11±0.03 vs 0.08±0.03 pg/ml). Post-testing, IL-4 response exhibited a 59% decline from T1 to T4 (0.14±0.05 vs 0.08±0.03 pg/ml) and a 157% increase from T4 to T5 (0.08±0.03 vs 0.13±0.03 pg/ml), however those responses failed to reach statistical significance throughout the experimental period (p<0.05). CONCLUSION: These findings indicate that long-term swimming training can affect the resting and acute (pre-post testing) anti-inflammatory profile in young swimmers.

Board #213 May 29 9:30 AM - 11:00 AM

Fitness-related Differences In The Polarization Of Lipid-exposed Macrophages Following Acute Exercise

Lauren Pedersen, Lindsay Lafrratta, Natalie Bohmke, Anson Blanks, Virginia Mihalick, Morgan Senter, Robert Lee Franco. Virginia Commonwealth University, Richmond, VA.

(No relevant relationships reported)

Compared to anti-inflammatory M2 (CD206+) macrophages, pro-inflammatory M1 (CD86+) macrophages are considered to be highly atherogenic. Increased cardiovascular fitness is linked to attenuated atherogenic plaque formation as well as anti-inflammatory alterations in the immune cells that mediate this process. Therefore, macrophage polarization in unfit individuals may differ from that of fit individuals following exposure to physical stress and elevated lipids. PURPOSE: To compare the effects of acute exercise on the polarization of lipid-exposed macrophages following acute, moderate-intensity exercise. METHODS: 8 fit (VO2 peak; M ≥ 45 mL/kg/min; F ≥ 35 mL/kg/min) and 12 unfit (VO2 peak; M < 40 mL/kg/min; F < 30 mL/kg/min) male and female subjects performed 30 minutes of moderate-intensity (60% VO2 peak) cycling. Blood samples were collected pre-exercise (PRE) and immediately post-exercise (POST), 1 hour (1HR), and 2-hours (2HR) post-exercise. Peripheral blood mononuclear cells (PBMCs) were isolated by density gradient centrifugation, and adherent monocytes were cultured with LDL (150 mg/dL) and palmitate (10ug/ ml) for 4 hours. Cells were washed and cultured with 20% autologous serum for 7 days. The resulting macrophages were subsequently stained with antibodies against CD68 and CD206 for flow cytometric analysis. A mixed between-within ANOVA was performed to determine differences in receptor expression between groups (fitness) and within subjects (time). RESULTS: A mixed between-within ANOVA found no significant between-subjects main effects for CD68 (p=0.667) and CD206 (p=0.675) macrophage expression. A main effect of time was significant for the expression of CD206 (p=0.033). A profile plot suggests that CD206 expression was different between fitness groups PRE, POST, and 1HR. CONCLUSION: Macrophage expression of CD206 was observed to be different between fit and unfit individuals immediately before and following an acute bout of moderate-intensity exercise and lipid exposure. Alterations in “M2” macrophage polarization may contribute to cardiovascular risk in unfit individuals.

A-52 Free Communication/Poster - Exercise and Children

Wednesday, May 29, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

Board #214 May 29 9:30 AM - 11:00 AM

Associations Among Obesity, Physical Activity, Nutrition, And Family Environment In Adolescents

Kimbo E. Yee1, Karin A. Pfieffer, FACSshort,1 Lorraine J. Weatherspoon2, Deborah L. Feltz3, Joey C. Eisenmam1.1The Citadel, Charleston, SC. 2Michigan State University, East Lansing, MI. 3Leeds Beckett University, Leeds, United Kingdom.

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(No relevant relationships reported)

Previous research has shown that the Family Nutrition and Physical Activity (FNPA) Screening Tool is related to obesity risk in children. However, there is limited research on the utility of the FNPA among adolescent populations and its association with health behaviors. PURPOSE: To examine the association of the FNPA Screening Tool with physical activity, dietary quality, screen time behaviors, and obesity risk in ninth grade students. METHODS: Data were collected from ninth grade students (n=175, 51% boys, 72% Caucasian) from a Midwestern high school. Physical activity, dietary quality, and screen time behavior were measured using the Physical Activity Questionnaire (PAQ-A; 8 items, scored 1-5), Healthy Eating Index-2010 (HEI-2010; scored 0-100), and self-reported total screen time (television, video game, and computer usage), respectively. Trained research assistants measured height and weight to calculate body mass index (BMI). Percent body fat (BF) was measured using a foot-to-foot bioelectrical impedance scale. The FNPA Screening Tool was mailed
Factors Associated to Mechanical Efficiency among Adolescent Boys Performing a Graded Maximal Exercise

Georges Jabbour, Lina Majed
1Qatar University, Doha, Qatar.

PURPOSE: To determine the mechanical efficiency (ME) and associated factors among adolescent boys at different stages of graded maximal exercise. METHODS: 45 sedentary adolescent boys were separated into three groups according to their percentage of fat mass as follows: 15 normal-weight (NW) (body fat: 16.0 ± 1.9%), 15 overweight (OW) (body fat: 24.0 ± 1.6%) and 15 obese (OB) (body fat: 31.0 ± 3.0%). Each of them completed a maximal graded test in which energy consumption in watt (E), ME (expressed as a %), plasma epinephrine, and norepinephrine concentrations were determined consecutively through three stages corresponding to ~ 50% and 75% of each participant’s maximal heart rate (50%HRmax and 75%HRmax) and at peak oxygen consumption (VO2peak) level. RESULTS: During the maximal graded test, plasma epinephrine, and norepinephrine as well as ME determined consecutively through three stages corresponding to ~ 50% and 75% of each participant’s maximal heart rate (50%HRmax and 75%HRmax) and at peak oxygen consumption (VO2peak) level. ME correlated negatively to body weight (r = -0.80, p < 0.01) at 50%HRmax and at VO2peak levels. Moreover, at 75%HRmax and at VO2peak stages, ME correlated significantly to powerful output (r = 0.88 and r = 0.91, p < 0.01) as well as with epinephrine (r = -0.82, p < 0.01) and norepinephrine concentrations (r = 0.88, p < 0.01) for entire group. CONCLUSION: These findings suggest that the body’s weight excess exerts a negative effect on ME values at a lower intensity, while at higher intensities (75%HRmax and VO2peak) the lower ME could be better explained by the reduced catecholamine responses as observed in obese adolescent boys.

Submaximal energy consumption was significantly higher (model R2 = 0.29) with lower initial weight z-score (b = −1.4 [0.2, 2.5] per 1 unit increase, p = 0.02), a decreasing slope of the weight z-score (b = −1.8 [1.4, 0.0], p = 0.01), male sex (b = 3.8 [1.2, 6.3], p = 0.004) and severe CHD (b = 4.0 [0.7, 7.4], p = 0.02), but not by age (b = 0.4, p = 0.15). CONCLUSIONS: Children with CHD who were overweight or had a negative growth trajectory had significantly higher energy consumption during submaximal exercise. The relationship between a negative growth trajectory and daily physical activity should be examined to assess whether the higher energy demands for submaximal exercise are also associated with an inactive lifestyle, and therefore the known increase in risk for sedentary lifestyle morbidities. Prospective studies are required to understand the mechanisms linking growth limitations to reduced exercise capacity.

Board #215 May 29 9:30 AM - 11:00 AM

Factors Associated to Mechanical Efficiency among Adolescent Boys Performing a Graded Maximal Exercise

Georges Jabbour*, Lina Majed
1Qatar University, Doha, Qatar.

PURPOSE: To determine the mechanical efficiency (ME) and associated factors among adolescent boys at different stages of graded maximal exercise. METHODS: 45 sedentary adolescent boys were separated into three groups according to their percentage of fat mass as follows: 15 normal-weight (NW) (body fat: 16.0 ± 1.9%), 15 overweight (OW) (body fat: 24.0 ± 1.6%) and 15 obese (OB) (body fat: 31.0 ± 3.0%). Each of them completed a maximal graded test in which energy consumption in watt (E), ME (expressed as a %), plasma epinephrine, and norepinephrine concentrations were determined consecutively through three stages corresponding to ~ 50% and 75% of each participant’s maximal heart rate (50%HRmax and 75%HRmax) and at peak oxygen consumption (VO2peak) level. ME correlated negatively to body weight (r = -0.80, p < 0.01) as well as with epinephrine (r = -0.82, p < 0.01) and norepinephrine concentrations (r = 0.88, p < 0.01) for entire group. CONCLUSION: These findings suggest that the body’s weight excess exerts a negative effect on ME values at a lower intensity, while at higher intensities (75%HRmax and VO2peak) the lower ME could be better explained by the reduced catecholamine responses as observed in obese adolescent boys.

Submaximal energy consumption was significantly higher (model R2 = 0.29) with lower initial weight z-score (b = −1.4 [0.2, 2.5] per 1 unit increase, p = 0.02), a decreasing slope of the weight z-score (b = −1.8 [1.4, 0.0], p = 0.01), male sex (b = 3.8 [1.2, 6.3], p = 0.004) and severe CHD (b = 4.0 [0.7, 7.4], p = 0.02), but not by age (b = 0.4, p = 0.15). CONCLUSIONS: Children with CHD who were overweight or had a negative growth trajectory had significantly higher energy consumption during submaximal exercise. The relationship between a negative growth trajectory and daily physical activity should be examined to assess whether the higher energy demands for submaximal exercise are also associated with an inactive lifestyle, and therefore the known increase in risk for sedentary lifestyle morbidities. Prospective studies are required to understand the mechanisms linking growth limitations to reduced exercise capacity.

Board #217 May 29 9:30 AM - 11:00 AM

Boys with Obesity have Attenuated Cardiorespiratory Fitness Independent of Fat Mass

Juliana J. Kilpatrick*, Kyleigh Allie*, Oscar E. Suman, FACSM**, Eric Rivas1
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PURPOSE: The assessment of cardiorespiratory fitness using ratio scaling to total body mass (TBM) is confounded by fat mass in obese populations because fat tissue does not contribute to oxygen utilization during exercise. Our objective was to isolate the independent effects of obesity on fitness when normalized to total lean body mass (TLM) and leg lean mass (LLM). We tested the hypothesis that boys with obesity would have attenuated cardiorespiratory fitness compared to age-matched non-obese boys. METHODS: Values are expressed as means ± SD with significance set at P < 0.05. Seventeen non-obese boys (10.6 ± 0.9 yr, 1.41 ± 0.45 m, 35.5 ± 7.0 kg, 24.4 ± 5% body fat) and thirteen age-matched obese boys (10.6 ± 1.4 y, 146.3 ± 10.6 cm, 60.25 ± 13.0 kg, 44.2 ± 2% body fat) completed a cardiorespiratory fitness test (VO2peak) and body composition scan (DXA). RESULTS: Utilizing a 2-tailed independent T-test, both groups had comparable VO2peak test times (9.1 ± 1.4 min; P = 0.80), and peak heart rates (187 ± 12 bpm; P = 0.50). Boys with obesity had a reduction in VO2peak when normalized to TBM (54% of age-matched boys without obesity); however, this effect was less reduced when compared to LBM (76%) and LLM (68%). Further, simple linear regression found that total body fat accounted for 69% variance for mL.kg.TBM⁻¹.min⁻¹, 49% variance for mL.kg.LBM.min⁻¹, and 40% variance for mL.kg.LLM.min⁻¹. Conclusions: These data indicate that obesity in young boys impairs cardiovascular fitness which supports the concept that obesity in pediatrics reduces aerobic capacity, which may have later life consequences in regards to cardiorespiratory fitness and all-cause mortality. Lastly, we show that the normalization of VO2 to LBM and LLM can provide an independent measure of fitness.

Board #218 May 29 9:30 AM - 11:00 AM

Social Media-Based Physical Activity Promotion by Craft Brewing Establishments Located in Knoxville, Tennessee

Paula-Marie M. Ferrara, Eugene C. Fitzhugh, Cory T. Beaumont, Kelley Strohacker, FACSM. University of Tennessee, Knoxville, TN.

PURPOSE: Preliminarily assess PA promotion by CBs located in a single community. METHODS: Facebook posts by 15 CBs located in Knoxville, TN were screened between November 2016-October 2017, with PA-related posts coded by activity type. Non-parametric correlations assessed associations between CBs’ total PA posts and built environment factors via Geographic Information System (e.g. walk score, transit score, culture score). Chi-square tests were also used to assess the distribution of PA-posts across each season (Winter, Spring, Summer, Fall).
RESULTS: Of 3845 Facebook posts, 147 (3.82%) referred to PA. PA posts made by individual CBs ranged from 0-47 (median=4.50; IQR=9; mean=10.13) over one year, and pertained to fitness classes (29.25%), biking (24.49%), running, (21.77%), outdoor activities (12.24%), sports (4.08%), and miscellaneous PA (8.16%). PA posts were not equally distributed across seasons (X²(N=3)=14.68, p=0.002); Summer contained the highest percentage of posts (34.51%), followed by Spring (28.87%), Fall (23.94%), and Winter (12.68%). PA posts were significantly and inversely correlated with scores regarding culture (r=-0.47, p=0.01) and shortpons (r=-0.46, p=0.01). Moderate, but statistically insignificant correlations were observed between PA posts and scores for walkability (r=-0.36, p=0.18), dining and drinking (r=-0.46, p=0.08), and errands (r=-0.38, p=0.16). CONCLUSIONS: Although PA posts represent a minimal portion of social media advertising in this local sample of CBs, a wide variety of activities is promoted. Additionally, promotion volume fluctuates seasonally, and CBs that promote PA more frequently tend to be located in areas that are less walkable, with fewer desired amenities.

381 Board #219  May 29 9:30 AM - 11:00 AM  Pre- and Post-Season Electroencephalography Measures of Brain Vital Signs in Youth Football Players  Thayne A. Munce, FACSM¹, Shaun D. Fickling², Daniel N. Poel¹, Jason D. Dorman¹, Ryan C.N. D’Arcy². ¹Sanford Sports Science Institute, Sioux Falls, SD. ²Simon Fraser University, Metro Vancouver, BC, Canada.  
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(No relevant relationships reported)

Amid growing concern of potential brain trauma caused by repetitive head impacts (RHI) in youth football, there is an emerging need to develop objective, physiologic assessments of brain function that can identify sub-concussive impairment. Electroencephalography (EEG) may be a viable tool to evaluate neurologic dysfunction associated with RHI. PURPOSE: To evaluate the neurophysiologic activity of youth football players in association with RHI. METHODS: EEG data were captured from nine middle school football players (13.1 ± 0.5 yr) before (PRE) and after (POST) one season using a portable 8-channel EEG cap with three electrodes (Fz, Cz and Pz) while subjects listened to an auditory stimulus sequence (~5 min). Amplitudes (A) and latencies (L) of event-related potentials (ERP) corresponding to auditory sensation (N100A, N100L), basic attention (P300A, P300L), and cognitive processing (N400A, N400L) were converted to normalized brain vital signs scores (0-100 scale). Larger ERP amplitudes equate to higher scores and delayed latencies equate to lower scores. RHI were measured during the season via accelerometry (Head Impact Telemetry System). EEG data from three subjects were of insufficient quality for analysis; thus, results were limited to the six remaining subjects. RESULTS: Scores for N400L decreased significantly (P < 0.031) from PRE (63.9 ± 7.6) to POST (38.2 ± 16.8). There were no significant changes in N100A (P = 0.971), N100L (P = 0.308), P300A (P = 0.562), P300L (P = 0.183), or N400A (P = 0.685) scores. On average, players sustained 134 ± 66 head impacts during the season. Head impact frequency was not significantly associated with any brain vital signs score (P = 0.169-0.783). CONCLUSION: In this small sample of youth football players, cognitive processing was delayed following a single season as measured by the significant reduction in N400 latency scores. However, this change was not associated with RHI incurred by the players. While these data should be interpreted with caution, they provide preliminary evidence for the potential value of using the brain vital signs framework to evaluate brain function and sub-concussive impairment in collision-sport athletes.  
This work was supported by a grant from the T. Denny Sanford Pediatric Collaborative Research Fund between Mayo Clinic and Sanford Health.

382 Board #220  May 29 9:30 AM - 11:00 AM  Aerobic Exercise Regulates Gamma Oscillation in Hippocampal CA1 of APP/PS1/Tau Mice  Yan Li¹, Cui Li¹, Lianwei Mu¹, Ziqi Zhao², Li Zhao¹. ¹Beijing Sport University, Beijing, China. ²Institute of Genetics and Developmental Biology, Chinese Academy of Sciences, Beijing, China.  
Email: yanli@bjgu.edu.cn  
(No relevant relationships reported)

PURPOSE: Changes in gamma oscillations have been observed in multiple brain regions in mouse models of Alzheimer’s disease. This study aimed to investigate the effect of aerobic exercise on gamma activity in hippocampal CA1 of APP/PS1/Tau transgenic (3×Tg) mice during wake state when theta oscillation occurs, and the effect on slow gamma activity in CA1 during sleep state when SWRs occur. METHODS: 3×Tg mice (6 months old) and C57BL/6J mice were randomly divided into exercise groups and sedentary groups respectively. The exercise groups were made to run on the treadmill for 1 hour per one day, five times a week, for 12 weeks. The exercise workload consisted of running at a speed of 12 m/min for the first 10 min, 15 m/min for the last 50 min, with 0% grade of inclination. Radial arm maze was used to evaluate the memory function of the mice. Multichannel recording technology was used to record electrical activity of hippocampal CA1 in vivo. Theta oscillation and sharp waves and ripples (SWRs) were detected by MATLAB programs, and spectral analysis was computed using multi-taper methods. Immunofluorescence was used to detect the Aβ deposits in CA1. RESULTS: 12 weeks of treadmill exercise ameliorated working memory (2.00±0.35 vs. 1.20±0.38, P<0.05) and reference memory (5.47±0.36 vs. 3.70±0.45, P<0.05) deterioration of 3×Tg mice. The 9-month-old 3×Tg mice exhibited a reduction of both gamma power (0.33±0.05 vs. 0.11±0.02, P<0.05) and slow gamma power (0.50±0.03 vs. 0.55±0.04, P<0.01) during theta rhythms awaking and slow gamma power (0.50±0.03 vs. 0.55±0.04, P<0.01) during SWRs sleeping in the hippocampal CA1 compared to control mice, respectively. 12 weeks of treadmill exercise could increase gamma power either being awake (0.50±0.06, P<0.01) or being asleep (0.50±0.03, P<0.05) in 3×Tg mice. Furthermore, these disturbances were observed to be consistent with Aβ pathological deposits (A,1.42±0.21, P<0.01 vs. CS; A, 0.31±0.09, P<0.01 vs. AS). CONCLUSIONS: Consistencies between these alteration in gamma power and Aβ deposits suggest that disturbances in rhythm organization of theta and gamma may contribute to spatial memory deficits in 9-month-old 3×Tg mice. Given these data, aerobic exercise could improve spatial performance by regulating gamma power when theta oscillations or SWR occur. Supported by the National Natural Science Foundation of China (31571229).

383 Board #221  May 29 9:30 AM - 11:00 AM  Aerobic Exercise Differential Alters Intrinsic Neuronal Properties In The 3xtg Mouse Model Of Alzheimer’s Disease  Li Zhao¹, Fei Chen¹, Cui Li¹, Ziqi Zhao², Forrest Fabian Jesse³. ¹Beijing Sport University, Beijing, China. ²Chinese Academy of Sciences, Beijing, China. ³Beijing Jiao Tong University, Beijing, China.  
Email: zhaoЛИ@126.com  
(No relevant relationships reported)

PURPOSE: Alterations in network activities in Alzheimer’s disease (AD) are accompanied by an early imbalance of excitation and inhibition that related to cognitive function. Although that aerobic exercise could enhance synaptic plasticity from various AD mouse models have been found, the properties of neurons firing in specific conditions remain poorly understood. This study was to investigate the neurophysiologic signals underlying the effects of aerobic exercise on the brains of APP/PS1/Tau transgenic (3Tg) mice and 129 mice as wild type (WT) control at 9 months of age. METHODS: 3Tg mice (6 months old) were randomly divided into exercise groups and sedentary groups (AS, AE), and WT mice as cohort control. The exercise groups would run on the treadmill for 12 weeks. Multichannel recording technology was used to record population spikes in cortical and hippocampal region at 9 months of age in vivo during awake or sleep state. Spike sorting was performed using offline sorter software. Pyramidal cells (PNs) were distinguished from putative interneurons (INs) on the basis of average firing rate, bursting properties, and spike width. RESULTS: Recordings took place across 5-7 consecutive days while mice were awake exploring or asleep, and the number of spikes was calculated every 10 sec as a session. During awake, in three AS, AE and WT mice, we recorded 15 PNs, 48 PNs and 10 PNs, while 9, 23 and 11 INs in cortex (with a total of 192 place fields); 36 PNs, 77 PNs and 35 PNs, while 10, 37 and 15 INs in hippocampus (with a total of 330 place fields). During sleep state, with a total of 138 place fields, we recorded 22 PNs, 19 PNs and 13 INs, while 7, 15 and 14 INs in cortex; 29 PNs, 58 PNs and 21 PNs, while 9, 24 and 11 INs in hippocampus (with a total of 270 place fields). In both awake and sleep state, IN firing rates were differential changed in AS compared to the control, and the ratio of IN/PNs was lower in both cortex (0.06±0.02, 0.31±0.00) and hippocampus (0.28±0.00, 0.31±0.01) of AS compared to WT mice (1.1±0.02, 0.43±0.01/1.08±0.02, 0.52±0.01, P<0.01). Exercise attenuated the phenomena (0.48±0.01, 0.48±0.01/0.79±0.02, 0.41±0.02, P<0.01). CONCLUSIONS: Aerobic exercise could regulate aberrant cellular neurophysiology related to cognitive impairments dependent network function.
were subjected to treadmill exercise for 12 weeks. The changes of behavior were detected by eight arm maze. The phosphorylation levels of AKT, GSK3β and Tau were measured by Western Blotting. **RESULTS:** The eight arm maze showed that working and reference memory errors and time to complete testing in AE decreased significantly compared with the mice of (AS:3.67±0.41 vs 4.83±0.24；P<0.05; 6.07±3 vs 8.40±0.59；P<0.01;109.35 vs 256±45.26；P<0.05), indicating that aerobic exercise improved behavioral and cognitive response ability. The levels of pTau ser262 and pTau ser396 were significantly increased at hippocampus in AS compared with those of control cohorts (C) (0.98±0.09 vs 0.82±0.09；P<0.05; 0.89±0.06 vs 0.73±0.11；P<0.05). Aerobic exercise could decrease pTau ser262 and pTau ser396 (0.69±0.08 vs 0.98±0.09；P<0.01; 0.67±0.02 vs 0.89±0.06；P<0.05). In case of AS group, the levels of pGSK3β ser9 were significantly decreased, while pGSK3β tyr216 were significantly increased in hippocampus of AS compared with those of C(0.51±0.08 vs 0.70±0.08；P<0.01; 0.67±0.02 vs 0.99；P<0.05). The levels of pGSK3β ser9 were increased (0.79±0.09 vs 0.51±0.08；P<0.01), and the levels of GSK3β tyr216 were decreased after aerobic exercise training in the hippocampus (0.69±0.06 vs 0.00±0.00；P<0.05). The levels of pAKT (GSK3 upstream regulator) ser473 were significantly decreased in hippocampus of AS compared with those of C(0.94±0.07 vs 0.73±0.13；P<0.05). Aerobic exercise induced to increase the activity of pAKT ser473 (0.74±0.13 vs 0.49±0.07；P<0.05). **CONCLUSION:** Aerobic exercise regulates GSK3β activity to attenuate the neuropathology of hyperphosphorylated Tau in APP/PS1 transgenic mice.

**METHODS:** Three-month-old male APP/PS1 transgenic mice and C57BL/6J mice were randomly divided into exercise group (C, AE) and sedentary group (AS, CS) respectively. The exercised mice were subjected to a treadmill exercise for 12 weeks, then the experimental age was at 9-month-old. The behavioral changes were detected by eight arm maze. Immunofluorescence, histochemistry and Dot blot were used to analyze mPTP opening, the levels of amyloid-β (Aβ) and soluble oligomers (oAβ). ELISA and Western Blotting were used to detect the activity of COXIV, ABAD, and the levels of COXIV, ABAD, Cyp-D, ANT1, ANT2, VDAC-1. **RESULTS:** Both working memory errors and reference memory errors were significantly increased in AS compared with those in the CS (40±4 vs 30±4%；71±2 vs 54±1%；P<0.01). The AE performed better than AS (22±1 vs 39±3%；55±3 vs 71±2%；P<0.05). Aβ aggregation was detected at hippocampus in AS, accompanied with an increase of oAβ (1.1±1.01 vs 0.05；P<0.05). A decline was detected in Aβ plaque and Aβ content in AE than AS (0.61±1.15 vs 1.5±1.01；0.9±0.1 vs 1.1±1.01；P<0.05). There was an increase in AS compared with CS in the mPTP opening (0.07±0.002 vs 0.08±0.002；P<0.01), and which was decreased after aerobic exercise training (0.07±0.002 vs 0.08±0.002；P<0.05). The increase in Cyp-D, ANT1, VDAC-1, ABAD of the hippocampus with the CS (1.1±1.01 vs 0.05), but a decrease in ANT2, COXIV protein (0.9±0.1 vs 1.01；P<0.05). Aerobic exercise decreased the expression of Cyp-D, ANT1, VDAC-1, ABAD in AS (1.1±1.01 vs 0.05；P<0.05) and increased ANT2, COXIV (0.9±0.1 vs 1.01；P<0.05). The activity of COXIV and ABAD in the hippocampus of AS were decreased compared with those of the CS (3.31±0.13vs 3.7±0.2；0.50±1.3vs 1.1±0.2；P<0.05), and aerobic exercise caused an increase of their activities (3.31±0.13 vs 5.6±0.2；0.51±1.08 vs 0.81±1.01；P<0.01). **CONCLUSIONS:** Aerobic exercise attenuates the αAb deposition and the opening of mPTP, then regulates the mitochondrial oxidative phosphorylation for energy production in AD models. Supported by the National Natural Science Foundation of China (NSFC) (No. 31571229).
and 25mm apart. Calipers were placed on the calcaneal plantar surface of the foot before the ultra-marathon and again immediately after the runners completed their ultra-marathon distance. The different width calipers were placed randomly either in a horizontal or vertical position. Subjects were in a prone position and were unable to observe caliper placement. Subjects were asked to indicate caliper placement position. Technicians used hand signals to indicate to the recorder: 1. caliper position and 2. the subject’s response either correct or incorrect. This was repeated 5 times randomly for each caliper setting and their respective answers were recorded as: correct=1 and incorrect=0. Two-Way ANOVA was used to analyze the overall Pre vs. Post accuracy difference (p<.05). Pre vs. post accuracy differences between each specific caliper distance were analyzed with a paired t-test (p<.05). RESULTS: A significant increase in 2PD was observed after completing the ultra-marathon across all caliper distances (p<.05). While the 2PD across all caliper distances increased in accuracy only the two widest caliper settings 20mm and 25mm were significantly more accurate (p<.05). CONCLUSION: The increased 2PD suggests an increase in cutaneous sensitivity after an ultra-marathon. We have previously found increased sensitivity in pain threshold after an ultra-marathon. There, and in this present study, it is likely that the inflammatory response from ultra-endurance activity has a sensitizing effect on nociceptors and cutaneous receptors, respectively, thus increasing pain and cutaneous sensitivity.

389  Board #227  May 29 9:30 AM - 11:00 AM
Postexercise Intracranial Hypotension

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Arterial hypotension, minutes to hours after exercise, is a well described phenomenon. The drop in mean arterial blood pressure (MAP) likely results from a combination of sustained vasodilation of the previously active muscles, centrally mediated reduction in sympathetic nervous activity and resetting of thermoregulatory, chemo-, and baroreceptors. Despite decreased MAP, cerebral blood flow is generally well maintained. PURPOSE: To characterize effects of moderate aerobic exercise on intracranial pressure (ICP) as a mechanism for maintaining cerebral perfusion pressure during and following exercise. METHODS: Sixteen healthy volunteers completed 30-min exercise at 70% estimated VO2-max on an upright ergonomic bicycle followed by a one-hour recovery phase in supine position. MAP, heart rate, stroke volume, and total peripheral resistance (TPR) were recorded continuously (Nexfin). In 15 subjects (8 female, 20±2 years, height 169±10 cm, weight 64±12 kg) ICP was estimated non-invasively by evoked tympanic membrane displacement (Cerebral Cochlea Fluid Pressure device). Invasive parenchymal ICP recordings were performed in one, cerebrally intact, former patient (male, 74 years, 176 cm, 80 kg) via a permanently implanted tip-transducer telemetric ICP-sensor (Neurovent-P-tele). RESULTS: 30 min moderate exercise did not increase ICP (-6.1 mmHg during seated rest vs -6.8 mmHg during exercise). Invasive (N=1) and non-invasive (N=15) ICP recordings followed the same trend, demonstrating a -6.1 mmHg during seated rest vs -6.8 mmHg during exercise. CONCLUSION: The increased 2PD suggests an increase in cutaneous sensitivity after an ultra-marathon. We have previously found increased sensitivity in pain threshold after an ultra-marathon. There, and in this present study, it is likely that the inflammatory response from ultra-endurance activity has a sensitizing effect on nociceptors and cutaneous receptors, respectively, thus increasing pain and cutaneous sensitivity.

390  Board #228  May 29 9:30 AM - 11:00 AM
Concussion History Does Not Predict Pupillary Light Reflex or Visual Sensory Performance in Young Adults

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Visual sensory performance (VSP) tasks may dynamically assess deficits following concussion, as these tasks reflect visual and cognitive function and motor response. The pupillary light reflex (PLR) represents autonomic nervous system activity, and is inexpensive and noninvasive to assess. This activity may be compromised following concussion; however, deficits in young adults are currently unknown. The relationships among PLR and VSP outcomes are interesting given these metrics may reflect different but overlapping visual domains. PURPOSE: To investigate the effects of concussion history on the relationships between PLR and VSP outcomes in young adults. METHODS: Participants [n = 89, age = 21.0 ± 1.5 years, concussion history = 19 (21.3%)] completed a test battery including PLR and VSP. Seven PLR parameters included initial and final pupil diameters, constriction and dilation velocities, constriction latency, time to 75% initial diameter recovery (T75), and average maximum constriction velocity. VSP tasks included visual clarity, contrast sensitivity, depth perception, near-far quickness, perception span, multiple object tracking, reaction time, target capture, eye-hand coordination, and go/no-go. Regression models tested concussion history effects on PLR controlling for age; and whether history moderated relationships between

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PLRs and VSP outcomes. RESULTS: The PLR and VSP outcomes did not differ by concussion history (P > 0.05). We found a negative relationship between reaction time and T75 (R = -0.40, p < 0.005) which was expressed moderated by concussion history (t = -0.97, p = 0.33), indicating that people with faster PLR recovery times also had faster reaction times. No other significant relationships were observed (P > 0.01).

CONCLUSION: Our PLR and VSP measures did not differ by concussion history. These measures may be insensitive to long-term physiological and behavioral deficits due to prior concussions. More research is needed to determine if such long-term deficits exist in young adults. It is worth further studying the inverse relationship between reaction time and time to diameter recovery, providing a possible link between an involuntary process supporting vision with visual-sensory task performance.

Falls are a major concern for older adults and their quality of life. Cognitive impairment is associated with falls in older adults; however, the electrophysiology while performing a working memory task has not been investigated. Working memory is a necessity for everyday function (walking, postural control, conversing), and the processing of a stimulus to elicit the appropriate response might lead to important insights into potential causes for falls and help us identify older adults at risk or develop future intervention strategies. PURPOSE: To examine differences between Non-Fallers and Fallers in performance on a working memory task and corresponding electrophysiology. METHODS: Older adults (n=38, female=23) aged 60 - 80 years (mean=68.8, SD=7.4) completed two separate sessions on two separate days. The first session incorporated general demographic questionnaires and neuropsychological assessments. Participants were classified as Non-Fallers or Fallers based on their self-reported falls history over the past 12 months. In the second session we assessed working memory using the n-back (0-, 1-, 2-) tasks, while behavioural and electroencephalograms (EEG) results were recorded. RESULTS: In the 2-Back test, the EEG results showed that Fallers were more impaired in processing the stimuli, with earlier latencies for the N2 (P<0.001) and P3 (P<0.001) components in comparison to Non-Fallers. As well, delayed peak latencies in the N2 (P=0.07 vs. P=0.01) and P3 (P=0.451 vs. P=0.024) components were associated with increased accuracy in the working memory task. CONCLUSIONS: Fallers show processing impairments in working memory compared to Non-Fallers. Future studies should consider incorporating working memory as a component of falls risk screening for older adults.

PLSD-95 and NCAM in the rat hippocampus, as well as improve the spatial learning and memory ability of rats; overload swimming has little influence on PSD-95 and NCAM expression.

CONCLUSIONS:

Many studies suggest that regular exercise could reduce memory impairment, the main symptoms of Alzheimer’s disease (AD), but the underlying mechanisms has not been elucidated. Inflammation induced by β-amyloid (Aβ) deposition has been shown to play a critical role in AD pathogenesis. Increasing evidence show that aerobic exercise has anti-inflammatory and neuroprotective effects. We hypothesized that aerobic exercise could attenuate memory deficits by regulating inflammatory status. PURPOSE: To investigate whether regular aerobic exercise regulate inflammation and attenuate memory deficits induced by Aβ1-42 in rat. METHODS: Sprague-Dawley rats were divided into 3 groups: control group (C), Aβ1-42 infusion group (A), Aβ1-42 infusion with exercise group (E). Rats in group A and E were injected 10μg Aβ1-42 oligomer (1μg/m) saline into their hippocampus, and rats from group C were injected with an equal volume of saline. The rats in group E underwent aerobic exercise training on a leveled motorized treadmill at a moderate speed for consecutive 5 weeks (once a day, 6 days/week) starting at the 2nd day after Aβ1-42 injection. The memory ability was evaluated by Morris Water Maze (MWM) and the inflammatory status was analyzed by expressions of proinflammatory cytokines (TNF-α, IL-1β) and anti-inflammatory cytokine (TGF-β1, IL-10) in hippocampus using Western Blot. RESULTS: MWM test showed that memory functions of rats were impaired by Aβ1-42 infusion, but this impairment was ameliorated by aerobic treadmill exercise. Compared with group C, both pro-inflammatory and anti-inflammatory cytokines in group A increased by different degrees (TNF-α: 306.9%, IL-1β: 255.6%, TGF-β1: 78.3%, IL-10: 80.0%). Compared with group A, the expression of TNF-α and IL-1β in group AE decreased by 31.4% and 25.0%, whereas TGF-β1 and IL-10 increased by 68.5% and 39.0% respectively. CONCLUSIONS: The findings demonstrated that treadmill exercise could adjust inflammation status in hippocampus and attenuate the cognitive impairment of rats induced by Aβ1-42. Supported by the Fundamental Research Funds for the Central Universities, Southwest University for Nationalities (2018QN19) and the Sichuan Science and Technology City (18YJC1355).

Microglia has been shown to play a pivotal role in the pathogenesis and prognosis of Alzheimer’s disease (AD) for its’ distinct activation phenotype, including pro-inflammatory, neurotoxic M1 and anti-inflammatory, neuroprotective M2. Previous studies have showed that regular exercise has anti-inflammatory effect and can reduces the memory deficit of AD rats induced by β-amyloid (Aβ), but whether exercise modulates microglial phenotype remain unclear.

PURPOSE: To evaluate the impact of a moderate treadmill exercise program on activation of microglial M1/M2 phenotype in the hippocampus of rats injected with Aβ1-42 and to probe the underlying molecular mechanism. METHODS: Health Sprague-Dawley rats were randomly separated into sham (S), Aβ1-42 (A) and Aβ1-42/ exercise (AE) groups. Rats in group A and AE were bilateral hippocampally injected with 10μl Aβ1-42 solution (1μg/ml), and rats in group S were injected with 10μl saline. Rats in group AE performed running on a treadmill for 5 weeks (6 days/week, once a day, 8-10min/m for 10-20 min at a time in the first week, 15 min/m for 30 min in a time in the next 4 weeks) starting 1 day after Aβ1-42 injection. The microglial M1/ M2 phenotype in the hippocampus were determined by flow cytometry (FC) and immunofluorescence (IF) of expression of nuclear factor-kappa B (NF-kB) p65, which has been shown to be involved in the regulation of microglial phenotype, was measured using western blotting (WB) and quantitative real-time PCR (qRT-PCR).

RESULTS: Both FC and IF showed that the number of M1 microglia (CD11b+CD86+ cell, Iba-1+NOs-1 cell) increased markedly in comparison with group C (P<0.01), but no significant change was observed in M2 microglia (CD11b+CD206+ cell, Iba-1+Arg-1+ cell), and that the number of M1 microglia in group AE was significantly lower than group A (P<0.01), but that of of M2 microglia was increased (P<0.01). WB and qRT-PCR analysis suggested that the expression of NF-κB p65 in the hippocampus was significantly increased after Aβ1-42 injection (P<0.01), which was...
395 Board #233 May 29 9:30 AM - 11:00 AM Brain Modulation for Perceived Exertion Processing After Different Cycling Exercise Intensities: An fMRI Study
Henrique Bortolotti1, Eduardo Bodnarie Fontes1, Kell Grandjean Costa1, Bruno Campos2, Timothy Noakes3, Maria Augusta Peduti Dal Molin Kiss4, Li Li Min5.
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(RELEVANT RELATIONSHIPS REPORTED)

Ratings of perceived exertion (RPE) during exercise is processed in the brain, however, the modulation of the associated areas at different intensities levels remains unclear.

PURPOSE: To verify the brain modulation while RPE processing immediately after cycling exercise performed at different intensities.

METHODS: 24 healthy adults (77.6±9.4 kg; 176±7.2 cm; 25.9±5.9 years old) performed an incremental load test on an adapted cycling ergometer attached to a MRI scanner. The workload started at 25 W and increased 25W every four blocks of 30 s of cycling and 30 s rest. At the end of each block, participants had four seconds to report their RPE based on the 6-20 Borg scale presented on a screen. The RPE processing periods for RPE responses from 6 to 12 were labeled as LOW intensity while those from 13 to 18 were considered as HIGH intensity. To identify the common areas associated to RPE processing, the one sample t-test was used for each condition (all RPE, LOW and HIGH intensities). The statistical threshold established was family-wise error corrected (FWE<0.05).

RESULTS: When grouping all RPE responses throughout exercise intensities, we found an activation of several areas related to motor control (primary motor cortex, primary somatosensory cortex and cerebellum), homeostatic regulation (insula cortex) and cognition for executive functions (dorsolateral and anterior prefrontal cortex), spatial cognition (superior parietal lobule), reflective self-awareness (precuneus), and cognition for executive functions (dorsolateral and anterior prefrontal cortex), spatial cognition (superior parietal lobule), reflective self-awareness (precuneus), and cognitive control processes (dorsolateral prefrontal cortex, anterior cingulate cortex, orbitofrontal cortex, and thalamus). A one-sample t-test was used to identify areas associated to RPE processing, the one sample t-test was used for each condition (all RPE, LOW and HIGH intensities). The statistical threshold established was family-wise error corrected (FWE<0.05).

CONCLUSIONS: When grouping all RPE responses throughout exercise intensities, we found an activation of several areas related to motor control (primary motor cortex, primary somatosensory cortex and cerebellum), homeostatic regulation (insula cortex) and cognition for executive functions (dorsolateral and anterior prefrontal cortex), spatial cognition (superior parietal lobule), reflective self-awareness (precuneus), and cognitive control processes (dorsolateral prefrontal cortex, anterior cingulate cortex, orbitofrontal cortex, and thalamus).
and CPM from the pre-PPT and CPM, respectively. Independent sample t-tests were used to assess differences in Delta values for PPT and CPM between the two age groups. RESULTS: Pre-PPT and CPM were significantly decreased (p<0.05) for both age groups, indicating greater pain sensitivity. The age group analysis (<40 vs >40) showed a decrease in Delta PPT in the older age group. (Mean Delta <40 yrs = 149.40 kPa, Mean Delta >40 yrs = 48.38 kPa (42)=2.69, p<0.05. A similar decrease was found in Delta CPM. (Mean Delta <40 yrs = 31.75 KPa, Mean Delta >40 yrs = 11.69 kPa (42)=2.05, p<0.05). CONCLUSION: Previous research from our group has shown a decreased PPT and CPM, indicating greater pain sensitivity, across all ages during an ultra-marathon. In this present study we have seen similar decreases in PPT and CPM but clearly a difference between age groups in the degree of these changes. Further research is required to determine how factors of immunosenescence, directly or indirectly, may affect the age group variations in pain during an ultra-marathon.

### Physical Exercise

Physical exercise has been shown to reduce craving for alcohol in alcoholics. There is a high prevalence of heavy episodic drinking in college-aged adults (18-29 years of age). This can be predictive of an alcohol or other substance use disorder developing later in life. PURPOSE: The purpose of this investigation is to examine the impact of acute aerobic exercise on cue reactivity to alcohol in heavy episodic drinkers. METHODS: Seven participants (6 females, 1 male) (Age = 20±4.4 years, BMI=22.6±3.59, VO2max =32.0±4.14 ml kg⁻¹ min⁻¹) completed 2 experimental sessions. Heavy episodic drinking was identified using an adapted version of the CAGE questionnaire. During one session subjects rested for 30 minutes and during the other session subjects exercised for 30 minutes at a moderate exercise intensity (77±1% of Peak HR). Sessions were randomized for each participant. Prior to and immediately following each session, EEG data were collected using a 64-channel system while subjects were exposed to 180 images (90 alcoholic drinks (ALC), 90 non-alcoholic drinks (NON)). Images were presented in a random order and proceeded by a fixation stimulus using a variable time span (0.5 to 1.5 sec). Mean amplitude and peak latency was calculated for F300 (300-380 ms post stimulus) in parietal-occipital electrodes. RESULTS: Before exercise the peak latency was shorter (p=0.025) for ALC (325±32 ms) compared to NON (366±25 ms). After exercise, the peak latency was similar for ALC (313±26 ms) and NON (323±27 ms). CONCLUSION: These findings suggest that acute aerobic exercise of moderate intensity attenuates cue reactivity to images of alcoholic beverages in heavy episodic drinkers.

### Parkinson’s Disease

Parkinson’s disease (PD) is a neurodegenerative disorder characterized by motor dysfunction. Impaired mitochondrial capacity, as well as glucose and lipid toxicity, have been linked to neuronal dysfunction and apoptosis. Although aerobic exercise impacts these outcomes, few data exist in PD. PURPOSE: We tested the hypothesis that high intensity aerobic exercise (AEX) would improve aerobic fitness and metabolic outcomes. METHODS: Nineteen subacute subjects (7 females, age = 67.5 ± 1.4 yrs) with idiopathic PD (Hoehn and Yahr stage 2 or 3) were enrolled in a 16-week supervised aerobic exercise program. Subjects exercised 3/d/wk at a rating of perceived exertion (RPE) of 15-17 for 30 min. They also performed 30 min. of unsupervised exercise 2/d/wk at an RPE of 10-12. Paired sample t-tests were used to assess maximal oxygen consumption, 6 min. walk, body weight (kg), body fat % (BIA), respiratory exchange ratio (RER), indirect calorimetry, blood pressure (BP), heart rate (HR), as well as fasting glucose and free fatty acids (FFA) pre/post intervention. RESULTS: AEX increased VO2peak (P= 0.0001), increased 6 min. walk distance (P<0.0001), increased muscle mass (P<0.0001), decreased body weight (P<0.0001), and decreased body fat % (BIA), respiratory exchange ratio (RER), indirect calorimetry, blood pressure (BP), heart rate (HR), as well as fasting glucose and free fatty acids (FFA) pre/post intervention.

### Effect of High Intensity Aerobic Training on Fitness and Health in Individuals with Parkinson’s Disease

Parkinson’s disease (PD) is a neurodegenerative disorder characterized by motor dysfunction. Impaired mitochondrial capacity, as well as glucose and lipid toxicity, have been linked to neuronal dysfunction and apoptosis. Although aerobic exercise impacts these outcomes, few data exist in PD. PURPOSE: We tested the hypothesis that high intensity aerobic exercise (AEX) would improve aerobic fitness and metabolic outcomes. METHODS: Nineteen subacute subjects (7 females, age = 67.5 ± 1.4 yrs) with idiopathic PD (Hoehn and Yahr stage 2 or 3) were enrolled in a 16-week supervised aerobic exercise program. Subjects exercised 3/d/wk at a rating of perceived exertion (RPE) of 15-17 for 30 min. They also performed 30 min. of unsupervised exercise 2/d/wk at an RPE of 10-12. Paired sample t-tests were used to assess maximal oxygen consumption, 6 min. walk, body weight (kg), body fat % (BIA), respiratory exchange ratio (RER), indirect calorimetry, blood pressure (BP), heart rate (HR), as well as fasting glucose and free fatty acids (FFA) pre/post intervention. RESULTS: AEX increased VO2peak (P= 0.0001), increased 6 min. walk distance (P<0.0001), increased muscle mass (P<0.0001), decreased body weight (P<0.0001), and decreased body fat % (BIA), respiratory exchange ratio (RER), indirect calorimetry, blood pressure (BP), heart rate (HR), as well as fasting glucose and free fatty acids (FFA) pre/post intervention.
metabolic health independent of weight loss in PD. Whether AEX improves metabolic health and PD related clinical outcomes more than other exercise prescriptions awaits further investigation. Supported by a grant provided by The Manning Foundation.

Multiple studies have indicated that physical activity regulation may be largely controlled by central neural factors, such as dopamine (DA) signaling in the nucleus accumbens (NAc). DA signaling has been shown to be altered by nutritional interventions. The key identified proteins involved with DA signaling are DA receptors one and two (DRD1, DRD2), tyrosine hydroxylase (TH), vesicular monoamine transporter (VMAT), and DA transporter (DAT).

**PURPOSE:** To determine if a high fat/high sugar (HFHS) diet alters DA signaling in the NAc of male and female C57Bl/6j mice. **METHODS:** Mice were randomly assigned to either a HFHS diet or a standard CHOW diet (C) at three weeks of age when examining brain fMRI responses to fatty foods.

**CONCLUSION:** A HFHS diet did not alter dopaminergic receptor or transporter densities in the NAc. Acute aerobic exercise has been shown to reduce craving for various addictive substances like cigarettes and alcohol. A similar effect has been seen in children assigned to either a HFHS diet or a standard CHOW diet (C) at three weeks of age for DRD1, TH, VMAT, and DAT in protein densitometries in male mice for DRD1, TH, VMAT, and DAT, or 1.5 ml peak=39.1 μV; Post=35.1 μV; p<0.05). Forced swimming increased food consumption by 88% ± 11 (p<0.05) two hours following exercise but was abolished by Naltrexone (p<0.05), verifying an increase in opioid mediated hyperphagia. An increase in hot water tail immersion time following free swimming (S = 2.72 ± 0.13 vs. FS = 4.28 ± 0.19; p<0.05) demonstrated an improvement in pain tolerance. Pain tolerance decreased by 20% ± 0.05 with the addition of Naltrexone (P<0.05).

**CONCLUSIONS:** Fifty minutes of forced swimming is an effective stimulus for the release of endogenous opioids and modulates behavioral changes specific to the release of endogenous opioids in mice.

**Exercise is specifically linked to at least three phenomena that are likely to involve opioid release; the ‘athlete’s high’, increased pain tolerance, and addiction to exercise. Exercise studies that have examined the effects of the opiate receptor blocker naltrexone, found that its administration prior to exercise alter these after mentioned phenomena. PURPOSE: The purpose of this study was twofold: 1) to establish an exercise modality that is sufficient to stimulate the release of endogenous opioids and 2) to examine the role endogenous opioids play in post-exercise pain tolerance and depression. METHODS: Following a week of familiarization, mice underwent a 50-minute (min) bout of forced swimming (FS). Mice were injected with either saline (5; 0.9%) or the opioid blocker naltrexone (NTX; 4x/kg) 15 mins prior to exercise. Following exercise mice were challenged with a tail suspension test (TST), pain tolerance test or monitored for post exercise food consumption for 2 hours. RESULTS: NXT injection decreased total FS time (46 ± 1.2 mins. vs. 35 ± 1.6 mins; p<0.05). Pain tolerance decreased by 20% ± 0.05 with the addition of Naltrexone (P<0.05). Finally, a TST demonstrated that following a bout of exercise, mice spent 49 ± 3.1% less time immobile (p<0.05), signifying lower depression levels. This effect was reversed with the opioid blocker (p<0.05). CONCLUSIONS:}

**PURPOSE:** Autophagy and neurogenesis play a pivotal role in maintaining cellular homeostasis of neurons in the brain. Endurance exercise (EXE) serves as a potent activator of both autophagy and neurogenesis in the hippocampus of the brain; however, the molecular mechanisms of the dual activation remains unclear. We investigated EXE-induced molecular signaling nexus of autophagy and neurogenesis pathways in the hippocampus.

**METHODS:** C57BL/6 mice (8 weeks old, male, n=24) were randomly divided into two groups: control (CON, n=12) and endurance exercise (EXE, n=12). Animals were determined in parietal-occipital electrodes. **RESULTS:** Before exercise, subjects had a greater P300 response (p<0.001) to FAT (5.68±0.46 μV) as compared to HEALTHY (5.23±0.48 μV) as compared to HEALTHY (5.23±0.48 μV). After exercise the response to FAT (4.9±0.45 μV) was similar to that seen for HEALTHY (4.9±0.45 μV). The N100 response to FAT (Pre=3.48±0.24 μV, Post=2.96±0.28 μV) was greater than the control response to HEALTHY (Pre=3.20±0.22 μV, Post=1.96±0.42 μV) before (p<0.001) and after (p<0.05) exercise. No differences in peak latency were seen for N100 or P300 at either time point. **CONCLUSION:** These findings suggest that acute aerobic exercise of moderate intensity can influence cue reactivity to images of fatty and healthy foods in college-aged women.
Screen time in children with ADHD can exacerbate symptoms and affect self-regulation and attention. **PURPOSE:** To test relationships between device-based ST and children’s executive function (EF) with behavior disorders. **METHODS:** Eleven African-American girls and 12 boys (mean age = 9.3 ± 1.9-years) wore a triaxial accelerometer for 5-consecutive-days at the beginning of an intervention trial. Everson (2008) cut-points were used to determine ST (min/day), sedentary breaks (min/day), and ST% (% per day) during weekdays and a filter to remove intervention time and non-wear time during the night. Data was included if a participant wore the accelerometer ≥ 3 weekdays for ≥ 8 hrs/day. EF was assessed through parent-report of behavioral manifestation of EF (BRIEF-GEQ) score and children underwent neuropsychological tests of verbal and visuospatial working memory (AWMA verbal and AWMA visuospatial scores). ST (min/day) was reciprocal by 100 transformed in ST, 417.60±120.78 min/day in sedentary breaks, and 49.31±7.11% of the day in ST. Children obtained an average score of 59.21±10.42 points in BRIEF-GEQ, 32.70±25.68 points in AWMA verbal score, and 38.05±23.31 points in AWMA visuospatial score. **RESULTS:** Overall, 19.7% of students reported ≥60 minutes of physical activity on four days of the week, and 55.2% reported sport team participation. Physical activity on four or more days per week was associated with a 27% reduction in the odds of suicidality, and sport team participation was associated with 17% reduction in suicidality. **CONCLUSIONS:** Exercise and sport team participation are inversely related to sadness and suicidality in adolescents and this relationship persists throughout adolescence. Future research should examine the influence of exercise and sport participation on a longitudinal basis and identify other biopsychosocial factors that may be contributing to these results in developing adolescents.
Mindfulness meditation (MM) and aerobic exercise (AE) decrease stress, but the combined effects are unknown. **Purpose:** Assess effects of AE plus MM, compared to effects of MM alone, on stress in young adults. **Methods:** High-stress, sedentary (N=32, 27 F, 20.5±2.7 years, 23.9±5.0 kg/m²) individuals were randomized to a 4-week AE, MM+AE, or control group. MM and AE/MM groups participated in 200 minutes/week of guided MM or AE/MM. MM consisted of present moment, non-judgmental awareness. AE consisted of moderate-intensity (40-60% heart rate reserve) exercise. Stress (PSS) and anxiety-depression symptoms (DASS) were measured at baseline, and after weeks 1 and 4. An analysis of variance assessed effects of group and time on PSS and DASS. **Results:** There were no group x time interactions for PSS (p=0.12) or DASS (p=0.21). There were main effects of time in which PSS and DASS were significantly lower after week 1 (PSS: p=0.04; DASS: p=0.01) and at post-intervention (PSS: p<0.001; DASS: p=0.004) compared to baseline. There were large effect size (ES; Cohen’s d) changes to post PSS and DASS scores for the MM group: -1.33; DASS: -1.03 and AE/MM group: PSS: -1.24; DASS: -0.97, and small ES changes in the PSS and DASS scores for the control group (PSS: -0.45; DASS: -0.13). **Conclusion:** MM may be as effective as AE/MM in combatting psychological distress in high-stress young adults. Further research should compare AE-only to AE/MM.
variance explained 90.25% and 70.56% of the variance in state anxiety change over the same period, respectively. Correlations between AUC indices and other NA measures also were not significant, possibly due to insufficient sample size. CONCLUSIONS: AUC indices were significantly and inversely associated with changes in state anxiety from baseline to wk 3 and the remaining outcomes showed nonsignificant associations in the predicted directions. HITT could be a promising intervention to reduce NA in anxiety disorders.

The demands of being a female college athlete/performer may create mental and physical stress that may increase the likelihood of eating disorders and disordered eating. PURPOSE: The overall purpose was to examine the prevalence of Eating Disorder (ED) risk among female college athletes/performers across academic status and sport type (equestrian, volleyball, beach volleyball, women’s soccer, softball, and ballet). METHODS: Data from a larger cross section was used. A convenience sample of NCAA Division I female athletes/performers (n=127; age: 19.8±2.0 years; weight: 63.6±9.2 kg) were recruited and surveyed in a cross-sectional study in a southeastern region of the United States participated in the study. Participants completed a basic demographic survey, the Eating Disorder Inventory-3 (EDI-3), and the EDI-3 Symptoms Checklist (SC). Basic descriptive stats were used for demographic information. Cross-tabulations were used to examine the proportion of participants classified as “at risk for EDI-3 and EDI-3 SC” across sport and academic status.

RESULTS: Significant differences [X2(15, N=127) = 25.2, P<0.04] were found between the distribution of ED risk and sport with 18.9% (n=24) at risk for EDI-3; 29.9% (N=38) EDI-3 SC, and 31.5% (n=40) were at risk for both EDI-3 and EDI-3 SC. Overall, pathogenic behaviors revealed: 52.8% (n=66) dieting, 13.6% (n=17) exercise 50-100% of the time to lose weight, 20% (n=25) binge eating, 13.6% (n=17) purging, 4.9% (n=5) laxatives, 7.2% (n=9) diet pill use, and 1.6% (n=2) use diuretics. A significant difference between dieting and sport [X2(2, N=515), = 12.2, P=0.03] was found with the highest prevalence within equestrian (16%, n=20/28) and ballet (13.6%, n=17/29). Sport type and exercise to control weight more than 50-100% of the time was significantly different [X2(20, N=125) = 54.1, P=<0.01] with the highest prevalence within equestrian (10.4%, n=13/29). CONCLUSIONS: Athletes in the college setting are at risk for eating disorders. Medical professionals such as athletic trainers who work within this setting need to be educated on the potential risk factors that can lead to EDs. There should be a referral process in place for those athletes who are at risk. Those involved in the screening, prevention, and treatment of at-risk athletes should understand the sensitive nature of the topic.

While previous studies have well documented the beneficial effects of physical activity (PA) and sleep quality on mental disorders (e.g., depression and anxiety), relatively few have explored their relationship with subjective well-being (SWB), which is a core construct in positive psychology and is linked with various health outcomes. Purpose: To examine the associations between the PA, sleep quality, and SWB in college students while controlling for gender and age. Methods: 726 college students (41.1% female, mean age = 19.28 years) voluntarily participated in a study to investigate the relationship between sleep quality (Pittsburgh Sleep Quality Index). Four multiple regression models were calculated to examine the associations of physical activity on mental health by sex. METHODS: Eighty-one young adults (20.5±1.5 years) took part in the investigation. The participants underwent body fat percentage assessment and completed the Depression, Stress and Anxiety Scale (DASS 21) and the Leisure and Physical Activity Survey (LPA). Data were analyzed for associations between sex, physical/sedentary activities, body composition and mental health via multiple linear regression analysis. RESULTS: Female participants (n=120) reported less weightlifting exercise (p=0.001, 55%±0.2) as compared to males (23%±0.2 days, 61.3%±3.5 days, 10%±0.7 days). Differences were also noted in dieting and sport (X2(5, N=125) = 12.2, p=0.03). However, MPA and walking exercise by sex was regressed against scores from the DASS 21. Significant interactions were noted between sex and min/day of aerobic exercise (F=6.26, p=0.003) and days/week engaged in weightlifting exercise (F=5.46, p=0.006) for anxiety. In contrast to males, females engaged in higher numbers of weight training sessions and reported increased anxiety (0-2 days: 5.33±4.28; 3-5 days: 5.65±5.51; 6-7 days: 7.50±9.19). Whereas increasing time of aerobic exercise among females was associated with lower anxiety (0.15 min per session: 12.5±3.9; 15-30 min per session: 4.65±7.47; >30 minutes per session: 4.47±2.87), male students who engaged in more activities (min/day of exercise: 4.65±4.74) reported lower levels of anxiety (0.2 days: 10.00±5.88; 3-5 days: 4.52±2.98; 6-7 days: 3.63±3.21). CONCLUSIONS: For college-aged females, a focus on time engaged in aerobic exercise may produce not only cardiovascular benefits, but also psychological, and encouraging resistance exercise among college males may have similar results. University and college communities should encourage different patterns of exercise for male and female students to reduce anxiety.

It is well known that moderate exercise can positively modulate mood states; however, few studies have shown the effects of intense exercise. PURPOSE: To examine the impact of moderate and intense exercise on anxiety, affective and positive subjective experience in healthy adults. METHODS: Ten healthy male subjects (28.70±6.25yrs; 72.51±10.68kg; 175.4±38cm; 25%±7% body fat mass) were submitted to two intensities based on maximal treadmill test separated by 7 days: 1) 60%; 2) 85%. For these conditions, the subjects answered a Subjective Exercise Experiences Scale (SEES) and IDATE-State scale in the following time-courses: baseline (B), immediately after (IA) and 30 minutes after (R) finishing of the exercise. The Feeling Scale (FS) was recorded at 1, 5, 10 and last minutes of exercise. The situations were compared by two-way ANOVA with post-hoc Duncan test, with significance level of p<0.05. The protocol was approved by Unifesp Ethics Committee (52.381.537).

RESULTS: We didn’t observe differences in anxiety comparing groups or time-courses, however, SEES Positive well-being subscale show lower scores at IA during 85% when compared with 60% (19.90±2.33vs17.40±2.95; p=0.02). The increase of fatigue was observed at B when compared IA in 60% (6: 3.83vs11.0:7.74; p=0.01). Similar data was observed in 85%, with increase in B when compared to IA (8.80±6.39vs14.40±7.41; p=0.006) and remain higher at R (p=0.03). The FS on 60% show a significant decrease at last minute compared to 1 (p=0.0002), 5p=0.0002) and 10p=0.0009) minutes; on 85%, similar data was observed. The last minute was lower when compared to 1 (P<0.0001), 5 (P<0.0001), 10 (p<0.001); but the 10 minute was associated with higher levels of life satisfaction (β = 0.37, p<0.001), happiness (β = 0.36, p<0.001), and positive affect (β = 0.43, p<0.001), and lower levels of negative affect (β = 0.47, p<0.001).
lower compared to 1 (p<0.001) and 5 (p<0.001). When comparing intensities 60% showed higher scores at the FS at the 10 (p<0.001) and the last minute (p<0.001) compared to 85%.

CONCLUSIONS: The comparison between the exercise intensities show that, there was no difference between anxiety scores, on the other hand, moderate exercise presented better IA well-being response, faster fatigue recovery and maintained affectivity with positive values indicating pleasure from the beginning to the end of the test.

419 Board #257 May 29 11:00 AM - 12:30 PM Impact of Wearing Graduated Compression Stockings on Psychological and Physiological Responses during Prolonged Sitting
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PURPOSE: Links between a prolonged sitting and increased risk of cardiovascular diseases or poor mental health have been found. A usage of compression garment may have some potential psychological and physiological benefits during prolonged sitting.

METHODS: We investigated the impact of with or without wearing graduated compression stockings on psychological and physiological responses in 18 healthy young people (12 men and six women) during 3 h prolonged sitting. Heart rate (HR) was measured during the sitting time, and heart rate variability (HRV) was analyzed to evaluate sympathetic and parasympathetic nerve activity at pre, 1h, 2h, and 3h during the sitting for 5-min each. To assess psychological stress-related variables, Profile of Mood States (POMS) and saliva cortisol were evaluated before and after 3 h sitting. Visual analogue (VAS) scale was also assessed for whole body and lower limbs uncomfortable feelings.

RESULTS: POMS scores did not show marked differences between with and without stockings. A 3 h sitting significantly decreased saliva cortisol in both conditions (P<0.05) with no differences between conditions (0.263±0.108 mg/dl vs. 0.189±0.075 mg/dl without stockings at pre vs. post; 0.267±0.100 mg/dl vs. 0.186±0.081 mg/dl with stockings at pre vs. post). Wearing stockings suppressed subjective uncomfortable sensation (e.g., pain, swelling) in the lower limbs assessed by VAS (58.2±23.3 mm without vs. 39.3±24.4 mm with stockings, P<0.001). HR at 1h and 3h was significantly greater without than with stockings (77±8 bpm without vs. 74±6 bpm with stockings at 1h, and 80±9 bpm without vs. 75±6 bpm with stockings at 3h, P<0.05, respectively). High-frequency oscillations (0.15-0.4 Hz) showed higher values with than without stockings throughout the 3 h sitting period, and it was significantly higher at 1h (229±169.6 sec without vs. 324±251.6 sec with stockings, P<0.05). When data for both conditions were pooled, pre-to-post changes in saliva cortisol were positively associated with higher VAS in the lower limbs and negatively associated with changes in the Vigor subscale of POMS (P<0.05, respectively).

CONCLUSIONS: These findings suggest that wearing graduated compression stockings may benefit from subjective comfort and increased parasympathetic nerve activity.

420 Board #258 May 29 11:00 AM - 12:30 PM Psychosocial Mechanism of Adolescents’ Physical and Mental Health: A Self-Determination Health Behavior Perspective
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PURPOSE: Research indicates that adolescents’ health can be promoted by satisfying their basic psychological needs through a supportive social environment in school physical education (PE; Ryan & Deci, 2017). Guided by the Self-Determination Behavior Model (SDBM; Ryan et al., 2008), this study aimed to examine the relations among perceived need support (i.e., autonomy support, competence support, and relatedness support), need satisfaction (i.e., autonomy, competence, and relatedness), physical health (i.e., physical fitness [PF]), and mental health (i.e., health-related quality of life [HRQOL]) among adolescents. The mediation models were conducted to specify relations among psychosocial processes toward PE, adolescents’ PF and HRQOL, respectively.

METHODS: A prospective correlational design was used across one academic school year. Participants were 198 adolescents (58.6% female; M = 12.63) recruited from three schools in the south region of the U.S. At the beginning of school year, participants completed previously validated questionnaires assessing their perceived need support and need satisfaction related to PE; the end of school year, they self-reported their HRQOL using the PedsQLTM inventory, which included measures of physical, emotional, school, and social functioning. Finally, FitnessGram® test battery was used to measure their PF including body composition, aerobic fitness, and muscular fitness.

RESULTS: Correlation analysis revealed positive associations among the study variables (r ranged from .19 to .83). Using structural equation modelling (AMOS 22.0), the hypothesized model resulted with a good fit to the data (χ²/df=130.46;61; IFI = .93; CFI = .93; RMSEA = .076; 90% CI [.058, .094]). The need support had a direct influence on need satisfaction (β = .79, p<.01), and need satisfaction had a direct contribution on PF (β = .23, p<.05). The psychosocial process from need support to need satisfaction had no direct influence on HRQOL, but had an indirect influence through PF (β = .34, p<.01). CONCLUSION: The findings supported the theoretical tenets of SDHBM in adolescents, particularly on their physical health. Creating a need-supportive environment in PE is critical in order to enhance adolescents’ need satisfaction, which ultimately indirectly influence their HRQOL.

421 Board #259 May 29 11:00 AM - 12:30 PM Differences in Depressive Symptoms across Physical Activity Levels Based on Comorbid Anxiety and Depression Status
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(Please enter your relevant relationships reported)

Research supports inverse associations between physical activity (PA) and depressive symptoms and status among adolescents. However, the degree to which comorbid anxiety and depression status may influence relations of PA with depressive symptoms is unknown.

PURPOSE: This study investigated differences in depressive symptoms across low, moderate, and high PA physical activity among adolescents with no anxiety or depression, anxiety-only, depression-only, and comorbid anxiety and depression.

METHODS: Adolescents (N=481; 200 female) aged 15 ± 1.1 ± 7 self-reported PA frequency (modified PACE®); low, moderate, and high PA were classified as engaging ≥250min of PA 2-3, 4-7, and ≥5d/wk, respectively. Depressive symptoms were assessed with the Quick Inventory of Depressive Symptomatology-27 indicated depression status). The Trait subscale of the State-Trait Anxiety Inventory assessed trait anxiety (≥50 indicated high trait anxious status). Two-way ANCOVA examined variation in depressive symptoms according to the interaction of PA and comorbid anxiety and depression status. Covariates were age, sex, rural or urban residence, and school sex-type (i.e., female only, male only, or mixed sex). Bonferroni-adjusted simple effects analysis decomposed significant interaction.

RESULTS: The two-way interaction between PA and comorbid status was statistically significant (F1,477 = 4.69, p <0.001, n2 = 0.07). Depressive symptoms were significantly lower among those with comorbid anxiety and depression with moderate PA compared to low PA (mean difference ≥2.29, p=0.007) and high PA (mean difference ≥2.65, p=0.003). Depressive symptoms were significantly higher for comorbid anxiety and depression compared to depression-only for those engaged in low PA (mean difference ≥3.73, p<0.001) and high PA (mean difference ≥3.40, p<0.001), and non-significantly higher among those engaged in moderate PA (mean difference ≥1.26, p=0.30). This finding may be due partly to the smaller number of comorbid anxiety and depression participants with moderate PA (22 vs. 48).

CONCLUSIONS: Depressive symptoms differed across PA levels based on comorbid anxiety status. Though the exact role of comorbid anxiety is not clear, it may be important to consider relative to relations of PA with depressive symptoms among adolescents.

422 Board #260 May 29 11:00 AM - 12:30 PM Improving Acute Exercise Prescription In Depression: Predictors Of Optimal Intensity For Improving Depressive Mood
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Overall mood improves following acute exercise for people with major depressive disorder (MDD), yet it is unclear how to maximize this effect. Determining factors that predict what the most beneficial intensity of exercise is for an individual could lead to prescriptions that maximize the positive effects of each session potentially leading to increased exercise participation. PURPOSE: To explore potential factors influencing the most effective exercise intensity for improving mood in individuals with MDD.

METHODS: Women with MDD (n=24) were prescribed 20-minute sessions of light (L), moderate (M), and hard (H) intensity exercise (rating of perceived exertion: 11: 13, 15, respectively) in a counterbalanced, within-subject design. The most effective session was defined as the one resulting in the greatest reduction in depressive mood (measured via depression subscale of Profile of Mood States) from pre- to post-exercise for each participant [L (n=10), M (n=10), and H (n=14)]. Polysomnography and several factors related to these effects were age, body mass index (BMI), objectively measured minutes of total daily moderate to vigorous physical activity as well as weekly physical activity in bouts ≥10min, and total sedentary time and prolonged sedentary time
Exercise improves sleep and reduces apnea severity in adults with obstructive sleep apnea (OSA). However, whether reducing sedentary behavior impacts sleep and apnea severity is unknown. PURPOSE: To examine whether reducing prolonged sitting during a simulated workday by use of a sit-stand desk leads to changes in sleep compared to a sedentary workday in a sample of adults at high risk for OSA. METHODS: Eight inactive adults (5 males, 53.8±8.5 yr, body mass index: 29.8±5.5 kg/m^2) who were classified as ‘high risk’ for OSA based upon the STOP-BANG screening algorithm were classified as ‘high risk’ for OSA based upon the STOP-BANG screening algorithm participated in a randomized crossover trial consisting of two simulated 8-h workdays: (1) continuous sitting (SIT); and (2) alternating periods of sitting and standing every 30 min (SIT-STAND). Sleep and apnea were assessed on the night following each simulated workday by wrist-worn actigraphy and a portable OSA testing device, respectively. Actigraphic measures of total sleep time (TST) and wake after sleep onset (WASO) served as the primary sleep variables, while the apnea-hypopnea index (AHI) and percentage of time asleep (P) served as the primary sleep disordered breathing variables. Results: There were no overall differences across groups, effect sizes indicated that light intensity led to the greatest improvement for people who were younger, had lower BMI, or spent more hours in PSED, while hard exercise was most beneficial for the reverse (i.e., older, high BMI, low PSED). The large effect sizes in the present sample suffering from MDD suggest personal characteristics may influence the affective response to acute exercise, yet more research is required to determine the reliability and magnitude of these effects.

424 Board #262 May 29 11:00 AM - 12:30 PM
Effectiveness Of Short-term Yoga Interventions For Stress Of College Students: A Meta-analysis
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Purpose: To determine the effectiveness of yoga interventions for the stress management of college students using a meta-analysis. METHODS: Key words, such as “yoga,” “stress,” “college students”, etc. were searched in a number of databases such as PubMed/Medline, Scopus, Cochrane Library, PsycINFO, Webscience and Google through Dec., 2018. Only randomized controlled trials of yoga based stress interventions for college student were included for the meta-analysis. Risk of bias the studies were independently assessed by two of the authors using the Risk of Bias Tool Potential Conflict Back Review Group. Effectiveness of Yoga intervention was determined by computing standardized mean differences (SMD), in which the difference in the means of pre- and post-test difference between groups was divided by the pooled standard deviations. RESULTS: 12 studies (Total college students = 763, Male’s =16.64, Intervention length = 8.79±9.36 wk.) were included in the final analysis. Main outcomes included self-reported anxiety, depression, stress, as well as objective measures of heart rate and blood pressure. The yoga interventions were found effective in reducing anxiety, depression, stress and heart rate: Anxiety Depression Stress Heart Rate
SMD -0.995, -1.708 -0.953 -1.623
95% CI [-1.762 -0.227] [-2.005 -1.412] [-1.707 -0.199] [-2.911 -0.334]
P 0.011 0 0.013 0.01

Due to the paucity and heterogeneity of the researches, the long-term effects could not be examined. Conclusion: Short-term yoga intervention has been found effective in helping the stress management of college students. Studies with longer intervention, with a comparison with other exercise mode, are needed.

Key Words: stress, yoga, college students, meta-analysis, review

425 Board #263 May 29 11:00 AM - 12:30 PM
Potential Effects of Mediators on Health Perception in Older Adults
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(No relevant relationships reported)

Several aspects could influence mental and physical components of subjective quality of life perceptions. In particular, healthy diet and physically active lifestyles could play a crucial role for successful aging and sustainable quality of life in advancing years. PURPOSE: To determine the mediating effects of energy expenditure (EE) and intake (EI), body composition (BC) and dissatisfaction (BD) on the relation between age and health and health perception. METHODS: 42 senior athletes, 55 physically active, and 61 sedentary adults (aged 55-85 years) were submitted to anthropometric (body mass, height - Body Mass Index [BMI]), weekly energy expenditure (EE), and dietary intake (EI) evaluations, and administered Body Image Dimensional Encompassment (BIDE), Short Form Health Survey - Physical (PCS) and Mental Component Summary (MCS) questionnaires. Two serial multiple model mediation analyses were applied to assess whether mechanisms involving diet-related and physical activity-related personal characteristics and behaviors (4 mediators: EE, EI, BMI, BDI) mediated the relation between age and PCS or MCS health-related quality of life perception. RESULTS: Only for MCS the mediation analysis showed: a) a direct effect of age on MCR (c=0.31, p=0.002; CI[95%]=0.12; 0.50); b) a mediation path by EE, EI, BMI, and BDI (c=0.027, Bootstrap CI[95%]=0.0105; 0.0002); and c) a positive total effect (c=0.22, p=0.02; CI[95%]=0.04; 0.39). CONCLUSIONS: The combination of positive and negative effects throughout the mediation path of mental health perception of older individuals underlined that the maintenance of adequate level of physical activity could influence the body image and, in turn, positively impact mental health with advancing age. Supported by MIUR Grant 2010KL2Y73

426 Board #264 May 29 11:00 AM - 12:30 PM
Cardiorespiratory Fitness Moderates the Relation Between Years of Drug Use and Stress in Drug Abusers
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Substance use disorders (SUD) have increased worldwide and is currently a major global issue. In SUD, stress is linked to drug-seeking behaviors and greater rates of relapse. Physical activity has been related with increased self-esteem, mood and reduced stress levels in SUD. However, it remains unclear whether the relation between the time of drug use over the years and stress might be under influence.
of cardiorespiratory capacity. **PURPOSE:** This study investigated whether cardiorespiratory fitness has a moderate function over the relation between years of drug use and stress levels. **METHODS:** Six-two male SUD individuals (34.17±8.82years; 24.62±2.91m/kg²) have participated in the study. We took a collection of measures in one visit including: (1) anthropometric measures of height and weight to compute BMI; (2) self-reported demographics and drug use history, including years of drug use, days of abstinence, and number of hospitalizations; (3) a questionnaire to measure subjective emotional states; and (4) a shuttle run test to estimate the maximum consumption of oxygen (VO₂max). For this study, we tested a moderation analysis using the Macro PROCESS plugin for SPSS (Model 1), in which the independent variable was the years of drug use, the dependent variable was stress levels and the moderator was VO₂max. The moderation analysis was adjusted for age, days in abstinence, BMI and number of hospitalizations. **RESULTS:** It was found that VO₂max moderates the relation between years of drug use and stress levels (β=−0.81, p=0.04) and for those with higher VO₂max the relation was even more significant (β=−2.03, p<0.01). **CONCLUSION:** For those SUD individuals with an average and higher VO₂max, the negative relation between years of drug use and stress is more pronounced. Therefore, fitness level seems to have a protective effect over stress in SUD individuals, which may minimize the chances of relapse and enhance the rehabilitation process.

**427 Board #265 May 29 11:00 AM - 12:30 PM Identifying Mental Health Risks through Screening among Collegiate Ethnic-Minority Athletes**

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(No relevant relationships reported)

Ethnic minority student-athletes are under immense amounts of pressure to perform, meet academic requirements for scholarships, and maintain relationships with peers, coaches, and parents. A change in stressors can cause physiological disturbances and mental health disorders such as depression (DEP), eating disorders (ED), low self-esteem (LSE) and body image dissatisfaction (BID). **PURPOSE:** To examine the prevalence of DEP, ED, LSE, and BID in ethnic minority student-athletes. A secondary purpose examined mental health risks across sex, academic status, and sport type. **METHODS:** Student-athletes (n=274) were recruited from multiple Ethnic Minority Universities to participate in an online study. Demographic information, Center for Epidemiologic Studies Depression Scale. Eating Attitudes Test. Rosenberg Self-Esteem Scale, and Standard Figural Stimuli were completed. **RESULTS:** Overall prevalence was 31.8% for DEP, 18.1% for ED, and 8.4% for LSE. Chi-square analysis revealed no significant differences between mental health risks and sex, academic status and sport type. A 2 sex (female, male) x 2 clothing type (daily clothing, competitive uniform) x 2 perceptions (perceived, desired) repeated measures ANOVA indicated a main effect (P<0.01) with significant interactions for perceptions (F1,208 = 4.586, P<0.03, n²=0.022) and perceptions by gender interactions (F1,208 = 7.384, P<0.007, n²=0.034). Body image results revealed female athletes desired to be smaller than their perceived image in both daily clothing and uniforms, whereas males desired to be larger. A 2 sex x 3 meta-perceptions (peers, parents, coaches) x 2 perceptions repeated measures ANOVA indicated a main effect (P<0.01) with significant interactions between perceptions by gender (F1,208 = 5.896, P<0.016, n²=0.028), meta-perceptions by perceptions (F1,208 = 2.382, P<0.001, n²=0.037), and perceptions by meta-perceptions and gender (F,1416 = 4.923, P<0.009, n²=0.023). **CONCLUSIONS:** Although no significant associations were found for gender, academic status or sport type, both male and female athletes demonstrated a high risk of DEP, ED, BID, and a lower risk for LSE. Future research is necessary to further examine mental health risks, screening, prevention strategies, and intervention in ethnic minority student-athletes.

**428 Board #266 May 29 11:00 AM - 12:30 PM Prevalence of Low Self-esteem and Weight Pressures among Collegiate Male Athletes**

Nicole C. Prunich, Toni M. Torres-McGehee, Allison B. Smith, Samantha R. Weber, Eva Monsma. University of South Carolina, Columbia, SC. 

(No relevant relationships reported)

Previous studies have examined mental health disorders in female athletes, but very few have examined the prevalence of signs and symptoms of sub-clinical mental health conditions (i.e., low self-esteem [LSE], and weight pressures [WP]) in male athletes. Understanding these sub-clinical mental health conditions may aid in preventing mental health disorders. **Purpose:** Examine the prevalence of low self-esteem (LSE) across academic status and the effects LSE on weight pressures (WP) in sport among male collegiate athletes. **Methods:** As part of a larger study, collegiate male athletes (n=238; age: 19.7±1.3 years; males: n=234, height: 184.3±7.5 cm, weight: 91.5±19.4 kg) were recruited over a 3-year period from a NCAA Division I Institution. Demographics, information (e.g., age, self-reported height, self-reported weight, ideal weight, mental weight, sex, academic status, and sport type), the Rosenberg’s Self-Esteem scale, and the Weight Pressures in Sports-Males surveys were collected via SurveyMonkey. Cross tabulations and chi square analyses examined the relationship and distribution of general weight pressures, LSE and WP with different academic status. One way ANOVA examined LSE risk and WP Total score and subscales. **Results:** A total of 95 athletes (39.9%) reported feeling pressure to change their weight and/or eating habits for their sport and 18.5% (n=44) revealed they felt pressured to meet a target weight with routine weigh ins. More specifically, athletes wanted to weigh 2.4±0.4 kg more than their current weight. Overall, Prevalence of LSE for all male athletes was 9.4% (n=22). No differences were found between academic status and prevalence of LSE, WP total score, Coach/Teammate Pressure subscale and Appearance Pressure subscale. Significant differences were found between Coach/ Teammate Pressure subscale and LSE prevalence (LSE risk: 2.6±0.86 vs. Not at Risk: 2.9±0.86, P=0.019). **Conclusion:** Although there was a relatively low number of male athletes at risk for LSE, male athletes still displayed weight pressures for their sport. Healthcare professionals working with male athletes need to be aware of these sub-clinical mental health concerns to ensure that prevention and treatment can occur before the onset of issues such as eating disorders and depression.

**429 Board #267 May 29 11:00 AM - 12:30 PM Characterization of Potential for Relationship between Anxiety and Cardiovascular Health in Different Racial Groups**

Zana B. Lee¹, Emily N. Blaszikow¹, Rachel L. Dickinson¹, Clara N. Baker², Emily H. Reeve³, Kevin M. Gill³, Mattison L. O’Brien¹, Concetta M. Magliochetti¹, Christopher S. Pak¹, Amber N. Orle³, Megan A. Carty³, Lindsay J. Rush³, Brielle S. Clarke³, Emily E. Ruch³, Paige E. DeAlba³, Rachel L. Coleman³, Allyson K. Getty³, Cassandra C. Derella³, Avery N. Perez³, Joyann E. Oakman¹, Vanessa V. Volpe³, Michael D. Brown, FACSM⁴, Deborah L. Fearhaller, FACSM⁴. ¹Urussels College, Collegeville, PA. ²Washington University School of Medicine, St. Louis, MO. ³Augusta University, Augusta, GA. ⁴National Institutes of Health Clinical Center, Bethesda, MD. ⁵Temple University, Philadelphia, PA. ⁶Auburn University, Auburn, AL. (Sponsor: Micheal Brown, FACSM)

(No relevant relationships reported)

There are a multitude of factors that contribute to cardiovascular (CV) health. Psychosocial factors contribute to CV risk, and anxiety is one of the psychological disorders diagnosed in CV patients. It is unclear whether there is a potential relationship between inflammation and anxiety. **PURPOSE:** 1) To compare CV health between Caucasian (C) and Mixed-Race (MR) adults, and 2) to explore the relationship between anxiety levels and CV health measures across these populations. This pilot study is the first step in our clinical trial to investigate the relationship between anxiety measures and CV risk factors across racial differences. **METHODS:** Thirty-two young adults (C: N=16, 22.94±7.4; MR: N=16, 22.81±7.51 yrs) underwent 3 health visits. First, CV health was assessed by fasting glucose, lipids, blood pressure (BP), carotid artery intima media thickness (IMT), body fat (BF) measured by bioelectrical impedance, and flow-mediated dilation (FMD). At the second visit, ECG, clinic BP and VO₂max were measured. Anxiety measurements using the DASS-21 scale are ongoing. **RESULTS:** Pilot data on physiological outcomes show no differences between groups. Compared to C adults, the adults in MR group show a small trend towards having worse CV profiles. In the MR group, we found higher levels of cholesterol (156.4±27.2 vs. 144.2±36.6 mg/dL), BF (31.1±9.7 vs. 28±9.2 %), and lower levels of FMD (7.1±4.3 vs. 8.7±4 %) and VO₂max (42.9±6.8 vs 38.65±10.6 ml/kg-min). Within groups, we found significant (p=0.05) race-related relationships between several variables. In C, we found an inverse relationship between IMT and HDL (R=-0.654). In MR, we found an inverse relationship between BF and FMD (R=0.832), and BF and HDL (R=0.836), and BF and VO₂max (R=0.741). Also, we found direct relationships between BF and glucose (R=0.834) and BF and DBP (R=0.751). Data from DASS-21 is being analyzed by groups. **CONCLUSION:** We found relationships with BF in the MR group that did not exist in the C group. Considering that literature suggests that young adults of color tend to have higher levels of anxiety, we hypothesize that we will find relationships between anxiety and CV measures in the MR group that are different than that in the C group. **WEDNESDAY, MAY 29, 2019**

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MEDICINE & SCIENCE IN SPORTS & EXERCISE®
A-55  Exercise is Medicine®/Poster - EIM - Mental Health

Wednesday, May 29, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

430  Board #268  May 29 11:00 AM - 12:30 PM
Effect Of Aerobic Exercise On Depression In Rats: Role Of Mitophagy
Lu Wang, Yingying Lv, Wenqian Deng, Xue Li, Yu Jin. Chengdu Sports Institute, Chengdu, China. (Sponsor: Tongjian You, FACSM)
(No relevant relationships reported)

Abstract:
Depression is a common health problem and a major cause of agrypnia and disability. Recent evidence supports an anti-depressive effect of aerobic exercise on unpredictable chronic mild stress (UCMS)-induced depression in rats; however, the biological mechanism remains to be investigated.

Purpose: To investigate whether aerobic exercise could improve UCMS-induced depression and alter mitophagy in depressive rats.

Method: Thirty-six male Sprague-Dawley rats were randomly divided into three groups: a control group (Con, n=12), a UCMS-induced depression group (UCMS, n=12), and a UCMS-induced depression plus aerobic exercise group (UCMS+E, n=12). After 4 weeks of UCMS stimulation, rats in the UCMS+E group carried out 3 weeks (60 min/day) of swimming exercise. A sucrose preference test (SPT) was performed, and the content of 5-hydroxytryptamine (5-HT) was measured to verify whether the depression model was successful. A Morris water maze (MWM) test was used to evaluate spatial learning and memory ability. The expression levels of mitophagy-related proteins (Beclin 1, LC3-I, LC3-II and P62) were determined by Western blot. Statistically significant group differences were assessed by using one-way ANOVAs and post-hoc tests.

Results: Based on the change of sucrose consumption and the expression level of 5-HT following UCMS treatment, the depression model was successfully established in the rats. Spatial learning and memory ability were lower in the UCMS group than the Con group (both p<0.05), but improved in the UCMS+E group (both p<0.05). According to the Western blot results, the expression levels of Beclin 1 (Con: 0.37±0.02, UCMS: 0.26±0.04, UCMS+E: 0.43±0.07) and P62 (Con: 0.34±0.03, UCMS: 0.20±0.02, UCMS+E: 0.31±0.05), as well as the LC3-II/LC3-I ratio (Con: 0.36±0.05, UCMS: 0.19±0.04, UCMS+E: 0.33±0.04) were significantly lower in the UCMS group than the Con group (all p<0.05), but were significantly higher in the UCMS+E group than the UCMS group (all p<0.05).

Conclusion: This study suggests that rats with UCMS-induced depression presented alterations in mitophagy. Three weeks of aerobic exercise significantly up-regulated mitophagy in depressive rats. Therefore, mitophagy may play an important role in the biological mechanism underlying the anti-depressive effect of aerobic exercise.

431  Board #269  May 29 11:00 AM - 12:30 PM
Exercise And Physical Activity Promotion Improves Cardiorespiratory Fitness, Symptoms Of Disease And Well-being In Patients With Schizophrenia
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(No relevant relationships reported)

Patients suffering from Schizophrenia (SZ) show low fitness, a sedentary lifestyle and comorbidities like diabetes and cardiovascular diseases, resulting in 20 years less of life expectancy.

Purpose: To evaluate the impact of an intervention combining exercise and physical activity promotion (PAP) on cardiorespiratory fitness (CRF), severity of SZ, symptoms of disease and well-being.

Methods: 35 patients were randomized into an intervention group (n=19, aged 39.0 ± 13.6 years, BMI 28.3 ± 7.3) or control group (n=16, aged 36.0 ± 9.3 years, BMI 25.7 ± 5.2), directly after inpatient treatment for SZ. Intervention included two sessions of high intensity indoor cycling (IC), each 45min, and one session of PAP (60min) per week for three months. In months 4-6, the intervention was reduced to one session IC and one session PAP per week. The control group received a psychologically ineffective control intervention. Measurements were conducted at baseline (t0), after three (t1) and 6 months (t2) of intervention, and after 12 months (six-month follow up, t3).

Results: The intervention improved significantly severity of SZ (t0: 55.4 ± 16.3, t2: 34.8 ± 3.3, p<.05), well-being (t0: 50.4 ± 10.1, t2: 60.5 ± 7.1, p<.05) and psychological distress (t0: 159 ± 47.4, t2: 119.8 ± 34.3, p<.05). CRF, patients were able to improve their physical capacity, expressed as W/kg (t0: 1.85 ± 0.6, t2: 2.13 ± 0.6, p<.05), but did not significantly improve their peak oxygen uptake. Changes in BMI was min/kg (29.0 ± 7.0, t2: 30.5 ± 8.7, n.s.). Six months after the intervention, only improvements in severity of SZ, well-being and psychological distress remained statistically significant (PANSS: 38.0 ± 9.0, SF-36: 59.2 ± 8.0, SCL-90: 119.2 ± 36.6, all p<.05).

Conclusion: Exercise and PAP significantly improves CRF, severity of SZ, well-being and psychological distress in SZ patients. Effects on CRF are declining shortly after the end of the intervention. We recommend the implementation of exercise and PAP into the post-acute care of SZ patients. Moreover, it is necessary to further strengthen the sustainability of effects with respect to CRF, in order to prevent fall-backs and health detriments caused by low physical fitness.

432  Board #270  May 29 11:00 AM - 12:30 PM
Fitness, Fatness And Survival In Older Adults With Intellectual Disabilities. Which One Is Key?
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(No relevant relationships reported)

Older adults with intellectual disabilities have very poor physical fitness levels. Additionally, overweight and obesity are highly prevalent in this population, even more prevalent than in the general population. Both fitness and fatness have been found related to survival in the general population. To improve healthy ageing and survival of older adults with intellectual disabilities we need to know which problem requires our main focus.

PURPOSE: To determine whether fitness or fatness is more important for survival in older adults with intellectual disabilities. METHODS: As part of the Healthy Ageing and Intellectual Disabilities (HAID) study, fitness (comfortable gait speed) and fatness (Body Mass Index) of 874 older adults with intellectual disabilities (≥ 50 years; 61.4 ± 7.8 years) was measured at baseline. All-cause mortality was collected over a 5-year follow-up period. The relationship between fitness, fatness, and survival was analysed with Kaplan-Meier curves and Cox proportional hazard models.

RESULTS: Fitness was significantly related to survival (HR = 0.21, 95% CI = 0.09 - 0.48, p < 0.001), while fatness was not related to survival. People who were unfit and fat were 4.6 (95% CI = 2.0 - 10.7) times more likely to die, and people who were unfit and not fat were 3.6 (95% CI = 1.7 - 7.5) times more likely to die within the follow-up period, than people who were fit, regardless of their fatness. CONCLUSIONS: Being fit is key for survival in older adults with intellectual disabilities. Our results therefore do not support the emphasis seen in research and practice on reducing weight. The focus should primarily be on improving the fitness of older adults with intellectual disabilities to improve healthy ageing and survival.

433  Board #271  May 29 11:00 AM - 12:30 PM
The Effect Of Moderate-intensity Physical Activity On Biopsychosocial Factors Among Veterans With Symptoms Of Ptsd
Michelle Bateman1, Jamie C. Clark2. 1Oklahoma State University, Stillwater, OK. 2University of Central Oklahoma, Edmond, OK.
(No relevant relationships reported)

Physical activity has been shown to have a positive impact on biopsychosocial variables among individuals who may be experiencing symptoms related to PTSD.

PURPOSE: The purpose of this study was to evaluate the impact of a moderate-intensity physical activity regimen on aerobic endurance, barriers to accessing health care, and symptom severity of PTSD among military veterans.

METHODS: Participants of this study (n=4) engaged in a 4-week physical activity regimen that met two times per week. The dependent variables were aerobic endurance, measured with the Cooper 12 Minute Walk test, barriers to accessing health care, measured with the B-55, and symptoms of PTSD, measured with the PCL-5. RESULTS: Pedometer, resting heart rate and psychological test scores were utilized to analyze data. There were statistically significant differences for all dependent variables at the post-assessment level, indicating statistically significant improvements in the PCL-total score (p<0.02), BACE-total score (p<0.03), BACE-stigma score (p<0.02), VO2 max (p<0.04), and METs (p<0.04). CONCLUSION: Researchers concluded that a moderate-intensity physical activity regimen may be effective at improving aerobic endurance, perceived barriers to accessing health care, and symptom severity of PTSD among military veterans. Future studies should aim to increase sample size and utilize a laboratory grade assessment for capturing changes in VO2 max and METs. Additionally, future
research should aim to investigate the dose-response effect on dependent variables based on varying physical activity intensity levels, duration of intervention, and the duration of acute bouts of physical activity.

**Purpose:** The aim of this study is to evaluate the impact of physical activity (PA) on academic performance. Several studies have already confirmed the importance of physical activity for the life quality and health. Several health problems can be avoided with the regular practice of PA, which is why it can be said that “exercise is medicine”. The question in this work is to seek key points in order to evaluate whether PA positively impacts academic activity. Will the practice of PA bring a positive impact on academic performance, will it entail a higher grade point average (GPA)? The final objective will be to present a framework with potentially impacting variables, within an physiological elements.

**Methods:** An initial research was done on academic bases to raise academic articles on the subject. The base consulted was PubMed. Keywords used were physical activity and academic performance. There was no concern in evaluating studies relating PA and health, because we assumed such a relationship as true in this review.

**Summary of Results:** From a physiological standpoint there are some important studies showing the impacts on cognitive and motor functions coming from the practice of PA. Through a dynamic interaction, regular PA can lead to a cerebral capillary growth, with the increase in blood flow and oxygenation. The growth of nerve cells in the hippocampus, that have a great function as a center of memory and learning, is another important effect of PA. The production of new connections, with the increase of density of neural network could have a positive impact in attention, cognition and academic performance.

**Conclusion:** There are good reasons to be physically active. Including reducing developing heart disease and diabetes, for example. So, it’s possible to say: Exercise is medicine. It’s a good point you can be health, lose weight, lower your blood pressure. But, maybe we have another one great reason to be physical active. Some studies show us that physical activity can improve academic performance and it’s great. You can be health, feel better and improve your GPA.

**Purpose:** Global cognitive function is associated with increased physical activity, physical frailty is associated with increased risk of Alzheimer’s disease (AD), and can predict future cognitive decline in adults. We performed an exhaustive literature review and meta-analysis of the effects of physical activity on cognitive functions in adults with AD and dementia, based on the published clinical data.

**Methods:** We applied novel clinical data extraction and aggregation technologies developed by MedAware Systems, Inc. It is a patent-pending process where two scientists, blinded to each other, extract data from the same study. Intelligent software compares each data field for matches (or mismatches). A senior scientist reconciles data mismatches. Where pre- and post-treatment outcome data are available, standardized mean differences are calculated as the MedAware Standardized Index of treatment effect (MSI-E). This methodology is used to capture the published literature, with physical activity as the treatment mechanism for MH than traditional methods (e.g., medication, psychotherapy). **CONCLUSIONS:** This study expands upon previous stigma literature by emphasizing the discrepancies between physical and mental health stigmas. Additionally, these findings suggest physical activity as a viable option to circumnavigate MH stigmas in first responders and military personnel.

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Supported by MedAware Systems, Inc.
Students Attending a Diverse University

Sharon Jalene, Jennifer Pharr, Brach Poston. University of Nevada Las Vegas, Las Vegas, NV.
Email: sharon.jalene@unlv.edu

Purpose: The purpose of the study was to determine the association between estimated cardiovascular fitness ($c$CRF) and moderate to severe depression (MS_DEP) in college students. The relationships between MS_DEP and age, sex, race, sexual/gender orientation, and grade point average (GPA) were examined.

Methods: This cross-sectional study occurred at a public university via electronic survey. Participants ($n=438$) reported their age, height, weight, race, sex, sexual orientation, GPA, resting heart rate, exercise habits (frequency, intensity, and duration), and completed the Patient Health Questionnaire (PHQ-9), a standard depression survey. A validated regression model (Nes et al., 2011) was used to calculate $c$CRF (ml/min/kg). The difference between $c$CRF and age-predicted CRF was used for analyses. Chi square and independent t-tests determined differences in demographic characteristics between students who reported MS_DEP and students who reported no depression. For odds ratio analyses, MS_DEP was dichotomized (yes/no) and fitness was categorized as FIT (reference), LOW-FIT, and HIGH-FIT. The reference (FIT) represented those with $c$CRF within +/- 1, LOW-FIT was <1, and HIGH-FIT >1 of their age-estimated CRF.

Results: Chi square analyses indicated fit individuals (age-predicted CRF) were less likely than unfit (age-predicted CRF) to have MS_DEP (36.4% vs. 63.6% respectively) ($P=0.02$). Belonging to a sexual gender minority (SGM) ($P=0.01$) or to the Hispanic race ($P=0.04$) were also significant for MS_DEP. Tests revealed that individuals who reported depression were more likely to be younger ($P<0.04$) or have a lower GPA ($P=0.01$) than those who reported no depression. Odds ratio analyses found that those with LOW-FIT were 2.39 times more likely to report MS_DEP when compared with the reference (95% CI=1.17-4.87). HIGH-FIT compared with FIT was not significant.

Conclusion: Students with low fitness are at a higher risk for depression. However, fitness above age-predicted CRF did not decrease susceptibility indicating that an age-appropriate level of fitness is sufficient to reduce depression risk. Also, Hispanic, SGM, and younger students may be more vulnerable. Those with depression have a lower GPA. Estimated CRF could provide a simple method to identify students at-risk for depression.

Abstracts were prepared by the authors and printed as submitted.
Increasing evidence implicates exercise as a front-line adjuvant therapy for the treatment of nearly all forms of chronic pain. Knowledge of efficacious dosing respective to exercise type and pain condition is extremely limited in the literature. This leaves both clinicians and patients less informed with regard to the best practice.

**PURPOSE:** To determine the optimal dose of moderate intensity treadmill walking necessary to reduce pain and improve health in humans with chronic pain. **METHODS:** One group was screened, 40 female participants (21.6±4.0 yrs) were pseudo-randomized into 1 of 4 groups: control (no exercise), low dose exercise (3x/wk), moderate dose exercise (5x/wk) and high dose exercise (10x/wk). Over a 7-day period, participants performed moderate intensity walking on a treadmill during assigned exercise days (days 1-5). Quantitative measures of pain were measured at baseline (day 0), 5- and 30-min post intervention on days 1, 3, and 5 and 24 hrs post-final intervention session (day 6) via a visual analog scale (VAS). Subjects also rated the intensity and unpleasantness of both thermal and pressure sensitivity thresholds to painful thermal stimulation and painful pressure stimulation.

Subjects also rated the intensity and unpleasantness of both thermal and pressure stimuli qualitatively on a visual analog scale (VAS). **RESULTS:** One-way ANOVA revealed a significant analgesic effect of treatment for constant pressure pain intensity (F(1,36)=6.2, p<0.01) and constant pressure pain unpleasantness rating (F(1,36)=6.4, p<0.01) as measured by VAS. Tukey post-hoc tests showed significant differences between the control and moderate dose groups (157.6±20.8 vs. 49.6±6.9%baseline, p<0.01) and control and high dose groups (157.6±20.8 vs. 67.3±25.8%baseline, p<0.01) for constant pressure pain unpleasantness rating and significant differences between control and moderate dose groups (127.9±19.3 vs. 46.6±9.4%baseline, p<0.01) and control and high dose groups (127.9±19.3 vs. 46.6±14.6%baseline, p<0.01) for constant pressure pain unpleasantness rating. **CONCLUSION:** In healthy adults, we have identified a dose response of exercise-induced analgesia. Our study suggests that a low dose of exercise is insufficient to induce analgesia. The moderate dose of exercise may be an appropriate starting dose for exercise-based adjutant pain therapy. Future studies include applying these results and techniques in chronic pain groups. Some of the most debilitating symptoms of fibromyalgia (FM) include widespread chronic pain (WCP), sleep disturbances (SD) and chronic fatigue (CF) all that negatively impact health status (HS) in individuals with FM. Yet, there’s a lack of effective self-management exercise interventions capable of alleviating FM symptoms.

**PURPOSE:** To examine the efficacy of a 10-week daily practice qigong program on WCP, SD, CF, and HS in individuals with FM. **METHODS:** 20 individuals with FM were randomly assigned to one of two groups with participants blinded to the intervention allocation. The experimental group learned, and practiced mild body movements synchronized with deep diaphragmatic breathing and meditation. The control group learned and practiced only the mild body movements (same movements as the experimental group). Both groups were asked to practice the interventions for 10-week, two times per day at home plus one weekly group practice with a qigong instructor. Clinical assessments collected at baseline and upon completion of the intervention were: Short-Form McGill Pain Questionnaire, a visual analog scale for pain graded from 0 (no pain) to 10 (worst possible pain), Pressure Pain Threshold measured by a dolorimeter, the Pittsburg Sleep Quality Index and the Revised Fibromyalgia Impact Questionnaire. WCP score comparisons were made using MANOVA. SD, CF and HS were compared with t-tests. **RESULTS:** The experimental group experienced greater clinical improvements when compared to the control group with the mean scores decreases for WCP SD, CF, and HS all being statistically significant at p<0.05. Within group analysis revealed that the experimental group improved WCP by 35% (p<0.01), SD by 34% (p<0.01), CF by 30% (p<0.05) and HS by 31% (p<0.01). The control group only presented significant improvement in HS by 21% (p<0.05). **CONCLUSION:** Daily practice of Qigong might have a positive impact on the main FM symptoms that is beyond group interaction and solely mild exercise.
The role of exercise to prevent SUD, and as a component of conventional treatment for Use Disorder physical activity as the independent variable, withdrawal symptoms, behavioral tobacco and alcohol-dependent population, mainly taking exercise intervention or health, pharmacology and sports science, etc. The research hotspots focused on classical literature, etc. by using CiteSpace, as a mean of visualization. The purposes study analyzed the annual output quantity, country/region, high-yield authors, subject dependence“ from 1991 to 2018 included in WOS core collection database, this Based on the 542 articles with the theme of “exercise intervention and drug recovery, reduce symptoms of Post-Acute Withdrawal Syndrome and to mitigate early training coupled with aerobic exercise can be a useful adjuvant to potentiate early Post-Acute Withdraw Syndrome in clients with SUD, and is should be considered an important adjunct to treatment.

Conclusion: Exercise significantly reduces the symptoms of Acute Post-Withdrawal Syndrome in clients with SUD, and is should be considered an important adjunct to treatment.
CONCLUSIONS: Results support the positive influence of exercise behavior on QOL. Using the healthcare system to assess PA behavior, such as including exercise as a vital sign, is a strategy that will enable providers to refer and deliver an EAT approach. Future research should include comparison of PA behavior as well as exercise program visits with specific chronic diseases and QOL.

METHODS: Fifteen veterans were randomly assigned to either the intervention (n=9) or control group (n=6). The intervention group received a cooled compression exercise system on markers of physical and emotional function in veterans.

RESULTS: Two-tailed T-tests were performed on the data. Sleep quality improved indicating this may be beneficial for addressing emotional and sleep dysfunctions. Combinations of low-pressure compression exercise and cooling have shown elevated growth hormone and testosterone and depressed nighttime cortisol, has shown elevated growth hormone and testosterone and depressed nighttime cortisol, indicating this may be beneficial for addressing emotional and sleep dysfunctions. Decreases in pain, (9.15±6.87 vs 5.57±3.74, p=0.0030), with 25% resolving below clinical delineation.

CONCLUSION: These findings suggest that the combination of cooling and compression exercise may be an effective intervention method to address symptoms of fatigue, and depression.
Purpose: To assess the feasibility and acceptability of two common types of exercise training—high-intensity interval training (HIIT) and moderate-intensity continuous training (MCT)—in adults with Crohn’s disease (CD).

Methods: In this mixed-methods pilot trial, participants with quiescent or mildly active CD were randomly assigned 1:1:1 to HIIT, MCT, or control (usual care). The HIIT and MCT groups were offered three exercise sessions per week for the first 12 weeks and followed up for 6 months. Feasibility outcomes included rates of recruitment, retention, outcome completion, and exercise attendance. Data were collected on cardiorespiratory fitness (e.g., peak oxygen uptake), disease activity, fatigue, quality of life, adverse events, and intervention acceptability (via interviews).

Results: Over 17 months, 53 patients were assessed for eligibility and 36 (68%) were randomised (47% male; mean age 36.9 ± 11.2 years). 13 to HIIT, 12 to MCT, and 11 to control. The overall exercise session attendance rate was 68% (608/891), and 64% (16/25) of participants completed at least 24 of 36 sessions. One participant was lost to follow-up. Outcome completion rates ranged from 89 to 97%. The mean increase in peak oxygen uptake, relative to control, was greater following HIIT than MCT (2.4 ± 0.7 vs. 0.7 mL/kg/min). There were three non-serious exercise-related adverse events, and two exercise participants experienced disease flare-ups during intervention.

Conclusions: The findings support the feasibility and acceptability of the exercise programmes and trial procedures. A definitive trial is warranted. Physical exercise remains a potentially useful adjunct therapy in CD.

Support: CUKC Grant SP2015/1.

Purpose: Renal transplant recipients (RTR) are at elevated cardiovascular mortality in comparison with the general population especially after surgical treatment. Literature supports the role of supervised exercise intervention, however few data are available on home-based exercise programmes and trial procedures. A definitive trial is warranted. Physical exercise remains a potentially useful adjunct therapy in CD. Support: CUKC Grant SP2015/1.

Exercise has been shown to improve the health of persons living with HIV.

Purpose: Identify the effects of a community-based exercise program on the immunity (CD4 cell count) and overall fitness (cardiovascular and strength) in individuals living with HIV in San Juan, Puerto Rico.

Methods: Twenty-five adults with HIV age 39.2 ± 1.7 years participated in this study. All participants were recruited by word of mouth to a Community Based Exercise Program (La Perla de Gran Precio). A Certified Personal Trainer performed all the exercise testing. Cardiovascular fitness was assessed using a submaximal treadmill test (Ross). Strength was assessed by determining the 1 repetition maximum (1RM) for bench press and leg press and the maximum number of push-ups and sit-ups that could be completed in 1 minute. Flexibility was tested using the Sit and Reach Test. Participants were asked to bring in the most recent lab for the CD4 data. This same evaluation was administered three times to track each participant's progress over a year.

Results: A repeated measures ANOVA was used to determine whether there was a statistically significant mean difference in CD4 count, cardiovascular fitness (time to exhaustion during submaximal treadmill test), and 1RM for bench press and leg press compared to baseline. Statistical significance was set at p < 0.05.

<table>
<thead>
<tr>
<th>RTR n = 30</th>
<th>RTR T0</th>
<th>RTR T6</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>70.6±15.6</td>
<td>70.7±15.3</td>
<td>0.830</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>24.3±3.8</td>
<td>24.9±4.4</td>
<td>0.631</td>
</tr>
<tr>
<td>Creatinine (mg/dL)</td>
<td>1.5±0.5</td>
<td>1.5±0.7</td>
<td>0.808</td>
</tr>
<tr>
<td>Urea (mg/dL)</td>
<td>66.0±26</td>
<td>71.0±43</td>
<td>0.787</td>
</tr>
<tr>
<td>Cholesterol (mg/dL)</td>
<td>187.0±55.7</td>
<td>194.7±47.8</td>
<td>0.688</td>
</tr>
<tr>
<td>HDL (mg/dL)</td>
<td>54.9±22.4</td>
<td>54.1±16.0</td>
<td>0.218</td>
</tr>
<tr>
<td>LDL (mg/dL)</td>
<td>130.6±95.0</td>
<td>134.5±93.0</td>
<td>0.655</td>
</tr>
<tr>
<td>Triglycerides (mg/dL)</td>
<td>198.1±152.4</td>
<td>193.3±127.6</td>
<td>0.951</td>
</tr>
<tr>
<td>Glucose (mg/dL)</td>
<td>1.01±0.25</td>
<td>0.94±0.25</td>
<td>0.550</td>
</tr>
</tbody>
</table>

Board #289 May 29 11:00 AM - 12:30 PM
High-Intensity Interval Training And Moderate-Intensity Continuous Training In Adults With Crohn’s Disease: A Pilot Trial
Garry Tew1, Dean Leighton2, Roger Carpenter3, Simon Anderson4, Louise Langmead5, John Ramage6, James Faulkner1, Elizabeth Coleman1, Caroline Fairhurst7, Michael Seed8, Lindsay Bottoms9. Northumbria University, Newcastle-upon-Tyne, United Kingdom. 2Queen Mary University of London, London, United Kingdom. 3University of East London, London, United Kingdom. 4Gys’s and St Thomas’ NHS Foundation Trust, London, United Kingdom. 5Barts and the London NHS Trust, London, United Kingdom. 6Hampshire Hospitals NHS Foundation Trust, Basingstoke, United Kingdom. 7University of Winchester, Winchester, United Kingdom. 8University of York, United Kingdom. 9University of Hertfordshire, Hatfield, United Kingdom. (Sponsor: Prof Glyn Howatson, FACSM)

Purpose: From a large cohort of 60 RTR, 30 RTR were randomly selected and assigned 1:1:1 to HIIT, MCT or control (usual care). The HIIT and MCT groups were offered three exercise sessions per week for the first 12 weeks and followed up for 6 months. Feasibility outcomes included rates of recruitment, retention, outcome completion, and exercise attendance. Data were collected on cardiorespiratory fitness (e.g., peak oxygen uptake), disease activity, fatigue, quality of life, adverse events, and intervention acceptability (via interviews).

Results: Over 17 months, 53 patients were assessed for eligibility and 36 (68%) were randomised (47% male; mean age 36.9 ± 11.2 years). 13 to HIIT, 12 to MCT, and 11 to control. The overall exercise session attendance rate was 68% (608/891), and 64% (16/25) of participants completed at least 24 of 36 sessions. One participant was lost to follow-up. Outcome completion rates ranged from 89 to 97%. The mean increase in peak oxygen uptake, relative to control, was greater following HIIT than MCT (2.4 ± 0.7 vs. 0.7 mL/kg/min). There were three non-serious exercise-related adverse events, and two exercise participants experienced disease flare-ups during intervention.

Conclusions: The findings support the feasibility and acceptability of the exercise programmes and trial procedures. A definitive trial is warranted. Physical exercise remains a potentially useful adjunct therapy in CD.

Support: CUKC Grant SP2015/1.

Board #290 May 29 11:00 AM - 12:30 PM
The Effect Of Traditional Chinese Exercise On early Diabetic Nephropathy
Jing Li1, Tongtong Gao1, Mian Jia1, YiYun Jiang1. Dongzhimen Hospital of Beijing University of Chinese Medicine, Beijing, China. 2World Federation of Chinese Medicine Societies, Beijing, China. 3Beijing Pingshu Hospital of Traditional Chinese Medicine, Beijing, China. (Sponsor: NatashaLee@163.com)

Purpose: It was reported that early diabetic nephropathy (DN) is associated with sedentary lifestyle, and proper exercise can improve its symptoms and prognosis. However, limited data evaluated the effects and safety of traditional Chinese exercise in patients with early DN. This study was aimed at observing the effects and safety of traditional Chinese exercise on early DN.

Methods: Participants (n=21) were divided into the traditional Chinese exercise group (A group, n=12) and the control group (B group, n=9) for 12 weeks. On the basis of foundation treatment, group A was given the exercise 30 minutes per day, 4 times a week while no exercise intervention was given in group B. Fasting blood glucose, glycated hemoglobin (HbA1c), serum creatinine, urea, and the MUNSH scale were measured at baseline and 12 weeks later.

Results: 1) Significant differences were found in group A in HbA1c (6.90±0.92 vs. 6.43±0.78, P<0.05), BMI (26.30±3.49 vs. 25.83±3.06, P=0.05) and VO2peak (15.43±1.49 vs. 16.14±1.89, P<0.05) compared with group B (Ps<0.05). The differences of MUNSH scale were significantly greater: positive emotion (6.75±3.14 vs. 7.92±2.97, P<0.01), positive (8.08±4.03 vs. 10.00±3.77, P<0.05), total score (32.67±11.28 vs. 38.33±12.27, P<0.01), 2) No adverse reactions were observed during the trial. Few changes were found in renal function and urinary protein in two groups (P>0.05).

Conclusions: Traditional Chinese exercise therapy was safe and effective in treating early DN patients. It also has effects on improving the physical and mental health. Supported by JHZX2015136.
completed and cardiac frequency), IRM bench press and leg press, the maximum number of push-ups and sit-ups that could be performed in 1 minute, and flexibility between evaluations. There was a statistically significant difference (p<0.05) between CD4 count from evaluation 1 (695±318.58) to evaluation 4 (945.57±433.12) and the most significant mean difference was noted between evaluation 1 (695±318.58) to evaluation 3 (932.85±408.42). The data showed the steady improvement in strength (bench press, leg press, push-ups, and sit-ups) occurred between evaluation 1 and evaluation 3; however, the gains were not statistically significant (p>0.05). Time completed during the submaximal test improved most between evaluation 1 and evaluation 2 but did not demonstrate the statistically significant mean difference (p>0.05).

CONCLUSION: Participation in a community-based exercise program can help significantly improve immune (increase CD4 count) in people with HIV. Therefore, clinicians should encourage people with HIV to participate in regular exercise and introduce them to community/recreational programs.

Non-alcoholic fatty liver disease (NAFLD) is the most frequent cause of liver disease with Non-alcoholic steatohepatitis (NASH) as a subtype showing lobular inflammation and ballooning as characteristic liver cell damage.

PURPOSE: Here we studied the impact of regular physical activity promoted and controlled by a novel Web-based approach on physical performance, liver inflammation, and histology. METHODS: We enrolled 44 Patients with NAFLD in a prospective, 8-week interventional single arm study with a 12-week follow-up period (NCT02526732). Peak oxygen uptake (VO2peak) was measured by spiroergometry (VCTE) were also measured after follow-up (T2). Training consisted out of combined endurance and strength exercise 3-5 times a week under qualified instruction. Via an online support platform, weekly bidirectional feedback was provided. Differences between groups were calculated by Mann-Whitney-U-rank test.

RESULTS: A total of 44 patients with NAFLD were assigned and 41 patients, including 29 patients with NASH, completed the study protocol. Median VO2peak increased significantly 6.6% from 27.0 ml/kg/min at T0 to 30.3 ml/kg/min (p<0.001) at T1. All laboratory values decreased significantly from T0 to T1 and T0 to T2. Median pressure measured by VCTE improved significantly from 7.4 kPa at T0 to 1.0 kPa (p<0.005) and also from T0 to T2 by 1.9 kPa (p<0.05). Interestingly, the subgroup of patients with NASH achieved better improvements of effect sizes for all measured parameters at all points in time. CONCLUSIONS: The current study demonstrates the feasibility and effectiveness of a Web-based individualized exercise program in patients with NAFLD. More severe liver inflammation and damage (NASH) does not compromise treatment effects. Sustained improvement in liver function tests and fibrosis marker support the concept of fibrosis resolution through decreasing hepatic inflammation during and following exercise intervention in this patient population.

Exercise is Medicine®: Physical Activity Prescriptions and Behavior During Pregnancy

Ariel A.B. Cruz1, Kara Whitaker2, Jennifer West1, Mark Stoutenberg3, Emily A. Weible1, Christopher P. Connolly1, Jennifer West1, Mark Stoutenberg3, Emily A. Weible1, Christopher P. Connolly1

1Washington State University, Pullman, WA. 2The University of Iowa, Iowa City, IA. 3Cabarrus Health, Kannapolis, NC.

Exercise is Medicine®: Physical Activity Prescriptions and Behavior During Pregnancy

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Exercise is Medicine®: Physical Activity Prescriptions and Behavior During Pregnancy

455 Board #293
May 29 11:00 AM - 12:30 PM
Web-based Individualized Exercise Intervention Improves Physical Performance and Hepatic Inflammation in Patients with NAFLD
Perikles Simon1, Yvonne Huber2, Daniel Pfrimmann1, Beate K. Straub3, Jörn M. Schattenberg. 1Institute for Sports Science, Johannes Gutenberg-University Mainz, Mainz, Germany. 2University Medical Centre, Johannes Gutenberg-University Mainz, Mainz, Germany. 3Institute of Pathology, Johannes Gutenberg-University Mainz, Mainz, Germany.

Email: simonpe@uni-mainz.de

456 Board #294
May 29 11:00 AM - 12:30 PM
Exercise is Medicine®: Physical Activity Prescriptions and Behavior During Pregnancy
Ariel A.B. Cruz1, Kara Whitaker2, Jennifer West1, Mark Stoutenberg3, Emily A. Weible1, Christopher P. Connolly1

1Washington State University, Pullman, WA. 2The University of Iowa, Iowa City, IA. 3Cabarrus Health, Kannapolis, NC.

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Minutes/week of physical activity were calculated, and providers were trained to provide physical activity prescriptions if the patient was not meeting current guidelines. Wilcoxon-Mann-Whitney tests were used to determine the association between healthcare provider PA prescription and self-reported physical activity from V1 to V2.

RESULTS: The frequency of PA assessment at visits decreased as pregnancy progressed (V1=82.1%; V2=45.9%). Median PA minutes reported increased from V1 (25.0 min/wk) to V2 (60.0 min/wk). Likewise, the percentage of pregnant women receiving a PA prescription decreased from visit to visit (V1=68.6%; V2=56.3%). Women who received a PA prescription reported a greater increase in PA from V1 to V2 (117 min/wk) compared to women who did not receive a PA prescription (72 min/wk) (p=0.001). However, only 18.1% of PA prescriptions were consistent with current PA guidelines at prenatal visits. CONCLUSIONS: PA among pregnant women appears positively influenced by PA prescriptions provided by healthcare individuals. Further training of healthcare providers is needed to increase the prevalence of prenatal exercise prescriptions consistent with PA guidelines.

457 Board #295
May 29 11:00 AM - 12:30 PM
Provider Advice on Weight Gain, Physical Activity, and Healthy Eating in Twin Pregnancies
Kara M. Whitaker1, Meghan Baruth2, Rebecca A. Schlaff3, Christopher P. Connolly1, Jihong Liu2, Sara Wilcox, FACSM4.

1University of Iowa, Iowa City, IA. 2Saginaw Valley State University, University Center, MI. 3Washington State University, Pullman, WA. 4University of South Carolina, Columbia, SC.

S98 Vol. 51 No. 5 Supplement
Table 1: Association Between Provider Advice on Gestational Weight Gain (GWG) and Compliance with the Institute of Medicine (IOM) Guidelines*

<table>
<thead>
<tr>
<th>Provider Advised GWG</th>
<th>GWG Below IOM Guidelines</th>
<th>GWG Above IOM Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted OR¹</td>
<td>95% CI</td>
</tr>
<tr>
<td>Below IOM guidelines</td>
<td>7.23</td>
<td>3.20, 16.33</td>
</tr>
<tr>
<td>Above IOM guidelines</td>
<td>0.64</td>
<td>0.07, 5.81</td>
</tr>
<tr>
<td>Within IOM guidelines</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Did not discuss</td>
<td>2.76</td>
<td>1.32, 5.78</td>
</tr>
</tbody>
</table>

*Due to differences in gestational age at delivery, a GWG ratio was calculated by dividing the lower and upper bounds of the IOM guidelines by 37 (guidelines created for women undergoing delivery ≥ 37 weeks gestation), to estimate GWG/week. The GWG ratios consistent with IOM guidelines for normal weight, overweight, and obese women were calculated as 1.00-1.46, 0.84-1.35, and 0.68-1.14 pounds per week, respectively.

1Model adjusted for maternal age at delivery, education, parity, twin type (dichorionic/diamniotic vs. dichorionic/monoamniotic or monochorionic/monoamniotic), assisted reproductive technologies (yes/no), and pre-pregnancy BMI category. Bolded values are statistically significant (p<0.05).

458 Board #296 May 29 11:00 AM - 12:30 PM Lifestyle and Exercise Interventions for Lumbopelvic Pain and Pelvic Floor Dysfunction: A New Protocol

Marc P. Bonis, Jenn Lormand, Christina Walsh. University of New Orleans, New Orleans, LA. (Sponsor: Mark Lofflin, FACSM)

Email: mbonis@uno.edu

(No relevant relationships reported)

PURPOSE: The purpose of this study was to evaluate whether a protocol that included the implementation of lifestyle modifications and a specialized exercise program would improve the symptoms of pelvic floor dysfunction and mild pelvic organ prolapse in women.

METHODS: The five-week IRB-approved study included 23 female subjects aged 43.0 ± 9.0 years (Mean ± S.D.) who exhibited symptoms of pelvic floor dysfunction as defined by 3 assessments (the Pelvic Floor Distress Inventory [PFQ]-7, the Oswestry Low Back Pain Disability, and the Pelvic Floor Impact [PFIQ-SF20] questionnaires). The study also included InBody570 body composition measurements, pelvic alignment assessments, diastasis recti assessments, and manual external pelvic floor muscle activation assessments. Participants were instructed in specific lifestyle modifications and participated in an exercise program over the course of seven live group sessions, 45 minutes each, led by one or both of the investigator clinicians. They were also taught to perform a home exercise program at least 5 days per week and completed compliance forms that were returned at the next live group session. The clinicians were a licensed physical therapist and a clinical exercise physiologist.

RESULTS: IBM SPSS version 24 statistical programming was utilized and non-parametric Wilcoxon “related-tems” analyses were employed. A 0.05 level of significance was applied. The study results of the pre- and post-values indicated significant improvements of lower back pain (Oswestry, z(23) = -3.67, p < .05), significant improvements of the quality of life subjective emotional gauge (PFDI-20, z(23) = -4.11, p < .05), and significant improvements of bladder, bowel, and prolapse symptoms (PFQI - 7, z(23) = -3.74, p < .05).

CONCLUSIONS: The study was highly labor- and time-intensive, and the sample was not large enough to eliminate statistical bias. However, the successful results warrant a continuation of the study to include 40 female volunteers with no modifications to the study’s protocol using the same clinicians. Researchers are currently recruiting volunteers to complete the study.

459 Board #297 May 29 11:00 AM - 12:30 PM Association Between Cognitive Function And Functional Capacity Of Patients With Peripheral Artery Disease

Juliana Ferreira de Carvalho1, Marília de Almeida Correia2, Paulo Longano3, Francielly Monteiro4, Nelson Wolosker5, Gabriel Grizzzo Cucato6, Raphael Ritti-Dias7, 'Hospital Israelita Albert Einstein, São Paulo, Brazil. 2Universidade Nove de Julho, São Paulo, Brazil. 3Hospital Israelita Albert Einstein, São Paulo, Brazil. (No relevant relationships reported)

Introduction: Patients with peripheral arterial disease (PAD) and symptoms of intermittent claudication present reduced mobility and decreased ability to exercise activities of daily living due to atherosclerotic plaques in the lower limbs that limit blood flow to the muscles. Because it is a systemic disease, PAD has been associated with cognitive decline, however, as far as functional impairment is related to cognitive impairment is still uncertain. Purpose: To analyze the association of cognitive function with the overall functional capacity and fragmented in three factors: walking speed, muscle strength and balance) of patients with PAD. Methods: Two hundred and nineteen patients with PAD and symptoms of intermittent claudication were submitted to the MoCA test to evaluate cognitive function. Functional ability was assessed by the Short Physical Performance Battery consisting of balance tests, sit-up and stand-up tests, and 4-meter walk test. For analysis of the association, the binary logistic analysis was used, using the sex and age adjustment of the patients. Results: There was no association between MoCA and sit-up (OR = -0.099, P = 0.780) as well as the test and balance (OR = -0.084, P = 0.832). The MoCA score was associated with performance on the test regardless of gender and age (OR = 1.186, P = 0.007). Despite the non-association in the first two tests, we found that cognitive function is associated with walking capacity. Conclusion: The cognitive function is associated with the ability to mobility in patients with PAD, based on these results we can assume that individuals physically active, yet affected by the disease, can slow cognitive decline.

460 Board #298 May 29 11:00 AM - 12:30 PM Correlates of Physical Activity in People With Heart Failure: Multivariable Analysis Based on REACH-HF Randomised Trials

Grace O. Diben1, Melvyn Hillsdon1, Hasnain M. Dalal1, Brad Metcalf1, Patrick Doherty2, Lars H. Tang3, Rod S. Taylor4, 1University of Exeter, Exeter, United Kingdom. 2University of York, York, United Kingdom. 3University of Southern Denmark and Odense University Hospital, Odense, Denmark.

Email: gd318@exeter.ac.uk

(No relevant relationships reported)

PURPOSE: To determine which patient demographics and patient reported outcomes (PROs) are associated with the average daily volume (ENMO) of accelerometer measured physical activity (PA) in people with heart failure (HF). METHODS: Baseline data was pooled from two studies which measured PA levels of people with both HF with reduced ejection fraction (HFrEF) and preserved ejection fraction (HFpEF) using 7-day wrist-worn accelerometry. Associations between PA volume, demographics and PROs were assessed using univariate linear regression. Variables with significant or close to significant associations (p<0.15) with PA were subsequently entered into multivariable stepwise regression models: (1) a demographic model, (2) a PRO model, (3) an overall model consisting of all closely associated variables (p<0.15), and (4) a final model consisting of all variables with p<0.05 identified in the demographic and PRO multivariable models. RESULTS: 245 participants were included in the analysis and had a mean daily PA volume of 17.8±6.6 mg, with no difference between HFrEF and HFpEF patients (t(242)=0.42, p<0.001). Univariate analysis showed age, body mass index (BMI), New York Heart Association (NYHA) class, ischaemic HF, NT-proBNP, living alone, chronic renal impairment, number of comorbidities, number of cardiovascular-metabolic comorbidities, incremental shuttle walk test (ISWT) distance, HEART QoL, global and physical scores, EQ-5D-3L, MLHFQ overall, physical and emotional scores, and HAD depression scores were significantly associated with PA volume (p<0.05). The overall multivariable analysis (3) showed that age, BMI, being employed, currently smoking, NT-proBNP and ISWT peak distance had the strongest association with PA volume (R²=0.42, p=0.001).

CONCLUSION: Multivariable analysis identified factors which may be important for clinicians and researchers to consider when tailoring PA interventions. These results should be treated with a degree of caution due to a relatively small sample size in relation to the number of exploratory variables included. That >50% of the variance in PA volume remained unexplained indicates the need for further investigation in this area, with bigger data sets required to make firm conclusions.

Abstracts were prepared by the authors and printed as submitted.
The effect of ethnicity and medication on blood pressure (BP) have been widely described; however, less is known about the interaction between ethnicity, BP medication and regular exercise on hypertensive patients. PURPOSE: This study was aimed to determine the effectiveness of an exercise training and healthy lifestyle education program to reduce BP levels and improve adherence to pharmacological therapy on a multiethnic group of hypertensive patients.

METHODS: An 8-month quasi-experimental longitudinal intervention with an exercise group (EG) and control group (CG) was designed. Five hundred and sixty-eight hypertensive patients (67.4±8.8 years; BMI, 26.4±3.1 kg/m²) entered the study. EG participated in 3 weekly exercise training sessions (30 to 60 minutes of moderate to vigorous training), which were complemented by medication and lifestyle education. The average of three repeated measures of BP performed with an electronic sphygmomanometer was utilized as primary outcome. Health status, medication adherence, salt consumption, tobacco and alcoholic habits were recorded by questionnaires during clinic history assessment. Non-parametric tests were carried out to compare differences between EG and CG. Several logistic regression models were used to find independent variables predicting two levels (-3 or -5 mmHg) of reduction in systolic (SBP) or diastolic blood pressures (DBP).

RESULTS: We found significant reductions both SBP and DBP in EG (-3.92 mmHg and -5.0 mmHg, respectively, P<0.001 for both) but not in the CG. Also, prevalence of medication adherence was significantly improved in the EG (P<0.002). In the logistic regression, all models confirmed the EG as the main explanatory variable of a 3 or 5 mmHg BP reduction, independently of other lifestyle risk factors and medication adherence. CONCLUSIONS: In accordance with other studies patients in EG showed more diminution in SBP and DBP than CG, which was independent of other risk factors. However, the main findings were that either ethnic or medication adherence did not influence statistically the reduction in BP associated with our exercise/lifestyle intervention.

Due to limited evidence professional health organizations are reluctant to recommend Tai Chi as antihypertensive lifestyle therapy. PURPOSE: We conducted a systematic review and meta-analysis to examine the efficacy of Tai Chi as antihypertensive lifestyle therapy. METHODS: Tai Chi interventions published in English and Chinese were included when they involved healthy adults, reported pre-and post-intervention blood pressure (BP), and had a non-exercise/non-diet control group. We systematically searched 11 databases from inception to August 2018. Each study included was evaluated by two investigators for risk of bias and methodological quality. For each RCT, a random effects model was used to pool results. RESULTS: A total of 11 meta-analyses and 12 systematic reviews comprising 52 RCTs were identified. Tai Chi elicited moderate to large reductions in systolic (SBP) and diastolic blood pressure (DBP). CONCLUSIONS: Tai Chi is a viable antihypertensive lifestyle therapy that produces BP reductions that rival or exceed the antihypertensive effects of aerobic exercise of 5-8 mmHg in both the English and Chinese literature. Further investigation is needed to explain the discrepancy in the magnitude of the antihypertensive effects between Tai Chi trials published in English and Chinese. Supported by a sub-contract from U.S. PHS grant 5U24AG052175, and University of Connecticut Center for Excellence in Teaching and Learning.

PURPOSE: Persons with chronic medical conditions, such as obesity and asthma, may be at higher risk for physical inactivity. In this analysis, we evaluated objectively-measured physical activity (PA) in a population of patients with asthma to determine whether physical activity varied by body mass index (BMI) or asthma control. METHODS: We used data from a prospective cohort of English and Spanish speaking adults ≥21 years of age with physician diagnosis of asthma recruited from the outpatient practices of two health care systems located in New York, NY and Denver, CO. Exclusion criteria included history of other chronic pulmonary conditions, smoking >15 pack-years. Physical activity was objectively measured using Actigraph wGT3X-BT accelerometers. BMI (kg/m²) was measured by trained research staff and the Asthma Control Questionnaire (ACQ) was used to assess asthma control. We used Kruskal-Wallis tests to compare physical activity measures among obese (≥30 kg/m²), overweight (≥25-30 kg/m²) and normal or underweight (<25 kg/m² and ≤18.5 kg/m²) individuals, as well as among subgroups by asthma control: good (ACQ<0.75), poor (ACQ>0.75, but <1.5) and very poor (ACQ≥1.5). RESULTS: Of the 125 participants, 103 (82%) were female. 56 (45%) were white; 52%, 30% and 18% were obese, overweight and normal/underweight, respectively. Half reported very poor asthma control. Mean (SD) sedentary time/day was 406.5 (114.1) minutes/day and did not vary by BMI or ACQ. Mean light activity was 397.4 (95.4) minutes/day and moderate-vigorous activity (MVA) was 38.9 (28.5) minutes/day. Patients with obese or overweight BMI had somewhat lower MVA than those with normal BMI (35.7, 39.9, 46.2 minutes/day; p<0.09) and significantly lower daily steps (5670, 7105, 7727; p<0.004). Similarly, patients with very poor asthma control had non-significantly lower MVA than those with poor or good control (34.1, 39.4, 49.0 minutes/day; p>0.08) and significantly lower daily steps (5690, 6742, 7910; p<0.003). CONCLUSIONS: Overall, activity levels in these patients with asthma were not lower than the general adult population. However, those with higher BMI and worse asthma control were less active (respectively), suggesting that interventions to increase PA in patients with asthma should consider addressing body weight and asthma control.

PURPOSE: To investigate the exercise habits of those with primary open angle glaucoma (POAG) and its associations with the progression of glaucomatous visual field (VF) loss. METHODS: Daily PA was monitored by an accelerometer (ActiGraph wGT3x-BT) which patients wore for 24-hours on their waist (right) for 1 week. main outcome measures are daily PA, such as calories (kcal), light PA time, moderate PA counts. Progressive VF loss is defined as the same three or more points in pattern deviation test, compared to baseline. Analysis was performed for 88 VA patients with POAG. RESULTS: No Analytical power was found for daily PA between the 76 non-progressive and 22 progressive patients who wore the device for more than 10 hours per day (P>0.05 for all). Better eye VF mean deviation (MD) averaged -3.1 dB in non-progressive group and -4.1dB in progressive group. 88 (89.8%) participants who had worn an accelerometer for an entire day were analyzed for their 24-hour exercise habits and preferred PA. The preferred to exercise more during 07:00-09:00 am, 15:00-17:00 pm, and 18:00-20:00 pm. Additionally, MPA is not significantly different in the progressive group at 18:00-20:00 pm (25.0±3.3 min VS 18.9±17.6 min), p=0.002. Binary logistic
regression analysis indicated that MVPA (18:00-20:00 pm) and other parameters, such as mean retinal nerve fiber layer (mRNFL), MD, mean arteriolar pressure (MAP), mean intra-ocular pressure (mIOP), age and gender were significantly correlated with POAG patients’ progressive VF damage. Multivariate analysis showed that MVPA (odds ratio, OR (95% confidence intervals, CI)) = 0.96 (0.94, 0.99), P=0.002, mRNFL (OR (95% CI) = 0.97 (0.94, 1.00)), P=0.02, MAP (OR (95% CI) = 0.88 (0.83, 0.92), P<0.001), age (OR (95% CI) = 1.10 (1.06, 1.15), P<0.001) and gender (OR (95% CI) = 0.44 (0.22, 0.91), P=0.001) were still related to progressive VF loss after adjusting the other risk factors.

CONCLUSIONS: Patients with POAG prefer to exercise more during 07:00-09:00 am, 15:00-17:00 pm and 18:00-20:00 pm. Less evening exercise is associated with glaucomatous progressive VF damage, with an increasing of one minute of MVPA time decreasing the progression of POAG about 4%.

RESULTS:

The sample (N=11) comprised eight women and three men, with mean age of 54 years (SD=11.5) and BMI 23.2 (SD=2.8). All participants spent at least 90% of the climb with heart rate >70% of estimated maximum, and 64% of participants spent at least 50% of the climb with heart rate >70% of estimated maximum. Elite participants spent a greater proportion of time in vigorous intensity activity than did novices (68% vs 55%), though this finding was not statistically significant (p=0.05). Participants did not differ in time taken to reach >70% of the sacroiliac joints and axial spine. The body’s immune response to chronic inflammation initiates calcification and excessive bone formation causing structural joint damage and spinal fusion subsequently restricting mobility. AS has a 3:1 male-to-female ratio and symptoms typically appear at 15 - 45 years of age. Current treatment involves both pharmacological and non-pharmacological therapy.

**RESULTS:** Exercise as part of treatment plan in AS patient. METHODS: Investigate and summarise current knowledge on recommended practice points, frequency, intensity, time and type of exercise as well as progression of an exercise program, in AS patients. RESULTS: Current literature indicates the importance of exercise as part of treatment with pharmacological agents is aimed to delay progression of disease, relieve pain, minimise inflammation, maintain function and improve quality of life. Recommended practice points include a professional team with: knowledge of continual patient assessment and exercise prescription with pharmacological therapy alone. The body’s immune response to chronic inflammation initiates calcification and excessive bone formation causing structural joint damage and spinal fusion subsequently restricting mobility. AS has a 3:1 male-to-female ratio and symptoms typically appear at 15 - 45 years of age. Current treatment involves both pharmacological and non-pharmacological therapy. PURPOSE: To identify the role of exercise as part of the treatment plan in AS patient. METHODS: Investigate and summarise current knowledge on recommended practice points, frequency, intensity, time and type of exercise as well as progression of an exercise program, in AS patients. RESULTS: Current literature indicates the importance of exercise as part of treatment with pharmacological agents is aimed to delay progression of disease, relieve pain, minimise inflammation, maintain function and improve quality of life. Recommended practice points include a professional team with: knowledge of continual patient assessment and exercise prescription with pharmacological therapy alone. The body’s immune response to chronic inflammation initiates calcification and excessive bone formation causing structural joint damage and spinal fusion subsequently restricting mobility. AS has a 3:1 male-to-female ratio and symptoms typically appear at 15 - 45 years of age. Current treatment involves both pharmacological and non-pharmacological therapy. PURPOSE: To identify the role of exercise as part of the treatment plan in AS patient. METHODS: Investigate and summarise current knowledge on recommended practice points, frequency, intensity, time and type of exercise as well as progression of an exercise program, in AS patients. RESULTS: Current literature indicates the importance of exercise as part of treatment with pharmacological agents is aimed to delay progression of disease, relieve pain, minimise inflammation, maintain function and improve quality of life. Recommended practice points include a professional team with: knowledge of continual patient assessment and exercise prescription with pharmacological therapy alone. The body’s immune response to chronic inflammation initiates calcification and excessive bone formation causing structural joint damage and spinal fusion subsequently restricting mobility. AS has a 3:1 male-to-female ratio and symptoms typically appear at 15 - 45 years of age. Current treatment involves both pharmacological and non-pharmacological therapy. PURPOSE: To identify the role of exercise as part of the treatment plan in AS patient. METHODS: Investigate and summarise current knowledge on recommended practice points, frequency, intensity, time and type of exercise as well as progression of an exercise program, in AS patients. RESULTS: Current literature indicates the importance of exercise as part of treatment with pharmacological agents is aimed to delay progression of disease, relieve pain, minimise inflammation, maintain function and improve quality of life. Recommended practice points include a professional team with: knowledge of continual patient assessment and exercise prescription with pharmacological therapy alone. The body’s immune response to chronic inflammation initiates calcification and excessive bone formation causing structural joint damage and spinal fusion subsequently restricting mobility. AS has a 3:1 male-to-female ratio and symptoms typically appear at 15 - 45 years of age. Current treatment involves both pharmacological and non-pharmacological therapy. PURPOSE: To identify the role of exercise as part of the treatment plan in AS patient. METHODS: Investigate and summarise current knowledge on recommended practice points, frequency, intensity, time and type of exercise as well as progression of an exercise program, in AS patients. RESULTS:
Exercise is Medicine (EIM) is a global joint initiative between the American Medical Association (AMA) and the American College of Sports Medicine (ACSM). West Chester University (WCU) is recognized by the ACSM as an EIM-On Campus which indicates that WCU is a campus that is actively trying to engage the campus community in physical activity. PURPOSE: The purpose of this study was to gauge opinions and attitudes related to EIM Day at WCU’s first-time event launched at the campus. This event was hosted by the College of Health Sciences (CHS) at WCU and included participation from all six departments in the CHS, faculty and staff across campus, alumni, and community stakeholders.

METHODS: Forty participants (11 male, 29 female) (M=24.6, SD=12.16) who visited the event responded to an exit program evaluation survey.

RESULTS: Descriptive results from Likert scale data (1=not at all−5=very much) indicated that participants reported high levels of enjoyment related to the event (M=4.5, SD=0.78). They also reported that they found the event largely beneficial for improving their physical activity and nutritional habits (M=4.4, SD=0.97). Participants also expressed strong intentions to revisit the event in the future (M=4.7, SD=0.75). Additional Bayesian analysis also suggested that in comparison to their male counterparts (M=3.75, SD=1.28), female participants (M=4.67, SD=0.51) found the event significantly (p < .05) more helpful for improving their nutritional habits. Of the motives for participation, 87.5% of the participants reported that they participated because they expected the event to be fun. Finally, with regards to participants’ recommendations two themes emerged from the qualitative content analysis: (1) additional activities to include in the event and, (2) greater variety of food and beverage options to offer throughout the event.

CONCLUSIONS: These results suggest that individuals that participated in this first-time event evaluated it highly favorably and found it beneficial for improving important health behaviors. Future research needs to explore the effectiveness of these initiatives and advance recommendations to further increase their impact.

Purpose: The University of North Carolina at Chapel Hill was recently registered as an Exercise is Medicine (EIM) campus. To enable effective and sustainable implementation of EIM within Campus Health, the purpose of the current study was to anonymously survey students and determine: current exercise behavior, barriers and motives, interest in receiving exercise advice and by whom, and appropriate methods of communication.

METHODS: 500 surveys were distributed in Campus Health services between January-April 2018.

RESULTS: The 407 respondents were evenly distributed among college statuses (20% Freshman, 21% Sophomore, 16% Junior, 17% Senior, 23% Graduate Student, 3% Post-Doc). Time was the biggest barrier to exercise (57%). More than half wanted to receive guidance about exercise (48% Agree, 10% Strongly Agree), and agreed they would be more likely to exercise if they were given advice about exercise (46% Agree, 11% Strongly Agree). Students wanted a referral to an exercise professional (41%), and to receive initial advice and communicate through email (56%).

CONCLUSIONS: Students attending Campus Health are interested in receiving exercise guidance and, following a referral, this advice should be delivered by trained exercise professionals, e.g., the Exercise and Sport Science Department. Findings from this study will be used to implement a full trial in Counseling and Psychological Services.

Purpose: All universities should promote physical activity (PA) on campus to make PA a part of campus culture. Kinesiology departments can promote PA for cardiorespiratory health by offering a simple walking class. Studies indicate that even a low-volume walking program can yield cardiovascular benefits.

METHODS: Six college students (1=M; 5=F) enrolled in a walking class offered in Fall 2018. Five students completed the course. The 50 minute class met twice per week for seven weeks and students walked a minimum of 40 minutes each class period. An estimated VO2max was determined for each student during the first class meeting using the Rockport 1-Mile walk test. Following the seven week course, students completed another Rockport 1-Mile walk for VO2max estimation. Pre-test and post-test estimated VO2max results were compared.

RESULTS: All students showed improvements in estimated VO2max. Mean estimated VO2max for all students pre-intervention was 47.11 (ml/kg/min±8.44) with a post-intervention mean of 42.06 (ml/kg/min±10.13). Paired t-tests identified significant improvement in estimated VO2max (p<0.008). Female mean estimated VO2max improved significantly by 3.23 (ml/kg/min±p<0.010).

CONCLUSION: Introducing PA courses as simple as walking to the campus course curriculum may yield improved cardiovascular health in college students.
Purpose: Pennsylvania State University has been promoting Exercise is Medicine in Campus (EIMOC) since 2010 and has expanded the year-round program to include events, student and employee-focused initiatives, numerous on- and off-campus partnerships, and more. A recent focus of the EIMOC program has been expansion to other Penn State campus locations. As a University, Penn State operates 24 campuses throughout the state, with over 84,000 undergraduates enrolled. The wide array of locations, sizes, and educational focus presents opportunities and challenges as EIMOC at Penn State attempts to expand beyond its founding campus. METHODS: The central EIMOC program conducts year-round activities in the main campus, while providing assistance and guidance to commonwealth campuses when appropriate. Several times per year the EIMOC team travels to commonwealth campuses to assist on-site in the development and execution of EIMOC commonwealth programs, in partnership with local EIMOC committees at each campus. Program components are adjusted based on campus location, setting, size, partners, and available funding. Counts are conducted at each event for participation and engagement, lessons learned are reviewed to ensure the successful progression and expansion of future initiatives. Reviews are shared with other campuses to inform program development. RESULTS: EIMOC at Penn State has expanded to six commonwealth campuses, with four locations earning official EIMOC recognition. In 2017, Penn State University Park, the largest undergraduate campus earned Gold. Penn State Berks and a campus earned Silver, and Penn State Hershey School of Medicine earned Bronze. Three other campuses are currently pursuing official EIMOC status. Larger campuses benefited from higher levels of available resources and partnerships, though struggled spreading awareness. Smaller institutions had greater success with awareness and engagement, though had smaller scopes. Additional differences were noticed between rural and urban settings.

Conclusions: The current study offered insights on the challenges and successes in leveraging a larger university network to expand EIMOC programming across a diverse array of campuses. EIMOC programming has proven successful across a broad range of campus settings and sizes.

Overweight and obesity are major public health problems among children and adolescents. However, the effects of different types of exercise on adiposity are not well established. We use the network metanalytic approach to determine the effects of different types of exercise (aerobic, strength training, or both) on adiposity in overweight and obese children and adolescents. METHODS: Direct and indirect randomized exercise intervention trials >/= 4 weeks that were published in any language up to June 16, 2018 and assessed body mass index (BMI) in kilograms-squared, fat mass (kg), or percent body fat in overweight and obese children 2-18 years of age were eligible. Studies were retrieved by searching seven electronic databases, cross-referencing, and expert review. Dual selection and data abstraction were conducted. Results were pooled using random-effects, restricted maximum likelihood models. Surface under the cumulative ranking curves (SUCRA) were used to rank studies based on exercise type (aerobic, strength, both). A two-tailed alpha value < 0.05 and non-overlapping 95%-confidence intervals were considered statistically significant. RESULTS: Fifty-seven studies representing 127,512 participants (1,667 exercise, 1125 control) met the criteria for inclusion. Statistically significant reductions in BMI, fat mass, and percent body fat were observed in aerobic vs. control comparisons (BMI, mean 95%-CI: 1.10.6, -1.0.1 to -1.0.8; percent fat, -1.5, -2.2 to -0.9%) and combined aerobic and strength vs. control comparisons (BMI, -0.7, -1.4 to -0.1; fat mass, -2.5, -4.1 to -1.0 kg; percent fat, -2.2, -3.2 to -1.2%). A statistically significant reduction in percent fat was also found for strength vs. control comparisons (-1.3, -2.5 to -0.1%). Based on SUCRA results, combined aerobic and strength training was ranked highest for improving fat mass and percent body fat while aerobic exercise was ranked first for improving BMI. CONCLUSIONS: Combined aerobic and strength training is optimal for improving adiposity-specific outcomes in overweight and obese children and adolescents. Supported by AHA Grant 17GRNT33630158

Purpose: The years in post-secondary education are important for building healthy lifestyle habits to transfer into adulthood. Previous research has indicated that physical activity (PA) declines during the years of college, and Exercise is Medicine on Campus (EIMOC) programs are poised to help address this. METHODS: To examine how freshmen exercise patterns and perceptions were related to fitness and physical activity in senior year of college at a large Northeastern university. METHODS: A volunteer sample of university seniors (n=439) completed a fitness assessment (YMAC bicycle test) and an online survey which addressed their PA participation, freshman exercise perceptions and engagement in on-campus exercise opportunities. Pearson correlations examined the relationship between fitness and PA with freshman variables. T-tests examined differences in fitness and PA by freshman variables. RESULTS: The sample was predominately male (n=254, 59.3%) and Non-Hispanic White (n=343, 78.4%). Many (n=232, 53.5%) reported being physically active more frequently than in freshman year. Most (n=178, 52.7%) reported that they were well informed of campus exercise options, 28.5% (n=125) reported doing intramural sports and 10% (n=44) did club sports as freshmen. Current VPA was associated with being better informed of options for exercise on campus as a freshman (r=.11, p=.04), campus fitness center membership as a freshmen (p=.004), and freshman club sport participation (p=.006). VO2max was associated with club sport participation as a freshman (p=.001). Challenges with time management (r=.305, 85.4%) and lack of motivation (r=.226, 63.6%) were frequent barriers to exercise as freshman. Motivation challenges as a freshman was negatively associated with current VPA (r=.21, p=.001) and VO2max (r=.19, p=.001). Students indicated that programs partnering with an exercise buddy (r=.25, 74.1%) or events around outdoor exercise/outings (r=.179, 52%) would have been the most useful to motivate them as freshmen. CONCLUSIONS: This study examined how exercise patterns and perceptions as a freshman were related to PA participation and fitness as a senior. Findings indicate the importance of developing EIMOC programs and strategies to specifically help freshmen transition to college campuses and engage in healthy behaviors.

Purpose: Exercise and Adiposity in Overweight and Obese Children and Adolescents: A Network Meta-analysis

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RESULTS: The sample was predominately male (n=254, 59.3%) and Non-Hispanic White (n=343, 78.4%). Many (n=232, 53.5%) reported being physically active more frequently than in freshman year. Most (n=178, 52.7%) reported that they were well informed of campus exercise options, 28.5% (n=125) reported doing intramural sports and 10% (n=44) did club sports as freshmen. Current VPA was associated with being better informed of options for exercise on campus as a freshman (r=.11, p=.04), campus fitness center membership as a freshmen (p=.004), and freshman club sport participation (p=.006). VO2max was associated with club sport participation as a freshman (p=.001). Challenges with time management (r=.305, 85.4%) and lack of motivation (r=.226, 63.6%) were frequent barriers to exercise as freshman. Motivation challenges as a freshman was negatively associated with current VPA (r=.21, p=.001) and VO2max (r=.19, p=.001). Students indicated that programs partnering with an exercise buddy (r=.25, 74.1%) or events around outdoor exercise/outings (r=.179, 52%) would have been the most useful to motivate them as freshmen.

Conclusions: This study examined how exercise patterns and perceptions as a freshman were related to PA participation and fitness as a senior. Findings indicate the importance of developing EIMOC programs and strategies to specifically help freshmen transition to college campuses and engage in healthy behaviors.
This change in PA represents greater reductions of risks of specific physical inactivity-related conditions, such as obesity and type 2 diabetes. The results showed meaningful change in MET-minutes, which resulted in participants moving from ‘moderate’ to ‘high’ on the IPAQ, suggesting that a scheme length of 12 weeks is sufficient for changing PA levels.

### Table 1: Low Usage of Physical Activity Related Diagnostic Codes Among Indiana Medical Providers

<table>
<thead>
<tr>
<th>Comorbidities of 5,221 Adults</th>
<th>ICD-9 Use within 1 Year of PA-Related Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults Only</td>
<td>Adults</td>
</tr>
<tr>
<td>Type 2 Diabetes</td>
<td>821</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1,577</td>
</tr>
<tr>
<td>Insomnia</td>
<td>592</td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>611</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>116</td>
</tr>
<tr>
<td>BMI 25.0-29.9</td>
<td>104</td>
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<tr>
<td>BMI 30.0-34.9</td>
<td>284</td>
</tr>
<tr>
<td>BMI 35.0-39.9</td>
<td>352</td>
</tr>
<tr>
<td>BMI &gt; 40-49</td>
<td>425</td>
</tr>
<tr>
<td>BMI &gt; 50</td>
<td>163</td>
</tr>
</tbody>
</table>

Discussion: Low use of PA-related ICD codes may be due to a lack of awareness of existing codes. Physician education regarding PA-related ICD codes may increase physician counseling, code usage and possibly referral to PA resources.
While healthy lifestyle modification is often the first line recommendation to treat and prevent chronic disease, physicians inconsistently provide patients with guidance and resources to ensure appropriate physical activity participation. PURPOSE: To increase physical activity among patients, this project aimed to expand a physician-led walking program from a single clinic to a community-based partnership for broader reach. METHODS: The originally developed Walk with a Doc (WwAD) program was established in a family medicine clinic. Patients were referred to attend the monthly program during clinical encounters. The four phases of the IHI Scale-up Framework were applied to (1) examine the existing program (provider buy-in for walking prescriptions, rate of referral, and patient participation and satisfaction); (2) define a scalable program; (3) test the new context for scale-up (validate feasibility, utility and acceptability); and (4) plan to go to full scale. RESULTS: The WwAD program had 82 unique patients participating over 36 months of implementation with 15 providers making referrals to the walking program and 100% participant satisfaction. A landscape assessment of available parks and trails was completed and locations were geospatially mapped to examine distance from outpatient clinics. In partnership with the city’s Parks and Recreation department, new walking program sites were identified to leverage “healthy mile” trails in local neighborhoods with existing clinics. Site surveys confirmed clinic patients’ and providers’ interest, and trail safety and accessibility. The scalable program was defined to include a walking prescription and referral to the program, program reminders for the patient, and use of the city’s designated healthy mile trails. Pre-health students were incorporated to improve the ratio of program leads to patients, improve participant satisfaction, and to build student volunteers’ understanding of exercise is medicine and interdisciplinary competencies for future health professions careers. CONCLUSION: Leveraging the commitment to interaction and behaviour change.

### Board #317 May 29 11:00 AM - 12:30 PM

**Translating Physical Activity Evidence into Exercise Medicine the Moving Medicine Project, UK**

Kush Joshi, Natasha Jones, Hamish Reid, Ralph Smith, Rebecca Robinson. Homerton University Hospital, London, United Kingdom. Oxford University Hospitals, Oxford, United Kingdom. Sheffield University Hospitals, Sheffield, United Kingdom. (Sponsor: Kathryn Schmitz, FACSM)

**PURPOSE**

Moving medicine is a novel interactive information resource in UK healthcare. This initiative from the Faculty of Sport and Exercise Medicine was developed in partnership with Public Health England and Sport England. PURPOSE The UK’s pandemic levels of physical inactivity are associated with high mortality and morbidity. Despite overwhelming evidence supporting the role of physical activity (PA) in management of non-communicable chronic disease, knowledge, skills, time and healthcare professionals (HCP) confidence limit PA promotion across healthcare environments. This integrative digital resource was developed to empower HCPs to give PA advice. The resource provides an evidence-based approach to facilitate interaction and behaviour change. METHODS Using a knowledge into action framework this interactive tool was developed in a 2-step process. 1. Knowledge creation Literature reviews defined the evidence and expert working groups were recruited across 9 NCD streams, undertaking narrative reviews, refining evidence in clinical context. 2. Action cycle Delphi study and behavioural change framework analysis underpinned an iterative development process to create action cycles in a time based framework. RESULTS Moving Medicine was launched successfully in October 2018 by the UK Secretary of State for Health, headlining this flagship set of resources that champion physical activity as a powerful tool to change behaviour and improve the trajectory of chronic disease. Formal evaluation will follow the initial research and delivery phase. CONCLUSION High levels of professional engagement and early positive feedback indicate Moving Medicine is an acceptable, adaptable novel tool supporting HCPs to engage patients with meaningful conversations about PA. Formal analysis will add to this knowledge and inform transferability across healthcare environments. Further steps for development are projected to include online modules on prescribing movement, educational resources and an active hospital toolkit. Moving Medicine welcomes international collaboration and is open access and free to use at www.movingmedicine.ac.uk.

**Abstracts were prepared by the authors and printed as submitted.**
Cerebral blood flow is commonly assessed in the middle cerebral artery (MCA) as blood velocity, using non-imaging transcranial Doppler ultrasound (TCD). However, to accurately determine blood flow, both velocity and vessel diameter are critical components, and there is mounting evidence that the MCA is vasoactive.

**PURPOSE:** Therefore, the purpose of this study was to employ imaging TCD (ITCD), utilizing color flow and pulse wave velocity, as a novel approach to measure both MCA blood velocity and diameter to quantify cerebral blood flow.

**METHODS:** ITCD was performed at rest in 9 healthy participants (7M/2F; 29±4 yrs) with sublingual nitroglycerin (NTG, 0.8mg) and without (CON). Measurements were taken for 2 minutes prior, and for 5 minutes following NTG or sham delivery (CON).

**RESULTS:** There was a 6-fold fall in MCA blood velocity in response to NTG (Δ -4.8±2.2 cm/s) compared to negligible fluctuations in CON (Δ -0.8±2.5 cm/s). MCA diameter increased much more in response to NTG (Δ 0.17±0.02 cm) compared to the basal variation in CON (Δ 0.01±0.04 cm). Interestingly, the product of this NTG-induced fall in MCA blood velocity and increase in MCA diameter was a significant increase in blood flow following NTG (Δ 159±59 ml/min) compared to CON (Δ 0.01±0.04 ml/min).

**CONCLUSIONS:** These juxtaposed data highlight the importance of measuring both MCA blood velocity and diameter when assessing cerebral blood flow and document ITCD as a novel approach to achieve this goal. Supported by the Veterans Administration Rehabilitation Research and Development Service (EX610-R, E1697-R, E1433-P, E2975-L, and E1572-P).

**Arm Circumference As A Method To Standardize The Practical Blood Flow Restriction Pressure**

**PURPOSE:** To characterize mean middle cerebral artery blood flow velocity (MCAv) kinetics associated with two exercise work rates: low and moderate. We tested the hypotheses that increasing work rate would increase the MCAv amplitude and that age and estimated maximum oxygen uptake (VO2max) would be related to the MCAv amplitude.

**METHODS:** Baseline values were collected for 90-seconds followed by a 6-minute exercise bout on a recumbent stepper. Heart rate, end tidal CO2 (PteCO2), beat-to-beat blood pressure, and MCAv were recorded at rest and during exercise. The MCAv kinetics response for participants from baseline (BL) was described by the response amplitude (Amp), time delay (TD), and time constant (τ). **RESULTS:** Sixty-four adults completed the low and moderate intensity exercise transitions. MCAv Amp increased from rest as a function of work rate, low and moderate intensity, respectively, (11.8±14.4 cm/s vs. 6.7±9.5 cm/s) while no difference between work rates were observed either TD (43.5 and 45.8 s; p=0.65) or τ (35.2±21.3 s vs. 31.4±20.7 s; p>0.47). Age showed a moderate, negative association with MCAv Amp (r=-0.40 and r=-0.42; p<0.01) while no difference between work rates were observed in either TD (43.5 and 45.8 s; p=0.65) or τ (35.2±21.3 s vs. 31.4±20.7 s; p>0.47). Age showed a moderate, negative association with MCAv Amp (r=-0.40 and r=-0.42; p<0.01). Higher estimated VO2max demonstrated a moderate, positive correlation with MCAv Amp (r=0.51 and r=0.50; p<0.01). **CONCLUSION:** Moderate intensity exercise induced a greater MCAv response amplitude compared to low intensity exercise. The amplitude of the initial MCAv response for both exercise intensities increased systematically with work rate whereas the TD and τ kinetics parameters were invariant. Therefore, the possibility exists that the cerebrovascular system may have protective mechanisms in place to avoid the more rapid responses as seen in skeletal muscle, however more work is needed to address this hypothesis. Finally, although the MCAv Amp declines with age, maintaining higher cardiorespiratory fitness may benefit the cerebrovascular response to exercise.

**The Influence of a High Sodium Meal on Cerebrovascular Reactivity**

**PURPOSE:** To characterize mean middle cerebral artery blood flow velocity (MCAv) kinetics associated with two exercise work rates: low and moderate. We tested the hypotheses that increasing work rate would increase the MCAv amplitude and that age and estimated maximum oxygen uptake (VO2max) would be related to the MCAv amplitude.

**METHODS:** Baseline values were collected for 90-seconds followed by a 6-minute exercise bout on a recumbent stepper. Heart rate, end tidal CO2 (PteCO2), beat-to-beat blood pressure, and MCAv were recorded at rest and during exercise. The MCAv kinetics response for participants from baseline (BL) was described by the response amplitude (Amp), time delay (TD), and time constant (τ). **RESULTS:** Sixty-four adults completed the low and moderate intensity exercise transitions. MCAv Amp increased from rest as a function of work rate, low and moderate intensity, respectively, (11.8±14.4 cm/s vs. 6.7±9.5 cm/s) while no difference between work rates were observed either TD (43.5 and 45.8 s; p=0.65) or τ (35.2±21.3 s vs. 31.4±20.7 s; p>0.47). Age showed a moderate, negative association with MCAv Amp (r=-0.40 and r=-0.42; p<0.01) while no difference between work rates were observed in either TD (43.5 and 45.8 s; p=0.65) or τ (35.2±21.3 s vs. 31.4±20.7 s; p>0.47). Age showed a moderate, negative association with MCAv Amp (r=-0.40 and r=-0.42; p<0.01). Higher estimated VO2max demonstrated a moderate, positive correlation with MCAv Amp (r=0.51 and r=0.50; p<0.01). **CONCLUSION:** Moderate intensity exercise induced a greater MCAv response amplitude compared to low intensity exercise. The amplitude of the initial MCAv response for both exercise intensities increased systematically with work rate whereas the TD and τ kinetics parameters were invariant. Therefore, the possibility exists that the cerebrovascular system may have protective mechanisms in place to avoid the more rapid responses as seen in skeletal muscle, however more work is needed to address this hypothesis. Finally, although the MCAv Amp declines with age, maintaining higher cardiorespiratory fitness may benefit the cerebrovascular response to exercise.
Shear Rate Patterns In The Common Femoral Artery

Abigail L. Cook, Gemma K. Lyall, Karen M. Birch, FACSM.
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(No relevant relationships reported)

Methods:

Each group completed six, 5km cycling time trials, each consisting of 3x5-min cycles of bilateral occlusion and reperfusion to the upper thighs. RESULTS: Comparing baseline control to IPC, mean time to completion did not reach significance (5:18 ± 1.0:0.18%, p=0.08), despite a 1% change commonly being recognized as the benchmark for a meaningful alteration in performance. Examination of individual participants’ data revealed 8 of 12 (67%) participants improved mean 5km TT performance following IPC (2:1.1 ± 1%). If the individual’s mean IPC response is considered only as an improvement that exceeded one’s own percent coefficient of variation from the repeated controls (0.40 ± 0.8% ± 5%) and 5 (42%) would be classified as legitimate responders and non-responders. When the individual response or non-response to IPC was examined over the three repeated IPC trials, 81% and 87% of trials confirmed the effect, respectively.

CONCLUSIONS: We present evidence that individual performance is affected at a magnitude that exceeds normal variability. This suggests the existence of participants who consistently respond to IPC exposure at a magnitude that exceeds chance.

Prolonged periods of uninterrupted sitting (1-6 hours) have been shown to reduce lower limb blood flow, impair vascular endothelial function of leg arteries, and increase central arterial stiffness. It is unclear whether sitting can have a similar negative impact on cerebrovascular hemodynamics. PURPOSE: To determine the impact of a brief period (1 hour) of uninterrupted sitting on total brain blood flow (BBF).

METHODS: Eleven participants (25±1 years, BMI=26±1 kg/m², Female=5) completed a 1-hour bout of sitting. Assessments of central (heart rate and mean arterial pressure) and cerebrovascular hemodynamics (carotid artery blood flow, assessed via Doppler-ultrasound) were performed pre- and post-sitting (supine), as well as during the sitting intervention (10- and 60-minutes). In a subset (N=7), blood flow through the internal carotid (ICA) and vertebral arteries (VA) was examined to estimate total BBF (ICA+VA)*2.

RESULTS: When measured supine, HR and MAP were similar pre- and post-sitting.

However, there was a significant increase in HR when measured while seated (i.e., 10-mins=67±3 vs. 60-mins=74 bpm; p=0.02). CCA blood flow was comparable pre- and post-sitting (p=0.25), but decreased 10-60 minutes while seated (10-mins=1049±64 vs. 60-mins=921±63 mL/min; p=0.006). Conversely, estimated total BBF significantly decreased pre-post sitting (pre=1039±135 vs. post=843±82 mL/min; p=0.01), but was comparable between the 10- and 60-minute time points (10-mins=799±148 vs. 60-mins=802±125 mL/min; p=0.95)

CONCLUSIONS: These preliminary findings suggest that cerebrovascular hemodynamics are significantly affected by a 1-hour bout of uninterrupted sitting, largely due to a reduction in estimated total BBF.

P524 Board #7 May 29 1:00 PM - 3:00 PM Impact of a Brief Period of Uninterrupted Sitting on Cerebrovascular Hemodynamics Raymond Jones1, Dominique McArthur2, Stephanie M. McCoy1, Lee Stoner, FACSM3, Daniel P. Credeur1. 1University of Southern Mississippi, Hattiesburg, MS. 2University of North Carolina, Chapel Hill, NC. (Sponsor: Lee Stoner, FACSM) Email: raymond.jones@usm.edu

(No relevant relationships reported)

525 Board #8 May 29 1:00 PM - 3:00 PM An Examination of Group and Individual Response Rates to Ischemic Preconditioning for Sport Performance Joshua Slysz, Heather Petrick, Jamie Burr, FACSM. University of Guelph, Guelph, ON, Canada. (Sponsor: Jamie Burr, FACSM) Email: jslysz@uoguelph.ca

(No relevant relationships reported)
Elevated renal vascular resistance (RVR) during heat stress may provoke localized ischemia, especially when exposed to multiple sympathetic stressors. Whole-body cooling reduces risks associated with heat stress. However, this cooling raises RVR and could therefore exacerbate increases in RVR caused by prior heat stress, particularly during sympathetic activation. PURPOSE: To test hypotheses that increases in both extra- and intra-RVR to the cold pressor test (a sympathoexcitatory stimulus, CPT) are exacerbated by whole-body cooling following heat stress.

METHODS: Nineteen healthy adults (22 ± 2 y) underwent passive heat stress sufficient to raise core temperature 1.2°C above normothermic baseline (NT), after which they underwent passive cooling recovery (CR) to within 0.2°C of NT. Participants completed a 2 min CPT at NT and at the end of CR. Changes in body weight provided an indication of dehydration. Heart rate (HR), mean arterial pressure (MAP), and renal blood velocity (RBV) were measured pre-CPT (Pre) and at the end of the CPT (End). RBV was measured using the coronal approach with Doppler ultrasound at the distal segment of the right renal artery (Extra-, r = 11) or in the same segmental artery within participants in the right kidney (Intra-, r = 8). RVR was calculated as MAP/RBV. Data are presented as mean ± SD.

RESULTS: The changes in body weight was −1.2 ± 0.5%.
In Extra- Pre, MAP was elevated in CR compared to NT (95 ± 9 vs. 85 ± 7 mmHg, P<0.01) with no differences in HR (58 ± 7 vs 56 ± 9 bpm, P=0.24). MAP and HR in Intra- Pre did not differ from Extra- (P=0.72). In Extra- Pre, RBV (33 ± 4 vs 36 ± 3 cm/s, P=0.01) and RVR (0.35 ± 0.06 vs 0.43 ± 0.08 mmHg/cm/s, P<0.01) were lower in CR compared to NT. RBV was lower and RVR was higher in Intra- compared to Extra- (P=0.02) at Pre. At End, increases in HR (12 ± 7 vs 14 ± 7 bpm, P=0.50) and MAP (24 ± 16 vs 24 ± 16 mmHg, P<0.05) were not different between CR and NT in Extra- Changes in RBV (1.2 ± 5 vs 5 ± 27 cm/s, P=0.59) and increases in RVR (1.24 ± 0.97 vs 0.95 ± 0.99 mmHg/cm/s, P=0.29) did not differ between CR and NT in Extra- at End. There were no differences in the HR, MAP, RBV, or RVR response to CPT in Intra- compared to Extra- (P>0.05). CONCLUSION: Whole-body cooling following passive heat stress does not affect the extra- or intra- renal vascular responses to sympathetic activation.

Elevated metabolism when EHS rats were treated with cooling.

Immunohistochemical staining showed increased AVP mRNA expression and AVP protein expression in hypothalamus in the homeostasis of water metabolism when EHS rats were treated with cooling. PURPOSE: To determine the role of AVP mRNA expression and AVP protein expression in kidney in the homeostasis of water metabolism when EHS rats were treated with cooling. METHODS: In this study, there were 4 groups of male SD rats, including normal control group (NC, n=8), EHS onset group (EHSO, n=9), EHS rest group (EHSR, n=9) and EHS cooling group (EHSIC, n=8).

We established the rat model of EHS by exercising to exhaustion in the environment of 36°C temperature and 75% humidity until rectal temperature reaching about 42°C. The cooling treatment for EHS was to immerse in cold water for 5 minutes at 19°C. Blood and kidney were taken. Hct in serum was measured by automatic blood cell analyzer. PCR and WB were used to detect AQP2 mRNA expression and AQP2 protein expression respectively.

RESULTS: When EHS occurs, Hct increased significantly (EHSO: 0.43±0.29 vs. 0.40±0.04/L, P<0.05). To fit for water metabolism, AQP2 mRNA expression and AQP2 protein expression were up-regulated significantly (EHSO vs. NC)(mRNA: 3.45±0.95 vs. 1.19±0.37, P<0.01; Protein: 2.76±1.01 vs. 1.00±0.00g/L, P<0.01). After cold water immersion, No significant change of Hct was found, AQP2 mRNA expression and AQP2 protein expression were significantly down-regulated(EHSIC vs. EHSO)(mRNA: 1.66±0.33 vs. 3.45±0.95, P<0.01; Protein: 1.52±0.85 vs. 2.76±1.01g/L, P<0.05). CONCLUSIONS: Hct, AQP2 mRNA expression and AQP2 protein expression are pathophysiological biomarkers of EHS. Cooling treatment restrain water reabsorption by down-regulating the expression of AQP2 mRNA and AQP2 protein in kidney.
The skin of the human face and head is uniquely sensitive to cold stimuli, influencing whole body thermal perception more than most other skin surfaces. This sensitivity might be particularly relevant for American football, where padding and equipment cover much of the body but athletes regularly experience large thermal stress.

**PURPOSE:** To assess how face and head cooling impact thermoregulation and perception during simulated American football.

**METHODS:** Ten male American football or rugby athletes (age = 27 ± 5 y, height = 184.1 ± 5.9 cm, mass = 96.7 ± 18.2 kg; mean ± SD) completed two 65 min football training exercises. Each protocol was divided into four quarters (Q1 - Q4) and consisted of maximal sprints and plyometric push-ups separated by breaks regularly occurring during an American football game (e.g. breaks between quarters, time outs, and offense-defense transitions). Sessions occurred in 36 °C and 50% RH and participants wore full American football uniforms throughout. During one session (COOL), each participant removed his helmet and donned a cooling hood during breaks longer than two minutes; the cooling hood covered the cheeks, forehead, head, and neck and was activated by soaking in an ice slurry mixture. During the other session (CON), each participant only removed his helmet during breaks longer than two minutes. Thermoregulatory and perceptual variables were measured throughout. **RESULTS:** No significant differences existed between COOL and CON for gastrointestinal temperature (COOL = 38.0 ± 0.5 °C; CON = 38.1 ± 0.5 °C), mean weighted skin temperature (COOL = 35.5 ± 0.7 °C; CON = 35.6 ± 0.7 °C), or heart rate (COOL = 124 ± 26 bpm, CON = 125 ± 26 bpm). COOL significantly improved whole body thermal sensation compared to CON (COOL: Q1 = 4 [4-5], Q2 = 5 [4-5], Q3 = 5 [4-5], Q4 = 4 [4-5]; CON: Q1 = 6 [6-7], Q2 = 6 [5-6], Q3 = 6 [5-6], Q4 = 6 [6-7]), median (interquartile range)). COOL similarly benefited thermal comfort. **CONCLUSIONS:** These data confirm the sensitivity of the face and head to cooling stimuli and reinforce their influence over whole body thermal sensation and comfort during exercise in the heat. Moreover, these data indicate a cooling hood covering the cheeks, forehead, head, and neck can significantly improve thermal perception during exercise in the heat without influencing classic thermoregulatory measures.
Multi-ingredient pre-workout supplements (MIPS) have become an increasingly popular ergogenic aid among fitness enthusiasts. Previous research has primarily focused on the effectiveness of individual ingredients, rather than the combination. PURPOSE: To examine the effectiveness of two MIPS, one with beta-alanine and caffeine (IAC) and one without (NBAC), vs. placebo (PLA) on anaerobic performance and endurance capacity. METHODS: Twenty-eight exercise-trained individuals (15 men, 13 women, 24.3 ± 4.9 years, 173.6 ± 9.2 cm, 74.7 ± 15.5 kg) participated in a randomized, counterbalanced, double-blind, placebo controlled cross-over study to assess anaerobic power and capacity via Wingate (WAnT and WAnTAC), and aerobic endurance via cycle VO2peak. On three separate occasions (7 days between trials) subjects completed vertical jump (VJ), 30-second Wingate test and VO2peak test 30 minutes after ingestion of BAC, NBAC, or PLA. WAnT and WAnTAC were calculated as the peak and average power relative to body mass, respectively. Following a 10 minute walking recovery, subjects completed the cycle VO2peak test. Blood lactate was collected within 5 minutes post WAnT (BLAmax), and VO2peak anaerobic threshold (VJ Anaer). Following tests for normality, outcome variables were compared between supplements using one-way repeated measures ANOVA or Friedman test (alpha=0.05) and Bonferroni adjusted pairwise comparisons as appropriate. RESULTS: There was a significant effect of treatment on WAnTAC (p=0.016), WAnTmax was higher in BAC (10.9 ± 1.4 W/kg) and NBAC (10.8 ± 1.2 W/kg) compared to PLA (10.5 ± 1.2 W/kg) (p = 0.018 and p = 0.004, respectively). WAnTmax was significantly different across supplements (p<0.04), but post hoc pairwise comparisons were not significant. BLAmax was higher with BAC (17.7 ± 3.5 mmol) and NBAC (17.4 ± 3.2 mmol) compared to PLA (15.3 ± 3.3 mmol) (p = 0.028 and p = 0.033, respectively). BLAmax was higher with BAC (12.7 ± 5.9 mmol) compared to NBAC (9.9 ± 2.4 mmol, p = 0.001) and PLA (9.7 ± 2.8 mmol, p = 0.001). No significant differences were observed in VO2max or VJ. CONCLUSION: MIPS demonstrate the potential to augment production of anaerobic power during a Wingate cycle test, accompanied by higher blood lactate accumulation. Improvements may be less apparent in vertical jump type movements or prolonged endurance exercise.
The protocol used to analyze the effect of different doses of caffeine on strength was examined by three different exercises (bench press (BP); deadlift (DL); and squats (SQ)) following a 10 PM test protocol. Blood samples were collected immediately upon arrival to the laboratory, followed by consumption of a standardized isocaloric shake along with capsules containing different doses of caffeine: 6 mg · kg⁻¹ (CF1), 8 mg · kg⁻¹ (CF2), or placebo (CG). Another blood sample was collected 45 minutes after caffeine/placebo consumption and immediately after the execution of each exercise. The supplementation was a double-blind, randomized model. RESULTS: The strength on BP, DL and SQ statistically improved between CG and CF2 (BP 98.5 ± 3.2 to 106.7 ± 2.7; DL 123.2 ± 6.5 to 138.3 ± 9.1; SQ 114.6 ± 7.9 to 131.5 ± 5.7; p<0.01); no other statistical differences were observed for strength outcomes. CPK statistically improved in CF2 in comparison to CF1 and CG one hour after strength tests (198.1 ± 10; UI to 171.8 ± 7.4; UI and 198.1 ± 10; UI to 169.4 ± 11.2; UI with p<0.001). The LDH levels were significantly higher in CF2 after the third exercise compared to CG and CF1 (229.1 ± 8.3; UI to 173.9 ± 11.4; UI and 229.1 ± 8.3; UI to 229.2 ± 13.2; UI with p<0.001). AU levels were significant higher in CF2 at 60 minutes posttest compared to GC (7.1 ± 0.8 mg/dL to 5.5 ± 0.6 mg/dL with p<0.01). CONCLUSION: In 8 mg · kg⁻¹ dosage of caffeine seems to be more effective than 6 mg · kg⁻¹ and placebo for improving strength levels on BP, DL and SQ. In addition, higher doses of caffeine increased LDH and uric acid concentrations compared to other treatments, which may imply a higher oxidative stress condition.

Individuals who are unaccustomed to resistance exercise experience greater levels of exercise-induced muscle soreness, this can deter individuals from completing an exercise programme and improving strength and power. To alleviate the symptoms, they may consume Non-steroidal anti-inflammatory drugs (NSAIDS). Evidence suggests NSAIDS blunt muscle protein synthesis (Trappe et al., 2002) and attenuate strength and muscle hypertrophic adaptations from resistance training (Lilja et al., 2018), negating the effects of the exercise. Omega-3 supplementation has been suggested as an alternative to NSAIDS but the impact of Omega-3 on resistance training is inconclusive. PURPOSE: To determine the effects of omega-3 supplementation on eccentric training-induced increases in torque and power. METHODS: Nine physically active but non-resistance-trained males (29 ± 9 years) were pair matched for isometric and eccentric quadriceps strength and randomly assigned, in a double-blind manner, to either omega-3 (5 g/d) or olive oil (6 g/d) supplementation for 3 weeks prior to and for 8 weeks during eccentric training. Performance measures of peak torque (isometric, concentric, eccentric) and jump height were conducted before and after 8 weeks of training. Supervised training included 3 sets of 8 to 10 repetitions at volitional effort and performed 3 times per week. RESULTS: Following 8 weeks of eccentric training, peak eccentric torque significantly increased by 40 ± 56 Nm in omega-3 group and 51 ± 52 Nm in olive oil group, with no differences between groups (p > 0.05). Both groups also significantly increased their maximal isometric torque (p < 0.02); omega-3 group increased by 21 ± 10 Nm and olive oil group increased by 23 ± 30 Nm, with no differences between groups (p > 0.05). There was no main effect of training on peak concentric torque (p > 0.05). Jump height increased by 1.0 ± 1.9 cm in the omega-3 group and decreased by 0.03 ± 1.33 cm in the olive oil group, with no differences between groups (p > 0.05). CONCLUSION: Omega-3 supplementation does not impair or augment eccentric training-induced increases in torque or power in young males.

Carbohydrate (CHO) ingestion is an established strategy to improve endurance performance. Race fuels should not only sustain performance, but also be readily digested and absorbed and replenish electrolytes. Potatoes are a cost-effective option that fulfils these criteria; however, their impact on endurance performance remains unexamined. PURPOSE: Compare the effects of potato purée (POT) ingestion during endurance cycling on subsequent performance versus commercial CHO gel (GEL) or a control (water, CTL). METHODS: Ten trained cyclists (28±5.6y; 70.1±7.4kg; 1.70±0.1m; 62.7±9.3mL/kg/min) consumed a standardized breakfast then completed a 2h cycling challenge (60-85%VO₂ max) following a time trial (6k/1kg body mass) while consuming POT, GEL, or CTL in a randomized-crossover design. POT, GEL and CTL were administered with U-13C glucose for an indirect estimate of gastric emptying rate.Repeated blood samples were collected. RESULTS: Time trial performance significantly improved (p<0.01) with POT (32.2±1.9min) and GEL (32.4±1.9min) versus CTL (38.6±1.9min); no difference between POT and GEL was observed (p=1.00). No difference in lactate or blood glucose concentrations was observed (p>0.05) across the entire challenge. Blood lactate concentrations were higher (p<0.005) with GEL (5.5±4.4mg/dL) compared to POT (3.4±0.4mg/dL). Blood U-13C glucose enrichments were not different between GEL or POT (p>0.05). CONCLUSION: Potatoes serve as a viable alternative to commercial gels by sustaining performance and blood glucose concentrations during endurance cycling events in trained cyclists.

Twenty current CrossFit® participants (25±6.5 years, 175.1±7.8 cm, 84.9±12.0 kg), who attended CrossFit® classes at least 3 days per week for the past 3 months, performed a benchmark performance test, “Nancy” (5 rounds of 15 overhead squats with a 95 lb (for males)/65 lb (for females) barbell followed by a 400m run). In a randomized order, 72 hrs apart, participants were tested under a control session and once after consuming 2.4oz beetroot nitrate supplement, Beet It®, 2 hours prior to beginning the assigned workout. For both workouts, time to completion, pre- and post-exercise blood lactate levels, and RPE, pre and post, and post-exercise heart rates were measured. RESULTS: No significant difference (p>0.05) between the control (15.5±3.21 min) and supplement (15.8±3.43 min) performance time on completion. Post-exercise blood lactate (11.14±2.84 mm/dL) was not significantly different (p>0.05) than the control (12.00±2.53 mm/dL). Additionally, mean RPE for BR supplement (14.7±2.5) was not significantly different (p>0.05) than the control (16.8±2.12). CONCLUSIONS: These findings may have been caused by the duration and intensity of the benchmark workout which included both anaerobic and aerobic components, unlike previous research that found relationships between beetroot nitrate and performance of aerobic and anaerobic exercises alone.
B-10 Thematic Poster - Hormones and Obesity

Wednesday, May 29, 2019, 1:00 PM - 3:00 PM
Room: CC-102B

543 Chair: Jody L. Classy, FACSM. University of Kentucky, Lexington, KY.

(No relevant relationships reported)

544 Board #1 May 29 1:00 PM - 3:00 PM

Post Meal Hypoglycemia With and Without Exercise in Non-Obese and Obese Individuals.
Jay W. Porter1, Ryan Petit-Mec1, Sean Ready1, Nathan C. Winn PhD2, Anand Chockalingam MD3, Guido Lastra Gonzalez MD4, Jill A. Kanale PhD, FACSM1. 1University of Missouri, Columbia, MO. 2University of Missouri School of Medicine, Columbia, MO. (Sponsor: Jill A Kanale, FACSM)

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(No relevant relationships reported)

PURPOSE: Hypoglycemia (<70 mg/dL) during exercise has been observed in some individuals when exercise is preceded by carbohydrate ingestion. Counterregulatory responses normally maintain plasma glucose concentrations to prevent hypoglycemic events in healthy adults. The degree to which hypoglycemia is observed across health statuses in response to an evening meal plus moderate intensity exercise is unknown. The purpose of this study was to examine glucose variability when a dinner meal was followed by moderate exercise in lean and obese individuals, and to establish if transient hypoglycemia occurs during exercise at a time of day when glucose tolerance is poorer.

METHODS: Obese (OB) and non-OB adults completed 2 study conditions: dinner meal only (NOEX) and meal + exercise (EX) 2 h post meal. Blood samples were collected prior to the meal and for 5 h post meal for blood glucose (BG). The meal contained 10 kcal/kg (40% CHO, 35% FAT, 25% PRO). EX was 45 minutes of 55% of VO2 peak. RM ANOVA was utilized for analyses. RESULTS: 21 adults (5 Male, 16 Female) completed both conditions. Groups consisted of 8 Non-OB and 13 OB. Peak BG was similar between conditions and groups (Non-OB: NOEX 168 ± 9.8, EX 153 ± 10.2 mg/dL; OB: NOEX 158 ± 7.7, EX 166 ± 8.0 mg/dL). BG nadir was different by group (p = 0.015) and condition (p = 0.001) (Non-OB: NOEX 58 ± 3.7, EX 44 ± 3.0 mg/dL; OB: NOEX 67 ± 1.2, EX 59 ± 2.3 mg/dL). Delta (peak-nadir) was similar between groups and conditions (Non-OB: NOEX 110 ± 6.10, EX 109 ± 5.9, 1 mg/dL; OB: NOEX 92 ± 8.3, EX 113 ± 7.1 mg/dL). Delta 7 Non-OB and 8 OB experienced hypoglycemia during NOEX, while 8 Non-OB and 12 OB experienced hypoglycemia with EX. Non-OB subjects experienced hypoglycemia from NOEX to time 165-225 min. EX shifted this hypoglycemic period earlier by 30 min. OB experienced hypoglycemia during EX from time 150-165 min post meal consumption, overlapping with the exercise session. CONCLUSIONS: Very low BG levels are seen following a modest carbohydrate dinner meal in healthy and obese participants, suggesting a previously unappreciated response to exercise.

Cancer-related fatigue (CRF) is the most common toxicity experienced by patients with cancer, particularly in patients with metastatic syndrome. Metabolic syndrome is associated with dysregulated metabolic hormones such as decreased ghrelin and increased insulin levels. Whether changes in serum metabolic hormones are associated with changes in CRF is unknown.

PURPOSE: To assess changes in serum metabolic hormones and their associations with CRF in cancer survivors after 4 weeks of behavioral interventions.

METHODS: We selected 36 cancer survivors (age 56.4 ± 1.8 years) based on changes in CRF, regardless of intervention assignments, from an ongoing randomized controlled trial. Twenty-four survivors reported having no change/improved CRF (IMPV) and 12 survivors reported having worsened CRF (DFCL). CRF and serum metabolic hormones (ghrelin, insulin, glucagon, leptin, PP) were assessed by Multidimensional Fatigue Symptom Inventory (MFSI) and a Luminex Multiplex Immunoassay, respectively, at pre- and post- intervention. T-tests and ANCOVAs were used to evaluate within- and between-group differences, respectively. Spearman’s rank correlation was used to examine the associations of metabolic hormones with MFSI.

RESULTS: Changes in ghrelin were significantly different between groups (p = 0.02) - serum ghrelin level was increased in the IMPV group (11.8 ± 2.19 pg/mL) but it was maintained asymptomatic throughout hypoglycemic periods, alluding that many adults may unknowingly experience low BG values even when exercise begins 2 h post meal.

SUPPORT: NIH RO1DK101-43-01A1 (-End fragment)
decreased in the DECL group (-8.0 ± 5.93 pg/mL) from pre- to post-intervention. Changes in MSFL were negatively correlated with changes in serum ghrelin levels (r = -0.32, p = 0.06), indicating that increased serum ghrelin level is associated with improvements in CRF. No within- or between-group differences in other tested metabolic hormones nor their associations of CRF were found.

CONCLUSIONS: These exploratory findings suggest a potential association between increases in serum ghrelin and improvements in CRF among cancer survivors. Studies with larger sample sizes are needed to further establish the associations of metabolic hormones and CRF.

Supported by NCI UGCA 189661, R25 CA102618.

547 Board #4 May 29 1:00 PM - 3:00 PM
Improved Immune Profile Accompanying Increased Fitness Following an Exercise Intervention Among Overweight Older Women
Emily C. LaVoy1, Mahmoud T. Elzayat1, Maria Cardenas2, Michael M. Levitt3, Carmen A. Cook4, Melody D. Phillips5, FACSM1. 1University of Houston, Houston, TX. 2Emory University, Atlanta, GA. 3Texas Christian University, Fort Worth, TX.
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(No relevant relationships reported)

Aging is associated with a decrease in naïve T cells and an increase in late differentiated T cells, an immune profile associated with increased inflammation and decreased protection against illness. Physical fitness appears to delay the appearance of the aging immune profile, but this has only been examined cross-sectionally.

PURPOSE: To assess longitudinally whether increasing fitness can increase naïve T cells and decrease late differentiated T cells in older overweight women.

METHODS: 16 women (63±5 years) completed 36 exercise training sessions over 14 weeks. Training occurred 3 days a week and consisted of supervised strength training and walking. 9 women (66±3 years) participating in a health education class meeting 24 times over the same period served as controls.

RESULTS: The training group decreased glycolytic fat pre: 49.2±1.0%; post: 49.0±1.0%; p = 0.05) and increased strength (RM leg press pre: 145.6±11lbs; post: 200±12 lbs; p = 0.001; 8 RM chest press pre: 60±3lbs; post: 84±4.3lbs, p<0.001); there was a trend for increased VO2max (pre: 21.6 ± 97 ml/kg/min; post: 24.1± 1.3 ml/kg/min; p = 0.62). No differences in body composition or performance were observed in controls (all p>0.05). The training group increased the proportion of naïve CD45RA+CD62L+ CD8 T cells (pre: 23.9±2.9%; post: 27±3.2%, p=0.05) and T memory stem cells (pre: 3.3±0.7%; post: 4.4±0.7%, p<0.05). No changes were observed in high CD8 T cells (pre: 3.3±0.7%, post: 4.4±0.7%, p<0.05).

CONCLUSIONS: Improvements in fitness following a supervised 14 week resistance and aerobic exercise intervention amongst overweight older women is accompanied by an increase in naïve and memory stem CD8 T cells. This suggests the immune system is modifiable with fitness, even at older age.

548 Board #5 May 29 1:00 PM - 3:00 PM
Obesity, Physical Activity, And Sedentary Behavior, Not Diet, Predict Low Testosterone Status in Men
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(No relevant relationships reported)

Hypogonadism (serum testosterone concentration < 300 ng dL-1) has been associated with poor health in men. The current treatment for hypogonadism—testosterone replacement therapy—is expensive, may produce adverse effects and its long-term safety is unknown.

Purpose: To identify nutritional and physical activity predictors of low serum testosterone status in men using the National Health and Nutrition Examination Survey (NHANES), a nationally representative sample of the United States.

Methods: A secondary analysis of cross-sectional data from 2011-2012 NHANES was carried out to examine the associations between weight status, dietary intakes, physical activity and serum testosterone concentrations. 1,933 adult men were included in the study after exclusion for missing and unreliable data. Nutrient intakes from foods and supplements were assessed using 24-hour recall via the 5-step Automated Multiple Pass Method. Participants self-reported typical weekly physical activity and daily sitting time. Body mass index (BMI), age, race, relationship status, education, and smoking behavior and serum testosterone concentration were assessed during mobile exam center visits. Logistic regression was used to identify predictors of low testosterone status (lowest quartile; 204 ± 4 ng dL-1). Sampling weights were utilized in the analyses to account for the complex sampling design.

Results: Overweight and obese men had greater odds (2.10, 95% CI 1.17-3.78; 5.23, 95% CI 1.32-18.76) of low testosterone. Men reporting any vigorous physical activity, either recreational or work-related, had lower odds (0.42, 95% CI 0.28-0.64; 0.56, 95% CI 0.33-0.98) of low testosterone, whereas sitting time was associated with increased odds (1.05, 95% CI 1.02-1.08). None of dietary variables were statistically significant predictors of low testosterone status in the logistic regression model (all p > 0.153).

Conclusion: BMI, vigorous physical activity and sitting time were independently associated with low testosterone status and appear to be candidates for lifestyle interventions. Future research should examine the effects of weight loss interventions employing dietary, sedentary behavior, and physical activity modification to increase testosterone in overweight/obese men with low testosterone status.

Energy Availability is Predictive of LH Pulse Frequency Across a 3-month Diet and Exercise Trial
Kristen J. Koltun, Mary Jane De Souza, FACSM, Nancy I. Williams, FACSM. Penn State University, University Park, PA.
(No relevant relationships reported)
RESULTS: 1) MVC force of the chronic resistance trained group was 33 % higher (p ≤ 0.001) than the untrained group. 2) The chronic resistance trained group had lower AMTs at all contraction intensities (p ≤ 0.03, p ≤ 0.01, p ≤ 0.08 for the 15 %, 25 % and 40 % of MVC, respectively) compared to the untrained group. 3) MEP amplitude (normalized to Mmax) did not differ between the two groups. 4) During 25 % of MVC, the untrained group exhibited decreased SICI in comparison to the chronic resistance trained group (SICI: 78 ± 13% vs. 97 ± 7% of test pulse; p ≤ 0.01, respectively). During 40 % of MVC, the untrained group also exhibited decreased SICI in comparison to the chronic resistance trained group (SICI: 86 ± 14% vs. 102 ± 11% of the test pulse; p ≤ 0.03, respectively). SICI did not differ between groups at 15 % MVC (p = 0.30).

CONCLUSION: Based on the results, chronic resistance training significantly reduces SICI at stronger contraction intensities compared to no training. The significant reduction in inhibitory outputs suggest the presence of an adaptive process of facilitatory network activation, which can cancel out the SICI, to increase corticomotor drive to the exercised muscle following a long period of resistance training.
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Poor Pelvic Control During A Knee Lift Test Is Associated With Increased Risk Of Knee Injuries

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Purpose: Poor pelvic control, with increased lateral pelvic drop, is associated with increased risk of non-contact knee injuries. However, how induced instability influences muscle activation during front plank is not well-understood.

Methods: Participants were six female athletes (n=6) from a NCAA Division III varsity golf team (19.3 ± 1.4 years). Data was collected before and after an 8-week ST program focused on increasing vertical jump height. Participants completed two 45-minute ST sessions per week under the supervision of a certified strength and conditioning coach. The included squats, box jumps, lunges with and without rotations, and sprints. vGRF was measured on force plates during the downswing phase of the golf swing with a driver and DD was measured with a golf launch monitor. Vertical jump height and measures of lower extremity and core strength were also collected.

Results: The correlation between vGRF and DD was weak (r = -0.03, p = 0.74). There were no significant differences between pre and post vGRF (25.3 ± 12.8 N, p = 0.12) nor DD (3.7 ± 11.6 m, p = 0.47) within subjects.

Conclusion: The golf swing is an intricate maneuver with numerous factors impacting ball flight and distance. It is likely that other factors such as club head speed and angle of attack have a greater influence on DD than vGRF. Further research with larger and more diverse populations may determine whether or not significant relationships exist between ST, vGRF production, and golf swing performance. The methodology has been deemed feasible for future studies.

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Effects of Foot Instability Variations on Muscle Activation during Front Plank Exercise

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Purpose: To examine how different foot stability variations of front plank influence activation of 5 different muscles.

Methods: 19 physically active, healthy individuals (8 males, 11 females; age 39 ± 16.0 years; height 1.68 ± 0.1 m; mass 75 ± 17.5 kg) performed each of 4 plank variations in a randomized order. The foot stability was modified by placing the feet: 1) on a level, stable floor (FLOOR); 2) on an elevated stable step (STEP); 3) in elevated suspension straps (SUSPEND); 4) on a rubber dome (DOME). STEPSUSPEND and DOME were matched for foot placement. Electromyography of 5 muscles, rectus abdominis (RA), external oblique abdominis (EO), rectus femoris (RF), sartorius anterior (SA) and erector spinae (ES) during front plank with 4 different foot stability conditions was examined and normalized at % voluntary isometric contraction (%VMVC). Foot stability variation effect on normalized average muscle contraction of 5-second static plank trials was assessed using one-way repeated measure ANOVA and Friedman test for normally and non-normally distributed data, respectively.

Results: SUSPEND was associated with greater muscle activation than DOME in RF (43.2 ± 25.8 vs. 32.9 ± 25.9 %VMVC, p < 0.05) and RA (39.5 ± 18.2 vs. 30.3 ± 15.8 %VMVC, p < 0.05). Compared to FLOOR, SUSPEND was associated with higher activation of SA (57.2 ± 27.5 vs. 48.2 ± 21.3 %VMVC, p < 0.05) and ES (8.9 ± 4.3 vs. 7.5 ± 3.4 %VMVC, p < 0.05).

Conclusions: Plank with suspended feet increased average activation of muscles used in the front plank. The use of RF and RA increased primarily due to foot instability induced by suspension, and the activation of SA and ES increased with combination of instability and increased weight distribution to the upper body.

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Gender Comparisons of Muscle Activation Patterns Across Handle Types During Seated Row Exercise

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Purpose: To compare the electromyographic (EMG) responses during seated row exercise in the Biceps Brachii (BB), Latissimus Dorsi (LD), and Flexor Carpi Radialis (FCR), using a neutral forearm positioning (NF) handle versus a Wrist flexed positioning (WF) handle. Methods: The protocol was performed on a cable machine by 10 males (21.6 ± 1.2 years) and 10 females (21.7 ± 2 years) with prior resistance training experience (5.0 ± 2.5 yrs). Participants completed a one-repetition maximal lift (1-RM) followed by one set at 85% 1-RM until failure, using both handle types in randomized order. Root mean square EMG (EMG RMS) from the BB, LD, and FCR were normalized to the 1-RM values. Two-way repeated measures ANOVA was used to analyze EMG differences for each muscle group between genders and handle types. Results: The 1-RM lifts were significantly greater (p < 0.05) with the WF handle (90.2 ± 30.6 kg) versus the NF handle (87.8 ± 30.4 kg). There were significant differences (p < 0.05) between genders for the 1-RM lifts across both handle types. However, there were no significant differences between handles for the total number of repetitions completed (15.3 ± 3.6; WF 11.2 ± 2.4). Although there was a trend (p = 0.07) for BB EMG activity between the genders, there was no significant difference in the EMG amplitudes between the LD and FCR for either gender or handle type.

Conclusion: These findings showed significantly higher maximal lifts with the WF handle type, but non-significant EMG differences in the BB, LD and FCR between genders and across handle types. This indicates similar muscle activation patterns. The possible mechanisms for the IRM differences may be related to actin and myosin overlap of the forearm flexors, ergonomic factors such as grip comfort and differences in handle contact surface area.

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Modified Supine Bridge Alters Muscle Coordination Patterns

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Purpose: To compare hip extensor muscles activation patterns during performing SLB and mSLB.

Methods: Participants (n=10 females (21.7 ± 2 yrs) with prior resistance training experience (5.0 ± 2.5 yrs). The protocol was performed on a cable machine by 10 males (21.6 ± 1.2 yrs) and 10 females (21.7 ± 2 yrs) with prior resistance training experience (5.0 ± 2.5 yrs). Participants completed a one-repetition maximal lift (1-RM) followed by one set at 85% 1-RM until failure, using both handle types in randomized order. Root mean square EMG (EMG RMS) from the BB, LD, and FCR were normalized to the 1-RM values. Two-way repeated measures ANOVA was used to analyze EMG differences for each muscle group between genders and handle types. Results: The 1-RM lifts were significantly greater (p < 0.05) with the WF handle (90.2 ± 30.6 kg) versus the NF handle (87.8 ± 30.4 kg). There were significant differences (p < 0.05) between genders for the 1-RM lifts across both handle types. However, there were no significant differences between handles for the total number of repetitions completed (15.3 ± 3.6; WF 11.2 ± 2.4). Although there was a trend (p = 0.07) for BB EMG activity between the genders, there was no significant difference in the EMG amplitudes between the LD and FCR for either gender or handle type.

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Contributions of mono- and bi-articular hip extensor muscles while performing single leg supine bridge (SLB) and modified single supine bridge (mSLB) is not quite clear. To identify hip extensor muscles activation patterns during different unilateral-bridges, could be a key point for hip extensor strength and rehabilitation trainings.

Purpose: To compare hip extensor muscles activation patterns during performing SLB and mSLB.
were disrupted immediately following the injury. These data indicate strength loss in force were all reduced to a similar degree (58-67%), indicating that various sites vivo peak torque and M-wave RMS in addition to ex vivo force and caffeine-induced from the ryanodine receptors (RyRs) in wildtype muscle. However, in mdx muscle, in disproportionate reductions in strength measured in vivo and ex vivo (36 and 28%, respectively) compared with that of in vivo M-wave RMS (10%) and ex vivo caffeine-induced force (10% 

559 Chair: Graham R. McGinnis. University of Las Vegas Nevada, NV. 

(No relevant relationships reported)

560 May 29 1:00 PM - 1:15 PM Sites of Disruption in Dystrophic Muscle Following Eccentric Contractions Cory W. Baumann1, Gordon L. Warren, FACSM2, Dawn A. Lowe, FACSM2. 1University of Minnesota, Minneapolis, MN. 2Georgia State University, Atlanta, GA. Email: cbbaumann@umn.edu 

(No relevant relationships reported)

PURPOSE: Dystrophin is responsible for maintaining plasmalemmal integrity and cellular homeostasis. A key feature of skeletal muscle that lacks dystrophin, as in the mdx mouse model for Duchenne muscular dystrophy (DMD), is a heightened sensitivity to eccentric ( ECC) contraction-induced strength loss. However, the mechanisms responsible for the exaggerated loss of strength in dystrophic muscle have yet to be fully established. The purpose of this study was to determine possible sites within mdx muscle that are disrupted following ECC contractions. METHODS: Male wildtype and mdx mice (n = 8 per group) were chronically implanted with stimulating electrodes on the left common peroneal nerve and EMG electrodes on the left tibialis anterior (TA) muscle. The left anterior crural muscles (TA and extensor digitorum longus; EDL) of anesthetized mice performed 50 maximal ECC contractions. In vivo peak dorsiflexion torque and M-wave root mean square (RMS) were measured prior to and immediately after the ECC contractions. Following the in vivo assessment, the EDL was removed and ex vivo peak isometric force and caffeine-induced force were analyzed. RESULTS: Peak torque and force in wildtype mice were reduced 36 ± 4 and 28 ± 4% (p < 0.001) following the ECC contractions, while no changes were observed in vivo M-wave RMS (10 ± 2%; p = 0.49) or caffeine-induced force (10 ± 4%; p = 0.20). To the contrary, both M-wave RMS and caffeine-induced force were reduced in mdx muscle (60 ± 4 and 58 ± 5; p < 0.001), and corresponded to reductions of 60 ± 2 and 67 ± 8% (p < 0.001) in peak torque and force. CONCLUSIONS: On the basis of the disproportional reductions in strength measured in vivo and ex vivo (36 and 28%, respectively) compared with that of in vivo M-wave RMS (10%) and ex vivo caffeine-induced force (10%), we confirm that ECC contractions uncouple the plasmalemna from the ryadionide receptors (RyRs) in wildtype muscle. However, in mdx muscle, in vivo peak torque and M-wave RMS in addition to ex vivo force and caffeine-induced force were all reduced to a similar degree (58-67%), indicating that various sites were disrupted immediately following the injury. These data indicate strength loss in wildtype and mdx mice differ, that in plasmalemmal function and sites at or distal to the RyRs may all be impaired in dystrophic muscle following ECC contractions. Exosomes are extracellular vesicles that carry cargo, such as microRNA, which may interact with different tissues and regulate cellular signaling pathways. PURPOSE: To determine the effects of exogenous bovine exosomes on the liver and skeletal muscle in young, growing rats. METHODS: Twenty-eight-day Fisher 344 rats were provided a milk-based diet that either contained exosomes (EXO+, n=12) or was exosome depleted via sonication (EXO-, n=12) for four weeks. Following the intervention, the liver and gastrocnemius were removed and measurements of respiratory control ratio (RCR), reactive oxygen species emission (ROS), antioxidant levels, cross sectional area (CSA), total RNA, and transcriptomics were performed. Except for transcriptomic data, independent samples t-tests were performed between diet groups and statistical significance was set at p<0.05. For transcriptomic data, all annotated transcripts with FPKM scores >1.0 were analyzed between groups and any score exceeding a fold-change cut-off >1.5 fold (p=0.01) were considered meaningful. RESULTS: There was no significant change in mitochondrial volume in either the liver (p=0.707) or gastrocnemius (p=0.724), however the liver had increased state 3 and state 4 in the EXO- treated group (p=0.040 and p=0.009) with complex 1 substrates. No significant differences were detected in liver antioxidant protein levels or oxidative damage markers (p>0.05). There was an increase in GPX protein levels in gastrocnemius in the EXO- rats (p=0.020), which may explain the significance of oxidative emission (p=0.016). No significant change was observed in gastrocnemius mitochondria respiration (p>0.05). Interestingly, gastrocnemius CSA and total RNA significantly increased in EXO- group (p=0.018 and p=0.001). Further analysis of the diet verified sonication decreased exosomes, however RNA was enriched per particle by >7.5
fold. CONCLUSION: An exosome depleted diet affects liver and skeletal muscle parameters and resulted in increased muscle hypertrophy. These changes may be due to the enhanced mTORC1-nature of the EXO- diet. Supported by AU IGP Grant; NIFA 2015-67017-23181 and 2016-67001-25301; NIH IP20GM104320; Gates Foundation, Gerber Health, Inc. JZ serves as a consultant for PureTech Health, Inc.

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Resolvins E1 Attenuates Inflammatory Induced Muscle Atrophy In Human Derived Muscle Cells
Martin R. Lindley1, Luke Baker2, Neil Martin1, Gareth Pritchard1, Marc Kimber1, Junii Qian1, Mark P. Lewis1, Loughborough, Loughborough, United Kingdom. University of Leicester, Leicester, United Kingdom. Email: m.r.lindley@lboro.ac.uk

Purpose: Loss in skeletal muscle size and function is a common debilitating co-morbidity in an array of chronic disease states as well as during the ageing process. This can lead to a loss of physical activity and ability to perform everyday tasks, leading those affected into a downward spiral of muscle loss and inactivity which has been strongly linked to increased rates of morbidity and mortality. Many factors have been linked to induce such processes, one of which is inflammation, with therapeutic research looking for ways to resolve chronic inflammation to subsequently alleviate related muscle atrophy. Resolvins E1 (RvE1) is a specialised pro-resolving lipid mediator, derived from the metabolism of the omega-3 fatty acid EPA, which has shown to have beneficial pro-resolving properties in an array of cell types, including our previous work in immortalised skeletal muscle cell lines. Method: This set of experiments cultured human derived skeletal muscle cells from healthy control participants (n = 6). Once differentiated, myotubes were exposed to Lipopolysaccharide (LPS) in the presence or absence of RvE1 (100ng/ml) and compared with a control condition. Post exposure, myotubes were harvested for gene expression and intracellular protein analysis. From the same experiment, wells were also fixed and stained for immunocytochemistry analysis of myotube size and number. Results: Our work indicates beneficial pro-resolving properties of RvE1 in human skeletal muscle cells. Specifically, the effects of a 72 hour exposure to RvE1 on subsequent anabolic signaling and ribosome biosynthesis response to resistance exercise (RE) were explored. METHODS: Eleven moderately trained men (28 ± 5 years, 181 cm ± 6 cm, 81 ± 8 kg) performed a unilateral bout of arm extensor aerobic exercise (~45 min) in a seated isokinetic dynamometer. Subsequently, unilateral resistance exercise (4 sets of 7 reps) was performed for both arms using flywheel technology. Thus, one arm was subjected to RE alone, while the other arm performed consecutive bouts of AE and RE interspersed by 15 min recovery. Peak power (averaged across concentric and eccentric actions) was assessed during the resistance exercise bout. Muscle biopsies were taken from the m. triceps brachii of each arm immediately after the AE bout in AE+RE compared to RE (main effect of time P < 0.05). Results showed increased (2.5-fold), and 4E-BP1 decreased (0.5-fold), after the AE bout (arm x time interactions P < 0.05). Phosphorylation of P70S6K remained unaltered.

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Concurrent Exercise of the Arm Extensors Modulates Anabolic Signaling and Gene Expression for Ribosome Biosynthesis
Tommy R. Lundberg1, Björn Hansson1, Luke A. Olsen2, Ferdinand von Walden1, Rodrigo Fernandez-Gonzalo3, Eric Rullman, Thomas Gustafsson. Karolinska Institutet, Stockholm, Sweden. 1University of Kansas, Minneapolis, MN. Email: rodrigo.gonzalo@ki.se

Purpose: As most concurrent exercise studies to date have focused on lower-limb muscles, this study explored the acute molecular response to concurrent exercise of the arm extensors. Specifically, the effects of a 45 minute bout of AE followed by a subsequent RE bout on subsequent anabolic signaling and ribosome biosynthesis response to resistance exercise (RE) were explored. METHODS: Eleven moderately trained men (28 ± 5 years, 181 cm ± 6 cm, 81 ± 8 kg) performed a unilateral bout of arm extensor aerobic exercise (~45 min) in a seated isokinetic dynamometer. Subsequently, unilateral resistance exercise (4 sets of 7 reps) was performed for both arms using flywheel technology. Thus, one arm was subjected to RE alone, while the other arm performed consecutive bouts of AE and RE interspersed by 15 min recovery. Peak power (averaged across concentric and eccentric actions) was assessed during the resistance exercise bout. Muscle biopsies were taken from the m. triceps brachii of each arm immediately after the AE bout in AE+RE compared to RE (main effect of time P < 0.05). Results showed increased (2.5-fold), and 4E-BP1 decreased (0.5-fold), after the AE bout (arm x time interactions P < 0.05). Phosphorylation of P70S6K remained unaltered.

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The Skeletal Muscle Transcriptome Signature of 84-day Bed Rest and its Reversal by Resistance Exercise
Rodrigo Fernandez-Gonzalo, Per A. Tesch, Tommy R. Lundberg, Eric Rullman, Thomas Gustafsson. Karolinska Institutet, Stockholm, Sweden. Email: rodrigo.gonzalo@ki.se

Conclusion: The results suggest that post-exercise translational signaling could be compromised by prior aerobic exercise. In contrast, concurrent exercise of the arm extensors accentuates the expression of key regulators of ribosome biosynthesis and promotes mRNA transcription.

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Lifelong Deficiency in Ulk1-Mediated Autophagy Precipitates Skeletal Muscle Aging
Anna S. Nichenkov1, William Michael Southern2, Grant Mercer1, Sarah M. Greising2, Jarrod A. Call1. 1University of Georgia, Athens, GA. 2University of Minnesota, Minneapolis, MN. Email: m.r.lindley@lboro.ac.uk

CONCLUSION: The results suggest that post-exercise translational signaling could be compromised by prior aerobic exercise. In contrast, concurrent exercise of the arm extensors accentuates the expression of key regulators of ribosome biosynthesis and promotes mRNA transcription.
Exercise is one of the few behavior modifications that enable long-term weight loss through unknown mechanisms. High-intensity exercise (HIE) induces norepinephrine and calcium signaling, which together, stimulate the Crct2 coactivator to activate the Crct2-mediated transcriptional program in skeletal muscle. We previously demonstrated that Crct2 activation drives an adaptive anabolic transcriptional response that includes hypertrophy and enhanced exercise performance (Bruno et al. EMBO J. 2014). PURPOSE: Here, we examined the role of skeletal muscle-selective Crct2/Creb1 signaling in the metabolic response to weight loss. METHODS: Crct2 was selectively overexpressed in skeletal muscle using a doxycycline-inducible transgene. RESULTS: 18-week old, naturally obese control or Crtc2 transgenic (Tg) mice were treated selectively overexpressed in skeletal muscle using a doxycycline-inducible transgene.

CONCLUSION: A lifetime of insufficient Ulk1-mediated autophagy exacerbates age-related skeletal muscle contractile dysfunction and may alter mitochondrial quality and/or quantity.

The inclusion of total body water (TBW) into body composition analyses improves the accuracy of measures. However, the criterion method using deuterium oxide dilution (D₂O) is impractical for clinical settings. PURPOSE: The purpose of this study was to compare TBW estimates from two commercial bioimpedance spectroscopy (BIS) devices against D₂O. METHODS: 89 subjects (64% female; age: 18 to 82 years; body mass index (BMI): 18.0 to 39.5 kg/m²) had TBW determined via D₂O and whole-body BIS using two devices: a standard supine BIS device (BIS sup); and a new commercial standing BIS device (BIS stand). Agreement between TBW from D₂O and the two BIS devices was determined using the Bland-Altman method.

RESULTS: Mean differences between D₂O and BIS devices were significantly greater than zero (ps<0.05), however the magnitudes of the differences were small (Cohen’s d=0.01). Bias and limits of agreement (BIS sup: -0.7±5.7 SD) and BIS stand: (0.7±5.8) were small and relatively tight. The BIS devices were strongly correlated with each other (r=0.99).

CONCLUSIONS: The results of this study demonstrate that both the standard and new BIS devices measured TBW with minimal bias and tight limits of agreement compared to D₂O. These findings support the use of both the standard and new BIS device as a surrogate of D₂O for the assessment of TBW in adults across a wide range of both age and BMI.

Maximal and sub-maximal physiological testing can assess aerobic variables important in running performance. We compared two protocols to demonstrate the impact of protocol on measures of maximal (VO₂max) and submaximal aerobic variables: energy cost of running (ECR), oxygen cost of running (OCR), and substrate utilization, assessed with respiratory exchange ratio (RER). PURPOSE: To compare two physiological testing protocols before and after marathon training. METHODS: Recreational runners (n=111; 72% female; ages 21±1.6) enrolled in a marathon training class participated in the study. Subjects ran a 2-mile time trial (2MI) on a 200m indoor track, followed by laboratory testing 1-2 weeks later, both prior to and after 18 weeks of training for a marathon race. Testing included a sub-maximal 6-minute treadmill run at 75% of 2MI velocity followed by a graded exercise test to assess VO₂max. The final 5 minutes of the 6-minute run were averaged for analysis of ECR, OCR, and RER. For post-testing one cohort (n=54) had the treadmill velocities adjusted to their current 2MI ability (ADJ) while another cohort (n=57) repeated the pre-test velocities (REP). Mean differences between D₂O and the two BIS devices were determined using the Bland-Altman method.

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**The Exercise Response In Blood Flow Restriction Training Varies As A Function Of Cuff Type**

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**No relevant relationships reported**

**PURPOSE:** Blood flow restriction (BFR) training is a popular method to induce muscle hypertrophy. Both conventional blood pressure cuffs and devices specifically developed for BFR are used. A previous vascular occlusion (BFR)/BF study showed that if the training response differs depending on the cuff type. This study elucidated the acute effects and the safety of exercising with a medical blood pressure cuff (MC) and a BFR cuff (BFR-C).

**METHODOLOGY:** Ten healthy individuals (30 ± 8 years, 5 males, 5 females) completed three sessions of unilateral low-intensity resistance exercise (30% 1RM) of the knee extensors. In the first session, wearing a BFR-C, the participants performed three sets until maximal exhaustion. In the second conditions (order selected randomly), the same workload (sets & repetitions) was used for a training session with a MC and without any BFR. Pre and post-intervention, blood lactate, thigh circumference, pressure pain threshold, stiffness and elasticity were measured. During exercise, heart rate, subjective discomfort and fatigue were documented. Twenty-four, 48 and 72 hours after training, muscle soreness was assessed. To judge safety, the pressure [mmHg] needed to provoke full occlusion at rest was determined with Doppler sonography. Differences between conditions were detected by means of Friedman tests including adjusted post hoc Conover comparisons.

**RESULTS:** Both, BFR-C (*p* < .05, MC = + 29 %, *p* < .003) induced greater lactate concentrations than the no-BFR control. Compared to the other conditions, BFR-C resulted in higher values for exercise heart rate (+ 3 % vs MC, *p* = .015, + 3 % vs. no-BFR, *p* = .015) as well as muscle soreness after 24 hours (+ 81 % vs MC, *p* = .012, + 150 % vs. no-BFR, *p* = .004), 72 hours post training, soreness was still increased in BFR-C (+ 3.5 pts on NRS vs. no-BFR, *p* = .045). Similarly, BFR-C elicited stronger activation (+ 36 % vs. no-BFR, *p* = .005). Ultrasound examinations revealed that MC could generate a full occlusion while BFR-C did not entirely obstruct blood flow as long as the normal scale was not exceeded. **CONCLUSIONS:** Although BFR-C seems to provide a stronger exercise stimulus than MC, it may be a better choice regarding exercise safety. This finding may particularly be of value if applying the method in elderly/untrained persons or individuals with chronic disorders.

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**Influence of Testing Sequence on an Adult’s Ability to Achieve Maximal Aerobic and Anaerobic Power**


**No relevant relationships reported**

**PURPOSE:** To examine how testing sequence affects an adult’s ability to achieve maximal aerobic and anaerobic power during a single assessment visit.

**METHODS:** Fifty-three adults (31 women, 22 men; 21.9 ± 1.6 years) participated in this investigation. All subjects were tested on three separate occasions. Participants completed two baseline visits (Visits 1 and 2) consisting of either a VO2max or WAnT in a randomized counterbalanced order. Participants then completed an experimental visit (Visit 3) which consisted of both a VO2max and WAnT in a randomized order (Group A: WAnT/VO2max; Group B: VO2max/WAnT) with 20 minutes of rest between tests. Mixed model ANOVAs with Bonferroni post hoc analyses compared baseline (Visits 1 or 2) and experimental (Visit 3) exercise test performance between and within groups for both relative VO2peak and absolute peak power.

**RESULTS:** No significant main or interaction effects were observed for relative VO2peak at baseline and experimental visits when comparing Group A (42.9 ± 7.2 ml/kg/min and 42.0 ± 8.0 ml/kg/min, respectively) and Group B (47.7 ± 22.9 W and 742.7 ± 221.3 W, respectively). There was an effect of protocol on OCR (p<0.001): REP did not change whereas ADJ increased (32.3±6.4, 35.7±4.5 ml/kg min−1). There was a trend toward an increase in VO2max with training (p=0.064), and an effect of protocol (p<0.001), with ADJ increasing in VO2max (49.2±3.6, 52.2±6.6 ml/kg min−1) and no change in REP. **CONCLUSIONS:** Marathon training decreases RER during moderate exercise at the same absolute but not relative velocity. Changing the speed of the exercise testing protocol to reflect current running ability helps detect changes in aerobic capacity (VO2max), but may mask changes in sub-maximal running variables such as ECR, OCR, and RER.

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**Effects Of Honest And Dishonest Pre-exercise Placebo Ingestion On Vo2Peak And Isometric Handgrip Performance**

Jessica Moon1, Christian Espitia2, Landon Hiebert1, Christopher A. Fahs3, Lindy M. Rossow4. 1Lindenwood University, St.Charles, MO. 2Lindenwood University Belleville, Belleville, IL. (No relevant relationships reported)

**PURPOSE:** The purpose of this study was to examine the effects of honest (subjects were told they were consuming placebo) or dishonest (subjects were told they were consuming a pre-workout supplement) placebo ingestion on VO2peak values determined during a maximal treadmill graded exercise test. A secondary purpose of this study was to examine the effects of placebo consumption on isometric handgrip performance. We hypothesized that pre-exercise ingestion of both placebo conditions would result in increased VO2peak and handgrip performance compared to control. **METHODS:** 28 males (178.4 ± 6.94 cm, 83.3 ± 14.8 kg, 22.6 ± 2.3 yrs.) and 13 females (166.4 ± 8.49 cm, 73.6 ± 20 kg, 26.4 ± 11 yrs.) participated in this study. In a randomized, cross-over design, subjects performed treadmill VO2peak and isometric handgrip testing after consumption of honest placebo (HP) or dishonest placebo (DP). In addition, a third baseline trial (CON) was performed to establish performance values that were unaffected by a perceived placebo effect due to supplementation. All outcomes were assessed for normality using the Shapiro-Wilks test. When assumptions of normality were violated, log transformations were computed. However, transformations did not improve model assumptions. Therefore, non-transformed data is reported. One-way ANOVAs were used to analyze VO2peak and handgrip strength data across conditions. Alpha was set at 0.05 prior to all analyses. **RESULTS:** Significant between-groups differences (p<0.05) were not detected for relative VO2peak (CON = 46.2 ± 9.3 ml/kg/min; HP = 46.7 ± 10 ml/kg/min; DP = 46.6 ± 9.6 ml/kg/min) or for maximal handgrip strength (CON = 43 ± 9.6 kg; HP = 44.1 ± 12.4 kg; DP = 43.4 ± 12.1 kg). **CONCLUSION:** Administration of honest or dishonest placebo immediately prior to VO2peak and handgrip testing had no effect on performance compared to control. The VO2peak and isometric handgrip tests were found to be robust exercise tests not significantly influenced by perceived pre-workout supplement consumption.

575  May 29 2:30 PM - 2:45 PM  
**Using a Stretch Sensor to Evaluate Muscle Contraction Timing During a Neuromuscular Control Screening Activity**

Shannon E. Linderman1, Donna Mosley Scarborough1, William Day2, Daniel Wrafter3, Eric M. Berkson4. 1Massachusetts General Hospital, Boston, MA; 2figur8, Inc, Boston, MA. 4Massachusetts Institute of Technology, Cambridge, MA. Email: slinderman@mgh.harvard.edu  

**Reported Relationships:** S.E. Linderman: Salary; figur8,Inc.

**PURPOSE:** Stretch sensors are wearable devices that when applied over a muscle group, can measure the physical output of muscle deformation resulting from a muscle contraction. Electromyography (EMG) is the clinical standard for assessing the electrical signal identifying muscle activation. The well-established challenges of EMG in research practice, group, can measure the physical output of muscle deformation resulting from a muscle contraction. Electromyography (EMG) is the clinical standard for assessing the electrical signal identifying muscle activation. The well-established challenges of EMG in research practice, 2peak values determined during (Sponsor: Joseph Andreacci, FACSM) and no change in REP. **CONCLUSIONS:** Our findings indicate that testing sequence had no effect on achievement of maximal aerobic and anaerobic power. Researchers and clinicians can include VO2max testing and a WAnT during the same visit with 20 minutes of rest without compromising maximal performance.

Pre-exercise consumption of placebo has been shown to improve resistance and endurance exercise performance. However, the effects of placebo ingestion on graded exercise test performance have not been widely reported in the literature. **PURPOSE:** The purpose of this study was to examine the effects of honest (subjects were told they were consuming placebo) or dishonest (subjects were told they were consuming pre-workout supplement) placebo ingestion on VO2peak values determined during a maximal treadmill graded exercise test. A secondary purpose of this study was to examine the effects of placebo consumption on isometric handgrip performance. We hypothesized that pre-exercise ingestion of both placebo conditions would result in increased VO2peak and handgrip performance compared to control. **METHODS:** 28 males (178.4 ± 6.94 cm, 83.3 ± 14.8 kg, 22.6 ± 2.3 yrs.) and 13 females (166.4 ± 8.49 cm, 73.6 ± 20 kg, 26.4 ± 11 yrs.) participated in this study. In a randomized, cross-over design, subjects performed treadmill VO2peak and isometric handgrip testing after consumption of honest placebo (HP) or dishonest placebo (DP). In addition, a third baseline trial (CON) was performed to establish performance values that were unaffected by a perceived placebo effect due to supplementation. All outcomes were assessed for normality using the Shapiro-Wilks test. When assumptions of normality were violated, log transformations were computed. However, transformations did not improve model assumptions. Therefore, non-transformed data is reported. One-way ANOVAs were used to analyze VO2peak and handgrip strength data across conditions. Alpha was set at 0.05 prior to all analyses. **RESULTS:** Significant between-groups differences (p<0.05) were not detected for relative VO2peak (CON = 46.2 ± 9.3 ml/kg/min; HP = 46.7 ± 10 ml/kg/min; DP = 46.6 ± 9.6 ml/kg/min) or for maximal handgrip strength (CON = 43 ± 9.6 kg; HP = 44.1 ± 12.4 kg; DP = 43.4 ± 12.1 kg). **CONCLUSION:** Administration of honest or dishonest placebo immediately prior to VO2peak and handgrip testing had no effect on performance compared to control. The VO2peak and isometric handgrip tests were found to be robust exercise tests not significantly influenced by perceived pre-workout supplement consumption.
Although the direct measurement of $V\text{O}_{2}\text{max}$ during an exercise test provides the most accurate assessment of cardiorespiratory fitness, estimates of $V\text{O}_{2}\text{max}$ are often more practical. Prior research suggests that $V\text{O}_{2}\text{max}$ obtained during a treadmill maximal graded exercise test can be accurately estimated in men using the Heart Rate Ratio Method. This method estimates $V\text{O}_{2}\text{max}$ using the following equation: $V\text{O}_{2}\text{max} (\text{mL/kg/min}) = (\text{HR}_{\text{max}} / \text{HR}_{\text{rest}}) \times 15$. The validity of this equation to estimate $V\text{O}_{2}\text{max}$ has not been established in women or in other modes of exercise, such as cycling.

PURPOSE: This study compared $V\text{O}_{2}\text{max}$ values measured during running and cycling to estimates of $V\text{O}_{2}\text{max}$ using the Heart Rate Ratio Method in 42 men and women. METHODS: Resting metabolic rate (RMR) and $V\text{O}_{2}\text{max}$ on the treadmill and cycle ergometer were measured on 21 men and 21 women between 19-39 years of age. Each subject’s running and cycling $V\text{O}_{2}\text{max}$ was estimated using the Heart Rate Ratio Method and their resting HR measured during the RMR test and their actual maximal HR achieved during the maximal exercise test. RESULTS: The average running and cycling $V\text{O}_{2}\text{max}$ values for males (54.2 ± 7.1; 50.0 ± 8.9 mL/kg/min) were higher ($p<0.001$) than in females (43.4 ± 5.8; 39.8 ± 7.4 mL/kg/min), respectively. Resting HR values for males (55 ± 7 bpm) and females (57 ± 6 bpm) were similar as were the maximal HR values during running (186 ± 12; 190 ± 12 bpm) and cycling (181 ± 11; 184 ± 13 bpm), respectively. The estimates of running and cycling $V\text{O}_{2}\text{max}$ under-predicted actual values in males ($-2.9 ± 8.0; -0.26 ± 7.8$ mL/kg/min) and overestimated actual values in females ($7.3 ± 7.9; 9.3 ± 8.2$ mL/kg/min), respectively. There was a significant gender effect in the prediction of $V\text{O}_{2}\text{max}$ using the Heart Rate Ratio Method. Regression and Bland Altman analysis for treadmill running yielded an $R^2 = 0.076$, an SEE = 8.19, and a 95% limits of agreement (LOA) of ±18.46 mL/kg/min. Likewise, regression and Bland Altman analysis for cycling yielded an $R^2 = 0.18$, an SEE = 8.85, and a 95% LOA = ±18.24 mL/kg/min. CONCLUSION: The high SEE and LOA precludes this method for predicting running and cycling $V\text{O}_{2}\text{max}$. Gender differences in maximal HR and $V\text{O}_{2}\text{max}$ are not accounted for in predictions of $V\text{O}_{2}\text{max}$ using the Heart Rate Ratio Method.
The Use Of Individualized Exercise Prescription To Target Oxidative Metabolism In A Stage Iv Colorectal, Metastatic Cancer Patient

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HISTORY: A 42 year-old male was diagnosed with stage IV colorectal, metastatic cancer. In 2017 (2 years post-diagnosis) he came to our laboratory seeking exercise advice. He had received 56 rounds of chemotherapy without signs of remission. He also exercised on the bike 4-5 days/week with a duration of 1-3/3session. PHYSICAL EXAMINATION: He performed an incremental cardiopulmonary cycling exercise test. O2 consumption, blood lactate (BLa) as well as fat and carbohydrate oxidation rates (FATox/CHOx) were measured to assess cardiopulmonary and mitochondrial function. Both his FATox and lactate clearance capacity were poor, suggesting poor mitochondrial function despite exercising 4-5 days/week. He was given an individualized exercise prescription program for 3 months with the same amount of days and hours/week but with specific exercise intensities based on his individual metabolic parameters with the aim to improve oxidative metabolism to try to target the glycolytic phenotype of cancer (Warburg Effect). During the course of this exercise program he continued with chemotherapy. TESTS AND RESULTS: 3 months after the individualized exercise program he returned to the lab for re-evaluation. Significant increases in oxidative metabolic capacity at different exercise intensities were observed: - At 115, 150 and 190 Watts his FATox significantly increased (0.11g·min⁻¹ vs 0.29g·min⁻¹; 0.06g·min⁻¹ vs 0.25g·min⁻¹ and 0.0g·min⁻¹ vs 0.25g·min⁻¹ respectively). - Significant decreases in (BLa) were observed at 115, 150, 190 and 235 Watts (2.0 mmol·L⁻¹ vs 1.5 mmol·L⁻¹; 2.0 mmol·L⁻¹ vs 1.4 mmol·L⁻¹; 4.4 mmol·L⁻¹ vs 2.2 mmol·L⁻¹ and 9.7 mmol·L⁻¹ vs 4.6 mmol·L⁻¹ respectively). FINAL WORKING DIAGNOSIS: The patient’s cardiovascular and oxidative capacity significantly improved after 3 months of individualized exercise program. TREATMENT AND OUTCOMES: One month later, he performed a new PET scan showing remission and no evidence of cancer. CONCLUSIONS: This case shows a novel approach to individualize exercise prescription in cancer patients to try to elicit improvements in oxidative metabolism to counteract the glycolytic phenotype of many cancers. The mechanisms for this metabolic reprogramming could be a possible crosstalk between skeletal muscle and cancer cells via exosomes could be a possible explanation.

Hand Mass in an Active Military Personnel

Benjamin Tan, Daniel Montero. Mayo Clinic Hospital, Jacksonville, FL. (Sponsor: George Pujalite, FACSAM)

History: A previously healthy 21 year-old male, right-hand dominant, presented into sports medicine clinic with a right thumb mass that had been present for approximately a year and a half. Over this period, the mass had grown slowly but had since stabilized. He denied any associated sensitive pain or dysfunction. He presented due to concern regarding the size of the mass, and because it was interfering with tasks related to his physical training and duties in the Air National Guard. Physical Exam: Generally healthy-appearing, muscular but thin-built, gentleman in no acute distress. Evaluation of the hand showed an obvious mass on the dorsal aspect of the right first interphalangeal (DIP) joint that was elevated by approximately 3mm and measured 17 mm x 5 mm. It was non-tender to palpation. It did not affect flexion or extension of the right DIP joint. However, it did not transilluminate by penlight. It felt firm on exam. Differential Diagnoses: Ganglion cyst of distal interphalangeal joint Epidermoid cyst Giant cell tumor Tests and Results: Ultrasound briefly performed showed echogenicity and no obvious free fluid within or surrounding the mass. X-rays revealed rounded a soft tissue density overlying the dorsum of the thumb’s interphalangeal joint. No radiopaque foreign object was present. No adjacent periosteal reaction or osseous destructive changes were noted. Magnetic resonance imaging (MRI) revealed an enhancing, soft tissue mass measuring 13 mm x 9 mm x 6 mm, along the dorsal aspect of the right thumb at the interphalangeal joint, most compatible with a giant cell tumor, associated with the extensor pollicis longus tendon sheath. Final Working Diagnosis: Giant cell tumor, rarely seen on the thumb (2% of cases occur within the hand) Treatment and Outcomes: Patient shortly underwent a surgical excision of the giant cell tumor which revealed intrarticular extension into the interphalangeal joint of the right thumb. Pathology confirmed the diagnosis.

A Phaeochromocytoma in an Elite Collegiate Athlete

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HISTORY: A 22-Year-old rugby union player presented to the Sports Medicine clinic complaining of a sore throat and skin rash over his back and upper arms for the past week. Further symptoms included rhinorrhea and dry cough for the previous week, feeling “hot” (especially at night) and constant fatigue. The occurrence of these symptoms coincided with a regional measles outbreak. The clinical symptomatology persisted at subsequent visits over a period of 12 months and ranged from diarrhoea, skin rash, dry cough, headaches, anxiety, night sweats, rapid heart rate and exercise intolerance. Despite follow-up visits when he was asymptomatic, constant weight loss occurred over the period since he first presented. Except for weight loss and a single blood pressure reading of 135/90mmHg previously his medical history was uncompromized. He had a history of various sport related musculoskeletal injuries and there was no family history of note. PHYSICAL EXAMINATION: At initial physical examination athlete was afibrile, HR 100 b/min with a blood pressure reading of 110/60mmHg. Palpable tender occult limb lymph nodes were present. Except for the non-purulent pharyngitis and maculopapular rash over the back and upper arms, the remainder of systemic physical examination was normal. Although normal or low BP measurements were noted on other visits, the athlete presented with BP mildy elevated (135/90 mmHg) with the skin rash located over the trunk at most visits. DIFFERENTIAL DIAGNOSIS: Viral infection (measles, rubella, coxaci,EBV), Viral infection unspecified, Hypothyroidism, Pulmonary tuberculosis, Vasomotor response to immune activation, Essential Hypertension, Pheochromocytoma. TEST AND RESULTS: 4C's-normal, ESR-normal, CRP-normal,Rubella/Measles IgM (-),Urea(5.5mmol/L),s-Creatinine(81μmol/L),s-ALT(101μmol/L), s-ALP(134μmol/L),s-GGT(20μmol/L),s-ALP(374μmol/L),s-Bilirubin(2.5μmol/L),s-IgM(-),s-IgG(12.7g/L),s-IgA(1.6g/L),s-IgE(236U/L). MIBG Scan negative (left) indicated a left adrenal gland mass, CT Abd (Triphasic)-well defined mass left adrenal gland. FINAL WORKING DIAGNOSIS: Benign phaeochromocytoma-left adrenal gland TREATMENT AND OUTCOMES: Laparoscopic adrenalectomy (left), Uncomplicated post operative recovery, Full return to sport.

Anaplastic Oligodendroglioma: Impacts Of Aerobic And Flexibility Training On Physiological, Psychosocial, And Cognitive Function

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HISTORY: A 44-year old female diagnosed with class III anaplastic oligodendroglioma with 1p19q genetic co-deletion who underwent a left-frontal craniotomy, chemotherapy, and radiation prior to starting an exercise-based cancer rehabilitation program. During initial assessments, she qualified and was enrolled in an ongoing research study examining the impacts of aerobic and flexibility training on cognitive function. CLINICAL EXAMINATION: Comprehensive physical, psychosocial, and cognitive assessments were completed pre and post training (36-session intervention). DIFFERENTIAL DIAGNOSIS: 1. Brain Metastases 2. Seizure Disorders 3. Globlastoma Multiforme TESTS AND RESULTS: Sought medical assistance following grand mal seizures. Magnetic resonance images (01/15/2013) revealed infiltrative lesions on the anterolateral aspect of the left frontal lobe which measured at approximately 4.6cm x 3.3cm in the axial plane - involved cortex and subcortical white matter (1p19q genetic co-deletion) Patient underwent craniotomy and pathology confirmed grade III anaplastic oligodendroglioma - positive: Ip36 and 19q13 sequence deletions - negative: epidermal growth factor receptor sequences, tumor suppressor gene phosphatase - negative for the loss of the tumor suppressor gene phosphatase and tensin homolog sequences Follow-up (02/12/2013) the patient was awake, alert, and oriented, but physically fatigued New presentations: - blurred visual acuity (left eye), ambulation and postural difficulty, lower right extremity weakness, continual word aphasia with speech interruption FINAL WORKING DIAGNOSIS: Class III anaplastic oligodendroglioma with 1p19q genetic co-deletion; referred to the University of Northern Colorado Cancer Rehabilitation Institute
and recommended participation in study. **TREATMENT AND OUTCOMES:**

1. Procarbazine, Lomustine, and Vincristine Sulfate (PCV) chemotherapeutic (6x) with ionized radiation (46 Gy followed by 14 Gy boost to resection site) and 2. FLAIR regions - temozolomide added as adjuvant to radiation 2. Patient completed 36 sessions of aerobic and flexibility training. 3. Improvements observed in physiological, psychosocial, and cognitive variables. 4. Patient then made a positive transfer into a standard exercise-based cancer rehabilitation program.

**BMI:** 28.74 kg / m²

**HISTORY:**

A 53-year-old female patient (Body mass = 71.30 kg; Height; 1.58 m; with stomach cancer, although it also requires future adaptations for this purpose.

Presented, in advance, with locomotor difficulties. Patients with stomach cancer should begin before surgery, because the current patient.

4. Prescription of physical exercises (as a non-pharmacological treatment) for patients with stomach cancer, reported stomach pain for at least 12 months, with no improvement in the use of proton pump inhibitors (omeprazole) and/or antacids (sodium bicarbonate).

She reported vomiting and increasing pain after consuming beer and using tobacco. The patient denied having decreased body weight over the last six months. Abdominal distension was reported.

**PHYSICAL EXAMINATION:**

Clear awareness, without edema, afibrile, normal blood pressure SARC-F questionnaire: score = 4 (tendency for sarcopenia).

**DIFFERENTIAL DIAGNOSIS:**

1. Reported muscle strength loss
2. Needed help to walk and lift chair
3. Could not climb stairs

**TEST AND RESULTS:**

Tomography of the whole abdomen: — wall thickening of the gastric antrum

Pathological stage:

— T1, N1, M1

Functional evaluation:

— Handgrip test: mean of 30 kg.f in both hands (good); 30-second elbow flexion test: 13 repetitions (good); 30-second chair stand test: 11 repetitions (adequate); Timed Up and Go test: 9 seconds (low risk of falls); Walking speed test: 1m / sec (adequate); 2-minute walk test: 109 knee elevations (good functional capacity)

**FINAL WORKING DIAGNOSIS:**

Locomotor difficulties were diagnosed through the physical/clinical examination and there was a tendency for sarcopenia; on the other hand, the physical tests did not corroborate this information and did not independently confirm physical incapacity prior to the total gastrectomy.

**TREATMENT AND OUTCOMES:**

1. Total gastrectomy.
2. Need to develop physical/functional tests to be applied, specifically, in cancer patients, regardless of tumor type.
3. Currently available physical tests were developed for an elderly population, which may compromise the interpretation of the results obtained (low specificity and sensitivity).
4. Prescription of physical exercises (as a non-pharmacological treatment) for patients with stomach cancer should begin before surgery, because the current patient presented, in advance, with locomotor difficulties.
5. The SARC-F questionnaire seems to be a good tool to detect sarcopenia in a patient with stomach cancer, although it also requires future adaptations for this purpose.

**FINAL WORKING DIAGNOSIS:**

Total gastrectomy.

2-minute walk test: 109 knee elevations (good functional capacity)

**DIFFERENTIAL DIAGNOSIS:**

1. Rotator cuff tendinopathy
2. Shoulder dislocation and/or glenoid labral tear
3. Occult Humerus fracture
4. Infection

**Initial Test and results:**

Left shoulder and humerus radiographs were normal. Due to the disposition of the patient, the patient and his family were advised to go to the pediatric ER. A work-up revealed a normal WBC count, and an elevated CK and CRP. Urine and blood cultures were positive for MSSA. MRI of the shoulder and elbow revealed osteomyelitis of left scapular body with left periscapular abscess. Pediatric Orthopedic Surgery was then consulted and performed an incision and drainage (I&D) of the left supraspinatus, infraspinatus, and subscapularis abscesses.

**Final Diagnosis:**

Acute MSSA osteomyelitis of left scapula with left periscapular abscess

**Treatments and Outcomes:**

After surgical I&D, the patient clinically improved over a two-week hospital course and discharged after 4 weeks of IV antibiotics. He was then transitioned to oral antibiotics for an additional 8 weeks. At the 8-week clinical follow-up there was a complete resolution of shoulder and upper extremity pain.
590 May 29 1:20 PM - 1:40 PM
Treatment of Neurogenic Thoracic Outlet Syndrome in a Professional Baseball Pitcher with Soft Tissue Technique
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(No relevant relationships reported)

HISTORY: A 28-year-old male, left hand dominant professional baseball pitcher, with a several year history of persistent left upper extremity numbness presented with increased pain and numbness of the elbow and forearm after throwing a pitch.

PHYSICAL EXAMINATION: On physical examination, the patient had decreased cervical range of motion with hypertonicity and tenderness of the supraclavicular fossa. Spurling’s maneuver was negative and his shoulder and elbow had full range of motion and strength. There was no significant laxity or pain with valgus stress of the elbow and his wrist and intrinsic hand muscle strength was intact. Skin was intact without discoloration or edema. Tinel’s was negative at the cubital and carpal tunnel, however, his sensation was slightly diminished throughout the ulnar nerve distribution. Roos and Adson tests were positive.

DIFFERENTIAL DIAGNOSIS: UCL tear, Flexor pronator strain, ulnar neuritis, thoracic outlet syndrome.

TEST AND RESULTS: Radiographic evaluation included views of the left elbow and cervical spine which were unremarkable. An MR arthrogram of the elbow was negative for any significant pathology.

FINAL WORKING DIAGNOSIS: Acute on Chronic Neurogenic Thoracic Outlet Syndrome

TREATMENT AND OUTCOMES: Access to formal physical therapy was limited. The patient’s pain and numbness persisted despite oral medications and daily treatment by the athletic trainer so he was referred to the team chiropractor. During the initial chiropractic treatment, which consisted of trigger point release and stretching applied to the anterior scalene musculature and cervical distraction manipulation, the patient experienced a sudden and complete resolution of his pain and numbness. He remained symptom free for the rest of the season.

591 May 29 1:40 PM - 2:00 PM
Abnormal Anatomical Etiology and the Resultant Bilateral Thoracic Outlet Syndrome: An Exploration Case Report
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(No relevant relationships reported)

HISTORY: 32-year-old healthy female presented to the vascular surgeon for right arm pain (pn) and a hand tremor. She was a mesomorph with forward head posture and was a volleyball athlete and triathlete.

PHYSICAL EXAMINATION: Patient reported years of pn and dysfunction with no mechanism of injury. Symptoms began as stabbing pn 8/10 along right ulnar and radial nerves. Pn increased when the arms were unsupported. Right hand tremor increased with ADLs, and arm above 100 degrees. Feeling of heaviness and tingling in the arms impaired sleep and decreased effective grasping of objects causing patient to often drop things. Left arm pn 6/10 in trapezius, radiated to the forearm. Trapezius felt as if it needed to be stretched, but stretching increased pn 7/10. Pn was felt in the jaw and teeth 5/10 and the ear had a “cloudy” sensation. Patient had three root canals yet the facial pn persisted.

DIFFERENTIAL DIAGNOSIS: Paget-Schroetter syndrome
Rotator Cuff Injury
Multiple Sclerosis

TEST AND RESULTS:
MRA right shoulder:
- Labrum tear, infraspinatus atrophy, rotator cuff tear. Supraspinatus nerve laceration with maximal involvement of infraspinatus
MRI c-spine:
- Minor arthrosis, slightly degenerated discs with no bulging at C5-C6
X-ray c-spine:
- No cervical ribs or narrow facets
MRI brain:
- No multiple sclerosis
Electromyography:
- Infraspinatus atrophy
Special Tests - Adson, Allen, Military Brace:
- Absent bilateral pulse
DASH score:
- Significant ADL impairment
Lidocaine muscle block, scalenes and right pec minor:
- Patient reported 50% decrease in pn

MRI bilateral brachial plexus:
- Post-surgical edema, asymmetrically large right jugular vein, pec minor and subclavian muscle atrophy with scarring at SC joint. Brachial plexus matted in scalene compartment, left side normal

FINAL/WORKING DIAGNOSIS:
Bilateral TOS with right pec minor impingement

TREATMENT AND OUTCOMES:
1. Sx 1: Subtotal resection of subclavious, scalenes, resection of scalene minimus, division of pec minor, brachial plexus neurolysis, and subclavian artery lysis
2. Sx 2: Subtotal resection of subclavious, scalenes, brachial plexus neurolysis, and subclavian artery lysis
3. Sx 3: Scaleneectomy of right scalenes and scar tissue removal
4. Paralyzed right diaphragm from surgery complication
5. Patient reports 75% improvement on right, 90% improvement on left.

592 May 29 2:00 PM - 2:20 PM
Shoulder Injury - Weightlifting
Andrew G. Cheung. John Muir Health, Walnut Creek, CA.
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(No relevant relationships reported)

HISTORY: 27-year-old male weightlifter with history of left UCL sprain and chronic bilateral partial-thickness supraspinatus tears was training for the 2017 FISU Summer World University Games in Taipei, Taiwan at the end of August 2017.

He was finishing his training session with pull-ups, when he felt a tearing sensation in his left anterior shoulder during the eccentric portion of the pull-up, with pain with flexion of that shoulder and tenderness to the area. Two days later, he felt a pop in his left anterolateral arm when he caught an 88 kg snatch slightly forward. He did not have any pain at that time and stopped his training session that day.

Physical Examination:
Left arm: Neurovascularly intact. Mild tenderness to palpation over bicipital groove. “Popeye” deformity of proximal lateral biceps without ecchymosis or significant tenderness, accentuated by active flexion of the forearm.

Differential Diagnosis:
1. Rupture of the left biceps brachii long head proximal tendon
2. Partial thickness tear of the left biceps brachii distal tendon
3. SLAP tear of the left shoulder
4. Exacerbation of left elbow UCL injury

Tests and Results: Patient was sent 2 days later for ultrasound, which showed disordered muscle fibers and fluid collection over the area of the left proximal biceps deformity. Proximal biceps long head tendon not directly visualized in the bicipital groove on ultrasound.

Final Working Diagnosis: Rupture of the left biceps brachii long head proximal tendon

Treatment and Outcomes: Over the following month, the patient was seen by a physical therapist twice a week for manual therapy, including ice, compression, e-stim, and therapeutic ultrasound to the area in an effort to prevent potential myositis ossificans. Throughout this period, the patient continued to have intermittent left anterior arm pain while training, worse with snatches and other barbell exercises involving a wide grip; he continued to train at lighter weights, avoiding snatchs more than 60% of his maximum in this period. Given the time proximity to competition, the patient decided against surgical evaluation. In competition, he snatched 99 kg (just 2 kg under his best), clean and jerked 125 kg (also 2 kg under his best), and had no significant discomfort or pain.

593 May 29 2:20 PM - 2:40 PM
Scapular Winging II - A New Approach
Kevin M. Mullins, Brian A. Davis, FACSM. University of California, Davis, Sacramento, CA. (Sponsor: Brian A. Davis, FACSM)
(No relevant relationships reported)

HISTORY: A 62-year-old woman sustained a right shoulder injury after falling onto an outstretched arm. Initial workup with essentially normal cervical x-rays, MRI, and shoulder x-rays. On shoulder MRI mild increased T2 signals at insertion sites of supraspinatus and long head biceps. NCS for median/ulnar nerves and EMG of deltoid, infraspinatus, serratus anterior and rhomboid major were normal. She was treated with a subacromial corticosteroid injection and therapy without improvement.

EXAM: On inspection decreased bulk in right trapezius, rhomboids and supraspinatus. No palpation tenderness. Full passive ROM. Right scapular wing with abduction greater than 90 degrees and loss of adduction control of scapula into anterior/superior suprascapular region. Active shoulder abduction pain limited to 54 degrees when...
standing, but full 170 degrees when supine. Right trapezius strength 4/5, remaining muscles 5/5 with scapula stabilized. Sensation intact and impingement maneuvers negative.


RESULTS: NCS: Normal left spinal accessory nerve CMAP to trapezius, abnormal right spinal accessory nerve with decreased amplitude and onset latency compared. EMG: Normal right deltoid, infraspinatus, serratus anterior, rhomboid major but abnormal right upper/middle trapezius findings with increased insertional activity, fibrillation potentials, positive sharp waves, polyphasic MUAPs and reduced recruitment.

DIAGNOSIS: Right incomplete spinal accessory neuropathy

OUTCOME: Custom anterior-wrapped to posterior shell scapular stabilization brace fabricated. Once donned, improvement in abduction/flexion ROM quantified utilizing the Microsoft Kinect Motion Analysis. However, there was decrease in cross body adduction, and poor compliance long term due to weight and bulk. An updated lighter weight orthosis was fabricated, including a primary dynamic force strap for anteriorly directed pressure with a scapula plate shield intended to provide a superiorly directed force. The newer materials and design have provided significant improvement in function and compliance, indicating future treatment options for spinal accessory neuropathy.

594 May 29 2:40 PM - 3:00 PM
Shoulder Injury - Rower
Rahul Khapekar. Advocate Lutheran General Hospital, Park Ridge, IL. (Sponsor: Mark Hutchinson, FACSM)
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(No relevant relationships reported)

HISTORY: A 64-year-old expert male rower presented with persistent overhead weakness for 27 months of his right shoulder. He initially felt pain when lowering his arm after placing his canoe on top of his car. Patient denied any acute popping, tearing or swelling. After failed alternative treatments, patient completed MRI shoulder showing full thickness supraspinatus tear and subsequently underwent arthroscopic repair. Despite adherence to physical therapy, patient reported persistent weakness with overhead activity. After an MR arthrogram showed massive supraspinatus re-tear without labral pathology, patient obtained a second opinion at which time he was instructed that he has an “unrepairable torn rotator cuff”.

PHYSICAL EXAMINATION: On inspection of his right shoulder, there is marked atrophy of muscles 5/5 with scapula stabilized. Sensation intact and impingement maneuvers negative. Right trapezius strength 4/5, remaining muscles 5/5 with scapula stabilized. Sensation intact and impingement maneuvers negative.


TEST AND RESULTS: EMG: no deltoid denervation with carpel tunnel findings XR: glenohumeral and AC joint arthritis changes MRI right shoulder w/o contrast: massive rotator cuff (supraspinatus and subscapularis) tear

FINAL WORKING DIAGNOSIS: Chronic right massive rotator cuff tear without deltoid denervation

TREATMENT AND OUTCOMES: 1. Physical therapy 2. No reverse total shoulder arthroplasty indicated given no pain 3. Resume all activities as tolerated, may resume kayaking and canoeing

Sedentary behavior is recognized as a detrimental behavior to one’s health.

PURPOSE: To describe 10-year trends in Americans sitting time.

METHODS: Data from 5 cycles (2007-2016) of the National Health and Nutrition Examination Survey (NHANES) were used in this analysis. During the 07-08 NHANES cycle, participants were asked: “How much time do you usually spend sitting or reclining on a typical day?” For the following NHANES cycles (09-16), participants were asked: “How much time do you usually spend sitting on a typical day?” Mean sitting time for the overall sample and for each sex separately were quantified. Regression analyses accounting for the complex, multi-stage design of NHANES were conducted to examine for linear trends and mean differences in sitting time between cycles.

RESULTS: 26,771 participants (51.5% females, 20 years of age or older) provided sitting time data for all cycles. Data are presented in Figure 1. Significant positive linear trends across cycles were observed for the overall sample and for each sex separately (p<0.001). For the overall sample and men, mean sitting time was significantly higher at each successive cycle between 07-08 to 13-14. During 15-16 cycle, mean sitting time was significantly lower than 13-14 but not different from 11-12 for the overall sample (p=0.16) and men (p=0.34). For women, sitting time trends were similar to those observed among the overall sample and men with the exception that the 07-08 and 09-10 cycles were not significantly different from each other (p=0.30).

CONCLUSIONS: Americans’ average self-reported sitting time increased between 2007 and 2014. 2016 data showed lower sitting time compared to 2014. Future NHANES waves will help determine whether Americans sitting time has reached a peak or if 2016 data were an exception.
Evidence suggests that physical activity (PA) may improve classroom behavior in elementary school children. Further, studies have shown that the most off-task children may exhibit greater benefit from acute bouts of PA. However, limited data exists in preschoolers. **PURPOSE:** To examine baseline relationships between PA and classroom behavior, and to identify if the most off-task preschoolers responded differently to PA compared to those least off-task. **METHODS:** Participants (n=31, age=3.8±0.8 years, 61% male) attended a university-based preschool. In week one of this two-week pilot study, children engaged in their typical curriculum. Week two included daily short bouts of PA that were integrated into early learning standards. PA was assessed with accelerometers worn on the lower back during preschool attendance. Trained researchers conducted weekly 10-minute classroom observations to quantify children’s classroom behavior [active engaged time, (AET); passive engaged time, (LOW); off-task motor, (OFT-M); off-task verbal, (OFT-V); off-task passive, (OFT-P)] using the Behavioral Observation of Students in Schools (BOSS) tool. Spearman correlations were used to examine baseline relationships between PA and classroom behavior variables. To test if children with high off-task behavior (HIGH) responded differently to PA compared to children with low off-task behavior (LOW), participants were categorized into tertiles based on baseline off-task behavior and groups were compared using t-tests. **RESULTS:** A negative correlation was observed between light intensity activity (min/day) and AET at baseline (r=-0.44, p<0.02). No other significant relationships were observed. However, when classroom behavior following PA in the most off-task children was examined, improvements were observed in OFT-M (HIGH=36.5±5.4%, LOW=10.5±5.7%, p=0.0001), OFT-V (HIGH=16.7±2.8%, LOW=5.7±3.3%, p=0.0004), and OFT-P behaviors (HIGH=19.6±7.6%, LOW=12.0±7.1%, p=0.01). **CONCLUSION:** Initial evidence for PA to improve classroom behavior among children who exhibited greater off-task behavior was observed and is consistent with previous findings. PA future work should build on this acute study and examine chronic PA to limit classroom off-task behaviors. Supported by: NASPME Marco Cabrera Student Research Award

**CONCLUSIONS:** A daily exercise oncology twitter campaign was able to engage a broad international audience and provide high levels of reach, indicating that this may be an effective strategy for communication and dissemination of exercise research.

Evidence of cardiorespiratory fitness (CRF) non-response is growing in both clinical and exercise training studies. Along with aerobic training, an increase in non-exercise physical activity may reduce CRF non-response contingency. **PURPOSE:** To determine if increases in non-exercise physical activity mitigates CRF non-response to exercise training among sedentary, overweight/obese adults. **METHODS:** Thirty-six adults (age: 54.19±7.14 years; BMI: 35.83±4.66 kg/m²; 77.8% female) were assessed from a previous exercise study (70% adherence to 4 weekly sessions across 24 weeks). Participants were randomized to an aerobic training group or an aerobic training and increasing non-exercise physical activity group (increase 1,000 to 3,000 steps per day from baseline). Both groups performed the same supervised aerobic training (50±25% VO₂ max, 24 weeks at a dose of 12 kca ls per kg per week). CRF non-response was determined via calculated delta (∆) values (follow-up minus baseline values) for absolute VO₂ max (L/min) and participants were categorized as non-responders via technical error (TE) (∆/0.71 L/min) and classical measures (∆/0 L/min). Pearson Chi-square test of independence was conducted for categorical variables (i.e. responders vs. non-responders) in TE and classical responders, separately. A binary multivariable logistic regression was used to estimate odds of CRF non-response based on baseline demographic factors (age, race, BMI, fitness, waist circumference). **RESULTS:** Participants increasing non-exercise physical activity with aerobic training were significantly more likely to increase CRF based on TE analysis, X² (2, N=36)=10.99, p<0.004, compared to aerobic training alone. Whereas, classic non-response did not show a significant relationship X² (2, N=36)=2.77, p=0.251. Baseline age (p=0.05) was a significant predictor of TE response, while baseline BMI (p<0.05) was a significant predictor for classic response. **CONCLUSION:** Increasing non-exercise physical activity concurrent with aerobic training may improve likelihood of increasing CRF and, thus, reduce risk of cardiovascular disease and mortality. Supported by a grant from the American Heart Association (13SG17140091).
low cardiorespiratory fitness level, while the LEPR, IGFBP1 and ENO3 genes were significantly associated with a low cardiorespiratory fitness level in female survivors. Positive associations between the cardiorespiratory fitness level and trainability genes were mainly observed in females.

CONCLUSIONS: For an identical level of MVPA in both survivors and control subjects, the cardiorespiratory fitness was significantly lower in survivors, which can be associated with variants in genes related to subjects' trainability. These findings could allow better follow-ups tailored to survivors' genetic profile and cardiorespiratory fitness. This study has important implications for survivors, physicians and researchers, which could help reduce at least some of the burden of long-term adverse effects of treatments.

601 May 29 1:50 PM - 2:00 PM Physical Activities in Northern Song Dynasty (906-1127), China: A Painting Analysis
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(No relevant relationships reported)

“Qingming Shanghe Tu, 图 屏 春” (Painting of “Along the River during the Qingming Festival”) is a historical Chinese painting collected in Palace Museum, Beijing, China. Painted around 1101-1108 by artist Zeduan Zhang (1085-1145), this 24.8 cm x 528 cm painting captures the daily life of people and the landscape of the capital Bianjing of North Song Dynasty. Together, a total of 814 persons were included in the painting revealing the lifestyle and activities of all levels of the society then. Thus, it provides a golden opportunity to study physical activity (PA) pattern of people in China about 900 years ago.

PURPOSE: To examine people’s PA pattern in North Song Dynasty, China through analyzing a historical painting.

METHOD: After each person in the painting was numbered, they were coded by their age category, sex, activity engaged (using 2011 Compendium PA codes when apply), activity context, if labor-saving means was used, etc. The coded information was then analyzed using descriptive statistics.

RESULTS: Except for very few female adults and young children and two older adults, most of persons in the painting are male adults, reflecting the male-centered culture then. Most of PA, due to likely the painting was used to record activities related to a major festival, are recreation (miscellaneous) - standing; only one person is running; a few fast walking; many sitting either on chairs or on the ground; and none was doing traditional Chinese exercise. Some labor-saving efforts were already made then, e.g., using donkeys or cows to pull carriage, horses for riding and one case camels for carrying goods. Meanwhile, human power was still the most important source of mechanical energy then, e.g., rowing or pulling boats, carry persons using sedan chair, pushing wheelbarrows for transportations etc. Most noticeable and frequent human power activities are carrying heavy goods on man’s shoulders directly or through a carry pole.

CONCLUSION: It was noticed that labor-saving efforts were already made in a well-developed civilization society about 900 years ago in China although human power was the major source of mechanical energy then. Painting analysis of ancient paintings and graphics provides a unique and useful means to understand the evolution of human power activities carrying heavy goods on men’s shoulders directly or through a carry pole.

602 May 29 2:00 PM - 2:10 PM A Spring in Your Step: Exercise Training Increases Stretch-Shortening Cycle Potentiation and Walking Economy
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(No relevant relationships reported)

PURPOSE: Our objectives were to: (1) examine the effects of combined strength and aerobic training program on stretch-shortening cycle potentiation (SSCP) and net VO2, (inverse of walking economy) among older women and; (2) determine the relationship between SSCP and relative exercise intensity on walking economy. METHODS: Participants were 93 postmenopausal women (60-74 years), 67 of which completed 16 weeks of supervised strength and aerobic training. Participants were randomized into one of three groups: 1 d wk-1 of resistance training and 1 d wk-1 of aerobic training; 2 d wk-1 of resistance training and 2 d wk-1 of aerobic training; 3 d wk-1 of resistance training and 3 d wk-1 of aerobic training. Body composition (DXA), peak VO2 uptake on a cycle ergometer, concentric velocity during a counter-movement leg press throw (CM: 100% of body weight), concentric velocity during a static leg press throw (CO; 100% body weight), SSCP (difference between CO and CM), and net VO2, while walking at 2 mph were measured before and after the training. Net VO2 was calculated by subtracting resting VO2 from steady-state VO2 during flat ground walking at 2 mph. A paired samples t-test was used to determine differences in measures before and after exercise training. Multiple linear regression of baseline measures was used to determine associations of walking economy adjusted for SSCP and relative exercise intensity (% peak VO2) during the walking task. RESULTS: Among all participants, body weight did not significantly change (-0.4 kg, p = .067), however, percent body fat decreased (-1.3%, p = .001). All groups increased peak VO2 (+1.2 ml kg-1 min-1, p = .002). In the 2 d wk-1 group (n = 24) mean CM velocity increased (p = .004), but mean CO velocity did not change (p = .711). Mean SSCP increased (p = .048), while net VO2 during the walk task decreased (p = .002). Linear regression analysis showed SSCP and relative exercise intensity were independently related to net VO2, while walking at 2 mph (r = .54, p < .001; r = -.21, p = .047, respectively). CONCLUSION: These results reveal exercise training in older women, not only increases walking economy, but increases SSCP. Multiple regression reveals SSCP is associated with walking economy independent of relative exercise intensity among older women.

603 May 29 2:10 PM - 2:20 PM Differences in Sleep Quality and Adherence to Energy Intake and Physical Activity Recommendations during an 18-Month Behavioral Weight Loss Intervention

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(No relevant relationships reported)

PURPOSE: Long-term adherence to EI and PA recommendations during a behavioral weight loss interventions is difficult. It is possible that short sleep duration and/or poor sleep quality makes adherence to these recommendations challenging. In this analysis, we explored the association between sleep duration and sleep quality and adherence to EI and PA recommendations during an 18-month behavioral weight loss intervention.

METHODS: Adults (n=104, age: 18-55 years, BMI: 27.42 kg/m2) were enrolled in a behavioral weight loss program. Participants were prescribed a calorie-restricted diet (1200-1900 kcal/day) and were instructed to complete ≥300 min of moderate to vigorous physical activity (MVPA) per week. In this post-hoc analysis, participants were grouped based on adherence to EI (measured using 3-day food records) and PA (measured using the SenseWear armband) recommendations at 18-months. Adherence to the EI recommendation was defined eating ≤ individually prescribed calories determined using a validated prediction equation at 18 months. Adherence to the PA recommendation was defined as accumulating ≥300 min/week of MVPA in bouts of ≥10 min at 18 months. Sleep duration, sleep onset latency (SOL), wake after sleep onset (WASO), and sleep efficiency were calculated at baseline and 18 months using the armband.

RESULTS: Individuals who were adherent to both the EI and PA recommendations had significantly lower WASO at baseline (65.7±11.2 min) compared to non-adherent individuals (82.9±49.1 min; p<0.05). Individuals who were adherent to only the EI recommendation had significantly lower WASO (61.0±30.7 min) at baseline compared to those who did not meet the EI recommendation (81.5±44.0 min; p<0.05). Individuals who were adherent to only the PA recommendation had significantly lower SOL (37.0±21.1 min) compared to individuals who did not meet the PA recommendation (44.2±28.4 min; p<0.05). There were no differences in sleep duration or sleep efficiency between any of the groups.

CONCLUSIONS: Sleep quality at the beginning of an 18-month weight loss intervention may influence adherence to EI and PA recommendations during the behavioral intervention. Future behavioral weight loss interventions may be improved by focusing on improving sleep quality in addition to EI and PA.
Acute exposure to hypoxia results in a stress response categorized by sympathetic dominance, resulting in increased ventilation to prevent arterial desaturation. Heart rate variability (HRV) can be used as an estimation of overall stress and a provides understanding of the balance between sympathetic and parasympathetic autonomic regulation. PURPOSE: The purpose of this study was to determine whether resting heart rate variability at sea level is correlated with arterial desaturation and respiratory responses to acute normobaric hypoxia exposure equivalent to an altitude of 3500 meters. METHODS: Resting HRV, %SpO2, and respiratory rate was measured in 24 male and female subjects at sea level for 15 minutes. HRV was measured using Firstbeat Bodyguard2 and included RMSSD, High Frequency (HF), and Low Frequency (LF) components. Subjects then returned for a subsequent visit and resting HRV, SpO2 and respiratory rate were measured at rest in a normobaric hypoxic chamber (Colorado Altitude Training) set at either 3500 meters or sea level for control subjects. Correlation analysis using RStudio was performed. RESULTS: No significant correlation was observed between HRV in the time domain (RMSSD) and %SpO2 at rest (r=0.26, p=0.39), %SpO2 during exercise (r=-0.15, p=0.62), or respiratory rate during rest (r=0.42, p=0.15) when exposed to hypoxia. No significant correlation was observed between HRV in the frequency domain (LF/HF Ratio) and %SpO2 at rest (r=-0.10, p=0.74), %SpO2 during exercise (r=-0.18, p=0.53), or respiratory rate during rest (r=-0.39, p=0.19) when exposed to hypoxia. CONCLUSION: Although exposure to acute hypoxia exerts a physiologic stress response, HRV, as a measure of overall stress and the balance of sympathetic and parasympathetic balance does not seem to be predictive of the change in %SpO2 or respiratory rate. Supported by The Doug Morton/Marilyn Brown Endowment for Biomedical Research, The Foundation for Aging Studies and Exercise Science Research, and The Borgensicht Program.

Individuals who develop acute mountain sickness (AMS) upon exposure to high altitude (HA) exhibit differential responses in resting measures of minute ventilation (V̇e) and end-tidal partial pressure of carbon dioxide (PETCO2). PURPOSE: To determine the biological variation and diagnostic potential of ventilatory parameters in association with AMS. METHODS: We performed a retrospective analysis via the Mountain Medicine Database of 22 studies completed by the U.S. Army Research Institute of Environmental Medicine (N = 424). First, we determined the biological variation of resting measures of ventilation and defined the accompanying static and dynamic thresholds that indicate a significant deviation from normal at sea level (SL). Second, the diagnostic accuracy of ventilatory measures for AMS development was assessed at HA (4300 m). RESULTS: Resting measures of ventilation demonstrated substantial variability within (range 0.4 - 7.7%) and between (range 1.0 - 24.5%) subjects. Based on the index of heterogeneity (HI), P_0, and peripheral oxygen saturation (SpO2) may be useful in the dynamic assessment of deviations from normal (HI = 1.91 and 0.41, respectively) at HA. RER and SpO2 showed significant diagnostic accuracy in the static assessment of AMS (sensitivity/specifcity = 53/86 and 24/96, respectively). Ventilatory efficiency for oxygen (Vo2/V̇e), RER, and SpO2 showed significant diagnostic accuracy in the dynamic assessment of AMS (sensitivity/specifcity = 72/54, 53/74, and 25/98, respectively). Among all measures, RER showed the greatest Youden’s Index, a value indicative of the combined sensitivity and specificity of a given predictor (static: 39, dynamic: 28). CONCLUSION: Many resting ventilation measures do not demonstrate potential for AMS prediction. However, the few measures identified as potential predictors of AMS following SL biological variation analysis also demonstrated the greatest diagnostic power for AMS at HA. RER shows particular promise as a potential AMS prediction tool.

Predicting responses to acute hypoxia based on physiologic measures at sea level may be valuable in anticipating adverse responses to acute hypoxia. PURPOSE: The purpose of this study was to determine the arterial saturation response in men and women (18-33 years old) of varying fitness levels, at a normobaric altitude of 3500 meters. METHODS: 91 subjects (54 women, 37 men) completed a VO2peak test on a stationary exercise bike at sea level; to determine aerobic fitness (range 27.7-72.2 ml kg/min). Each subject then performed an 8-10-minute bout of cycling in normobaric hypoxia corresponding to 3500 meters at 65% of their maximal heart rate at VO2peak (sea level). RESULTS: VO2peak was positively correlated with decreased oxygen saturation during exercise at normobaric hypoxia corresponding to 3500 meters. For women (n=54), a greater predictive response was observed with a linear model depicting a strong positive correlation between VO2 peak and oxygen desaturation in hypoxia (r = 0.1643, p = 0.001028). For men (n=37), a predictive response was also observed with a linear model that was slightly less significant compared to women subjects (r = 0.1319, p = 0.0412). Furthermore, a relationship between average oxygen saturation difference (resting SpO2 minus exercise SpO2) at normobaric altitude, and VO2 peak at sea level in women subjects (r=0.1855, p=0.01719) was observed. CONCLUSION: These results demonstrate that increased VO2 peaks in individuals at sea level, is predictive of higher arterial oxygen desaturation during exercise, in normobaric altitude (3500m), especially in women which may make them more susceptible to adverse responses to acute altitude exposure.

Supported by The Doug Morton/Marilyn Brown Endowment for Biomedical Research, The Foundation for Aging Studies and Exercise Science Research, and The Borgensicht Program.

Hematocrit (Hct) and hemoglobin concentrations (Hb) rapidly increase when sea-level (SL) residents ascend to high altitude (HA) due to a decrease in plasma volume (PV), generally but not universally, attributed to changes in oncotic pressure. The ΔPV at HA varies, depending on exposure duration and elevation, and sojourner age, sex and SL red cell mass. A quantitative model for predicting individual PV changes (%ΔPV) over the first 7d at HA was recently published (Beidleman et al., 2016). That model, developed from measurements of those parameters and the measured %ΔPV in 393 HA sojourners, was internally cross-validated using boot-strap resampling, but has not been validated against an independent sample of sojourners, or for sojourns >7d in real world conditions, e.g. energy deficit (ED). PURPOSE: To compare measured %ΔPV with %PV predicted by the model in 17 young, healthy, male, SL natives sojourning 21 d at HA and consuming a diet designed to elicit 40% ED. METHODS: Hct, Hb, and total circulating protein (TCP) measured in 92 participants at SL and after living 2, 7, 13 and 19 d (HA2, HA7, HA13 & HA19, respectively) at 4300 m were used to calculate %TCP and %PV from SL. Correlations between %ΔPV and %ΔTCP were calculated, and means and individual values of measured %ΔPV were compared to predicted %ΔPV. RESULTS: Body mass loss was 8 kg by d21 at HA, but body mass loss was not associated with %ΔPV or %ΔTCP on HA2, 7, 13 or 19. Mean [95% CI] measured %ΔPV on HA2, 7, 13 and 19 were -2.5 [-8.1, 3.2], -11.0 [-16.6, -5.5], -11[-15.9, -7.4], and -16.8 [-22.2, -11.3], respectively. %PV and %TCP were positively correlated (P<0.001) at HA2, 7, 13 and 19 (r = 0.77, 0.88, 0.78, 0.89, respectively). The model over-predicted mean [95% CI] decrease
These hemodynamic changes are tolerable in young healthy individuals, but could be
min and the average V m
underwent a 10-day trek from Kathmandu, Nepal to Gorak Shep, Nepal. Cerebral
increases in cerebral blood flow to maintain oxygen delivery. An inability to increase
Cognitive function may be negatively impacted at high-altitude, which has important
Hypertension is a major risk factor for cardiovascular disease, and is present in 46%
decrease (p=0.00) during rest and exercise
change in %∆PV on HA19 (12.4 [-5.0, 29.8]). On HA2, 7, 13 and 19 only 2, 2, 6 and
in %∆PV were within 95% CI for predicted %∆PV. CONCLUSION: These observations indicate that human PV responses to HA exposure are oncostically mediated, vary considerably among individuals, and available
neurovascular coupling (NN) and hypobaric hypoxia (HH; Gorak Shep, Nepal 5,160 m).
Changes in cognitive function were calculated as the change in accuracy and RT from
Acutery was reduced at HH compared with NN (9.8 ± 10.0% reduction; p = 0.001) while RT was faster (0.06 ± 0.08 s faster; p = 0.007). Univariate
had the lowest V m
exposure. RESULTS: Accuracy was reduced at HH compared with NN (9.8 ± 10.0%
low-altitude (116 m). V m
is known of the acute effect on BP in young healthy individuals when exposed to
RESTING AND SUBMAXIMAL EXERCISE HEMODYNAMIC CHANGES WHEN SEA LEVEL INDIVIDUALS ARE EXPOSED TO ALTITUDE (11,237ft)

RESULTS: 5 males and 4 females; age=21.9±4.1 y; weight=72.3±14.3 kg; height=174.2±6.1 cm; VO2max=43.6±8.3 ml/kg/min; completed the study.
Oxygen saturation decreased (p=0.00) during rest and exercise
This study was designed to observe BP changes during rest and submaximal exercise in normotensive sea level (SL) individuals after 24 and 96 hours of altitude exposure (11,237ft).
METHODS: Nine college students were asked to participate in five trials. Trials 1&2 determined their VO2max and 60% HRR workload (WL) at SL, respectively. Trials 3-5 assessed BP, O2 saturation, heart rate and blood pressure (BP = (SBP*HR)/100) during rest and submaximal exercise.

METHODS: This was a randomized, double-blind, placebo-controlled, parallel group trial. Subjects were recruited at annual ACSM convention in San Diego, CA. The study included 17 adult volunteers, of which 8 were assigned to placebo and 9 were assigned to intervention. All trials were performed in a climatic chamber with 50% simulated altitude (4000m) air density and 25°F ambient temperature. The study followed ethical standards requisite for human subject research.

CONCLUSIONS: These results demonstrate that when sea level individuals are acutely exposed to altitude (11,237ft), there is a significant decrease in O2 saturation, and a significant increase in HR, BP and DP after 24h and up to 96h. These hemodynamic changes are tolerable in young healthy individuals, but could be concerning in individuals with documented or latent CVD.

Hyperventilation (Hv) was calculated as the average of the 2nd and 3rd minutes of each trial.

Table 1: Cerebrovascular hemodynamics at rest and during activation (mean ± SD).

<table>
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<tr>
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<th>1400m</th>
<th>3400m</th>
<th>4240m</th>
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</thead>
<tbody>
<tr>
<td>Rest Stroop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPO2 (%)</td>
<td>94±2</td>
<td>96±1</td>
<td>88±3†</td>
</tr>
<tr>
<td>Mean pressure (mmHg)</td>
<td>84±8</td>
<td>85±9</td>
<td>87±4†</td>
</tr>
<tr>
<td>Vm (cm/s)</td>
<td>64±10</td>
<td>67±11</td>
<td>65±10</td>
</tr>
<tr>
<td>ACA</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>PI</td>
<td>0.93 ± 0.08</td>
<td>0.86 ± 0.06</td>
<td>0.80 ± 0.12</td>
</tr>
<tr>
<td>Vm (cm/s)</td>
<td>55±9</td>
<td>58±11</td>
<td>56±15</td>
</tr>
</tbody>
</table>

Hyperventilation (Hv) was calculated as: 

Hv = Vm – 0.8 × Vm

Hypoxemia: Mean ± SD values for resting Vm and PI are presented. Hemoglobin was measured by CO-oximeter and arterial oxygen saturation by pulse oximetry.

Resting and submaximal exercise hemodynamic changes when sea level individuals are exposed to altitude. Each condition lasted 4 min. V m

RESULTS: Blood pressure increased, MCA and ACA PI, and arterial oxygen saturation decreased (p<0.05) at all altitudes. No significant high-altitude hypoxia by exercise interaction was found. Asthenia, emotional and memory impairments were observed at 10,500 ft and 11,237 ft. Exercise-induced asthenia was more prominent during the second stage of the test at 11,237 ft. Cognitive function was decreased at altitude (p<0.001) during rest and exercise.

CONCLUSION: There was no evidence of hypoxia at rest or during exercise at 4,240 m (14,000 feet) in healthy young adults.

WEDNESDAY, MAY 29, 2019

ACSM May 28 – June 1, 2019 Orlando, Florida
PURPOSE: To determine the effects of hypoxia on CBFV and hemodynamics during bicycle ergometer exercise. METHODS: In a randomized, double-blind, crossover study, Twelve healthy volunteers (22±1.06 yrs) were asked to perform the bicycle ergometer exercise three times in two hypoxic (3150m and 1900m altitudes) and control (sea level) condition with a week interval, respectively. Exercise intensity was set initially at 50W and increased by 25W every 2 minutes to 125W. Acute normobaric hypoxic condition corresponding to the altitudes of 3150m and 1900m was maintained using low oxygen gas mixture for the whole procedure of 40 minutes. CBFV in middle cerebral artery (MCA) were measured at rest 15 minutes, 5 and 10 minutes during exercise, 10 minutes recovery using transcranial-Doppler sonography. Non-invasive electrical cardiometry was used to obtain cardiac output (CO), thoracic fluid content (TFC) and flow time corrected (FTC). All data were analyzed using two-way ANOVA with repeated measures and Pearson’s correlation. RESULTS: CBFV in MCA in 3150m and 1900m was significantly higher than in control condition at 10 minutes during exercise (110±28 and 99±25 vs. 75±18 cm/s, p<0.05). Heart rate (HR) in 3150m was significantly higher than in 1900m and control condition at 10 minutes during exercise (163±10 vs. 154±6 and 152±8 bpm, p<0.05). FTC in 3150m and 1900m was significantly lower than in control condition at 10 minutes during exercise (27±1 and 26±1 vs. 30±2, p<0.05). CO and stroke volume (SV) were not different between three conditions. CONCLUSIONS: These results suggest that exercise in normobaric hypoxic condition might increase CBFV, which might be independent of hemodynamic changes.

B-37 Thematic Poster - New Findings in Physical Activity Assessment

Wednesday, May 29, 2019, 3:15 PM - 5:15 PM
Room: CC-102A

Chair: Nicholas Wareham. Institute of Metabolic Science, Cambridge, United Kingdom.

(No relevant relationships reported)

683 Board #1

May 29 3:15 PM - 5:15 PM
Free-Living Accelerometer Calibration: A Novel Direct Observation System

Melanna F. Cox, Greg J. Petrucci, Robert T. Marcotte, Brittany R. Masteller, John Staudenmayer, Patty S. Freedson, FACSM, John R. Sirard, FACSM. University of Massachusetts, Amherst, MA. (Sponsor: John R. Sirard, FACSM)

(No relevant relationships reported)

PURPOSE: To develop a direct observation (DO) system to serve as a criterion measure for model calibration using free-living (FL) accelerometer data. METHODS: Ten participants (19±0.8 yrs) were video-recorded during four, 1-hr FL sessions in different settings: school, home, community and physical activity (PA). For each setting, 10-min clips from three, randomly selected sessions were extracted and coded by a criterion coder and assistant coders (ACs) using the Observer XT software (Noldus, Wageningen, the Netherlands). Coders identified the movement/body position and four modified locomotion (yes or no), activity type (e.g. reading), MET value, and intensity category. For intra-rater agreement, the criterion coder coded all 12 videos twice, separated by at least one week. For inter-rater agreement, all 12 videos coded by each AC were compared to the criterion coder. Intraclass correlation coefficients (ICCs) were calculated to assess agreement of intensity category for intra- and inter-rater comparisons. RESULTS: Intra-rater agreement ranged from 91% to 100% across all variables in all four settings. Inter-rater agreement between the criterion coder and the ACs ranged from 88±3.5% to 100±0% across all variables in all four settings. As shown below, ICCs for intensity category ranged from 0.74-1.00 and 0.81-1.00 for intra- and inter-rater comparisons, respectively. CONCLUSION: The DO system is reliable and feasible to serve as a criterion measure of FL physical activity in young adults. The DO system can serve as a standardized instrument to develop accelerometer models for estimating PA and sedentary behavior in FL settings.

Supported by: NIH NIDDK 1R01DK110148-01

684 Board #2

May 29 3:15 PM - 5:15 PM
Reliability Analysis of the COSMED K5 Portable Metabolic System

Lindsey E. White, Jacob P. DeBlois, Tiago V. Barreira. Syracuse University, Syracuse, NY.

(No relevant relationships reported)

Increased energy expenditure via physical activity has been shown to improve health outcomes. It is difficult to measure energy expenditure and physical activity outside the laboratory. PURPOSE: To determine the reliability of the COSMED K5 portable metabolic system. METHODS: 27 (n = 14 females) healthy adults (27 ± 5 yrs; 21.0 ± 8.2% body fat) completed a treadmill walking protocol. Participants completed 3 identical trials of 5-min stages that included standing and 6 walking speeds from 1.5 to 4.0 mph in 0.5 mph increments, with a 2-min rest between stages for a total of 47 minutes. Visit 1 consisted of wearing the K5 system. During visit 2 (1-7 days later), participants wore the K4 and K5 systems in a randomized, counter-balanced order. Oxygen consumption (VO2, ml min-1), carbon dioxide production (VCO2, ml min-1), ventilation (Ve, L min-1), metabolic equivalents (METs), respiratory exchange ratio (RER), and energy expenditure (EE, kcal min-1) were recorded breath-by-breath and averaged from minutes 2.5 to 4.5 for each stage for analysis. Reliability of the K5 was determined using an intraclass correlation coefficient (ICC) and coefficient of variation (CV). RESULTS: As shown in Table 1, the ICC for standing ranged from 0.26-0.75 and CV ranged from 4.0-11.0%. During walking, ICC ranged from 0.41-0.88 and CV from 3.0-8.0%.

Table 1. Reliability of COSMED K5 in standing and at various walking speeds
CONCLUSIONS: The K5 provided reliable measures of \( \text{VO}_2 \), \( \text{VCO}_2 \), \( V \), METs, RER, and EE across a variety of walking speeds, with higher reliability noted at 3.0-4.0 mph. Future studies should examine the reliability of the K5 during running and other activities.

Machine learning (ML) classification models for accelerometer data are potentially more accurate methods to measure physical activity in young children than conventional cut-point methods. However, existing algorithms have been trained on laboratory-based activity trials. To our knowledge, no studies have evaluated the performance of classification algorithms trained on structured activity trials for preschool-aged children under free-living conditions, and none have used fine-grained video-based direct observation to evaluate algorithm performance.

**Purpose:**
To evaluate the performance of hip and wrist Random Forest (RF) and Support Vector Machine (SVM) activity classification algorithms for preschool-aged children (Tröst et al. 2018) under free-living conditions.

**Methods:**
31 children (4.0 ± 0.9 yrs) were video recorded using a GoPro during a 30-minute unstructured active play session in a park while wearing an ActiGraph GT3X+ accelerometer on their right hip and non-dominant wrist. Direct observation was used to continuously code ground truth activity type and activity class using the Noldus Observer XT. Algorithm performance was assessed using overall accuracy and confusion matrices were generated to summarize class-level classification accuracy.

**Results:**
Accuracy for the hip and wrist RF algorithms was 69.4% (95% CI: 67.4 – 71.2), and 59.1% (95% CI: 57.1 – 61.1), respectively. Accuracy for hip and wrist SVM algorithms was 66.4% (95% CI: 64.4 – 68.3), and 59.3% (95% CI: 57.3 – 61.3), respectively. Classification was moderate for sedentary (71%-77%), poor-moderate for light activity and games (58%-79%), and moderate-good for moderate to vigorous activity and games (71%-84%) and running (66%-75%). Classification for walking (9-15%) was poor. When 15-sec windows with multiple activities were excluded from analysis, overall accuracy was improved by 8-10%. Prediction of walking improved by 19-34%.

**Conclusion:**
The accuracy of laboratory-based activity classification algorithms for preschool-aged children was attenuated when tested on new data collected under free living conditions. Future studies should develop and evaluate the performance of activity classification algorithms trained on accelerometer data collected under true free-living conditions.

**Thigh Inclination has been shown to be a highly specific discriminator between upright and seated activities. During periods of sitting, the background noise in the acceleration signal can provide important contextual information about the seated behaviour.**

**PURPOSE**
The purpose of this study was to develop and validate a simple algorithm to distinguish periods of seated car travel. The algorithm is based on the premise that during seated car travel, 1) body-worn accelerometers register a background level of external dynamic acceleration due to forces generated by the road surface and car engine and 2) leg movements are restricted due to the spatial constraints of the car.

**METHODS**
Participants (n=26, mean age=30.5yrs, 16 female, 20 male) were directly observed in their free-living environment on two separate occasions, for two hours each. Raw accelerometer data were summarized in 15-second epochs and synced with direct observation video. Using knowledge based on a priori observations of car travel, four features of the accelerometer signal were extracted from periods of sitting and tested 1) median vector magnitude (VM), 2) lower VM decile, 3) maximum VM and 4) range of inclination angles. Parameter constants were chosen based on grid search methods with the objective of maximizing positive and negative predictive value (PPV, NPV). RESULTS Threshold constants identified included 1) median VM < 500, 2) lower VM decile > 5, 3) maximum VM < 5000 and 4) inclination angle range < 40. 100% of car travel events were correctly identified, with a single false positive (1%). PPV and NPV were 95.5% and 100%, respectively. CONCLUSION Using a thigh worn accelerometer, seated behaviours can be identified as car travel or not. Importantly, acceleration features pertaining to both the inclination angle and vector magnitude were needed to optimize classification accuracy.
Quantifying gait parameters and ambulatory monitoring of changes in these parameters has become increasingly important for epidemiological and clinical studies. Wearable accelerometers provide objective high-density measurements of human gait dynamics through recording of acceleration. Many studies use accelerometry to objectively measure physical activity using the activity counts, vector magnitude, or number of steps. These measures use just a fraction of the information in the raw accelerometer data as they are typically summarized at the minute level. To address this problem, we focus on raw, sub-second level accelerometer data and define a set of gait characteristics based on these data. Additionally, to overcome the analytical challenges of these complex and voluminous data we develop automatic and unsupervised methodology for precise segmentation of stride patterns.

PURPOSE: We propose Adaptive Empirical Pattern Transformation (ADEPT) and maximization-tuning procedure for automatic identification of individual walking strides from raw accelerometer data that uses data-derived baseline patterns, representing a population-specific strides.

METHODS: Data were collected as a part of the study on Identification of Walking, Stair Climbing, and Driving Using Wearable Accelerometers, funded by the Indiana University Center for Translational Science, RMD Fairbanks School of Public Health at Indiana University. The study enrolled 32 healthy participants between 23 and 52 years of age. Participants wore accelerometers on a wrist, hip and both ankles during a 450-meter outdoor walk. RESULTS: ADEPT yields results that are in most cases visually indistinguishable from manual segmentation and reduces strides segmentation time radically. The average absolute deviation of estimated stride duration across study participants was 4.74, 1.42, 1.28 and 1.31 percent, for wrist, hip and both ankles respectively.

CONCLUSIONS: Our results indicate that the errors are small relative to the signal and reduces strides segmentation time radically. The average absolute deviation of estimated stride duration across study participants was 4.74, 1.42, 1.28 and 1.31 percent, for wrist, hip and both ankles respectively.

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There is expanding interest in the 24-hr activity cycle in relation to health outcomes, creating a need for new statistical approaches to analyze the joint effects of distinct but inter-related physical behaviors (e.g., exercise, sitting time, sleep). The development and test an integrated physical behavior score (PBS) in relation to all-cause mortality. There is expanding interest in the 24-hr activity cycle in relation to health outcomes, creating a need for new statistical approaches to analyze the joint effects of distinct but inter-related physical behaviors (e.g., exercise, sitting time, sleep). The development and test an integrated physical behavior score (PBS) in relation to all-cause mortality. There is expanding interest in the 24-hr activity cycle in relation to health outcomes, creating a need for new statistical approaches to analyze the joint effects of distinct but inter-related physical behaviors (e.g., exercise, sitting time, sleep). The development and test an integrated physical behavior score (PBS) in relation to all-cause mortality. There is expanding interest in the 24-hr activity cycle in relation to health outcomes, creating a need for new statistical approaches to analyze the joint effects of distinct but inter-related physical behaviors (e.g., exercise, sitting time, sleep). The development and test an integrated physical behavior score (PBS) in relation to all-cause mortality. There is expanding interest in the 24-hr activity cycle in relation to health outcomes, creating a need for new statistical approaches to analyze the joint effects of distinct but inter-related physical behaviors (e.g., exercise, sitting time, sleep). The development and test an integrated physical behavior score (PBS) in relation to all-cause mortality. There is expanding interest in the 24-hr activity cycle in relation to health outcomes, creating a need for new statistical approaches to analyze the joint effects of distinct but inter-related physical behaviors (e.g., exercise, sitting time, sleep). The development and test an integrated physical behavior score (PBS) in relation to all-cause mortality.
ACSM May 28 – June 1, 2019
Orlando, Florida

B-38 Thematic Poster - Special Needs

Wednesday, May 29, 2019, 3:15 PM - 5:15 PM
Room: CC-102B

691 Chair: Jennifer Lee Trilk, FACSM. University of South Carolina School of Medicine Greenville, Greenville, SC.

(A no relevant relationships reported)

PURPOSE: Fit 5 is a resource published by Special Olympics that provides instruction for making healthy choices including exercise, diet, and hydration. The purpose of this study was to examine the effectiveness of the Fit 5 program at improving the health of persons with developmental disabilities when promoted through a community day program. METHODS: Individuals with developmental disabilities were invited to participate in a weekly fitness program that utilized the Fit 5 resources at their community day program. Participants were given a Fit 5 booklet that provided instructions on making healthy choices. Participants attended one 45-minute exercise session per week for a total of six weeks. Exercise sessions included Level 1 and Level 2 exercises from the Fit 5 resource and targeted aerobic endurance, muscular fitness, flexibility, and balance. At each group exercise session, participants submitted a weekly record of their exercise, diet, and hydration and were prompted to continue healthy behaviors. A pre-test/post-test design was used. Exactly one week before (pre-test) and one week after (post-test) the 6-week intervention, waist circumference, total modified push-ups performed, and total modified curl-ups performed were recorded for each participant. Repeated measures MANOVA was used to test the effect of time (pre-test, post-test) on the measures of waist circumference, total push-ups, and total curl-ups in order to evaluate the effectiveness of the intervention for improving body composition and muscular fitness. RESULTS: 18 individuals (Mean age: 43 ± 19; 11 females) have participated in the intervention to date. Pillai’s trace repeated measures MANOVA revealed a significant difference between measures of fitness on the pre-test and post-test (FPillai= 0.382, p <.01, n=58). The total curl-ups (p <.001) increased between the pre-test (15±11) and post-test (23±13). Neither total push-ups performed nor waist circumference was significantly changed by the intervention (p >.05). CONCLUSIONS: A 6-week intervention using the Fit 5 resources was effective at improving muscular fitness for persons with developmental disabilities within a local community day program.

692 A Fit 5 Program for Adults with Developmental Disabilities in a Day Program

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(A no relevant relationships reported)

PURPOSE: The feasibility of a 6-week handcycling high intensity exercise program (HIIT) could be a time-efficient and accessible means of improving fitness. The primary aim of this study was to examine the effectiveness of the Fit 5 program at improving the health of persons with developmental disabilities when promoted through a community day program. METHODS: Individuals with developmental disabilities were invited to participate in a weekly fitness program that utilized the Fit 5 resources at their community day program. Participants were given a Fit 5 booklet that provided instructions on making healthy choices. Participants attended one 45-minute exercise session per week for a total of six weeks. Exercise sessions included Level 1 and Level 2 exercises from the Fit 5 resource and targeted aerobic endurance, muscular fitness, flexibility, and balance. At each group exercise session, participants submitted a weekly record of their exercise, diet, and hydration and were prompted to continue healthy behaviors. A pre-test/post-test design was used. Exactly one week before (pre-test) and one week after (post-test) the 6-week intervention, waist circumference, total modified push-ups performed, and total modified curl-ups performed were recorded for each participant. Repeated measures MANOVA was used to test the effect of time (pre-test, post-test) on the measures of waist circumference, total push-ups, and total curl-ups in order to evaluate the effectiveness of the intervention for improving body composition and muscular fitness. RESULTS: 18 individuals (Mean age: 43 ± 19; 11 females) have participated in the intervention to date. Pillai’s trace repeated measures MANOVA revealed a significant difference between measures of fitness on the pre-test and post-test (FPillai= 0.382, p <.01, n=58). The total curl-ups (p <.001) increased between the pre-test (15±11) and post-test (23±13). Neither total push-ups performed nor waist circumference was significantly changed by the intervention (p >.05). CONCLUSIONS: A 6-week intervention using the Fit 5 resources was effective at improving muscular fitness for persons with developmental disabilities within a local community day program.

693 Board #2 May 29 3:15 PM - 5:15 PM Feasibility of a 6-week Handcycling High Intensity Interval Training Program for Spinal Cord Injury


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(A no relevant relationships reported)

PURPOSE: Spinal cord injury (SCI) can be debilitating to one’s health, functional capacity, and quality of life. Specifically, SCI contributes to an elevated risk of preventable cardiometabolic and hypokinetic diseases. Many individuals with SCI have low levels of fitness due to barriers including lack of time, accessible equipment and awareness of exercises that are safe and effective. Using an indoor stationary handcycle to perform a high-intensity exercise program (HIIT) could be a time-efficient and accessible means of improving fitness. The primary aim of this study was to determine adherence, acceptance and fitness outcomes of a 6-week HIIT program for non-ambulatory persons with SCI. METHODS: Three men with SCI have completed the study to date (Table). At baseline, S2 did not participate in regular physical activity (PA). S1 and S3 participated in 1-3 hours of PA 2 times/week. Participants completed a baseline and post graded exercise test. The HIIT program consisted of 2, 25 min supervised at-home sessions (2-3 min warm-up, 10-1 min work/recovery phases at 90% peak power output (PPO) and 0-20% PPO and 2-3 min cool-down). Real-time power, heart rate (HR), cadence and velocities were recorded via sensors and an app (Garmin Connect). RESULTS: Subjects completed all 12 sessions and 10 bouts with the exception of S2 (7/10 and 8/10 bouts for sessions 1 and 4). S2 performed 3 unsupervised sessions verified via the app. Fitness outcomes were not apparent for S2 and S3 while S1 showed increases in VO2 (16.0 to 17.1 ml/kg), minute ventilation (37.9 to 42.0 ml/kg), and tidal volume (1.2 to 1.5 L) peaks after training. Table: Baseline and training data averaged over the 12 sessions (work phases)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age, SCI level, Years Post Injury</th>
<th>Baseline HR</th>
<th>Baseline PPO</th>
<th>HR Beats/ min</th>
<th>Power Watts</th>
<th>Cadence Rev/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>58, L5/S1, 24</td>
<td>89</td>
<td>50</td>
<td>85 (3)</td>
<td>51.8 (6.0)</td>
<td>57 (5)</td>
</tr>
<tr>
<td>S2</td>
<td>17, C5, 2</td>
<td>133</td>
<td>50</td>
<td>100 (3)</td>
<td>4.4 (4.5)</td>
<td>51 (13)</td>
</tr>
<tr>
<td>S3</td>
<td>30, C5/C6, 15</td>
<td>100</td>
<td>40</td>
<td>102 (3)</td>
<td>29.0 (2.8)</td>
<td>59 (5)</td>
</tr>
</tbody>
</table>

CONCLUSION: Feasibility was demonstrated by excellent adherence and remote monitoring of compliance with HIIT intensities. A greater number of weekly sessions and/or a longer training period are likely to lead to improvements in fitness parameters.

694 Board #3 May 29 3:15 PM - 5:15 PM Physical Activity, Sleep, And Stereotypic Behaviors In Youth With Autism Spectrum Disorder


(A no relevant relationships reported)

PURPOSE: The purpose of this study was to compare the associations between moderate-to vigorous physical activity (MVPA), sedentary behavior (SB), sleep quality, and stereotypic behaviors in children with Autism Spectrum Disorder (ASD). METHODS: Activity levels and sleep quality were measured in 16 children with ASD (ages 8-17) using Actigraph GT9X Accelerometers. All participants wore the device on their non-dominant wrist for a period of seven days and nights. Parents completed the Aberrant Behavior Checklist (ABC) which examined child irritability, stereotypic behaviors, hyperactivity, inappropriate speech, and lethargy. Spearman correlations were used to examine associations between minutes of MVPA, sleep duration, and adverse behaviors. RESULTS: Greater levels of MVPA were correlated with less stereotypic behaviors (r=-.62, p<.02). Although they did not quite reach statistical significance, trends were seen for the associations between 1) longer sleep duration and lower ratings of hyperactivity (r=-.43, p<.1); and 2) greater amounts of SB and higher ratings of lethargy (r=-.4, p<.1). CONCLUSIONS: Adequate duration of sleep and participation in MVPA may be linked with fewer adverse behaviors in children with ASD. Future studies should examine larger samples of children with ASD over a longer duration to better determine causal mechanisms that may explain these associations between MVPA, sleep habits and ASD-related behaviors.

695 Board #4 May 29 3:15 PM - 5:15 PM Comparison of Energy Expenditure in Wheelchair Users During Active Video Gaming with Adapted Game Controllers

Laurie A. Malone, FACSM, Sangheeda Padalabalanarayanan, Mohanraj Thirumalai. UAB/Lakeshore Research Collaborative, Birmingham, AL.

Email: lamalone@uab.edu

(A no relevant relationships reported)

Active video gaming (AVG) options are limited for individuals with mobility impairments due to inaccessibility of the gaming controllers. Two gaming controllers (Wii Fit balance board and gaming mat) were recently adapted for individuals with physical disabilities (www.rectech.org), thereby providing increased opportunities for AVG play. PURPOSE: To compare energy expenditure in persons with mobility impairment during seated AVG play using an adapted Wii Fit balance board (WFFB) and adapted gaming mat. METHODS: During the first lab visit, demographic data were collected, and participants completed a game play familiarization period. During the next two lab visits, metabolic data (COSMED) were collected during a 20-minute baseline, followed by two 10-minute bouts of game play. During one visit, participants played select Wii Fit Plus games on the adapted WFFB and during the other visit Active Life Explorer and Outdoor Challenge games were played on the adapted gaming mat. For all AVGs participants played seated. The adapted WFFB was designed so that the player could wheel onto the platform. For play using the adapted gaming mat, the mat was placed on a height-adjustable table. A paired sample t-test was computed to compare mean energy expenditure during game play on the adapted WFFB and gaming mat. RESULTS: Sample included 26 participants, 16 men, mean age 37.50 ± 12.77 yrs. All participants utilized a wheelchair for mobility and daily activities. Mean energy expenditure (METs) during game play was significantly greater
INTRODUCTION: For accurate physical activity assessment with accelerometers in adults with Down syndrome (DS), there is a need to examine if the relationship between the rate of oxygen uptake (VO$_2$) and output from hip and wrist-worn accelerometers across different activities and sedentary behaviors is different between adults with and without DS. In this study, we examined this question and we also evaluated the accuracy of hip- and wrist-worn accelerometers in estimating the VO$_2$. METHODS: The sample included 16 adults with DS (10 men; age 31 ± 15 years) and 19 adults without DS (10 men; age 24 ± 6 years). We measured VO$_2$ with a portable spirometer (K4b$^2$, Cosmed) and accelerometer output (Vector Magnitude [VM]) with a hip- and a wrist-worn accelerometer (wGTX-BT, Actigraph). We used multi-level regression to predict VO$_2$ from VM and group. Additional predictors included body mass index (BMI), age, height, weight, and sex. We evaluated the accuracy of the prediction with the absolute percent error and Bland-Altman plots. RESULTS: For both the hip and the wrist accelerometer, VM and group were significant predictors of VO$_2$ (p<0.01). However, when BMI was added to the models, BMI was a significant predictor and DS was no longer significant for both accelerometer models. The final models included Vector Magnitude and BMI (p<0.001; R$^2$ = 0.78 and 0.57, for hip and wrist accelerometer model, respectively). For the hip accelerometer, absolute percent error across all tasks and for both groups combined was 22.5 ± 27.4%, whereas, for the wrist accelerometer, error was 37.8 ± 38.0%. Absolute percent error across tasks combined and for each task separately did not differ between groups. The Bland-Altman plots indicated nearly zero mean error for both groups. However, error had somewhat greater 95% confidence intervals for the wrist- than the hip-accelerometer models. CONCLUSION: Adults with DS have different VO$_2$ to VM responses, but this is due to their higher BMI. Predictability of VO$_2$ from accelerometer output is better for a hip- than a wrist-worn accelerometer. These results may help advance physical activity assessment for adults with DS.  

## CONCLUSIONS

Walking with a RA. The greater mass of the HA may explain the lower GE observed during graded treadmill walking. Longer familiarization with HA may improve GE during walking.

Persons with spinal cord injury (SCI) are at an increased risk of physiological morbidity compared to their ambulatory counterparts in whom well-established, beneficial correlations exist between exercise, cardiorespiratory health and body composition. Furthermore, SCI who participate in sport may have reduced risk of physiological morbidity than SCI who are sedentary. PURPOSE: This pilot study was two-fold: 1) to determine whether differences exist in cardiorespiratory health and body composition between SCI athletes (ATHL) and sedentary SCI (SED); and 2) to determine whether an 8-week handcycle exercise training program is feasible in an SED SCI population, and if improvements in cardiorespiratory fitness and body composition occur. METHODS: Twenty-seven SED and six ATHL were recruited to participate in the study. All SCI completed a graded hand cycling maximal exercise test for cardiorespiratory health and body composition testing (DEXA). SCI participants were then randomized into a virtual reality intervention (VR) or waitlist (WL) group (e.g. offered VR after 8 weeks of WL). The intervention consisted of an 8-week community-based VR group hand cycling exercise training with a USA level 1 coach two days/week. Pre-post measures were measured in each group. RESULTS: Thirty-three SCI were recruited to participate (SED =27; ATHL =6). All ATHL and 17 SED participants (VR=9, WL=8) completed study protocol, with 10 (VR=1 and WL=9) lost to follow up. One participant was dropped from analysis due to not giving a full effort during testing as determined by investigators. ATHL had 23 physiological and anthropometric variables that were significantly different (p≤0.01) compared to SED including lower VO$_2$max (2.3 ml·kg$^{-1}$·min$^{-1}$), lower BMI (46.9 kg·m$^{-2}$), and lower total body fat percentage (-10.4%). VO$_2$max increased 16% in VR and 9% in WL, which was not statistically different. CONCLUSION: This study demonstrates the feasibility of a hand cycling program in SCI. ATHL had better outcomes associated with long term health compared to their SED counterparts. Though no significant changes were noted in VR compared to WL, changes in VO$_2$max may be clinically relevant. A larger sample size or longer training period may be needed to observe significant differences in physiological health in an SED SCI population.
Sport specialization and menstrual dysfunction (MD) are of concern for high school athletes as they may contribute to sports injury. Limited evidence exists on the extent of sport specialization and prevalence of MD assessed at pre-season screening.

METHODS: Seven hundred ninety-two (250 females, 542 males) athletes from 14 San Diego high schools participated in a pre-season screening clinic. The athletes completed a questionnaire regarding sport specialization, sport type (individual vs. team/ball sport), menstrual health. Sport specialization was determined by the athletes’ responses to 1) declared a primary sport in the past year; 2) quit other sports to focus on primary sport, and 3) trained ≥8 months/year in primary sport in the past year. Scores of 0-1 were considered low specialization, and scores of 2 and 3 indicated moderate and high sport specialization, respectively. MD was defined as ≥9 menstrual periods reported in the past year. RESULTS: Overall, 54.8% of the athletes were classified as low sport specializers, 38.4% as moderate sport specializers, and 6.8% as high sport specialists. Golf (42.9%), swimming/diving (18.8%), and tennis (15.8%) had the greatest percent of high sport specialization. High sport specialization was almost two times (OR=1.81, 95% CI: 0.9-3.4; p=0.07) greater among those whose primary sport was an individual sport (10.0%) than athletes participating in a team/ball sport (6.0%). Females (9.2%) were twice as likely (OR=1.94, 95% CI: 1.1-3.5; p=0.02) to highly sport specialize than males (5.7%). Twenty-four (9.7%) female athletes reported MD. Tennis (33.3%), cross-country (15.8%), and swimming (14.3%) had the highest percent of MD. Although a non-significant trend, females who reported MD were twice as likely (OR=2.01, 95% CI: 0.9-4.9; p=0.10) to participate in an individual sport (14.5%) as their primary sport than those whose primary sport was a ball/team sport (7.6%). CONCLUSIONS: Females were more likely to sport specialize than males. High sport specialization was most common among individual-type sports.

Conclusions: This study provides preliminary evidence that sport specialization and menstrual dysfunction are associated during adolescence in women. Sport specialization, sport type, and menstrual dysfunction may contribute to sports injury and menstrual dysfunction among female high school distance runners.
Methods: A cross-sectional design of 26 female college ballet & contemporary dancers (age: 20.5 ± 3.6, weight: 56.4 ± 7.0 kg, height: 165.2 ± 6.9 cm) was conducted at a local university. Dancers completed 1 week of dance classes/rehearsals and data collection included: anthropometric data, questionnaires (e.g., demographics, health history, Eating Disorder Inventory-3, RMR, a 7-day food log to measure dietary energy intake (EI) and wore a SenseWearm band to calculate exercise energy expenditure (EEE).

Results: Overall, 69.2% (n=18) were at risk for LEA (< 30 kcal/kg/FFM) and none were at risk for low BMD. Energy needs assessments measured: RMR (1155.5 ± 206.54 kcal), EI (1473.9 ± 321.5 kcal), and EEE (884.7 ± 324.8 kcal). Macronutrient profile included: 100% (n=26) below the recommended CHO and 73.1% (n=19) were below PRO, and fat was within limits. There were 88.5% (n=23) dancers with elevated EP/DE risks. Retrospective injuries demonstrated: 96.2% (n=25) dancers self-reported a previous dance related injury and 23% (n=4) were previously diagnosed and treated for a stress fracture, and during their current dance season 61.5% (n=16) of dancers were diagnosed with an injury. Of those diagnosed within the current season, 34.6% (n=9) presented with LEA and 19.2% (n=5) had EEE risk.

Conclusion: Overall, there were high occurrences of LEA & injuries among dancers. LEA and Triad symptoms impair mass skeletal integrity, thus negatively affecting overall health. Primarily, dancers’ LEA was due to diet restriction (low CHO and PRO). Understanding more about the effects LEA and the Triad have on dancers will aid in treating injuries, maintaining nutritional balance, and improving the health of performers.

Social media has a great impact on adolescent’s behavior. Since many young ballet dancers spend many hours on dance websites, they may adopt unhealthy eating attitudes and behaviors that are depicted on-line. Objective: The purpose of this descriptive study was to evaluate dancers aged 10-16 years in Northeastern Pennsylvania who completed the Children’s Eating Attitude Test (ChEAT-26) and adolescent female dancers (13.7 ±1.8 years) from five dance studios in Northeastern Pennsylvania who completed the Children’s Eating Attitude Test (ChEAT-26) and the Questionnaire of Exposure and Reinforcement Through Facebook (QERF) to assess eating attitudes and social media viewing practices. Data were analyzed using descriptive statistics and Pearson correlations. Results: Mean time spent dancing each week was 6.2 ± 2.0 hours. Mean ChEAT-26 score was 20.8±15. Over one-third (36%) of the dancers had acceptable eating attitudes and behaviors. Mean QERF score was 26.2 ± 5.7. 87.5% of the dancers scored 23 or greater out of a possible 45, exposure to social media. Mean time spent on Facebook was 4.7 ± 2.8 hours per week, while mean time spent on Facebook looking at dance websites was 1.3 ± 1.2 hours per week. Although we did not observe a significant relationship between ChEAT-26 and QERF, there was a trend (r=0.4; p=0.12), as social media exposure increased, disordered eating attitudes and behaviors also increased. Conclusion: Adolescent dancers are at risk of developing unhealthy eating attitudes and behaviors. Their substantial exposure to social media, especially on dance websites, may play a role in accelerating problematic eating patterns. Since limiting young dancers’ social media exposure may well be problematic, parents, dance teachers, nutritionists and other health professionals must become aware of these issues and should consider interventions that model positive eating attitudes and behaviors.

705 May 29 4:15 PM - 4:30 PM How are Adolescent Ballet Dancers’ Eating Attitudes Related to Social Media Viewing Habits?

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706 May 29 4:30 PM - 4:45 PM Surgical Outcomes of Os Trigonum Syndrome in Dancers

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Purpose: Management of ankle pain in dancers can be challenging due to the complex demands placed on their ankles and feet. Despite the prevalence of ankle pain or injuries in this population, literature on the outcomes of surgical approach is limited. The hypothesis of this study was that dancers return to their previous level of activity following open excision of a symptomatic os trigonum syndrome.

Methods: We followed 54 ankles (44 patients, 91% female, mean age 18.2 years) in patients who underwent surgery for posterior impingement. Dance style varied across patients but was largely ballet and included many professionals. All patients completed a specific rehabilitation protocol prior to surgical discussions and eventual excision of the os trigonum was done through an open approach. All patients then committed to a specific rehabilitation program and gradually returned to dance. Outcomes were evaluated with the Veterans Rand 12 Item Health Survey (VR-12) Mental and Physical Function Index-Revised (FFI-R), Visual Analog Scale (VAS) scoring, and patient satisfaction preoperatively and postoperatively. This study was conducted in compliance and approved with a local Institutional Review Board (IRB).

Results: Most recent follow-up was a mean 32.3 months with data collected across a range of 8 weeks to 8 years post-operative. Between pre-operative and most recent post-operative visits, there was no difference in VR-12 Mental Scores (mean scores of 55.4 and 55.9), however Physical Scores increased 37.8 to 51.2, respectively. Significant improvement was also seen in both the FFI-R cumulative score (63.2 to 42.4) and VAS (54% to 17%). Major complications included transient sural nerve paresthesia and scar tissue buildup that resolved over time. Overall, patients were extremely satisfied with their result (82.7% post-operative satisfaction). Conclusion: Os trigonum excision is fairly simple, has a low complication rate, and proves to have a high success rate in returning athletes back to their sport of choice. In this study, dancers of varying level and primary style improved significantly according to various clinical measures and maintained thriving postoperative careers. Successful return to dancing relied greatly on well-structured physical rehabilitation therapy.
linked instrument included: a study synopsis; an informed consent statement; and; the IRB-approved survey tool. Reminder emails were sent approximately two months after the original participation request. Statistical analysis, using JMP software, included frequency distributions and chi-square tests for categorical association. Significance level was set at p<0.05. RESULTS: Coaches (n = 143; mean age = 40.7 ± 11.9 years; mean coaching experience = 14.1 ± 10.3 years) from 45 conferences participated; 74% of respondents were male. All NCAA Divisions were equitably represented (I = 29.7%, II = 35.5%, III = 34.8%). While respondent majorities: coached male and female athletes (82.1%); reported they were familiar with the Triad (73.4%); and; felt comfortable/very comfortable discussing diet (87.6%) and menstruation (65.6%) with female athletes, only 54% correctly identified all three Triad components (re: low energy availability, amenorrhea, low bone mineral density). Female coaches, however, were more comfortable than male coaches discussing menstrual issues (X² = 947, p< 0.001). When compared to the other divisions, Division I coaches were more likely to: have Triad awareness (X² = 10.1, p<0.05); and; have athletes with access to registered dieticians (X² = 16.5, p<0.01) and sports psychologists (X² = 18.0, p<0.01).

CONCLUSION: A slim majority of NCAA cross country coaches demonstrated comprehensive understanding of Triad components, but; resource disparities to effectively address the Triad exist between the NCAA divisions. Future research should examine how to increase coaches’ Triad awareness and education; and; optimize resources across NCAA divisions to reduce the negative outcomes associated with this common morbidity.

B-40 Free Communication/Slide - Behavioral Approaches to Increasing Physical Activity

Wednesday, May 29, 2019, 3:15 PM - 5:15 PM
Room: CC-105B

709 Chair: John M. Jakicic, FACSM. University of Pittsburgh, Pittsburgh, PA.

(No relevant relationships reported)

710 May 29 3:15 PM - 3:30 PM

A Comparison Between Physician and Patient Perceptions Regarding Barriers to Exercise

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(No relevant relationships reported)

PURPOSE: To compare physician vs patient perceptions regarding barriers to exercise, preferred physical activities, and amount of time spent exercising.

METHODS: A survey was given to patients and their physicians at a family medicine residency clinic. The survey consisted of a Likert scale of barriers to exercise, a checklist of preferred exercise activities, and the amount of exercise their patients engaged in. Barriers to exercise were categorized as motivational, physical, or external barriers.

RESULTS: Physicians consistently overestimated the importance of external barriers to exercise (t = -2.38, df = 19.473, p-value = 0.0275) when compared to their patients (e.g. “There are no facilities in my area.”, “It’s too dangerous in my area”). Residents also consistently overestimated the importance of internal motivational barriers (t = -2.2355, df = 18.77, p = 0.03774)” (“I hate to fail, so I will not start.”). “Exercise is boring”). There was an 80% correlation between the activities physicians predicted their patients enjoyed and what patients actually endorsed enjoying. Physicians predicted 54% less exercise than that endorsed by their patients.

CONCLUSIONS: Our data show that physicians overestimate their patients’ external and motivational barriers to exercise. This suggests an opportunity for physicians to enhance motivational interviewing by reducing their focus on external and motivational barriers. Physicians were excellent predictors of the exercise modalities preferred by their patients but significantly underestimated the amount of exercise endorsed by their patients, suggesting a missed opportunity to acknowledge patient efforts towards a healthy lifestyle.

SIGNIFICANCE: Exercise prescriptions and motivational interviewing are the two most effective tools physicians have to increase physical activity in their patients. Our study and survey can be a template to facilitate and enhance this discussion.
713 May 29 4:00 PM - 4:15 PM
Variations in Preschoolers' Physical Activity Across the School Year
Email: Connie.Tompkins@med.uvm.edu

PURPOSE: To examine variations and sex differences in preschoolers' physical activity (PA) across the school year, with and without a PA intervention

METHODS: The Kiddie CATs on the Move PA curriculum was implemented in preschools in over 22 weeks, 2-3 times per week by classroom teachers and college students enrolled in a service-learning course. Accelerometer was used to measure PA during the school day at 5 time points across the year [2 Baseline (Fall, Winter), 3 Intervention (Fall, Winter, Spring)]. A total of 68 children (Mm2 = 4.15 ± 0.63, 33 males, 35 females) with ≥2 days of valid data at each time point were included in analyses. Minutes per hour of moderate-to-vigorous (MVPA) and total PA (light + MVPA) were calculated. Paired-samples t-tests were used to compare sex differences at each time point. A series of 5 (time) x 2 (sex) mixed model ANOVAs were used to examine PA across assessments and whether or not patterns of change in PA varied by sex.

RESULTS: Boys engaged in significantly more total PA than girls only during the Winter Baseline assessment (17.3 ± 4.0 vs 15.0 ± 4.8 min/hr, p < 0.04). Boys engaged in significantly more MVPA (min/hr) than girls during the Fall Baseline (9.6 ± 2.4 vs 8.3 ± 2.7, p < 0.04), Fall Intervention (10.2 ± 3.1 vs 8.7 ± 2.8, p < 0.04) and Winter Baseline (9.2 ± 2.5 vs 7.4 ± 2.9, p < 0.01). For the combined sample, total PA, F(4, 264) = 6.8, p < 0.001, and MVPA, F(4, 264) = 9.43, p < 0.001, varied across the time points. Total PA (min/hr) was significantly higher at all intervention time points compared to winter baseline (17.2, 17.4, 17.9 vs 16.1, p < 0.01) and spring intervention also significantly higher than fall baseline (17.9 vs 16.9, p < 0.01). MVPA (min/hr) was significantly higher at all intervention time points compared to winter baseline (9.4, 9.1, 9.8 vs 8.3, p < 0.05) and spring intervention was significantly higher than fall baseline (MVPA 9.8 vs 8.9, p < 0.01). The pattern of change in PA across assessments did not vary based on child sex.

CONCLUSIONS: Findings highlight the importance of structured programs to promote preschoolers' PA, especially during winter months when PA appears to decline. Although there were no sex differences in the pattern of PA change for boys and girls, consistently engaged in less PA than boys during the year and future work should examine factors related to this sex difference.

714 May 29 4:15 PM - 4:30 PM
Supporting Physical Health Of Black Male Faculty Through A Wellness-integrated Professional Development Program: FIT Leaders
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Purpose: An intervention strategy examining the integration of professional development and wellness for black male faculty at an R1 university was conducted. The intervention was directed at supporting the retention and academic promotion of black male faculty through minimizing the impact of culturally relevant physical (i.e., hypertension, obesity) and cognitive (i.e., John-Henryism, social isolation, discrimination, etc.) challenges. The implications on the physical health of the participants are presented here. Method: A 24-week intervention brought together black male faculty of differing ranks at a university fitness center twice per week. Each session included a 45 min trainer lead exercise session followed by a 30 min semi-guided discussion on culturally relevant professional development topics. A series of assessments implemented in a pre-/post-structure around the intervention included cardiovascular measures including central aortic pressure, brachial blood pressure (BP) and carotid-femoral pulse wave velocity measured via the Sphygmocor Xcel Device, body composition via BodPod, strength and cardiorespiratory fitness via graded exercise treadmill test. Pre-post analyses using paired T-tests were performed using STATA 13.4. Results: Among 9 participants the mean age was 40.4 ± 13.4 years. Cardiovascular measures improved including Aortic Systolic Pressure: 123±3 vs 117±12 mmHg, p=0.007; Brachial systolic BP 136±10 vs 128±12 mmHg, p<0.002; Brachial diastolic BP 87±10 vs. 84±10, p=0.057; and C-f pwv 3.8±1.4 vs. 6.9±10.6 mm/s (p=0.007). Adiposity measures improved including body mass index 29.6±5 vs 29.0±4.9 kg/m2, p=0.014; waist circumference 96.6±11.8 vs. 93.4±12 cm, p=0.001; and body fat percented 26.9±7.7 vs. 23.4±7.6%, p=0.005. Max chest press improved from 174.4±52.1 vs. 191.4±45.9 lbs, p<0.008. There were no improvements in cardiorespiratory fitness, highest VO2max 37.1±7.4 vs. 37.5±6.9 ml/kg/min (n=7), p=0.801. Conclusion: Changes in the physical health of participants indicate that this intervention shows promise for supporting the physical wellness of black male faculty in parallel with culturally relevant leadership support.

715 May 29 4:30 PM - 4:45 PM
Effects Of A National School Intervention Programme On The Levels Of Physical Activity
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Since the school context greatly influences children and youth and can ensure that a large number of school children participate in activities and maintain active behaviors during the school day.

PURPOSE: The aim of this study was to compare the level of physical activity during the school day of a group of children participating in the school intervention program in comparison to a control group.

METHODS: A randomized sample of 154 school children (7-11 y) was obtained out of the Integral Sports Schools of the National Sports Institute of Chile, (70 intervention group; 84 control group), all belonging to socioeconomic vulnerable public schools. The program is structured as a comprehensive sports practice workshop with a duration of 90 min/session and performed three times/week. Each session develops activities to strengthen the skills for life and healthy living. The children participate in a wide range of pre-sports and sports activities. Physical activity levels were recorded continuously with triaxial accelerometers during the school day, recess, physical activity session (PA) or physical education session (PE), and lunch. A value of p<0.05 was defined as statistically significant in Student’s t-tests.

RESULTS: Fifty per cent of the children in the intervention group complied with the recommendations of moderate-to-vigorous physical activity (MVPA), vs. 22.7% of the control group. During the first recess, the MVPA time of the control group was double that of the intervention group (p=0.001), where the recommendations of MVPA were not met, but at lunch it was possible to add important minutes of physical activity. None of the groups complied with the recommendations for steps in the PA or PE. During the PA, sedentary time was less and MVPA was greater in the intervention group (Table 1).

CONCLUSIONS: It was concluded that although the MVPA in recesses and lunchtime was greater in the control group, the activity in the PA of intervention group was greater and contributed more MVPA to the school day. This highlights the role of physical education classes in meeting MVPA’s daily recommendations.
tool in promoting routine physical activity among a large population of individuals who desperately need a lifestyle modification, although adding alternate game choices may be beneficial in future studies. Supported by American Heart Association grant #13B1GA1711021.

**717** May 29 5:00 PM - 5:15 PM

**Use of Wearable Technology and Social Media to Improve Physical Activity and Dietary Behaviors among College Students: A 12-week Randomized Pilot Study**

Zachary C. Pope, Dahecia J. Barr-Anderson, FACSFM, Beth A. Lewis, Mark A. Pereira, Zan Gao, FACSFM. *University of Minnesota, Minneapolis, MN.* (Sponsor: Zan Gao, FACSFM)

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(No relevant relationships reported)

**PURPOSE:** Evaluated efficacy of combining smartwatch use and a theoretically-based, social media-delivered health education intervention on improving college students’ (CS) health behaviors/outcomes relative to a comparison arm. Intervention use/acceptability were also assessed.

**METHODS:** Thirty-eight CS (28 female; mean ± SD age = 21.5 ± 3.4 years) participated in this two-arm randomized 12-week pilot trial. After screening, participants were randomized into two groups: (a) experimental: consisted of Polar M400 use and a twice-weekly theory-based Facebook-delivered health education intervention; or (b) comparison: intervention adherence was high (~86%), with participants implementing approximately 4.2 and 1.6 minutes/day of exercise-induced hypertension is an area of active research. An exaggerated and high blood pressure (BP) and blood glucose concentration. The predictive value of exercise-induced hypertension is an area of active research. An exaggerated and hypertensive individuals require a combination of medical and exercise intervention. The MAC-3-Minute step test and bioelectrical impedance assessed cardiorespiratory fitness and body fat percentage, respectively.

**RESULTS:** Only whole grain consumption differed between groups at baseline, t = 2.3, p = 0.03. For PA, a trend toward a significant main effect for time was observed for moderate-to-vigorous PA, F(2, 72) = 2.6, p = 0.08; partial eta-squared = 0.07, with experimental and comparison groups demonstrating 4.2- and 1.6-minute/day increases, respectively, at 6 weeks. For secondary outcomes, both groups demonstrated non-significantly decreased weight from baseline to 12 weeks (experimental: -0.6 kg; comparison: -0.5 kg). Further, significant main effects for time were observed for self-efficacy, social support, and intrinsic motivation (all p < 0.05; partial eta-squared: 0.18, 0.38) as both groups improved over time. Finally, both groups demonstrated lower daily caloric consumption over time (experimental: -41.0 calories; comparison: -143.3 calories). Intervention adherence was high (~86%), with participants implementing health education tips at least once weekly.

**CONCLUSIONS:** While both arms demonstrated initial efficacy in improving CS health outcomes, observations did not indicate the experimental intervention as more efficacious than comparison. Future research warranted.

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**718** May 29 3:15 PM - 3:30 PM

**Ambulatory Central Blood Pressure Over 24 Hours Following Intermittent Vs. Continuous Moderate Intensity Exercise**

McKenzie A. Williams, Erika Silva, Nicholas Curlini, Brandon Kistler, Bradley Fleener, Matthew Harber, FACSFM. *Ball State University, Muncie, IN.* (Sponsor: Matthew Harber, FACSFM)

(No relevant relationships reported)

Ambulatory blood pressure (BP) derived from the large central arteries has been shown to be a better predictor of cardiovascular events and mortality compared with peripheral ambulatory brachial blood pressure. Currently, however, it is unknown if exercise, either intermittent or continuous bouts, influence ambulatory central BP.

**PURPOSE:** To examine the ambulatory central blood pressure response over 24 hours following a moderate intensity intermittent (MI) bout of aerobic exercise compared to a moderate intensity continuous (MIC) bout. **METHODS:** Eight, non-hypertensive males (61.5±2.4yrs) performed three trials in a randomized order: control, MII (3X10 minutes at 50-60%heart rate reserve (HRR)) with 5 minutes of seated rest), and MIC (30 minutes continuous at 50-60% HRR). Total work performed during the exercise trials was matched. Ambulatory brachial and central hemodynamics (Santech Oscar 2 with PhysmomoCor) were averaged over 24 hours, and divided by time of day (Morning, Afternoon, Evening, and Nighttime) and compared among each trial.

**RESULTS** No differences (P>0.05) between CON, MII, and MIC were observed for any variable. Brachial and central hemodynamic variables were lower (P<0.05) during Nighttime (Nt) compared to other times of day, independent of trial. Brachial SBP was lower (P<0.05) during MII (120.5±4.5 mmHg) compared to morning (Mn, 131.6±5.6 mmHg); afternoon (An, 132.3±5.2 mmHg) and evening (Evn, 134.4±5.3 mmHg). Central SBP was lower during Nt (112.7±4.4 mmHg) compared to morning (Mn, 120.8±4.9 mmHg); afternoon (An, 119.3±4.5 mmHg) and evening (Evn, 120.9±4.5 mmHg). **CONCLUSION:** An acute bout of moderate intensity exercise in accordance with the physical activity guidelines of the American College of Sports Medicine (continuous or intermittent), did not influence 24 hour ambulatory brachial or central hemodynamics in middle-aged and older men. Moreover, we show that reductions in central hemodynamics during night time hours (i.e., dipping) is not compromised after exercise. Future work should explore different exercise parameters to better understand the influence of acute exercise on ambulatory central hemodynamics.

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**719** May 29 3:15 PM - 3:30 PM

**Ambulatory Blood Pressure Reduction In Response To Supramaximal Interval Exercise; Interactions With Antihypertensive Medication.**

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(No relevant relationships reported)

Metabolic Syndrome (MetS) increases the risk of cardiovascular and all-cause mortality. High blood pressure is the most frequent factor of MetS. General guidelines for hypertension recommend both pharmacological and exercise treatment while their combined effects on blood pressure have not been thoroughly explored yet. **Purpose:**
To compare the blood pressure (BP) response to a bout of supramaximal aerobic interval exercise (SIE) alone or in combination with antihypertensive medicine in MetS hypertensive patients. **Methods:** Twelve patients chronically medicated with angiotensin II receptor 1 blockade antihypertensive medicine (AHM), underwent 3 trials separated by 1 week in a randomized order: a) control trial without exercise and substituting their AHM by a placebo (PLAC); b) placebo medicine and a morning bout of SIE (PLAC+SIE) and c) combining AHM and exercise (AHM+SIE). Acute and ambulatory blood pressure responses were measured for 21-h after treatments. Repeated-measures crossover, double-blind, placebo randomized design was used. **Results:** Acutely (i.e., 20 min after treatments), systolic blood pressure (SBP) were reduced similarly after PLAC+SIE (9.7 ± 6.0 mmHg, P<0.001) and AHM+SIE (10.4 ± 7.9 mmHg, P=0.001). Chronically, (21-h following treatments) SBP remained reduced after PLAC+SIE (12.5 ± 12mmHg, P=0.022) and AHM+SIE (12.2 ± 12 mmHg, P=0.013) in comparison to PLAC (13.2 ± 16 mmHg). The BP reduction in AHM+SIE faded out at 4 a.m., whilst in AHM+SIE continued over the complete measurement period (Figure 1). At nighttime BP reduction was larger in AHM+SIE than PLAC+SIE (5.6 ± 4.0 mmHg, P=0.006). **Conclusion:** Our data show that a bout of supramaximal aerobic interval exercise in combination with antihypertensive medication in the morning elicits a sustained blood pressure reduction that lasts at least 21-h. Exercise potentiates the effects of antihypertensive medicine reducing blood pressure longer and at a larger magnitude than exercise alone.

**Purpose** To examine the effects of amount, intensity, and mode of exercise training on Lipoprotein Insulin Resistance Index (LP-IR; a relatively new spectroscopic biomarker of insulin resistance) across 10 exercise interventions from the STRRIDE studies.

**Methods** A total of 531 men and women with dyslipidemia [STRRIDE I (n=222) and STRRIDE AT/RT (n=142)] or prediabetes [STRRIDE-PD (n=167)] were randomized to either control group or one of 10 exercise interventions, which ranged from 8-22 kcal/kg/week (Kkw); intensities of 50-75% VO\(_{2}\)\_peak; and durations of 6-9 months. Two groups included resistance training and one group included dietary intervention (weight loss goal of 7%). Fasting blood samples were obtained at both baseline and 16-24 hr after the final exercise bout. NMR spectroscopy was performed at LabCorp to determine LP-IR score, which is comprised of six lipoprotein subclass and size parameters. LP-IR score ranges from 0 (most insulin sensitive) to 100 (most insulin resistant). Paired t-tests determined post- minus pre-intervention change score significance within groups (p<0.05). Study-specific ANCOVA determined differences between groups.

**Results** The inactive control group did not significantly change LP-IR. After training, seven of the 10 exercise groups significantly improved LP-IR, ranging from 4.0 ± 7.6 to -12.5 ± 14.2. The figure displays change scores across all groups. The Aerobic plus Resistance group resulted in significantly greater change than the Resistance only group in STRRIDE AT/RT. The Moderate plus Diet group had significantly greater LP-IR change than all other groups in STRRIDE-PD.

**Conclusion** On average, STRRIDE interventions improved LP-IR. Our results provide compelling evidence that adding resistance to aerobic training elicits a synergistic training effect on LP-IR. In individuals with prediabetes, incorporating dietary intervention with aerobic training results in the most robust LP-IR improvement.
into: normal glucose metabolism group (N, n=18), impaired fasting glucose (IFG) group (PD, n=20), and diabetes group (D, n=20). Everyone completed 30-minute cycle ergometer at 45%-55% HRR. According to assessment standard of HR recovery and abnormal standard of SBP increasing during exercise, the CVD risk was judged.

All subjects were provided the same amount diet, and exercise began just after one hour of the meal. All wrote consent, and the study was approved by the ethical committee of BSU.

RESULTS: (1)Compared with blood glucose at the beginning of the meal, the decreased amount of PD and D were bigger than N’s. At the moment of finishing exercise, blood glucose of N, PD and D decreased respectively 2.19±1.25 mmol/L, 3.59±1.47, 3.19±2.02; at 1h-point after exercise, 1.31±1.25, 2.29±2.63, 2.66±2.57; at 2h, 2.11±1.31, 3.72±1.77, 4.66±2.47, P<0.05, (x)2)The fluctuation of blood glucose in PD and D were much sharper than N’s when the data of seven time-point samples were calculated. 1.62±0.53, 1.96±0.73, 1.11±1.04, P<0.05 and P<0.01, and the seven time-points followed as fasting glucose, 1h after meal, the moment just finishing exercise, 1.5min, 30min, 1h, 2h in turn. (3) As to N, PD, D’s HR, the incidences of abnormal recovery at the 1st minute after exercise were 6.7%, 13.3%, 13.3% respectively, and the incidences of SBP abnormal increase during exercise were 20%, 33.3%, 66%. CONCLUSIONS: (1) The study found blood glucose of healthy or glucose metabolism disorders people after aerobic exercise changed regularly: decreased remarkably at the end of exercise, and then increased gradually with its peak at 30min, recovering almost entirely at 2h-point. (2) IFG subjects benefited more in blood glucose from 30min aerobic exercise than diabetes. (3) The CVD risk of exercise for diabetes patients was higher than that for IGR people and healthy ones. Supported by Research on Prevention and Control of Major CVD (2016YFC1300202).

Purpose: Air travel over several time zones causes disruption of circadian rhythms resulting in disorientation, nausea, gastrointestinal distress and difficulty concentrating. This may compromise health and decrease performance in travelling athletes. Heart rate variability (HRV) used to assess autonomic cardiac control may be an indicator of jetlag. This case study investigated trans-meridian travelling effects on the autonomic nervous system (ANS) by measuring time domain (RMSSD), high frequency domain (HF) and autonomic balance (LF/HF) indicators. Methods: A recreational athlete was monitored on tour from South Africa (SA) to New Zealand (NZ) for 28 days. HRV measurements were averaged over 3 days/night and reported as means (SD): a) after a 18 hour flight from SA, b) after 1 week in NZ, c) after 2 weeks in NZ, d) upon return to SA. Results: Active daytime vagal cardiac influence showed a return to normal/higher values measured after 2 weeks of arrival in Auckland, with a marked decline directly upon return to SA; RMSSD (ms): a) 45.63 (23.88), b) 62.90 (32.20), c) 67.00 (40.06) and upon return to SA d) 43.50 (26.93), (x)2)LF (ms²): a) 613.33 (366.11), b) 1164.00 (632.90), c) 1324.50 (795.30) and upon return to SA d) 834.33 (849.58). However, night time measurements indicated a decrease of the vagal control set point. RMSSD (ms): a) 52.37 (26.93), b) 50.55 (29.29), c) 46.80 (27.02) and upon return to SA d) 36.07 (18.12); HF (ms²): a) 829.33 (471.39), b) 772.50 (451.86), c) 530.00 (309.22) and upon return to SA d) 336.00 (179.77). Daytime autonomic balance (LF/HF) followed the same pattern, returning to lower/normal values after 2 weeks in NZ, and upon homecoming values reversed, signifying a new stress response due to the return flight: a) 3.66 (1.97), b) 2.83 (1.66), c) 2.71 (1.59) and finally d) 7.64 (4.50). Night time LF/HF values had small increases during the first 2 weeks with a stress response upon return to SA: a) 2.81 (1.62), b) 2.83 (1.66), c) 3.25 (1.88) and d) 6.40 (3.39). Conclusion: Reduced daytime vagal control improved with time (i.e. ANS adaptation) following international travel, illustrating the potential for HRV quantification as a jetlag marker. A novel finding is that during periods of travel it appears if autonomic cardiac control, as measured by HRV during daytime, differs to the nocturnal response.
Surgical referral for consideration of piriformis release. Ultrasound guided sciatic nerve hydrodissection coupled with neural flossing provided temporary relief of Extensive PT with plateau in improvement.

TREATMENT AND OUTCOMES:
Superimposed, chronic, inactive right S1 radiculopathy Piriformis syndrome resulting in active, compressive, right S2 neuritis

FINAL WORKING DIAGNOSIS:
Coursing through the piriformis muscle. Coursing deep to the right piriformis muscle and identified the right S2 nerve root.

MRI of the pelvis with lumbosacral plexus protocol demonstrated the sciatic nerve fascicle, separate from the sciatic nerve, appearing to pierce the piriformis muscle. L5-S1 effacing the right S1 nerve root. Electromyogram showed evidence of a chronic, Ischiofemoral Impingement Syndrome Proximal Hamstrings Tendinopathy Hip Osteoarthritis S1 Radiculopathy:

DIFFERENTIAL DIAGNOSIS:
Sacroiliac Joint Dysfunction Piriformis Syndrome Hip Osteoarthritis Proximal Hamstrings Tendinopathy Ischiofemoral Impingement Syndrome

TEST AND RESULTS:
Lumbar spine x-rays showed anteroloesis of L5 on S1 with associated disc space narrowing and MRI showed parametral disc protrusion at L5-S1 effacing the right S1 nerve root. Electromyogram showed evidence of a chronic, inactive right S1 radiculopathy. Ultrasound of the right hip identified a small nerve fascicle, separate from the sciatic nerve, appearing to pierce the piriformis muscle. MRI of the pelvis with lumbosacral plexus protocol demonstrated the sciatic nerve coursing deep to the right piriformis muscle and identified the right S2 nerve root coursing through the piriformis muscle.

FINAL WORKING DIAGNOSIS:
Piriformis syndrome resulting in active, compressive, right S2 neuritis

TREATMENT AND OUTCOMES:
Extensive PT with plateau in improvement. No relief with right S1 selective nerve root block. Ultrasound guided piriformis corticosteroid injection provided temporary relief of buttock pain. Ultrasound guided sciatic nerve hydrodissection coupled with neural flossing provided several months of relief and allowed the patient to return to cross country skiing. Surgical referral for consideration of piriformis release.

HISTORY: A 32 year old male cross country skier presented with a multi-year history of right posterior “deep” buttock pain. He endorsed associated radiation down his posterior right thigh, leg and into the plantar foot. He described “burning” and “tingling” that increased with prolonged sitting and standing. Surgical history was significant for bilateral hip arthroscopic surgeries for femoral acetabular impingement. He denied any significant weakness or change in bowel/bladder function.

PHYSICAL EXAMINATION: Exam revealed right toe flexor weakness. Straight leg raise reproduced his right lower limb and buttock pain. Reflexes were physiologic and symmetric. Hip range of motion was full and pain free. Intraarticular provocative maneuvers were negative. He had tenderness to palpation of his deep hip external rotators. FABER’s test and passive piriformis stretch reproduced his right buttock and lower limb symptoms.

DIFFERENTIAL DIAGNOSIS:
1. Radiculopathy
2. Sacroiliac Joint Dysfunction
3. Piriformis Syndrome
4. Hip Osteoarthritis
5. Proximal Hamstrings Tendinopathy
6. Ischiofemoral Impingement Syndrome

TEST AND RESULTS:
Lumbar spine x-rays showed anteroloesis of L5 on S1 with associated disc space narrowing and MRI showed parametral disc protrusion at L5-S1 effacing the right S1 nerve root. Electromyogram showed evidence of a chronic, inactive right S1 radiculopathy. Ultrasound of the right hip identified a small nerve fascicle, separate from the sciatic nerve, appearing to pierce the piriformis muscle. MRI of the pelvis with lumbosacral plexus protocol demonstrated the sciatic nerve coursing deep to the right piriformis muscle and identified the right S2 nerve root coursing through the piriformis muscle.

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HISTORY: A 41-year-old male Bulgarian was lifting in a Masters Championship in Barcelona in the 105+kg weight class. The first series was the snatch with his first attempt at 115 kg (254 lbs) going well and without pain. On his second attempt at 121 kg (267 lbs) he experienced some anterior left thigh pain. He attempted the third at 126 kg (278 lbs) unsuccessfully. After a short break he attempted the clean and jerk series first at 145 kg (320 lbs) and had a good lift. He attempted his second clean and jerk at 150 kg (331 lbs) at which point his pain increased and he forfeited the last attempt. Overnight at his hotel his pain intensified, and he sought care at a local ER. He was subsequently discharged with no imaging, intervention, or treatment plan. The following morning, he presented to the event medical tent with worsening pain, swelling and difficulty with bearing weight on his left lower extremity. PHYSICAL EXAMINATION: Appreciable difference in thigh size, no erythema with mild lacy bruising over left knee and distal to the knee joint. Right thigh measuring 65cm and left thigh measuring 72cm. Marked tenderness to palpation over the superior quad tendon and over the bodies of the rectus femoris and vastus lateralis. Limited hip and knee flexion, with endorsed pain in anterior thigh and superior aspect of patella. Sensation intact, Palpable femoral, DP, PT pulses. DIFFERENTIAL DIAGNOSIS: 1. Quadriiceps hematomata 2. Superior patella avulsion fracture 3. Quadriiceps tendon tear 4. Morel-Lavallee Lesion 5. Evolving thigh compartment syndrome TEST AND RESULTS: Plain film showed superior pole avulsion fracture of the left patella and soft tissue swelling suggestive of hematoma. MRI obtained 4 days following evaluation indicated significant diffuse edematous changes of muscle and fascia with interstitial hematoma and evidence of muscle body rupture of the vastus lateralis. FINAL WORKING DIAGNOSIS: Left vastus lateralis rupture with avulsion fracture of the superior pole of the patella

TREATMENT/OUTCOMES: Sent back to ER, radiograph obtained, placement in a long leg splint and LMWH given. Inability to obtain better imaging in Spain due to cost. Orthopedic evaluation upon return to Bulgaria within 4 days of injury with subsequent MRI. Patient treated conservatively with rehab and no surgical intervention.

HISTORY: 21 year old female division 1 rower with history of left L5 radiculopathy s/p L5-S1 microdiscectomy and foraminotomy presented with a 3 month history of dull, deep, aching anterior hip pain radiating into the groin, provoked by hip flexion, prolonged sitting, and rowing. Her symptoms started after a 15 mile row. She complained of quadriiceps weakness worsening over the past month. She tried NSAlDS, heat, ice, and stretching without success. A separate provider ordered EMG/NCs for radiculopathy workup, which showed an L5 radiculopathy, but did not investigate the rectus femoris, medial femoral cutaneous nerve or saphenous nerve.

PHYSICAL EXAMINATION: Atrophy of the quad musculature. No gait abnormalities. She was not tender to palpation at the greater trochanter, ischial tuberosity, piriformis, and quadratus femoris. Sensation intact, Palpable femoral, DP, PT pulses. DIFFERENTIAL DIAGNOSIS:

1. Acetabular labral injury
2. Femoral neuropathy
3. Lumbosacral stenosis
4H  lgh lumbar disc herniation
5. External Iliac artery fibrosis

TEST AND RESULTS:
Lumbar MRI: no abnormalities at L1-L4, scar tissue at L5-S1 causing mild flattening of the S1 nerve root and a shallow disc bulge at L4-L5 with no canal or foraminal stenosis. Pelvic MRI: no compressive lesions in the lumbosacral plexus and no labral injury.

Diagnostic ultrasound of the anterior hip: negative based on a complete ultrasound following AIUM protocol.

FINAL WORKING DIAGNOSIS:
Lumbar injury vs femoral neuropathy, chronic L5 radiculopathy

TREATMENT AND OUTCOME:

Abstracts were prepared by the authors and printed as submitted.
Initial treatment was a diagnostic ultrasound guided (USG) intraarticular hip injection with local anesthetic with no response. This was followed by an USG femoral nerve diagnostic block with lidocaine that provided short term relief. 1 week later, she received an USG femoral nerve hydrodissection with 1.5cc of D5W and sent for femoral nerve focused therapy. At 3 month follow up she had relief of her symptoms. She is now assistant coach for the rowing team with no symptoms.

### HISTORY

A 22-year-old female soccer player for a Division 1 College team with a previous history of contralateral hamstring injury a year ago presents to the training room with acute onset left posterior thigh pain. She was seen in the training room 5 days prior with an ache in the posterior thigh. Sideline ultrasound was unremarkable for any abnormality at that time. Pain worsened while performing a drill during practice so she presents for re-evaluation.

#### PHYSICAL EXAMINATION

No obvious gait abnormalities. No ecchymosis over posterior thigh. Tendon to palpation at left proximal semitendinosus muscle belly but no palpable defect noted. Resisted knee flexion/hamstring activation and reverse plank reproducun. Strength was full and symmetric and sensation intact in bilateral lower extremities.

#### DIAGNOSIS

1. Acute medial hamstring strain/tear
2. Proximal medial hamstring tendinitis
3. Ischial bursitis
4. Adductor strain

#### TEST AND RESULTS

Limited training room ultrasound reveals separation in the layers of investing fascia of semitendinosus/biceps femoris interval with sonopalpation tenderness reproducing her concordant symptom at the proximal hamstring region. There were no signs of muscular injuries on ultrasound. **FINAL WORKING DIAGNOSIS:** Acute left proximal semitendinosus/biceps femoris fascia tear without sonographic evidence of muscle strain in a senior soccer player with 3 games left of her career.

#### OUTCOMES

Using sonographic guidance, 4 cc of autologous conditioned plasma (ACP/PRP) was injected at the site of fascial abnormality. Patient remained prone for 5 minutes following the injection followed by application of ACE wrap for the next 2 hours and use of thigh compression until she was pain free. She was instructed to rest completely for 24 hours with a progressive rehabilitation program to return to play. At 6 days post procedure, she progressed to jogging and warm up exercises with minimal residual pain but was advised to continue to refrain from soccer. At 1-week post procedure she was completely pain free and was cleared to return to play in the game the following day. She then returned as a starter in the last game of the season, 11 days post injection, and even assisted a goal that led to her return to play in the game the following day. She then returned as a starter in the last game of the season, 11 days post injection, and even assisted a goal that led to her return to play in the game the following day.

### HISTORY:

A 34 year-old male basketball player/coach with left hip pain. Pain anterolateral for the last month with hip rotation and lying on left. No preceding injury or trauma. No pain at rest. Improves with sitting. No fever, chills, numbness, tingling, radiation, other joint involvement, swelling, erythema, catching, locking. No pertinent medical, surgical, or family history. No medications other than ibuprofen above. Works as a teacher and basketball coach, recreational basketball player. Denies tobacco, alcohol, or drugs.

#### PHYSICAL EXAMINATION:


#### FINAL WORKING DIAGNOSIS:

Osteoarthritis, Inflammatory arthritis, femoroacetabular impingement/labral pathology, fracture, lateral hip pain/gluteus medius tendinopathy and weakness, IT band syndrome, lumbar radiculopathy, infiltrative process/mass.

#### TEST AND RESULTS:

X-ray: Decreased bone density within the left femoral head without fracture or mass. This could recommend transient osteoporosis of the hip. MR arthrogram: Subchondral insufficiency fracture in the superior aspect of the left femoral head with significant bone marrow edema in the left femoral head and neck. Small left anterior superior labral tear.

#### TREATMENT AND OUTCOMES:

Crutches for pain-free guided weight-bearing and pain-free water exercise. 6 weeks after diagnosis, doing pain-free ADLs without difficulty. Physical therapy started. 6 months after diagnosis: x-ray with no fracture seen and improved bone density. Cleared for all activity without restrictions.

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WEDNESDAY, MAY 29, 2019

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**Clinical Case Slide - Spine I**

**Wednesday, May 29, 2019, 3:15 PM - 4:35 PM**

Room: CC-306

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**Chair:** Joseph Ihm, FACSM. Shirley Ryan AbilityLab, Chicago, IL. (No relevant relationships reported)

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**736**

**Discussant:** Osawaru A. Olufade. Emory University, Johns Creek, GA. (No relevant relationships reported)

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**737**

**Discussant:** Prakash Jayabalan. Shirley Ryan AbilityLab/Northwestern University, Chicago, IL. (No relevant relationships reported)

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**738**

**May 29 3:15 PM - 3:35 PM**

**Bilateral Upper Extremity Weakness in a Wrestler**

Kimberly S. Casten, Adam Lewno. University of Michigan, Ann Arbor, MI. (Sponsor: Robert Kinningham, FACSM) (No relevant relationships reported)

**HISTORY:** A 19-year-old male college Wrestler with a history of right labral repair presented with 4-month insidious 10/10 neck pain and hand-like pain over his shoulders. In the last month he developed bilateral dorsal hand paresthesias with shoulder fatigue while wrestling. After a month off, symptoms would emerge after 2.5 minutes of wrestling and progressively longer. No illness, increase in activity, color changes, temperature differences, loss of dexterity.

**PHYSICAL EXAMINATION:**
- General: Well-developed male
- Skin: No rashes or lesions
- Vascular: Normal pulse and capillary refill
- Neuromuscular: Normal muscle bulk and tone. Normal range of motion, strength, deep tendon reflexes, and sensation to light touch and pinprick in the bilateral upper extremities. Positive Trommer reflex bilaterally, otherwise negative special testing of the cervical spine, shoulder, scapula, and neurovascular bundle.

**DIFFERENTIAL DIAGNOSIS:**
1. Cervical Radiculopathy
2. Transient quadriplegia
3. Suprascapular or Axillary Mononeuropathy
4B. Racial Plexopathy
5. Thoracic Outlet Syndrome
6. Myopathy
7. Quadrilateral Space Syndrome
8. Spinal cord injury
9. Cervical facet pathology

**TEST AND RESULTS:**
- Cervical MRI identified absent right C5 pedicle with no spinal cord signal abnormality. C5 and C6 spinal nerve roots were separate with no dural extension
- Cervical CT showed no fracture of the right C5 pedicle; likely congenital absence
- C5 and C6 spinal nerve roots were separate with no dural extension
- 7. Quadrilateral Space Syndrome
- 8. Spinal cord injury
- 9. Cervical facet pathology

**TREATMENT AND OUTCOMES:**
1. Neurosurgical consultation which confirmed spinal stability with no restriction on sporting activities
2. Progressed from limited sporting activities including aerobic activities without lifting restriction of less than 10 pounds for 6 weeks.
3. Neck extension exercises out antibiotic therapy.
4. Cervical collar for 2 weeks weaned out of over the third week.
5. Surgical Excision of the ossicle complicated.

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**739**

**May 29 3:35 PM - 3:55 PM**

**Back Injury - CrossFit**

Kevin Bonfield. University of Kentucky, Lexington, KY. Email: kevin.bonfield@uky.edu (No relevant relationships reported)

**HISTORY:** A 31 year old female with obesity s/p gastric sleeve presents with left shoulder pain after an injury sustained performing a power clean during a crossfit session 2 months prior. At the top of the lift she felt a tearing pain between her scapula and spine that radiated all the way down her left arm and felt like numbness and tingling in her small three fingers. She has tried ibuprofen, ice, heat, and cyclobenzaprine which have only mildly improved her pain over the past 2 months.

**PHYSICAL EXAMINATION:** Examination revealed a normal appearance to the left shoulder. Palpation noted for tenderness over the left rhomboid, trapezius. Tenderness over spinous process with tenderness at C6-C7 spinous processes. ROM of left shoulder intact with pain elicited on extension, abduction and external rotation. Strength 3/5 with forward flexion, abduction and external rotation. Positive Lift Off test.

**DIFFERENTIAL DIAGNOSIS:**

**TEST AND RESULTS:**
- Left Shoulder x-ray - No acute findings
- Spinal Survey AP/Lat - Small ossicular fragment along posterior aspect of C6 spinous process. Large osteo-chondral fragment between the C7 and T1 spinous processes. MRI Thoracic Spine without contrast - Old 50% compression deformity of T4. Syrinx in the lower thoracic spinal cord centered at T9 level measuring 4cm craniocaudally and 5mm in maximal transverse dimension. NM Bone Scan SPECT- Increased bone uptake at the spinous process of C7 extending between C7 and T1. 15mm well corticated fragment most compatible with healing fracture. C7 spinous process excisional biopsy pathology - Bone and dense peri-osseous soft tissue without significant histological abnormality.

**FINAL WORKING DIAGNOSIS:**
C7 vertebral fracture with C7 spinous process ossicle

**TREATMENT AND OUTCOMES:**
1. Surgical Excision of the ossicle complicated by wound dehiscence and surgical site infection necessitating debridement and antibiotic therapy.
2. Cervical collar for 2 weeks weaned out of the third week.
3. Lifting restriction of less than 10 pounds for 6 weeks.
4. Neck extension exercises out of the collar and isometric exercises.
5. Returned to activities as tolerated 3 months post op from original excision surgery with improvement in strength, range of motion and numbness symptoms.

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**740**

**May 29 3:55 PM - 4:15 PM**

**Perplexing Presentation- Preserving Function**

Germaine Herman. Eskenazi Health System, Indianapolis, IN. Email: germaine.herman@eskenazhealth.edu (No relevant relationships reported)

**HISTORY:**
A 60-year-old female with uncontrolled DM II, HTN, hyperthyroidism, tobacco abuse and depression arrived to physical therapy for evaluation of chronic left leg pain and weakness of sudden onset eight months prior. She reported constant pain including unrelenting night pain, changes in bowel habits and a twenty five pound weight loss within the last six months. She denied urinary incontinence, night sweats, chills and fevers. She reported left knee buckling, falls, difficulty working as a bartender and completing daily activities. She endorsed non-adherence with medications and marijuana and non-prescription opiate use.

**Physical Examination:**
- Examination revealed gross atrophy of the left thigh and left foot drop during gait.
- Sensation was decreased to light touch and deep pressure along L2-4 dermatomes in the left leg and was normal on the right.
- Reflexes were absent in L4/5 and S1 bilaterally; she had a negative Hoffman and Babinski bilaterally. Myotomes were 2-/5 proximal and 3-/5 distal to the knee on the left and 4-/5 throughout on the right. There was flaccidity throughout the left leg. All other tests of the hip and spine including slump and straight leg raise tests were unremarkable.

**Differential Diagnosis:**
- * Lower motor lesion with systemic etiology
- * Malignancy

**Tests and Results:**
- The physical therapist referred the patient back to the primary care physician (PCP) who ordered an abdominal CT and a spinal MRI. The patient was referred back to physical therapy. At re-evaluation one month later the patient presented with progressive motor loss scoring 3-/5 grossly on the right and 2-/5 grossly on the left. Sensory deficits extended to both lower extremities. Falls increased to three a week forcing patient to discontinue work. The patient was referred back to the PCP who admitted the patient to hospital for further workup. A brain MRI, myositis panel, aldolase, ANA and inflammatory markers were all unremarkable. EMG results revealed lumbosacral polyradiculopathy without evidence of myopathy.

**Final Working Diagnosis:**
Diabetic Lumbosacral radiculoplexus neuropathy

**Treatment and Outcomes:**
Abstracts were prepared by the authors and printed as submitted.
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**Methods:** 8 trained athletes (5M, 3F, 32.1±9.2 years, 177.4±8.1 cm, 67.9±7.5 kg) performed a Half Marathon during competition. A total of 8 IMUs (240 Hz) were placed at the feet, tibia, upper legs, sacrum and sternum. Parameters of interest included two indicators of impact: peak tibial acceleration (PTA) and peak sacral acceleration (PSA), and the knee angle at midstance (MS). Mean values over 100 strides were calculated bilaterally during three periods in the Half Marathon (1st km, halfway and 20th km). Paired sample t-tests were used to test for statistical differences in the parameters between the three periods.

**Results:**

Both PTA and PSA increased significantly during a Half Marathon, despite a unilateral increase in knee angle at MS.

**Conclusions:**

In the first part of the Half Marathon, an increase in PTA did not increase PSA, probably due to an increase in shock absorption by active structures (i.e. unilateral increase in knee angle at MS). During the last part of the Half Marathon shock absorption decreased, resulting in an increased PSA. We speculate that fatigue caused the shock absorption mechanism to shift from active to more passive structures during the last part of the Half Marathon. Future research should determine if shock absorption by passive structures is sufficient to prevent overuse injuries.

**Evidence suggests that running mechanics may differ between runners based on their weekly mileage; greater weekly mileage (WM) may act as a protective mechanism against injury.**

While the interaction between coordination patterns and WM has been investigated, interaction between lower extremity (LE) kinematic variability and WM has not.

**Purpose:** To compare changes in LE kinematic variability between low (LM) and high mileage (HM) healthy runners after a prolonged run.

**Methods:** 23 healthy participants (27.4±7.7 yrs., 1.70±0.1 m, 67.9±15.4 kg, 16.3±5.6 km/week) were included in the LM group, while 12 participants (25.1±6.3 years, 1.71±0.1 m, 65.8±9.4 kg, 46.9±14.5 km/week) were included in the HM group. Participants ran on a treadmill for 30 minutes at a self-selected training pace. 3D kinetic data were collected after 5 minutes of running and again at the end of run at 200Hz using reflective markers placed on the lower body with 6 infrared cameras. Variables of interest included ankle, knee and hip sagittal and frontal plane angles. Standard deviation (SD) and coefficient of variation (CV) were calculated for each dependent variable (DV) at the beginning and end of the run. Approximate entropy (ApEn) was also calculated for each DV at both time intervals. Two repeated measures ANOVAs with time and joint as the within-subject factors and group as the between-subject factor, were used to compare kinematic variability. Post hoc analyses were conducted for significant interactions. Alpha level was set at 0.05.

**Results:** Average running speed for the LM and HM group were 2.5±.3 m/s and 2.9±.4 m/s, respectively. In the sagittal plane, a significant interaction was found between joint and group (Ft1,55 =5.5, p=.006). Specifically, the HM group demonstrated greater amounts of variability (SD) than the LM group (LM=25.7±3.0; HM=29.5±3.7). No other statistically significant differences were attained.

**Conclusions:** Kinematic variability differed between the LM and HM groups, but only for the knee in the sagittal plane. Ankle and hip sagittal plane movement was comparable between the LM and HM groups. This may suggest that movement of the ankle and the hip do not differ in response to having to control variability at the knee. When assessing kinematic variability, it is important to consider the weekly mileage of each runner.

**745 May 29 3:25 PM - 3:35 PM Differences in Lower Extremity Kinematic Variability between Healthy Runners Classified as Low or High Mileage**

Amanda Estep1, Steven Morrison2, Shane Caswell3, Nelson Cortes1, Austin Peay State University, Clarksville, TN. 1Old Dominion University, Norfolk, VA. 2George Mason University, Manassas, VA.

*(No relevant relationships reported)*
Proximal redistribution of joint work to the hip occurs following intensive running in novice runners [1] and might explain the reduced running economy following prolonged running [2]. These findings in novice might be different in well-trained runners due to their training status. PURPOSE: The purpose of this study was to assess if proximal redistribution of joint kinetics following a running bout is observed in well-trained runners. METHODS: 14 well-trained male runners with habitual rearfoot strike patterns (76±22km/week) completed 5 running trials at a speed equivalent to ±5% of their long run pace while 3D kinematic and ground reaction force data were collected before and after a treadmill run equal to 25% of weekly mileage (19.6km). Joint powers and work were calculated from these data using Visual3D. Percent contribution of each joint work relative to total lower limb joint work was computed. Paired samples t-tests were used to compare joint kinetics before and after the run (p < 0.05). Cohen’s d effect sizes were computed to assess mean difference magnitudes. RESULTS: Peak ankle negative power (Table 1) and hip negative relative work contribution (pre: 14.2±3.6%, p=0.041; d=0.33) showed significant pre- to post-run effects. Positive ankle (pre: 50.6±6.8%; p=0.03; d=0.16) and hip relative work (pre: 26.2±10.1%, p=0.03; d=0.10) were unaffected by the long run in these well-trained male runners. CONCLUSIONS: These findings suggest that previously reported distal-to-proximal shift in positive joint work in novice runners following a running bout [1] is not observed in well-trained male runners. This might be the result of chronic training exposure in these trained runners and suggest a preservation of mechanical joint output despite prolonged running exposure. Differences in run type (intense vs steady prolonged run), foot strike, and gender might also be responsible for these differences between studies.

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Running with a jogging stroller has become a viable option for exercise in individuals serving as caregivers. Previous research has shown that stroller running leads to altered kinematics, but for many studies, running velocity was not constant between conditions. Some studies have reported altered trunk and pelvic motion during prolonged running exposure in these trained runners and suggest a preservation of mechanical joint output despite prolonged running exposure. Differences in run type (intense vs steady prolonged run), foot strike, and gender might also be responsible for these differences between studies.

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Running biomechanics are influenced by footwear and insole properties. The sensorimotor system, specifically subcutaneous plantar receptors, play a role in initiating adaptive gait mechanics. Designed to increase afferent signaling via plantar surface deformation, an insole inlaid with a textured heel-plate (TI) is proposed to precipitate gait changes during running. PURPOSE: To compare biomechanical patterns during over-ground running between the TI and a non-textured insole (NI). METHODS: Nineteen rearfoot strike runners (24.9±5.7 yo; 6.13 F) performed twenty, 35-meter running trials under TI and NI conditions. Insole conditions were counter-balanced, and velocity was controlled (±5%). Plantar sensation was assessed using a 3.61g monofilament applied to seven standardized sites. Thirty-six reflective markers (d=16–20 cm) were affixed bilaterally to lower extremity bony landmarks and were tracked via a 10-camera motion analysis system (120 Hz), and ground reaction forces were collected (1200 Hz). Visual3D and a custom MatLab script were used to determine lower extremity kinematics and kinetic variables. Perceived insole comfort was scored with a visual analogue scale. Dependent variables were analyzed using paired-samples t-tests; for data that violated assumptions, a Wilcoxon signed-rank test was utilized. RESULTS: Kinetic measures did not differ significantly between insole conditions; impact peak (NI=1.46±0.58 BW, TI=1.50±0.44 BW, p=0.74), active peak (NI=2.37±0.16 BW, TI=2.35±0.15 BW, p=0.28), loading rate (NI=35.9±12.2 BW/s, TI=34.0±13.2 BW/s, p=0.26), peak braking (NI=31.03 BW, TI=32.06 BW, p=0.69) and peak propulsion (NI=27.05 BW, TI=27.04 BW, p=0.28). A significant increase in ankle internal rotation angle at initial contact was observed in the TI versus NI (NI=5.9±5.9; TI=7.3±5.9; p=0.01, d=24), however, no other significant kinematic differences were detected. NI (mdn=9.0) was rated as significantly more comfortable than TI (mdn=8.0) (z=2.026 p=0.04). CONCLUSION: Because kinematic and kinetic variables did not vary significantly between the TI and NI, the efficacy of the TI as a method of immediately altering running mechanics in a population of rear foot strikers should be further investigated. Insoles provided by: ShoeCue Inc (ShoeCue, Orelans, MA)
control group demonstrated more hip extension at toe off, which could suggest greater forward propulsion of the body. Greater propulsion is also associated with shorter ground contact times, and requires greater stability. The ASD group exhibited greater anterior, and gastrocnemius were measured. VO\(_2\), HR, RPE, and muscle activity from lower extremity were analyzed using a 2 (running direction) X 3 (BWS) X 3 (SF) repeated measures analysis of variance (n = 10). RESULTS: VO\(_2\), HR, RPE, and muscle activity from the rectus femoris, biceps femoris, tibialis anterior, and gastrocnemius were measured. VO\(_2\), HR, RPE, and muscle activity from the rectus femoris were significantly different between SF conditions (P<0.05). For example, VO\(_2\), HR and RPE during running at PSF+10% were significantly higher than when running at SF, regardless of running direction and BWS (e.g., 27.7 ± 5.7 ml/kg/min and 24.9 ± 4.3 ml/kg/min in VO\(_2\), PSF+10% and PSF during forward running at 50% BWS, respectively; P<0.05). However, RPE was not different between SF conditions (P>0.05). CONCLUSION: These observations suggest that manipulation of SF (i.e., a 10% change in SF from the PSF) during conditions (P<0.05). For example, VO\(_2\)PSF during forward running at 50%BWS, respectively: P<0.05). Nevertheless, no research has investigated the influence of a change in SF on physiological and perceptual responses during backward running with BWS.

PURPOSE: To investigate influence of a change in SF on physiological and perceptual responses during backward running at different levels of BWS. METHODS: Nine participants (33.2±12.1 years) ran forward and backward at 0% BWS, 20% BWS, and 50% BWS conditions on a lower body positive treadmill. The SF conditions consisted of forward and backward running at preferred stride frequency (PSF), PSF+10%, and PSF-10%. Oxygen uptake (VO\(_2\)), heart rate (HR), rating of perceived exertion (RPE), and muscle activity from the rectus femoris, biceps femoris, tibialis anterior, and gastrocnemius were measured. VO\(_2\), HR, RPE, and muscle activity from lower extremity were analyzed using a 2 (running direction) X 3 (BWS) X 3 (SF) repeated measures analysis of variance (n = 10). RESULTS: VO\(_2\), HR, RPE, and muscle activity from the rectus femoris were significantly different between SF conditions (P<0.05). For example, VO\(_2\), HR and RPE during running at PSF+10% were significantly higher than when running at SF, regardless of running direction and BWS (e.g., 27.7±5.7 ml/kg/min and 24.9±4.3 ml/kg/min in VO\(_2\), PSF+10% and PSF during forward running at 50% BWS, respectively; P<0.05). However, RPE was not different between SF conditions (P>0.05). CONCLUSION: These observations suggest that manipulation of SF (i.e., a 10% change in SF from the PSF) during running may have greater impact on physiological responses than on perceptual responses, regardless of running direction and BWS. Supported by JSPP Grant Number 16K01663.

Manipulation of stride frequency (SF) influences gait mechanics of forward running, regardless of body weight support (BWS). Nevertheless, no research has investigated the influence of a change in SF on physiological and perceptual responses during backward running with BWS.

### 751 May 29 4:25 PM - 4:35 PM

**Non-Linear Relationship between Footstrike Angle and Vertical Loading Rate during Running**

Mikel R. Stiffler-Joachim, Christa M. Wille, Bryan C. Heiderscheit. UW-Madison, Madison, WI.

Email: joachim@ortho.wisc.edu

(No relevant relationships reported)

Footstrike is considered a primary determinant of lower limb mechanics during running. Indeed, vertical loading rates, often a focus of investigations into running-related injuries, are typically found to be lower in footstrike compared to rearfoot strikers fostering the belief that footstrike is desirable. However, prior work has shown that foot angle relative to the ground (foot inclination angle (FIA)) is a poor predictor of vertical loading rate when using a linear model, suggesting a more complex relationship is present.

**PURPOSE:** To determine if a non-linear model improves the ability to estimate average vertical loading rate (AVLR) from FIA compared to a linear model.

**METHODS:** Whole body kinematics and vertical ground reaction forces (VGRF) were collected for 169 NCAA Division 1 athletes (96 males) during treadmill running at 2.68, 3.35, and 4.47 m/s. Athletes were healthy at testing, had no history of lower limb surgery, and no bone stress injury within 3 months prior to testing. FIA and AVLR were calculated for 15 strides and averaged across strides for each limb. FIA at initial contact was calculated, with positive and negative FIA indicating a more rearfoot and forefoot position, respectively. AVLR was the VGRF slope over 20-80% of the force contact was calculated, with positive and negative FIA indicating a more rearfoot and forefoot position, respectively. A VLRs were lowest at the extremes of FIA (i.e., -15°, 20°), while greater A VLRs were observed between 5-10°. The non-linear model to estimate AVLR from FIA resulted in an approximate increase in R\(^2\) values of 0.30 above the linear model at all speeds (linear: 0.13 ± 0.14, 0.12 ± 0.06, 0.24 ± 0.09, 0.34 ± 0.04, for 2.68, 3.35, and 4.47 m/s, respectively). Model error was reduced in the non-linear models by 30-60 N/kg/s (linear: 165.2, 202.6, 293.4 N/kg/s; non-linear: 130.7, 170.9, 234.9 N/kg/s for 2.68, 3.35, 4.47 m/s, respectively).

### 750 May 29 4:15 PM - 4:25 PM

**Stride Frequency Manipulation: Physiological And Perceptual Responses During Backward Running With Body Weight Support**

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(No relevant relationships reported)

**PURPOSE:** To investigate the influence of a change in SF on physiological and perceptual responses during backward running at different levels of BWS. METHODS: Nine participants (33.2 ± 12.1 years) ran forward and backward at 0% BWS, 20% BWS, and 50% BWS conditions on a lower body positive treadmill. The SF conditions consisted of forward and backward running at preferred stride frequency (PSF), PSF+10%, and PSF-10%. Oxygen uptake (VO\(_2\)), heart rate (HR), rating of perceived exertion (RPE), and muscle activity from the rectus femoris, biceps femoris, tibialis anterior, and gastrocnemius were measured. VO\(_2\), HR, RPE, and muscle activity from lower extremity were analyzed using a 2 (running direction) X 3 (BWS) X 3 (SF) repeated measures analysis of variance (n = 10). RESULTS: VO\(_2\), HR, RPE, and muscle activity from the rectus femoris were significantly different between SF conditions (P<0.05). For example, VO\(_2\), HR and RPE during running at PSF+10% were significantly higher than when running at SF, regardless of running direction and BWS (e.g., 27.7 ± 5.7 ml/kg/min and 24.9 ± 4.3 ml/kg/min in VO\(_2\), PSF+10% and PSF during forward running at 50% BWS, respectively; P<0.05). However, RPE was not different between SF conditions (P>0.05). CONCLUSION: These observations suggest that manipulation of SF (i.e., a 10% change in SF from the PSF) during running may have greater impact on physiological responses than on perceptual responses, regardless of running direction and BWS.
times (40, 32, 32, 28, 24, 24). But the total gear meters of sessions were set to be increased gradually (26m, 27.2m, 27.2m, 27.2m, 27.8m, 28.4m, 28.4m) by adjusting the air brake gear of Wattbike. The power, work and HR were recorded with the sampling rate of 200 Hz. Blood lactate was tested at one and three minutes after each group. RESULTS: Except the average cadence (Cavg) of the first session was closed to 120 rpm, other six sessions’ Cavg were only around 117 rpm. Although the total work of HIIT sessions were decreased from 266.8 kJ of the first session to the last session’s 201.0 kJ. But the larger gear meters of HIIT sessions were decreased gradually by 341.2±10.2 kJ, 369.0±9.2 W, 383.0±18.8 W, 377.1±9.8 W, 408.4±26.9 W, 416.3±9.3 W and 418±1.9 W respectively. The average HR only decreased by 6.1% in the second session than the first, and rised to the same level in the next five sessions. Although the post-group BLa increased obviously from the third session, the degree of BLa recovery over 201 session than the first, and rised to the same level in the next five sessions. 

Middle-aged women often have a tendency to gain weight due to decreased basal metabolic rate and physical activity. In order to make women’s elderly life more quality, women’s physical fitness in middle age is an issue that needs attention. PURPOSE: To investigate the effects of different percentages of critical velocity (CV) training on cardio-pulmonary fitness, body composition, and sleep quality in middle-aged women.

METHODS: Twenty-four middle-aged women (age: 45.0±7.2 yrs, height: 160.3±5.0 cm, weight: 61.6±7.1 kg, body fat percentage: 38.3±17.1%) participated in the study who were paired by CV to perform high-intensity interval training (HIIT, 130% CV, running 2 minutes with 1 minute recovery, repeated 7 times) or moderate-intensity continuous training (MICT, 90% CV, running 20 minutes) 3 times a week for 12 weeks. Participants were asked to wear the Mi band II 3 weeks before and during the intervention period to record the number of steps and sleep status.

RESULTS: The body fat percentage (HIIT group: 39.7±4.5% to 38.5±14.7%, MICT group: 36.9±3.2% to 35.7±3.3) and maximal oxygen uptake (HIIT group: 30.7±5.3 to 33.8±5.3 ml/min/kg, MICT group: 30.8±3.5 to 33.3±5.0 ml/min/kg) were significantly improved in both groups (p < 0.05), and there was no difference between the groups (p > 0.05). However, the HIIT group significantly improved the ventilation threshold (36.9±5.6 to 29.3±5.2 ml/min/kg) and increased the proportion of deep sleep (31.1±8.0% to 33.2±9.2%) (p < .05).

CONCLUSIONS: When training was the same, both HIIT and MICT have significant improvement on body composition and cardio-respiratory fitness, but HIIT can also improve high-intensity exercise ability and sleep quality.

RESULTS: There were significant between group differences in post-test absolute V̇ O2peak, with an adjusted pre-test mean of 2.44L min⁻¹ and PPO, with an adjusted pre-test mean of 130.9W. Absolute V̇ O2peak was greater in the 30:4 (2.53±0.38L min⁻¹, p = .036) than CON (2.17±0.34L min⁻¹), and PPO was greater in 30:4 than CON (136±14 vs. 127±22W, p = .007, respectively). No differences were observed between groups in CP (p = .530), Ẇ (p = .900), EMGdiff (p = .692), PP (p = .692), MP (p = .290), or TW (p = .291).
High-intensity strength training is known to induce muscle strength gain and muscle hypertrophy. However, there are only few reports on the effects of high-intensity strength training on strength gain and muscle hypertrophy in females. PURPOSE: To conduct a systematic review of a meta-analysis to compare changes in strength gain and muscle hypertrophy between males and females after high intensity resistance training.

METHODS: To carry out present review, English-language literature searches on PubMed and SPORTDiscus databases were conducted from all time points up until June 2018. Combinations of the following keywords were used as search terms: “training intensity,” “strength training,” “resistance training,” “strength,” “muscle hypertrophy.” RESULTS: Thirty-five articles were included in the meta-analysis. The standardized mean differences for muscle strength gain were 1.27 (95% confidence interval [CI], 0.99-1.55) and 1.16 (95% CI, 0.45-1.87), in males and females, respectively. The standardized mean differences for muscle hypertrophy were 0.73 (95% CI, 0.41-1.05) and 0.33 (95% CI, 0.07-0.60) in males and females, respectively.

CONCLUSIONS: Our results suggested that high-intensity strength training induces muscle strength gain and increases muscle hypertrophy in both males and females. However, in the case of muscle hypertrophy, females tend to have lower standardized mean difference than males after high-intensity strength training.

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No differences in performance improvement (-4 ± 2 vs. -4 ± 2%∆ in 5km time) or running economy were observed between groups (p>0.05). Resting HR (-2 ± 3 vs. -2 ± 2%∆) and HRV (SDNN 5 ± 2 vs. 11 ± 6%∆) were improved in both groups but were not different between conditions (HIIT vs. HIIT+Heat, p=0.05). However, cSBP (1 ± 2 vs. -7 ± 3%∆), dSBP (2 ± 2 vs. -8 ± 2%∆), and PWV (0 ± 1 vs. -6 ±3%∆) only decreased in the HIIT+Heat (HIIT vs. HIIT+heat, respectively, all p<0.05). Improvements in jump velocity (-3 ± 5 vs. 8 ± 5%∆) and power (-2 ± 5 vs. 9 ± 6%∆) tended be greater in HIIT+heat (p=0.08-0.10). CONCLUSION: Short term HIIT combined with heat stress did not improve running performance or economy more than HIIT alone, but did significantly improve blood pressure, vascular stiffness, and tended to improve muscle function in thermoneutral conditions. Further work exploring longer training and/or greater heat stress in larger populations, or those with vascular dysfunction, is warranted.
CONCLUSIONS: The findings of the study indicate that a 3-min duration of HIIT style warm-up may be enough to physically prepare individuals to improve flexibility and vertical jump. Future studies should compare and contrast the efficacy of varying work to rest ratio of HIIT style warm-up with other warm-up protocols to determine the most effective warm-up protocol.

778 Board #12  May 29 2:00 PM - 3:30 PM
The Effect Of Varying High-intensity Interval Training Style Warm-ups On Hemodynamic, Power, And Flexibility Responses
Nelson Wise, Orlando Cepeda, Klarris Ybarra, Brenda Palma, Brianna Lopez, Manuel Nunez, Ezra Meza, Alexandria Hinojosa, Amanda Hankins, Murat Karabulut, Jay A. Campbell, Rebecca D. Larson, Christopher D. Black, Brenda Palma, Jason Sartor, Kansas State University, Manhattan, KS.

PURPOSE: The purpose of this study was to examine the effectiveness of high-intensity interval training (HIIT) style warm-up on hemodynamic, power, and flexibility responses.

METHODS: Twelve male subjects (age: 24.15 ± 3.1 yr; weight: 78.78 ± 16.83 kg) completed the study. On the first day, initial screening, anthropometric measures, and familiarization with testing procedures were completed. There was a total of 6 randomized testing sessions (separated by at least 48 hours). The testing sessions were as follows: 3-min warm-up session with 20 sec work followed by 10 sec (C1), 3-min warm-up session with 30 sec work followed by 10 sec (C2), 5-min warm-up session with 20 sec work followed by 10 sec (C3), 5-min warm-up session with 30 sec work followed by 10 sec (C4), 8-min warm-up session with 20 sec work followed by 10 sec (C5), and 8-min warm-up session with 30 sec work followed by 10 sec (C6). The warm-up sessions included timed interval body weight squats. Hemodynamics (heart rate (HR) and systolic (SBP) and diastolic (DBP) blood pressure), a countermovement jump, and flexibility values were recorded before and after warm-up protocols.

RESULTS: There was a significant duration*time interaction for flexibility (p<0.01) and vertical jump (p<0.02). Flexibility increased from pre to post for 3-min and 5-min warm-up conditions, however, decreased for 8-min warm-up conditions. Vertical jump increased for 3-min conditions and decreased for 5-min and 8-min conditions. There were significant duration main effects for HR (p<0.01), the main effects for HR (p<0.01), SBP (p<0.01), and DBP (p<0.01), duration*time interaction for HR (p<0.01) and intensity*time interaction for SBP (p<0.04).

CONCLUSIONS: ROTC cadets could recover 24H following a bout of HIIT exercise with no differences between M & F cadets. CMJ performance did not match the change in exercise performance. Soreness patterns were similar for M & F cadets for high-intensity exercise. PRS matched the pattern of soreness indicating it is not associated with soreness rather than performance. More work is needed to understand the utility of CMJ for recovery monitoring in this population. Lastly, this type of resistance exercise protocol may be useful for improving muscle fitness in entry-level ROTC cadets.

780 Board #14  May 29 2:00 PM - 3:30 PM
Comparing Strength Outcomes Of An 8 Week Hiit Intervention Vs 8 Week Traditional Weight Training.
Jason Sartor, Kansas State University, Manhattan, KS.

PURPOSE: To compare effects of HIIT and TWT on power, strength and muscular endurance in college students.

METHODS: Participants (n = 95) were enrolled in 8-week TWT or HIIT fitness classes. Baseline and posttest measures were completed by 83 participants (87.4%). TWT: N = 35, age = 22.6 ± 4.11 years, body mass = 78.3 ± 21.4 kg; HIIT: N = 48, age = 21.2 ± 3.1 years, body mass = 77.2 ± 14.6 kg. After completing a standardized warm-up participants completed measures testing lower body muscular power (vertical jump), strength (handgrip dynamometer), and muscular endurance (2-minute timed push-ups and 1-minute body weight squats). Within (paired) and between (independent change scores) samples t-tests were conducted using SPSS 25.
Metabolism after interval-based exercise.

Conclusion: Data showed an increase in the rate of fat oxidation and a reduction in groupXtime interaction (p=0.35). There was a significant trainingXboutXgroup interaction in the rate of fat oxidation (p=0.016) and VO2max (p=0.000). Data showed an increase in VO2max in C (30.5 ± 1.3 vs 32.6 ± 3.9 mL/kg/min) and females (n=5; age 21 ± 3.6, VO2max 39.4 ± 7.7 mL/kg/min) were more likely to respond to HIIT than males (n=10; age 20 ± 3.5, VO2max 32.6 ± 4.9 mL/kg/min).

Effect Of Ethnicity On Change In Vo2max And Substrate Oxidation In Response To Hiit

Board #15 May 29 2:00 PM - 3:30 PM
Jamie DeRevere1, Todd A. Astorino1, Sean Walsh, FACSM2. 1California State University San Marcos, San Marcos, CA. 2Central Connecticut State University, New Britain, CT. (No relevant relationships reported)

Introduction: About 20% of adults meet the 2008 Physical Activity Guidelines and this lack of physical activity increases individuals’ risk of heart disease, stroke, type-2 diabetes, and certain cancers which increases morbidity and all-cause mortality. Typically, moderate intensity continuous training (MICT) is prescribed to clients to improve overall fitness and health status, although a primary barrier to regular physical activity among sedentary individuals is lack of time. An alternative to MICT is high intensity interval training (HIIT) which significantly increases VO2max and fat oxidation, in turn improving exercise capacity and reducing health risks. One widely ignored aspect of individual response to exercise training is ethnicity, as there are minimal data examining the effect of ethnicity on responses to exercise training.

Purpose: To determine if ethnicity alters adaptive responses to HIIT in sedentary women.

Methods: Inactive, non-obese women (age and VO2max = 24 ± 3 ± 4.1 yr and 29.1 ± 2 ± 1 mL/kg/min) participated in 9 sessions over a 3-week period of cycling-based HIIT (8-10 1-minute bouts at 85% PPO interspersed with 75-s recovery at 10% PPO). Participants were Caucasian (C) (n=6) or Hispanic (H) (n=4). To assess VO2max, the initial work rate began at 30 or 40 W for 2 minutes followed by a 15 or 20 W/min increase in power output until volitional exhaustion. To assess substrate oxidation, a 6-min warm up began at 10% PPO and subsequently work rate increased by 10% PPO every 5-min during 4 remaining stages. These variables were measured pre- and post-training.

Results: Training elicited a HR equal to 88-94% HRmax. Data showed an increase in VO2max in C (30.5 ± 1.3 vs 32.6 ± 3.9 mL/kg/min, ±14%) with no significant groupXtime interaction (p<0.05). There was a significant increase in XboutXgroup interaction for fat oxidation (p<0.005), carbohydrate oxidation (p<0.009), and RER (p<0.000). Data showed an increase in the rate of fat oxidation and a reduction in carbohydrate oxidation in response to training which differed based on ethnicity.

CONCLUSIONS: These data show HIIT induces significant increases in VO2max which are slightly higher in H vs C. In addition, ethnicity seems to mediate changes in substrate metabolism after interval-based exercise.

High-Intensity Interval Training Does Not Induce Anti-Inflammatory Changes in Healthy Men

Board #16 May 29 2:00 PM - 3:30 PM
Paul Nagelkirk, James Sackett, Dan Farrell. Ball State University, Muncie, IN. Email: pmagelkirk@bsu.edu (No relevant relationships reported)

Low-grade inflammation is associated with the risk of various chronic diseases, and the protective effects of a physically active lifestyle may be partially ascribed to the anti-inflammatory effects of exercise. The impact of moderate intensity exercise training on circulating pro-inflammatory molecules has received much attention in recent years. However, there are very few well designed and adequately powered studies on the influence of high-intensity interval training (HIIT) on circulating markers of inflammation.

Purpose: The purpose of this study was to examine potential changes in plasma concentrations of C-reactive protein (CRP), interleukin-6 (IL6), and soluble interleukin-6 receptor (sIL6r) following four (4w) and eight weeks (8w) of HIIT in healthy men.

Methods: Healthy, sedentary men participated in a HIIT program three days/week for eight weeks. Training bouts were modeled after the traditional Wingate test, consisting of repeated, 30-second bouts of maximal intensity cycling separated by 4.5 minute rest intervals. Training began with three bouts per day and an additional bout/day was added to the regimen every two weeks, progressing up to six bouts per day in the final two weeks. Plasma concentrations of CRP, IL6, and sIL6r were assessed by ELISA at baseline, 4w, and 8w. Statistical comparisons across the three time points were done using repeated measures ANOVA. Variables that deviated from normality were log transformed prior to analysis. Significance was set to p<0.05.

Results: 21 men (age: 25 ± 5 yrs, BMI: 26.7 ± 6.2 kg/m²) completed the study. No significant changes were observed for CRP during training (baseline: 1.5 ± 2.3, 4w: 1.0 ± 1.4, 8w: 2.2 ± 3.0 ng/mL, p>0.05). Likewise, IL6 (baseline: 1.4 ± 1.6, 4w: 1.6 ± 1.7, 8w: 1.2 ± 2.2 pg/mL, and sIL6r (baseline: 36.3 ± 23.9, 4w: 27.8 ± 20.8, 8w: 32.6 ± 22.2 ng/mL) did not change with training (all p>0.05). Conclusion: Though it has been suggested that HIIT may reduce inflammation, results of the present study do not indicate HIIT influences specific inflammatory mediators in healthy young men. Future research should explore the potential anti-inflammatory benefits of HIIT in different populations and disease states.

Effects Of Heart Rate Variability Modulation On High Intensity Functional Training Strength Outcomes

Board #18 May 29 2:00 PM - 3:30 PM
Brady K. Kurtz1, Nicholas B. Drake2, Justin A. Deblauw1, Derek A. Crawford1, Katie M. Heinrich1. 1Kansas State University, Manhattan, KS. 2Pittsburg State University, Pittsburg, KS. (Sponsor: Craig Harms, FACSM) Email: bkurtz@kstate.edu (No relevant relationships reported)

Purpose: High Intensity Functional Training (HIIT) involves completing concurrent aerobic and resistance training functional movements at high intensity with the goal of increased fitness. We examined the effectiveness of using daily heart rate variability (HRV) status to modulate training intensity and increase performance outcomes. We hypothesized that HRV modulation for HIIT would facilitate strength improvements. METHODS: Participants (N = 55) were healthy, untrained or recreationally trained adults not participating in a structured exercise program. Participants were randomly assigned to either HIIT (n = 29, age = 24.1 ± 4.1 years, 41.4% male) or HIIT-HRV (n = 26, age = 23.7 ± 4.5 years, 53.8% male) groups. Both groups underwent an 11-week training protocol which included: 2-weeks baseline HRV collection, baseline, midpoint, and post-intervention HRV assessments and fitness assessments, and 6 weeks of HIIT, 5 days/week. All participants recorded their HRV daily via validated mobile app throughout the study. HIIT-HRV participants’ exercise was modulated by reducing rate of perceived exertion based on their daily HRV status. Maximum strength was tested using the squat, overhead press, and deadlift in kg at baseline, midpoint, and post-intervention. RESULTS: There were no differences in intervention fidelity between groups, which included adherence to HIIT (p = 0.21) and providing daily HRV data (p = 0.75). The HIIT-HRV group had their training modified 17.1 ± 6.75 days. Additionally, one-way RM-ANOVA showed significant increases in the squat (HIIT = 114.0 ± 1.63 kg, F = 55.38, p < 0.001; HIIT-HRV = 83.0 ± 22.7 kg, p < 0.001). There were no differences in the bench press (HIIT = 68.0 ± 11.0 kg, F = 2.05, p = 0.17; HIIT-HRV = 72.0 ± 17.8 kg, p = 0.17) or the deadlift (HIIT = 210.0 ± 33.0 kg, F = 0.15, p = 0.70; HIIT-HRV = 230.0 ± 41.0 kg, p = 0.43). CONCLUSION: HRV modulation for HIIT elicited significant improvements in strength compared to unmodulated HIIT.
The definition of high-intensity interval training (HIIT) is broad, with no accepted procedure for classifying HIIT protocols with different workloads and work and recovery interval times. Additionally, little is known about the differences in training load and recovery between common HIIT protocols. The purpose of this study was to evaluate the differences in acute physiological demands and perceived difficulty between three common HIIT protocols.

METHODS: Eight participants completed the following training sessions on a cycle ergometer in a randomized order, with at least one week between sessions: 4 x [30-sec all-out, 4-min active recovery], 12 x [1-min 100% VO2max, 1-min 50% VO2max], and 4 x [4-min 90% VO2max, 3-min 60% VO2max]. Metabolic variables and HR were measured throughout exercise and 30-min of recovery. Training impulse and session-RPE were also determined.

RESULTS: There were significant differences during exercise in total O2 consumption between the 30-sec and 1-min (ES=3.4, p<0.001), and 30-sec and 4-min (ES=3.4, p<0.001) protocols, average VO2 between 30-sec and 1-min (ES=2.6, p<0.001) and 30-sec vs. 4-min (ES=1.9, p<0.001) protocols, average HR between 30-sec and 1-min (ES=1.3, p=0.007) and 30-sec and 4-min (ES=1.3, p=0.02) protocols, and blood lactate between 30-sec and 1-min (ES=0.9, p>0.001) and 30-sec and 4-min (ES=1.0, p=0.01) protocols. There was a difference in training impulse between 30-sec and 4-min protocols (ES=1.5, p=0.009). There were no significant differences in peak VO2 or peak HR attained during the protocols, or in session-RPE reported after the protocols. There were no differences in VO2 or HR after 5-min or 30-min of recovery. Blood lactate was not significantly higher after 30-min of recovery from the 30-sec compared to the 4-min (ES=1.3, p=0.001) protocol.

CONCLUSIONS: These findings show several differences, but also some similarities, in the acute physiological demands from HIIT protocols. However, differences in total metabolic work, average intensity, and training load did not result in differences in VO2 or HR during recovery or in the perceived difficulty of these protocols. These factors should be accounted for when planning training sessions or research studies, or when interpreting past research.

During running, the lower extremities are compared to a spring due to their ability to store and release energy. Recent evidence suggests a relationship between increased lower extremity stiffness and enhanced athletic performance, specifically in distance running. Current literature lacks information on the influence of fatigue on leg stiffness across multiple days in response to competition.

PURPOSE: To determine how leg stiffness in runners was influenced in the 24- and 48-hour period following a cross country race.

METHODS: Twenty-two collegiate cross-country runners (13 M, 9 F, 19.5 ± 1.4 yrs old) participated. Leg stiffness was assessed 24h before a race and 24h and 48h post-race. Participants performed three static jumps (SJ) and three countermovement jumps (CMJ) on two force plates (AMTI Optima O4464580, Watertown, MA; 1000 Hz). During each jump, participants held a dowel across the shoulders to prevent arm swing. Participants then performed a hop test (HT) where they completed 10 straight 15-s maximal hopping in sync with a metronome (2.2Hz). Leg stiffness was calculated, in agreement with previously reported methods, from the vertical ground reaction force of the 5th-7th hop of the HT. Repeated measures ANOVA and post-hoc analysis were used to assess significance (p<0.05).

RESULTS: A significant main effect was found for SJ height, CMJ height and leg stiffness. Leg stiffness was significantly reduced 24h post-race (pre-race 36.84 ± 9.66 kN · m⁻¹, 24h post 33.11 ± 8.05 kN · m⁻¹, p=0.05) and then increased significantly from 24h post-race to 48h post-race (36.84 ± 8.88 kN · m⁻¹, p<0.01). No significant differences were found in post-hoc analysis for CMJ height (pre-race 30.81 ± 5.79 cm, 24h post-race 29.89 ± 6.06 cm, 48h post-race 31.44 ± 6.47 cm, p>0.05) and eccentric utilization ratio (pre-race 1.24 ± 0.10, 24h post-race 1.20 ± 0.10, 48h post-race 1.22 ± 0.10, p>0.05). SJ height increased significantly from 24h to 48h post-race (24h post-race 25.99 ± 5.65 cm, 48h post-race 27.19 ± 5.63 cm, p>0.05). CONCLUSION: Following a cross country race leg stiffness significantly declined in a group of collegiate runners 24 hours post-race but returned to baseline 48 hours post-race. Sport scientists and coaches may be able to monitor leg stiffness as a metric to properly prescribe training regimens.

Physiological correlates with 300 and 1000 m performance in U14 athletes.

PURPOSE: To determine the contribution of selected field tests physiological parameters with running performance in U14 track athletes.

METHODS: Fifteen U14 young track and field athletes (12 girls and 3 boys, 12-13 years old) participated in the study. During the first and second visit after anthropometry the athletes performed a 20 m Shuttle Run Test, a RAST (Running Anaerobic Speed Test), a vertical sprint jump and a 40 m maximal effort to determine aerobic, anaerobic capabilities and leg explosive strength. The 300 and 1000 m time trial followed. All maximal tests were performed at least three days apart. Pearson’s r and Stepwise Multiple Linear Regression were used for the correlation between maximal O2 uptake (VO2max), velocity at VO2max (vVO2max), maximal heart rate (HRmax), minimal, maximal and mean relative power output values (Pmin, Pmax and Pmean respectively), squat jump (SJ), maximal running speed (Vmax), body mass (BM), body height (BH), body fat (%BF) and the time trials 300 (300m) and 1000 m (1000m).

RESULTS: Univariate relationships showed significant correlations between 11000m and VO2max (-0.866, p<0.01), VO2max (-0.899, p<0.01), Pmin (-0.519, p<0.05), Pmax (-0.568, p<0.05), Pmean (-0.606, p<0.05), BM (0.770, p<0.01) and %BF (0.698, p<0.01). Furthermore, t00m significantly correlated with Pmean (-0.553,
Effects of Pulsed Electromagnetic Field Application on Aerobic Performance in Runners

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No relevant relationships reported

Pulsed Electromagnetic Field (PEMF) application increases microcirculation throughout the body and has been shown to be beneficial in clinical populations. In athletic populations, PEMF is used to improve recovery. Altitude training has long been used by endurance athletes to improve sea-level performance. PURPOSE: To determine if PEMF during altitude performance leads to greater improvements in running performance compared to a control group. METHODS: Twenty-four male, 16 female distance runners (mean ± SD: 23.0 ± 9.2 yrs, mean ± SD: 72.8 ± 13.2 kg) were randomly divided into two groups (CON: n=12; INT: n=12). Both groups performed a 12 week altitude training program with CON performing the same training without PEMF exposure. In the INT group, PEMF was applied to the legs for 15 minutes twice a day for the last 4 weeks of altitude training. CONCLUSIONS: There was no significant difference between groups for peak VO2 (p=0.24), however, the INT group displayed a positive trend for VO2peak when compared to CON. In addition, the INT group improved 2.5 ± 1.4% (p<0.05) for absolute VT and 2.5 ± 1.3% (p<0.05) for relative VT. There was no significant difference between groups for PminRT (-0.579, p<0.05) and PmeanRT (-0.670, p<0.01). Stepwise Multiple Regression showed that the best predictor for VO2peak of 1200m was 444.229-15.857*VO2max + 37.105*Pmean1.270*BM + 23.042*Pmmax. Adjusted R2=0.948, P<0.001, SEE=6.86 s, while the single predictor variable for 1300m was Pmean1300=61.805-8.270*Pmean1300. Adjusted R2=0.406, P=0.006, SEE=3.97 s.

CONCLUSIONS: The moderate to high correlations shown in the present study with the NVF, SPIKE and the FMS Deep Squat in DIII Track & Field Runners indicate higher correlation with the NVF in distance runners. However, these results do not support the addition of PEMF in this population.

791 Board #25 May 29 2:00 PM - 3:30 PM
Prevalence And Spectrum Of Electrocardiogram Abnormalities In Amateur Marathon Runners
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PURPOSE: The purpose of this study was to assess the prevalence and the spectrum of electrocardiogram (ECG) abnormalities in amateur marathon runners.

METHODS: The participants of this study were the marathon runners who were instructed to participate in the Zhejiang University Student Marathon from 2015 to 2016. A total of 2446 amateur marathon runners were included in this study. The purpose of this study was to assess the prevalence and the spectrum of ECG abnormalities in amateur marathon runners. ECG abnormalities were detected by an electrocardiograph (Biospace, Korea) during routine pre-marathon examination.

RESULTS: Sinus bradycardia and sinus arrhythmia were found in approximately 15% and 5% of participants. Prevalence of left ventricular high voltage, T wave change and right axis deviation were also higher than 1%. Runners with better performance had higher odds ratios to have sinus bradycardia, left ventricular high voltage, right ventricular high voltage and atrioventricular block (AVB).

CONCLUSIONS: Sinus bradycardia, sinus arrhythmia and left ventricular high voltage are the most common ECG abnormalities in amateur marathon runners. Sinus bradycardia and ventricular high voltage could be physiological adaptation after long-term marathon training, but ST-T change and axis deviation are not training-related ECG abnormalities.

Running economy represents a complex interplay of physiological and biomechanical factors that are able to adapt chronically through training or acutely through other interventions such as changes in footwear. The Nike Vaporfly (NvF) shoe was designed for marathon running on the roads and has been shown to improve running economy by ~4% compared to other marathon shoes, however, during track racing distance runners traditionally wear a much lighter shoe with an embedded spike plate around the foot. PURPOSE: To determine if, and to what extent, the NVF enhance running economy compared to track spikes.

METHODS: 24 highly-trained runners (12 male, 12 female) ran 4x5 min trials on a treadmill while wearing each of the four shoes. Differences in running economy while running in the four shoes were compared using a one-way ANOVA with repeated measures. Multiple regression analyses were used to evaluate potential relationships between changes in running economy and changes in biomechanical variables.

RESULTS: The NVF improved running economy by 2.6 ± 1.3% compared to SPEKE, 4.2 ± 1.2% compared to MAR, and 2.9 ± 1.3% when matched in weight of the MAR shoe. Among the 24 subjects, the difference in running economy over the four velocities between the NVF and SPEKE shoes ranged from +0.50 to -5.34% and from -1.72 to -7.15% for NVF versus MAR. Correlations between changes in running economy and changes in biomechanical variables were either trivial or small (r < 0.27) but unclear. CONCLUSION: The NVF enhanced running economy compared to track spikes and marathon shoes and should be considered a viable shoe option for track and road racing.
PURPOSE: Anthropometrics, summer training volume, and functional movement including unilateral strength, flexibility and coordination have all previously been linked to athletic performance. The purpose of the current investigation was to determine the best predictor of mile time trial performance in division III cross country runners across the variables of body weight, functional movement screen (FMS), and total volume of miles run in the 14 weeks leading up to the start of the cross country season. METHODS: 31 subjects (M=22, F=9) aged (20 +/- 2 yrs) on a division III collegiate cross country team were asked to record and report summer mileage each week for the 14 weeks preceding the start of the season. Additionally, FMS tests were conducted on all subjects, as well as body weight measurement within the first week of the season. All subjects also completed a mile time trial run consecutively. A multiple regression analysis was utilized to determine if FMS score, pre-season mileage, and/or body weight were significant predictors of mile time trial performance. RESULTS: The overall regression analysis revealed that FMS, body weight, and summer mileage were significant predictors of mile time trial performance (r = .41; p < .05). When covaried out, body weight was not significantly (p = .05) correlated with mile time trial performance for males or females (r = .35, r = .27, respectively). Summer mileage was statistically significant (p < .05) to mile time trial results. Lastly, FMS testing was deemed not significant (p > .05) towards mile time trial performance. CONCLUSIONS: Summer running volume, as recorded in the 14 week period leading up to the cross country season is the best predictor of performance when compared to anthropometric data as well as functional movement screening. Cross country athletes should focus on utilizing the progressive overload principle to gradually increase running volume over the summer months in order to maximize in season performance.

CONCLUSIONS: Hemoglobin saturation levels are important in cross country athletes. The relationship, however, is more important and significant when saturation levels go below the normal range compared to those within the range. Runners categorized as low in hemoglobin saturation see significant decreases in performance for two-mile time trials compared to those in the normal range.
HIIT is a common training method incorporated for all fitness levels and been shown to improve athletic performance. However, these results were shown in sedentary and recreationally active populations and little research has been done with the Division I collegiate athlete population. PURPOSE: This study questioned whether HIIT could increase performance within this level of athletes, specifically middle distance runners (800/1500 m).

METHODS: A total of six Division I Collegiate level (800/1500 m) runners completed the study (three males, three female). The participant completed four weeks of HIIT, consisting on two HIIT workouts per week. The HIIT consisted of four 20-s Wingate tests with 4-min recovery between each. Both pre- and post- performance tests were completed, consisting of a run to volitional exhaustion, RPE, HR, which were collected on a treadmill. Stride length and stride frequency, were also measure during a 1500 m time trial on the track.

RESULTS: Significant differences were not found for performance pre- and post- training intervention, with respect to time to completion of the 1500 m time trial (pre-intervention: 5.0 ± 0.7 min; post-intervention: 4.8 ± 0.5 min; p = 0.23), and time to volitional exhaustion (pre-intervention: 20.1 ± 1.2 min; post-intervention: 19.7 ± 1.3 min; p = 0.14). RPE (p = 0.64), HR (p = 0.09), stride length (p = 0.09), and stride frequency (p = 0.78), showed no significant changes pre- and post-intervention.

CONCLUSIONS: HIIT did not impact 800/1500 m middle distance runner’s performance, suggesting it can maintain performance, providing alternative training methods.

**REFERENCES:**
1. Price, G. F. Alana Turner, Benjamin Krings, Hunter Waldman, Harish Chander, Adam Knight, John Eric Smith, Matthew McAllister. Mississippi state university, Starkville, MS. Email: fgp13@msstate.edu (No relevant relationships reported)

**BACKGROUND:** Previous studies have shown that middle-aged Master Athletes have better body composition and lipid profile, as well as longer leukocyte telomeres compared to untrained peers. However, no comparisons were made with markers of biological aging, body composition, and metabolic health among athletes who performed different training regimens through life (ie, sprint / strength vs. resistance training).

**PURPOSE:** The telomere length, lipid profile and body composition were compared in sprinters and endurance runners from Master category.

**METHODS:** Middle-aged master athletes (n=23) with a minimal of 20 yrs of lifelong training in Track and Field were allocated according to their training specificity, being Sprinters (n=12; 49.4+11.9 yr-old) and Endurance Runners (n=11; 55.45±7.84 yr-old). Blood samples were collected after 8-hour fasting. Relative leukocyte telomere length was determined with qPCR analyses (T/S). The serum lipid profile was analyzed using commercial kits and body composition was predicted though skinfold measures.

**RESULTS:** Unpaired T-test revealed no differences between Sprinters vs Endurance athletes regarding to Leucocyte Telomere Length (T/S) [1.26 ± 0.11 vs. 1.11 ± 0.13 (p = 0.732)], Body Fat (%) [12.32±4.51 vs. 13.29±4.69 (p = 0.612)], Free Fat Mass (kg) [87.68±4.51 vs.86.70±4.49 (p = 0.612)] and lipid profile (mg/dL) through Triglycerides [79.04±51.28 vs. 120.20±75.81 (p = 0.139)], HDL [93.21±28.66 vs. 70.41±38.06 (p = 0.116)], LDL [83.53±76.34 vs. 125.59±58.18 (p = 0.155)] and Total Cholesterol [192.56±72.85 vs. 220.04±29.02 (p = 0.256)].

**CONCLUSION:** For master athletes, regarding of whether they were trained lifelong in sprints or endurance, both training models revealed to be similar for the leukocyte telomere length and equally beneficial for lipid profile and body composition.

**REFERENCES:**
1. A. Maciel1, Lysleine A. Deus, Samuel S. Aguiar1, Caio V. Sousa1, Herbert G. Sinô1,1 Universidade Católica de Brasilia, Brasilia, Brazil. 2Universidade Católica de Brasilia, Taguatinga, Brazil. Email: larmaciel1@live.com (No relevant relationships reported)
801 Board #35 May 29 2:00 PM - 3:30 PM

The Isokinetic Muscular Strength Characteristics Of Ultra-endurance Runners

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(NO relevant relationships reported)

The concept of barefoot running (BFR) is to purposely change foot strike patterns to promote metabolic efficiency, however exposing normally shod runners to BFR may have detrimental effects on overall running performance. PURPOSE: The purpose of this study was to examine the differences in physiological variables in running performance when individuals were acutely exposed to BFR. METHODS: This study consisted of 9 college aged males, (22.67±1.0 y/o, 83.68±9.01 kg, 178.36±64.54 cm, and 14.68±5.27% body fat), who engaged in aerobic exercise at least twice a week with no prior BFR experience. Subjects were blindly asked during each condition to self-select running speeds that they could maintain for 10 min. Variables collected included speed, VO2, HR, RER, VE, LRPE, SRPE, and foot pain. RESULTS: Data analysis revealed no statistically significant differences in physiological variables between conditions. However significant differences were seen between selected running speed and foot pain. Results indicated that subjects decreased their running speed by .98mph (p=0.004) and experienced greater amount of foot pain (2.12, p=0.02) when in the BFR condition. CONCLUSIONS: The findings of this study suggest that acute exposure to BFR may decrease overall running speed during a workout and subjects may also experience a greater amount of foot pain compared to shod running. Caution should be used when introducing the concept of BFR to athletes or recreational runners.

803 Board #37 May 29 2:00 PM - 3:30 PM

Evaluation of Running Performance in Recreationally Active Individuals at Submaximal Speeds: Shod vs. Barefoot Conditions

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(NO relevant relationships reported)

The concept of barefoot running (BFR) is to purposely change foot strike patterns to promote metabolic efficiency, however exposing normally shod runners to BFR may have detrimental effects on overall running performance. PURPOSE: The purpose of this study was to evaluate the differences in physiological variables in running performance when individuals were acutely exposed to BFR. METHODS: This study consisted of 9 college aged males, (22.67±1.0 y/o, 83.68±9.01 kg, 178.36±64.54 cm, and 14.68±5.27% body fat), who engaged in aerobic exercise at least twice a week with no prior BFR experience. Subjects were blindly asked during each condition to self-select running speeds that they could maintain for 10 min. Variables collected included speed, VO2, HR, RER, VE, LRPE, SRPE, and foot pain. RESULTS: Data analysis revealed no statistically significant differences in physiological variables between conditions. However significant differences were seen between selected running speed and foot pain. Results indicated that subjects decreased their running speed by .98mph (p=0.004) and experienced greater amount of foot pain (2.12, p=0.02) when in the BFR condition. CONCLUSIONS: The findings of this study suggest that acute exposure to BFR may decrease overall running speed during a workout and subjects may also experience a greater amount of foot pain compared to shod running. Caution should be used when introducing the concept of BFR to athletes or recreational runners.

802 Board #36 May 29 2:00 PM - 3:30 PM

Relationship Among Physiological, Perceptual, And Biomechanical Variables During Exercise On A Non-motorized Treadmill In D2 Cross-country Athletes

Sean Bonilla, Anne Roquet, Elizabeth Corella, Steven Deverell, Bryan Haddock, FACSM

(NO relevant relationships reported)

Purpose: The purpose of this study was to examine the relationship between physiological, perceptual, and biomechanical variables during exercise on a non-motorized treadmill (NMT) in cross-country athletes.

METHODS: Thirty female cross-country Division II athletes (age, 20.77 ± 3.27 yrs; height, 161.92 ± 5.48 cm; weight, 55.54 ± 6.45 kg) participated in separate familiarization and testing sessions. On day one (familiarization), participants performed a treadmill protocol that consisted of a 5-min warm-up walk, 5-min walk, 5-min run, and 5-min cool-down on the NMT. Participants’ velocity was recorded every minute to determine self-selected pace for walking and running. Day two (testing day) consisted of performing the treadmill protocol with the previously determined velocities. Heart rate (HR), rating of perceived exertion (RPE), oxygen uptake (VO2), vertical GRF (GRFv), horizontal GRF (GRFh), power, and velocity were recorded and steady-state minutes were averaged and used for analysis. Separate Pearson’s r correlation analyses were used to determine the relationship among HR, RPE, VO2, GRFv, GRFh, power, and velocity.

RESULTS: There was a significant strong positive correlation in walking between HR and velocity (r = 0.75; p < 0.003), horizontal force (r = 0.73; p = 0.004), and power (r = 0.76; p = 0.002). There was a significant positive strong correlation in running between HR and velocity (r = 0.76; p = 0.002), power (r = 0.76; p = 0.002). There was a significant positive strong correlation in running between VO2 and running velocity (r = 0.71; p = 0.006), GRFv (r = 0.69; p = 0.008), and power (r = 0.72; p = 0.005). There was no significant (p > 0.05) correlation for all other variables in walking and running conditions.

804 Board #38 May 29 2:00 PM - 3:30 PM

Relationship Between Training Load and Intensity and Next Day Resting Heart Rate in Running.

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(NO relevant relationships reported)

Resting heart rate (RHR) is a commonly used indicator used to monitor adaptations in aerobic conditioning. In long distance training, measures such as heart rate and distance covered are used as indicators of intensity and workload to affect changes in aerobic conditioning. However, there appears to be a need for more information on possible interactions between measures of intensity and workload and their effect on RHR as an indicator of adaptation. PURPOSE: To examine the relationship between training load (LOAD) and training intensity (INT) on next day RHR. METHODS: Seven middle-long distance runners, members of a Division I varsity team participated in the study during a cross country season in the fall. Variables were morning RHR, INT measured using Borg’s Ratings of Perceived Exertion 16-point scale and LOAD expressed as miles ran. Variables were recorded by each participant on each training day and were aggregated for a total of 224 data points among the seven participants. Correlation and Multiple Regression analyses were used to examine the relationship between the variables. RESULTS: Significant correlations were found between LOAD and INT (r = 0.392) and between INT and next day RHR (r = 0.268). Multiple Regression found INT contributed significantly to the prediction of RHR yielding the following formula: RHR = 4.7183 + 0.483(INT), R² = 0.095, SEE = 4.722. CONCLUSIONS: Although a relationship was found between LOAD and INT it seems that each may have a unique contribution to next day’s RHR.
Soccer is a sport characterized by intermittent efforts and by a variation of intensity between the first and the second half-times of the match. The sprints, actions performed at high speeds and which demand a high energy expenditure, are among the several parameters which can be used to evaluate the performance capacity of the players along a match.

**PURPOSE:** To compare the sprints performed by professional players of different playing positions along Soccer matches. METHODS: Twenty-two professional Soccer players (weight = 76.4 ± 5.2 kg; height = 179.9 ± 6.2 cm; BMI = 23.7 ± 1.7 kg/m²) participated in the study. The Polar Team Pro® GPS system was used to measure distances and speed of the subjects during the games. The number of sprints at speed above 25 km/h were registered in the first and in the second halves of the matches. Only players who participated during 75% of the total time of each of 10 matches were included in the study. Data normality was tested using the Shapiro-Wilk (p = .714). The Friedman test followed by the post-hoc Tukey were used to analyse the sprints (p < .05). RESULTS: The average number of sprints (> 25 km/h) was 13.3 ± 6.4 sprints per game. There was a difference amongst playing positions (Expected P = .039 and Calculated P = .042) and there was a difference between the second half and the total match time. The number of sprints of mid-fielders and forwards, but not of full-backs and half-backs, was reduced in the second half-time. CONCLUSIONS: There was a difference in the number of sprints between players of different positions and also a difference between the first and the second half-times. This information may be used by coaches in conducting training sessions and in matches.

**Average number of sprints in the 10 matches**

<table>
<thead>
<tr>
<th>Player Position</th>
<th>1st half</th>
<th>2nd half</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-backs</td>
<td>7</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Half-backs</td>
<td>7</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Midfielders</td>
<td>8</td>
<td>7</td>
<td>15</td>
</tr>
</tbody>
</table>

Physical training programs are designed to improve sport performance. To augment these programs, specific injury prevention protocols can be included. However, structured physical training programs alone could reduce injury risk. **Purpose:** To determine the effects of a structured offseason training program on physical performance and modifiable LE injury risk factors.

**Methods:** Twenty-three male collegiate soccer players were enrolled (20 ± 1.54 yrs.). Body fat percentage (BF%), aerobic capacity (VO2max), vertical jump, anaerobic power (Wingate), bench press (RM1), Y-balance (YB) bilaterally and weight bearing lunge ankle dorsiflexion (WBDF) bilaterally were measured pre and post a 12-week physical training program.

**Results:** Performance measures of BF%, VO2max, vertical jump, and Wingate were not significantly different after the 12-week program. Bench press RM1 (177.22 ± 31.44 lb.) was the only statistically significant performance measure (n=9, p=0.02), Right(R) (691.13 ± 81.27 mm) and Left(L) (684.54 ± 85.49 mm) side absolute YB in the anterior-posterior direction (p=0.03) and LWBDF (26.5 ± 8.47°, p=0.05) were statistically different pre to post assessment (n=10). All other YB directions (posterior-medial, posterior-lateral) and RWBDF were not statistically significant. Composite scores for YB normalized to leg length pre (RYB=82.84± 9.64%, LYB=80.63 ± 12.64%) and post (RYB=78.76 ± 26.88%, LYB=80.53 ± 19.36%) resulted in no significant change.

**Conclusion:** Participants improved some modifiable injury risk factors at the LE (YB, WBDF) and increased upper extremity strength. However, no other performance measures significantly changed. These results indicate structured physical training programs could positively affect injury risk factors, absent of specific injury prevention programming and unrelated to physical performance improvements. Specific physical training programming and its relationship to reduction of injury risk factors requires further research.

**Board #41 May 29 2:00 PM - 3:30 PM Effects of Soccer Kicking Training Using Virtual Reality on Kicking Performance in Boy Soccer Players**

Somi Yun1, Min Gi Jung1, Jaemyung Kim1, Yunbin Lee1, Daet Keck Lee2, Seung Chan Lim2, Kookmin University, Seoul, Korea, Republic of. Airpass, Seoul, Korea, Republic of. Email: ysmysm7@naver.com

(No relevant relationships reported)

Purpose: Adoption of virtual reality (VR) into sports, games, and educational settings has become popular in recent years, but no evidence regarding VR’s effects on athlete’s performance has been elucidated. This study evaluated an efficacy of VR soccer kicking training system for kicking performance in young soccer players. Methods: A total of 24 experienced boy soccer players enrolling in a elementary school soccer team was recruited for the 6 months study, and divided into two groups; VR training group (VR-G; n=13, 11.8±1.0 years, 148±15.7 cm, 39.0±7.9 kg) and outdoor training group (OT-G; n=11, 11.4±3.4 years, 152±9.7 cm, 45.2±10.2 kg). Before (M0) and after (M6) the study, they were tested. For the test, they kicked a ball, in which a sensor was installed, to a curtain screen on which targets were marked by a beam. The VR room was sized 12×9 meter. Using the data of ball speed and target hitting accuracy, a scoring point was calculated for kicking accuracy (Ka) and speed (Ks). They were also tested on a soccer field for measurement of kicking accuracy (Kfa). For the test, they practiced twice and kicked 5 times for measurement. During the study, they were trained for two phases; regular and extra training. For the regular training, the team was trained 4 times/week in a soccer field for 120 min/session. For a total of 15 sessions of extra training, OT-G practiced only kicking on the field, while VR-G did in a VR room. Results: For VR-G, Ka, KS, and Kfa increased from 53.6±9.5, 26.1±11.8, and 18.6±14.9 at M0 to 62.9±10.0 (t=6.138, p=0.001), 38.0±13.2 (t=2.396, p=0.05), and 31.9±16.0 unit (t=-2.442, p=0.05), respectively. For OT-G, Ka, KS, and Kfa were not changed from 58.8±9.9, 35.9±15.5, and 19.6±13.6 at M0 to 63.1±5.7, 29.1±10.6, 22.2±12.8 unit, respectively. No differences were found in 3 kicking variables at M0 and M6 between two groups. Conclusion: The regular soccer training and the extra kicking training improved the kicking speed and accuracy in VR-G, while OT-G maintained their performance. VR soccer kicking training program could be a potential substitutional and additional training model for young soccer players.

This research project was supported by the Sports Promotion Fund of Seoul Olympic Sports Promotion Foundation from Ministry of Culture, Sports and Tourism, project #s072016122016)

**Board #42 May 29 2:00 PM - 3:30 PM Initial Profiling of Division II Soccer Athletes Revealed Minimal Body Composition Changes Throughout Competitive Season**

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(No relevant relationships reported)

Body composition (BC) assessment is a metric utilized in sport performance, yet there is a paucity of BC data profiling NCAA Division II female athletes. **PURPOSE:** To measure and compare BC data of Division II female soccer athletes during a competitive season thereby developing an initial profile relative to this sport and division. METHODS: Subjects (Age: 19.09 ± 1.15 yrs.) consisted of Division II women’s soccer athletes (n=22). Body fat percentage (BF%) utilizing air plethysmography [BODPOD, Cosmed] was measured during pre-season and within the penultimate week of the competitive season. Descriptive statistics and dependent t-tests (SPSS version 25.0) were used to analyze data. RESULTS: Pre-season data indicated the following team anthropometrics: Height: 165.38 ± 9.05 cm, Weight: 60.02 ± 5.2kg; BMI: 21.64 ± 1.39. Team BF% was 19.99 ± 4.39% with freshman BF% increasing to 20.55% ± 4.90 % while returners decreased to 20.02 ± 3.47%. There were no statistically significant differences in team, freshman, or returners BF% or BMI for both time points assessed. **CONCLUSION:** Team BF% was lower at both assessment points than recently
published data on Division I female soccer athletes (Field et al., 2018). Freshman demonstrated lower BF% than returners initially but returners BF% trended downward at the latter part of the season. Future research should thoroughly examine physical and functional profile changes over time while expanding sport performance testing metrics to obtain a more comprehensive snapshot of the Division II female soccer athlete.


809 Board #43 May 29 2:00 PM - 3:30 PM
Use Of Muscle Saturation Oxygen As A New Marker Of Fatigue In Female Soccer Players
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(No relevant relationships reported)

According to UEFA, a paucity of relevant studies has led to a significant increased interest in women’s soccer research. Additionally, early detection of muscle fatigue could have profound impact on injury prevention and recovery in many sports including soccer. Measurement of muscle oxygen saturation (SmO2%) with non-invasive near infrared spectroscopy (NIRS) technology has been investigated as a possible indicator of fatigue, however no clear protocol exists regarding interpretation of NIRS data or its application for training assessment or fatigue detection.

PURPOSE: To evaluate SmO2% kinetics and relate it to markers of fatigue induced by an official match. METHODS: 12 female soccer players (age 19 ± 3 years, weight 59.1 ± 5.7 kg, height 1.61 ± 0.05 m, Fat 18.5 ± 3.5%). They were evaluated pre-match (PRE) and 24 hours after an official match (POST). Blood plasma parameters were measured including Blood Urea Nitrogen (BUN), Glutamate-Pyruvate Transaminase (GOT), Lactate Dehydrogenase (LDH), Creatine phosphokinase (CPK), and total hemoglobin (THb). Additional outcomes were assessed including rate of perceived exertion (CR-10 Borg scale), Visual Analog Scale (VAS-pain 1-10), and “Repeated Ability Sprint Test” (RAST) using a portable “Muscle Oxygen Monitor” (MOXY) placed in the gastrocnemius muscle of the dominant leg to measure SmO2%. Deoxygenation rate (De-Oxy) and Reoxygenation Rate (Re-Oxy) were calculated. For statistical analysis, T-Test, Pearson correlation and mechanical inferential statistics were applied to measure the magnitudes of change.

RESULTS: Average SmO2% during test RAST increased after match with (23 ± 8 ± 29 ± 8 ± 0.05; %A = 19.1%), as well minimum SmO2% values (12 ± 8 ± 21 ± 8 ± 0.05) and maximum values (31 ± 8 ± 36 ± 8 ± 0.05). Other fatigue markers increased too after match, LDH (282 ± 45 ± 3.41 ± 79 IU/L, p=0.05) and VISA pain (3.2 ± 1.7 ± 5.1 ± 1.7 ± 0.01). It was also found that a higher Re-Oxy was correlated with increases in LDH (r = 0.89 ± 0.01), VISA pain (r = 0.61 ± 0.05) and BUN (r = 0.84 ± 0.01). Taken together, the decrease in SmO2% was considered as the best performance in the RAST test (r = -0.79 ± 0.01).

CONCLUSIONS: MOXY monitor can be used as a novel, non-invasive method to identify post-match fatigue in female soccer players through measurement of SmO2% kinetics and the rate of reoxygenation.

810 Board #44 May 29 2:00 PM - 3:30 PM
Effects of Video Feedback on Kicking Performance and Temporal Patterns in U-10 Soccer Players
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(No relevant relationships reported)

Kicking is a crucial motor skill in soccer. Accuracy and velocity are the two primary factors responsible for kicking performance. Coaches and practitioners design programs with practice sessions in which kicking actions are involved. PURPOSE: To examine the effects on kicking performance of different types of extrinsic video feedback such as slow-motion video feedback (SMVF) or normal video feedback (NVT), with additional velocity feedback, in comparison with no feedback (NF) was studied in U-10 soccer players.

METHODS: Thirty male children soccer players (mean age: 8.9 ± 0.8 years) asked to perform 4 blocks of 5 kicks with a 30-second rest period and a retention block of 10 kicks 2 days later.

RESULTS: Results showed significant differences both between the SMVF and NF groups in terms of performance (F1,41 = 3.97, p < 0.005; η2 = 0.227). SMVF group significantly improved performance during the practice phase but not in retention. Significant differences of the coefficient of variation (CV) were found in the main temporal variables of the action (F1,41 = 6.96, p = 0.000; η2 = 0.44). Univariate analysis showed a significant effect of group on LSTIME (F1,41 = 4.07, p = 0.015; η2 = 0.06) and DTIME (F1,41 = 16.99, p = 0.000; η2 = 0.16) but not on ATIME (F1,41 = 1.28, p = 0.30; η2 = 0.16).

CONCLUSIONS: The type of multimodal feedback (slow motion video and velocity) significantly affects the acute kicking performance in children and its temporal pattern. The present study suggests possible benefits of using slow-motion video feedback in the learning sessions of children soccer players. The accessibility of such technology using low-cost cameras or mobile phones makes this finding especially relevant. Coaches and practitioners can include significant changes in kicking performances (and other motor skills) and temporal patterns. This study is inconclusive about the retention of these changes and has not studied the transfer in learning.

811 Board #45 May 29 2:00 PM - 3:30 PM
Lower and Upper Body Muscle Characteristics among Collegiate Baseball and Soccer Players
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(No relevant relationships reported)

Increased muscular strength in athletes has a prolific effect in the development of sports skills including jumping, throwing, sprinting, and change of direction abilities. Sports, such as soccer and baseball, differ largely in specific characteristics needed for success. To date, few studies have reported differences in sports specific skills between these two sports to measure and quantify the neuromechanical capacity.

PURPOSE: To compare both lower and upper body strength among collegiate baseball (BB) and soccer (SC) players. METHODS: In this non-randomized cross-sectional study, 19 baseball and 19 soccer players, age ranges from 18-25 years completed the protocols. Lower body strength and power were assessed by a two- leg press maximal strength test (IRM) and vertical jump test (Just Jump Mat, Tendo Sports Machine), respectively. Upper body strength was assessed by a handgrip (HG) test using handgrip dynamometry (Takei, Japan). RESULTS: Independent sample t-test showed BB players (88.05 ± 7.1 kg) were significantly heavier than SC players (72.1 ± 7.2 kg) (p<0.05). However, weight-adjusted upper body strength and leg power were not significantly different between the two groups. BB players had significantly higher jump height (HH), time in air, and IRM leg strength compared to SC players (p<0.05). CONCLUSIONS: BB players showed significantly higher lower muscle strength compared to SC players, however no differences were observed for peak power. These results provide a quantitative measure of the performance difference between these two sports, reinforcing the need for further research along with large sample size to assess the possible differences in training effectiveness and inherent characteristics between BB and SC players.

Table 1. Athlete Performance Variables (Adjusted Mean ± SE)

<table>
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<tr>
<th>Variables</th>
<th>BB Players (n=19)</th>
<th>SC Players (n=19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time in air (s)*</td>
<td>0.72 ± 0.01</td>
<td>0.64 ± 0.01</td>
</tr>
<tr>
<td>Jump Height (inches)**</td>
<td>25.99 ± 0.79</td>
<td>20.10 ± 0.79</td>
</tr>
<tr>
<td>Velocity (m/s)</td>
<td>1.42 ± 0.02</td>
<td>1.39 ± 0.02</td>
</tr>
<tr>
<td>Power (Watts)</td>
<td>1125.99 ± 25.62</td>
<td>1075.14 ± 25.62</td>
</tr>
<tr>
<td>Relative Power (Watts/kg)</td>
<td>13.99 ± 0.31</td>
<td>13.31 ± 0.31</td>
</tr>
<tr>
<td>I RM (Kg)</td>
<td>355.54 ± 14.88</td>
<td>300.43 ± 14.88</td>
</tr>
<tr>
<td>Rt HG (Kg)</td>
<td>44.91 ± 2.36</td>
<td>41.15 ± 2.36</td>
</tr>
<tr>
<td>Lt HG (Kg)</td>
<td>42.51 ± 2.20</td>
<td>42.20 ± 2.20</td>
</tr>
</tbody>
</table>

*Significant p<0.05; **Significant p<0.01; Rt, Right; Lt, Left

812 Board #46 May 29 2:00 PM - 3:30 PM
Performance Implications of Arousal State in Female Collegiate Soccer Players
Adam Lowe1, Neil M. Johannsen2, Brian A. Irving, FACSM1, Jack Marucci1, Shelly Mullenich1, Arnold Nelson, FACSM3, Guillaume Spielmann2, Erik Lind2, 1Louisiana State University, Baton Rouge, LA. 2State University of New York-Tortland, Cortland, NY. (Sponsor: Brian A. Irving, FACSM)

(No relevant relationships reported)

Arousal, defined as a blend of physiological activation and psychological awareness, prior to collegiate soccer matches may have important implications on performance. How various arousal states are related to measures of sport-specific performance and

Abstracts were prepared by the authors and printed as submitted.
the hormone cortisol in and around matches in female collegiate soccer players is largely unknown. PURPOSE: To investigate the effect of arousal state on passing performance and salivary cortisol in female collegiate soccer players.

METHODS: Eighteen NCAA Division I female soccer athletes (20.2±1.1 y) participated in this study during the spring season. One hour before five competitive matches, the Activation-Deactivation Adjective Checklist (AD-ACL) was administered to assess tension arousal (TA) and energy arousal (EA) using tiredness (Ti), energetic (E), tension (Te), calmness (C) subscale scores. Salivary samples were collected via synthetic swab placed under the tongue 1 hour before, and 30 minutes after each match. Enzyme-linked immunosorbent assay (ELISA) was used to analyze salivary samples for cortisol. Passing performance was defined as percentage of total attempted passes received by a teammate.

RESULTS: Pre-match subscale scores (out of 4, [mean, ±SD]) for the five competitions were: Ti: 1.9±0.8, 1.7±0.9, 1.6±0.6, 1.6±0.8, 1.4±0.5, respectively; E: 2.9±0.6, 3.1±0.7, 3.2±0.4, 3.0±0.6, 3.0±0.6, respectively; Te: 1.7±0.5, 2.1±0.5, 1.9±0.4, 1.7±0.5, 1.7±0.5, respectively; C: 2.1±0.5, 2.0±0.5, 2.0±0.4, 2.0±0.5, 1.8±0.6, respectively. Passing performance for the five competitions was 73.6±14.1%, 81.6±9.6%, 79.1±8.6%, 74.6±8.6%, 76.6±12.1%, respectively (p > 0.05). Collapsed across matches, Ti and C scores demonstrated negative associations approaching significance with passing performance (both p = 0.06, r = -0.28). E score was positively associated with passing performance (p = 0.04, r = 0.30). Collapsed across matches, post-match cortisol was significantly greater than baseline-predicted-values (p = 0.03). Percent change in cortisol pre-to-post-match in the first match was associated with E score (p = 0.04, r = -0.72).

CONCLUSIONS: Higher energy-arousal states were associated with improvements in passing performance. Cortisol response may be mediated by energy arousal. Future investigations should examine mediating factors of pre-match arousal states.

814 Board #48 May 29 2:00 PM - 3:30 PM Influence of Thresholds on GPS Speed Zones and Sprint Determination in Female Collegiate Soccer Players
Matthew F. Moran, Jessica L. Trapp. Sacred Heart University, Fairfield, CT.
Email: morann@sacredheart.edu

No relevant relationships reported

Use of team sport global positioning system (GPS) to track player movements and determine training load has expanded recently. Following training sessions or games, player velocity is categorized into discrete zones utilizing velocity thresholds (VT). VT are typically pre-defined by the software provider or modified from previous reports. Currently there is no universally accepted standard for VT in collegiate women’s soccer games.

PURPOSE: To determine the influence that VT individualization based on maximum speed testing (MST) has on distance covered in speed zones and sprint determination.

METHODS: Twelve collegiate female soccer players (19.6 ± 0.9 y, 61.0 ± 6.5 kg, 1.63 ± 0.05m) were recruited and participated. Maximal velocity (MV) was determined via MST on a 37-meter runway. GPS speed testing (MST) has on distance covered in five velocity zones when using either MS or PS velocity thresholds (Z1: MS 234.1±95.6m, PS 235.0±103.7m, p=0.88) (Z2: MS 1504.9±442.8m, PS 1490.2±472.2m, p=0.18) (Z3: MS 1373.2±343.6m, PS 1380.0±367.7m, p=0.58) (Z4: MS 260.4±141.1m, PS 274.7±156.6m, p=0.42). Number of sprints determined from MS (32.2±14.6% was not significantly different from PS (35.0±17.9% (p=0.18).

CONCLUSIONS: Distance covered in speed zones and sprint determination from GPS data was not significantly different when using an absolute scale (MS) versus a relative scale (PS) determined from MST. Although aggregate team data did not significantly differ between methods, sport scientists should remain cautious when utilizing an absolute scale. Analysis of individual player differences between methods yielded overestimations >250m for Z5 and an overestimation in the number of sprints completed by >30 for the fastest player when using an absolute scale.

816 Board #50 May 29 2:00 PM - 3:30 PM Correlation between Sprint Tests and Agility 505 Test and Ktest in Elite Young Soccer Players
Lee Cabell1, Frantisek Zahalka2, Tomas Maly2, Lucia Mala2. 1Arkansas Tech University, Russellville, AR. 2Charles University, Prague, Czech Republic. (Sponsor: Kevin Ford, FACSM)
Email: leecabell@gmail.com

No relevant relationships reported

Agility, acceleration, change of direction (COD), deceleration, and sprinting are critical technical skills in soccer. The ability to sprint and quickly change direction are determinants of performance in a soccer game. Sprint performance relative to a new Agility K-test and 505 tests were examined. PURPOSE: To examine the relationship between the sprint and agility tests in elite young soccer players.

METHODS: Elite
Czech young male soccer players (n=29, age=19.5±0.4yrs) volunteered for this study. The KT consisted of the subjects running at maximum speed between cones positioned in a “K” pattern on a field with non-slip running surface. The subjects started and ended running at the intersection of the “K” pattern with two conditions: touching a photocell with the foot (KT_foot) or a contact switch placed on the top of each cone with the hand (KT_hand). The 505 COD test allowed subjects a “flying start” with a 10 m run-up before crossing the timing gates, a five-meter sprint, turn 180° either right or left at a five-meter sprint. Linear sprinting was also tested using subjects sprinting 5 m at 5 m and 10 m from a static position. The subjects performed two trials of each test, and the time of test execution was measured in seconds. Pearson correlation coefficient test was used to correlate two dependent variables, and independent t-test was used to test differences between KT_hand and KT_foot. p<.05. RESULTS: The correlation tests between dependent variables showed weak to moderate correlations. Specifically, 505_R vs S_IN=49, p<.01; 505_L vs S_IN=11, NS; 505_L vs S_IN=11, NS; KT_foot vs SS=34; KT_foot vs S_IN=32, NS; KT_hand vs S=30, NS; KT_hand vs S_IN=41, p<.05. The association between KT_hand and KT_foot was NS. T-test showed the significance, t(56)=17.48, p<.01. CONCLUSION: Specific “movement strategy” may affect the 505 COD tests due to asymmetry that may exist from the one dominant nature of the participants. However, due to multiple direction tested, KT_hand coordination “eye-hand” is faster and a more natural motor pattern than KT-foot. The speed variables exhibited significant heterogeneity. Speed and agility are not dependent; therefore, each component of speed must be considered independently when designing training programs for young soccer athletes.

Tensiomyography (TMG) has been shown to be a non-invasive technique to assess the contractile properties of skeletal muscle which may have application in assessing the effectiveness of warm-up procedures prior to training and athletic competition. Purpose: The purpose of this study was to evaluate the effects of three different warm-up protocols in collegiate male soccer athletes. Methods: Fifteen collegiate male soccer athletes (age = 20.1±1.3y; height = 176.6±6.9cm, body mass = 78.2±7.8kg, body fat percentage = 12.9±3.6%) participated in this study. The three testing days consisted of: pre- and post-TMG assessments; warm-up protocol [dynamic (DYN); plyometrics (PLY); and passing patterns (SOC)]; and two 20-m sprints. Pre- and post-TMG assessments were completed for the biceps femoris (BF) and rectus femoris (RF) of both legs for all participants. The DYN warm-up protocol consisted of a six-minute jog followed by nine minutes of dynamic stretching. The PLY warm-up protocol consisted of a six-minute jog followed by nine minutes of plyometric exercises. The PAS consisted of a five-minute jog followed by a passing pattern drill typically used in advanced soccer athletes termed the “Rondo.” Repeated measures ANOVAs (condition x leg x time) were used to evaluate muscle displacement (Dm) and contraction time (Tc) in the BF and RF. A repeated measures ANOVA was used to evaluate the fastest of the two 20-m sprint times between conditions. Results: Results showed no significant interactions for Dm (BF: 2.831 to 3.508ms; RF: 6.793 to 8.253ms) or Tc (BF: 2.851 to 3.508ms; RF: 6.793 to 8.253ms) or Tc (BF: 20.04 to 24.00ms; RF: 20.47±15.01ms). Significant differences (p<0.05) between conditions for 20-m sprint performance were also noted (DYN: 2.76±0.27 s; PLY: 2.64±0.13s; SOC: 2.62±0.15s). Significant differences (p<.01; 505_L vs S_IN=49, p<.01; 505_L vs S=11, NS; 505_L vs S_IN=11, NS; KT_foot vs SS=34; KT_foot vs S_IN=32, NS; KT_hand vs S=30, NS; KT_hand vs S_IN=41, p<.05. The association between KT_hand and KT_foot was NS. T-test showed the significance, t(56)=17.48, p<.01. CONCLUSION: Specific “movement strategy” may affect the 505 COD tests due to asymmetry that may exist from the one dominant nature of the participants. However, due to multiple direction tested, KT_hand coordination “eye-hand” is faster and a more natural motor pattern than KT-foot. The speed variables exhibited significant heterogeneity. Speed and agility are not dependent; therefore, each component of speed must be considered independently when designing training programs for young soccer athletes.

In 2006, new category of motor disorders was established: musculoskeletal ambulation disability symptom complex (MADS). MADS is defined as an increased rise of falls and isolation due to an age-related decline in balance and walking ability. PURPOSE: To examine physical, mental and dietary functions of older community-dwellers using balance assessment, physical, and cognitive function tools, and eating habit questionnaire and understand the MADS in older women. METHODS: Eighty-six women aged 65 years and over (mean age 71±3 yrs.) participated in this study. The participants completed a demographic questionnaire, and isolation due to an age-related decline in balance and walking ability. PURPOSE: To examine physical, mental and dietary functions of older community-dwellers using balance assessment, physical, and cognitive function tools, and eating habit questionnaire and understand the MADS in older women. METHODS: Eighty-six women aged 65 years and over (mean age 71±3 yrs.) participated in this study. The participants completed a demographic questionnaire, one-leg standing time with eyes open (OLS) and timed up-and-go test (TUG). Then, they were divided into two groups according to OLS: G1 (longer than 15 sec. (n=61) and G2) less than 15 sec. (n=25). Following items were measured: hand-grip strength, chair-stand, functional reach, gait speed as physical function, Mini-Mental State Examination (MMSE) and Trail Making Test-A (TMT-A) as cognitive function, and brief-type self-administered diet history questionnaire (BDHQ) as examining eating habits. RESULTS: The average time of OLS was significantly different in G1 and G2 (72.7±5.80 and 7.6±3.9 sec., p<0.01). Age was significantly different in G1 and G2 (70.2±2.5 vs. 73.2±4.4 yrs., p<0.05). The results showed that maximal gate speed and TUG was significantly lower in G1 than G2 (1.73±0.24 vs. 1.87±0.28 m/sec., p<0.01) and (6.8±1.1 vs. 7.5±1.5 sec., p<0.01). BDHQ revealed that the consumption of marine products (34.4±43.5 vs. 5.0±2.5 g, p<0.01) and cooked fish (25.7±30.4 vs. 5.6±3.5 g, p<0.01) were significantly higher in G1 than G2. Older adults without MADS consumed more marine products and cooked fish. In ANCOVA adjusting for the age, only TMT-A was significantly different in G1 (86.2±25.2 sec) and G2 (98.4±28.5 sec.), p<0.01. MADS may affect the TMT-A in the older women living in Japan. CONCLUSIONS: These results suggest that decline in physical, dietary and cognitive functions may be associated with MADS in older women.

B-56 Exercise is Medicine®/Poster - EIM - The Elderly and Their Health Problems

Wednesday, May 29, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

819 Board #53 May 29 3:30 PM - 5:00 PM
Physical, Cognitive and Dietary Characteristics of Older Women with Declines in Balance and Walking Ability
Yasu KIMURA1, Mamoru Hisatomi, Kazuko Ohki2, Junko Kawai3, Toshinobu Ikegami4, Mieko Shimada5, Nobuko Kayo Hongo, FACSMD6,7. 1Inst. Fitness & Health Sciences, Toshima, Tokyo, Japan. 2Sugiyama Jogakuenn Univ., Nagoya, Japan. 3Sugiyama Jogakuenn Univ., Nagoya, Japan. 4Saga Univ., Saga, Japan. 5Chiba Prefectual Univ. of Health Sciences, Chiba, Japan. 6The University of Arizona, Tucson, AZ 85721-0038, AZ. (Sponsor: Nobuko Kayo Hongo, FACSMD)
Email: yasuok1944@yahoo.co.jp

In 2006, new category of motor disorders was established: musculoskeletal ambulation disability symptom complex (MADS). MADS is defined as an increased rise of falls and isolation due to an age-related decline in balance and walking ability. PURPOSE: To examine physical, mental and dietary functions of older community-dwellers using balance assessment, physical, and cognitive function tools, and eating habit questionnaire and understand the MADS in older women. METHODS: Eighty-six women aged 65 years and over (mean age 71±3 yrs.) participated in this study. The participants completed a demographic questionnaire, one-leg standing time with eyes open (OLS) and timed up-and-go test (TUG). Then, they were divided into two groups according to OLS: G1 (longer than 15 sec. (n=61) and G2) less than 15 sec. (n=25). Following items were measured: hand-grip strength, chair-stand, functional reach, gait speed as physical function, Mini-Mental State Examination (MMSE) and Trail Making Test-A (TMT-A) as cognitive function, and brief-type self-administered diet history questionnaire (BDHQ) as examining eating habits. RESULTS: The average time of OLS was significantly different in G1 and G2 (72.7±5.80 and 7.6±3.9 sec., p<0.01). Age was significantly different in G1 and G2 (70.2±2.5 vs. 73.2±4.4 yrs., p<0.05). The results showed that maximal gate speed and TUG was significantly lower in G1 than G2 (1.73±0.24 vs. 1.87±0.28 m/sec., p<0.01) and (6.8±1.1 vs. 7.5±1.5 sec., p<0.01). BDHQ revealed that the consumption of marine products (34.4±43.5 vs. 5.0±2.5 g, p<0.01) and cooked fish (25.7±30.4 vs. 5.6±3.5 g, p<0.01) were significantly higher in G1 than G2. Older adults without MADS consumed more marine products and cooked fish. In ANCOVA adjusting for the age, only TMT-A was significantly different in G1 (86.2±25.2 sec) and G2 (98.4±28.5 sec.), p<0.01. MADS may affect the TMT-A in the older women living in Japan. CONCLUSIONS: These results suggest that decline in physical, dietary and cognitive functions may be associated with MADS in older women.
In Taiwan, frailty patient can receive post-acute rehabilitative care in hospital after they leave acute care hospital. The post-acute care program is proposed by the Ministry of Health and Welfare in Taiwan for functional recovery of the frailty patient. The post-acute care program including strengthening, flexibility, cardiopulmonary, and balance exercise. **PURPOSE:** To evaluate the functional recovery of the frailty patient in Taiwan with a two-weeks of regular exercise training. **METHODS:** Twelve frailty elderly (Age: 83.25±5.5 years of age) just leave acute medical care were included in this study. The patient must have one of the underlying diseases include dementia, chronic kidney disease, Parkinsonism, and Chronic Obstructive Pulmonary Disease. The therapeutic interventions were regular exercise training including strengthening, flexibility, cardiopulmonary, and balance exercise for two weeks. Before and after intervention, Functional outcome were evaluated. Data collection from multiple variables was conducted using questionnaire and examination including Barthel index, IADL, Clinical Frailty scale, Confusion Assessment Method, and Mini Nutritional Assessment-Short Form. **RESULTS:** The result shows significant improvement in Barthel index, Clinical Frailty scale, and Mini Nutritional Assessment-Short Form (p < .05). Among other tests, there is no significant difference. **CONCLUSION:** Two-week exercise training program can improve functional outcome of frailty patient during post-acute care.

### Table 2

<table>
<thead>
<tr>
<th>Groups</th>
<th>Blood Glucose (mmol/L)</th>
<th>Plasma Insulin (mu/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined (Sedentary)</td>
<td>6.0 (0.2)**</td>
<td>48.8 (4.6)**</td>
</tr>
<tr>
<td>Combined (Active)</td>
<td>5.3 (0.1)</td>
<td>26.8 (2.8)</td>
</tr>
<tr>
<td>YS</td>
<td>5.7 (0.3)*</td>
<td>45.6 (5.7)*</td>
</tr>
<tr>
<td>YA</td>
<td>4.7 (0.2)</td>
<td>25.5 (4.1)</td>
</tr>
<tr>
<td>MS</td>
<td>6.0 (0.4)</td>
<td>38.1 (8.8)</td>
</tr>
<tr>
<td>MA</td>
<td>5.6 (0.2)</td>
<td>22.6 (4.0)</td>
</tr>
<tr>
<td>OS</td>
<td>7.5 (1.0)</td>
<td>60.9 (11.6)</td>
</tr>
<tr>
<td>OA</td>
<td>5.9 (0.4)</td>
<td>43.2 (8.0)</td>
</tr>
</tbody>
</table>

Note: *p < 0.05, **p < 0.01, and ***p < 0.001 between Active and Sedentary groups

### Purpose

The study aimed to elucidate the effects of age and self-reported exercise behavior on metabolic risks in clinically healthy participants according to age and exercise behaviour groups (Table 1). The participants were from the Exercise for Life Across Asia (ELIXA) cohort. Active participants reported ≥ 3 X 45 min of moderate to high intensity exercise weekly and sedentary participants reported < 1 X 30 min of moderate intensity exercise weekly in the last 5 years. **Methods:** The participants performed an oral glucose tolerance test (OGTT), with fasted blood (13 mL) collected at baseline, followed by ingesting 75 g of glucose in a solution, and blood collections at 0.5 h intervals until 2 h. **Results:** Age and exercise behaviour had no significant effects on body mass index, blood pressure, and waist-to-hip ratio, and fasted blood glucose and lipids (total cholesterol, triglycerides, and high- and low-density lipoproteins), and plasma insulin and non-fasted plasma pro-inflammatory cytokine concentrations. However, the magnitude of increases in plasma insulin and blood glucose concentrations after glucose ingestion were significantly higher in the sedentary than in the active groups over the 2 h OGTT, when all the age groups were compared. Among other tests, there is no significant difference. **Conclusion:** In a clinically healthy population, regular exercise can lower metabolic risks, which can increase from young age due to sedentary lifestyle.

### Table 1 Sample sizes in age and exercise behaviour groups

<table>
<thead>
<tr>
<th></th>
<th>Young (18 – 39 Yr old)</th>
<th>Middle-aged (40 – 59 Yr Old)</th>
<th>Older-aged (≥ 60 Yr Old)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>YA, n = 33</td>
<td>MA, n = 36</td>
<td>OA, n = 14</td>
</tr>
<tr>
<td>Sedentary</td>
<td>YS, n = 28</td>
<td>MS, n = 25</td>
<td>OS, n = 11</td>
</tr>
</tbody>
</table>

Table 2 Mean (SEM) for blood glucose and plasma insulin concentrations at 2-hour time point of the oral glucose tolerance test

### Purpose

**Regular physical activity helps older adults improve their health and enhances overall quality of life.** The aim of this study was to determine how the community-based, group exercise program, “Walking People – Aruku-hito” has offered and continues to expand its reach through training health educators for the program in various cities in Japan. **MEHTODS:** This presentation highlights “Walking People – Aruku-hito” program that was started helping older adults who were the victims of Tohoku earthquake and tsunami that created over 300,000 refugees in Tohoku/Northeast region, Japan in 2011. The contents and resources for reaching older adults, maintaining and expanding the “Walking People – Aruku-hito” program will be presented. **RESULTS:** The “Walking People – Aruku-hito” program started helping sedentary older adults who had limited social activities in a living temporary apartment complex after the loss of their houses. The program teams visited about 400 community-gathering centers, where people who had deeply affected by the Tohoku earthquake and tsunami met regularly. From April 2012 to April 2018, more than 10,000 older adults (65 to 96 years) participated in a supervised workshop. The workshop emphasized 1) benefits of walking, 2) stress-free walking, 3) basic conditionings (strength training, flexibility, balance) for walking, and 4) benefits of habitual daily walking. This tailored physical activity was developed by the joint efforts of community agencies and academic partners. Because of the popularity of the “Walking People – Aruku-hito” program, the workshops have been offered in several regions of Japan with the support of Japan Medical Association and Ministry of Health, Labor and Welfare. Originally, instructors for the program were either certified exercise instructors, nurse practitioners, or physical therapists. Now, the number of instructors is increasing using the Train-the-Trainer approach; the instructors of the program train well-fit older participants who have been helping other participants in the program. **CONCLUSIONS:** The “Walking People – Aruku-hito” program started a community-based program designed for older adults’ specific needs and challenges. With the new supports and existing community resources, the program will be disseminated widely in Japan.

### Purpose

**Effects Of Social Network incentives And Financial Incentives On Physical Activity Among Elderly Women**

Ryo Yamashita1, Shinji Sato2, Ryooichi Akase1, Tatsuo Doi1, Shigeki Tsuzuki1, Toyohiko Yokoi2, Shingo Otsuki1, Eisaku Harada1, 1Kumamoto Institute of Total Fitness, Kumamoto, Japan. 2Osaka Sangyo University, Osaka, Japan. 1Kumamoto Kinoh Hospital, Kumamoto, Japan. 2Dynamic Sports Medicine Institute, Osaka, Japan. 3Kumamoto University, Kumamoto, Japan.

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(No relevant relationships reported)
the benefit of the incentive is lost when the intervention ends. Thus, we focused on social network incentives that leveraging the power of peer pressure to regulate behavior.

**PURPOSE:** The main goal is to ascertain whether combining financial incentives with social network incentives can lead to changes in physical activity (steps/day) during and after the intervention.

**METHODS:** We conducted a three month, randomized controlled study using pedometers. The effects of incentives on physical activity were measured six months post-intervention. The subjects were 39 elderly women over 65 years of age, residing in Kumamoto, Japan. The financial incentive (FI) group received a payment ranging from US$4.40 to US$6.20 per month depending on the number of steps taken during the intervention. For the other group, we provided a social network incentive (SNI) in addition to the financial incentive. The SNI+FI group walked in three people to use peer pressure.

**RESULTS:** A two-way ANOVA revealed that in terms of physical activity, there was a statistically significant interaction between group and time (p=0.017). The FI group showed no statistically significant improvement in physical activity during the observation period.

**CONCLUSIONS:** Our results suggest that combining financial incentives and social network incentives is more effective than financial incentives alone. Especially, the effect can continue in post-intervention.

**826 Board #60**  
**May 29 3:30 PM - 5:00 PM**  
**Effect Of Acute Specific Exercise And Wuqinxi On Hand Function Of Patients With Parkinson's Disease**

Tian Wang, Guiping Xiao, Kunchen Jie, Zhenlan Li, Zhen Wang, Jie Zhuang, Shanghai University of Sport, Shanghai, China.  
Email: 724793513@qq.com

(No relevant relationships reported)

**825 Board #59**  
**May 29 3:30 PM - 5:00 PM**  
**Functional Capability, Flexibility, Strength And Quality Of Life In Sedentary Or Trained Elderly Women**

OTÁVIO A MACHADO¹, BRUNA VEIRA DE SOUZA¹, FABIO GIANOLLA¹, LUIZ F. KILLIAN¹, GIOVANNA A C MACHADO¹, WALDECIR P. LIMA², RENATA GOPÍO³, ¹FIEF, SOROCABA, Brazil, ²IFSP, SAO PAULO, Brazil. ³UNICLS, SAO PAULO, Brazil.  
Email: otaviaosm@gmail.com

(No relevant relationships reported)

Throughout the last decade the elderly population has been increasing around the world. During the aging process, all physiological systems undergo significant functional changes and sedentary lifestyle has an elevated correlation with this unbalance. The inactivity increases the rate of chronic diseases development. Although any type or amount of physical exercise may discontinue the cellular aging processes, regular physical exercise can attenuate the decline in physical and functional capabilities observed in elderly. Currently, some of the most encouraged activities in gyms are resistance exercise, weight-bearing training, and hydrogymnastics.

**PURPOSE:** The main objective of this study was to compare the effects of the above-mentioned exercises regarding muscle strength, flexibility, functional capability and quality of life in elderly women.

**METHODS:** We evaluated 36 elderly women (age 70.17±5.18 years) separated in four groups in agreement with their physical activity practice: Hydrogymnastics (H); Walking (W); 9 Resistance Training (RT). This was a transversal study, and all exercise practitioners had at least 3 months with 3 days a week of frequency.

**RESULTS:** All exercised groups showed a significant difference (p<0.05) in relation to S in all measured variables. Among the exercises groups, the RT had greater strength and better functional capability.

**CONCLUSIONS:** Regular physical exercise is important to reduce the deleterious effects of sedentary lifestyle in muscle strength, flexibility, functional capability and quality of life and among the exercises evaluated, RT showed to be a key component of a training program for elderly women.

**824 Board #58**  
**May 29 3:30 PM - 5:00 PM**  
**Does High-Cadence Cycling Improve Emotional Recognition In Individuals With Parkinson’s Disease?**

Bryan Dowdell¹, Sara Harper¹, Alena Varner¹, Jin Hyun Kim¹, Brandon Pollock², Angela Ridgel, FACSM². ¹Kent State University, Kent, OH. ²The University of Alabama at Birmingham, AL.

(No relevant relationships reported)

Parkinson’s disease (PD) is a progressive neurodegenerative disease that can lead to cognitive dysfunction including deficits in emotional recognition, which is the ability to identify different facial expressions. This deficit has been shown to lead to difficulties in social interaction and communication. High cadence cycling is a unique rehabilitation modality that has been shown to improve motor function in PD, but it is not known how this modality alters cognition.

**PURPOSE:** To examine if three bouts of high-cadence cycling improved emotional recognition in individuals with PD.

**METHODS:** Individuals with PD (N=20) completed three sessions of high cadence cycling (48 hours apart), on a custom motorized stationary cycle, consisting of a 5-minute warm-up at 50 revolutions per minute (rpm), 30 minutes of high cadence cycling between 75-85 rpm, and a 5-minute cool down. Emotional recognition was assessed using a computerized cognitive assessment battery at baseline and after the three cycling sessions. Individuals with PD in the control group (N=15) did not cycle between 75-85 rpm, and a 5-minute cool down. Emotional recognition was measured using a range from 3 to 5. The three score ranges were used for the analysis. Independent samples t-tests were run for the change scores between the intervention and control group. Any p<0.05 was considered significant.

**RESULTS:** Both groups displayed negative z-scores representing an emotional recognition deficit. There was no significant difference between the cycling and control group in the overall emotional domain (p=0.76). Cycling resulted in a z-score improvement in the emotion domain by 0.22 while the control group improved 0.14. Cycling did significantly improve “disgust” emotion accuracy compared to the control group (p=0.05).

**CONCLUSIONS:** Three bouts of high-cadence cycling specifically improved “disgust” emotional recognition compared to the control. However, there was no significant difference between groups in the overall emotional domain. While high-cadence cycling might be a valuable rehabilitation modality for improving motor function in individuals with PD, the efficacy for improving emotional recognition and potentially social interaction is unclear.
chronic diseases to incorporate exercise into their everyday lives. PURPOSE: Due to the initial development of EIM within Western cultures and traditions, the purpose of our work was to examine how best to adopt, implement, and disseminate EIM for the older adult population in Asia. METHODS: From April, 2017 to September, 2018 numerous discussions were held between researchers and practitioners from Asian countries who had between 15 to 30 years of experience in the area of aging and physical activity. Additionally, research articles, reports, and web-sites related to EIM were reviewed and analyzed for inclusion among EIM personnel in Asia. RESULTS: The results have been divided into three sections. The first section provides a historical overview of EIM development in Asia. The second presents an assessment of the potential role of EIM for older adults in Asia. The final section provides a blueprint for the development of an extended concept of EIM as a stimulus for further conversations and discussions among the medical, exercise, and health related communities. CONCLUSION: EIM has the potential to play an important role in the prevention and management of chronic diseases in Asia, and improving quality of life among Asian seniors.

828 Board #62 May 29 3:30 PM - 5:00 PM
Effect Of Wu Qi Xin Exercise On The Quality Of Life Of Parkinson's Patients
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PURPOSE: To determine the effect of 12-wk Wu Qi Xin exercise intervention on the quality of life of Parkinson’s patients.

METHODS: 23 Parkinson (PD) patients (12 men and 11 women; age in 65.65±4.82 yr.) were recruited to participate in a 12 wk Wu Qi Xin, a traditional Chinese exercise, intervention in the Pai Training Camp of Shanghai University of Sport, China. Patients’ clinical status was assessed with Unified’s Disease Rating Scale (UPDRS) parts I-III, and Quality of life ‘s Disease Questionnaire (PDQ-39). The assessments were conducted before and after the intervention group, which included 120-minute Wu Qi Xin exercises, twice a week for 12-wk. The paired sample t test was used for the pre- and post-test difference. RESULTS: A statistically significant pre- and post-test difference were found after the 12-wk Wu Xin Xintervention: UPDRS score decreased by 23% (p<0.01); UPDRS part I score decreased by 28% (p=0.003); part II decreased by 20% (p<0.004), part III decreased by 24% (p=0.036) and PDQ-39 score decreased by 30% (p<0.001). -- CONCLUSIONS: Wu Qin Xie exercise could improve the quality of life of PD patients.

829 Board #63 May 29 3:30 PM - 5:00 PM
Significant Improvement In Dxa Scores Is Observed With Osteoporotic Patients When High Force, Short Duration Stimulus Is Created
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PURPOSE: Determine if high intensity short duration forces applied to bone results in improved DXA measures.

The relationship between bone geometry and mechanical influences on bone suggests that when significant forces are applied to bone, the compression will stimulate an adaptive response, commonly known as Wolff’s Law. However traditional exercise as a treatment for osteoporosis has generally not been able to create the forces needed to stimulate bone growth in a safe and effective manner. METHODS: Twenty-six women X age 63 with diagnosis of osteoporosis participated in a one-year study using a novel exercise device that allows bone to adapt to significant forces. A subset (9 individuals) were followed for one additional year after the study concluded. Three independent clinics had identical equipment and protocol. Subjects completed a minimum of 48 sessions once a week over the year. DEXA scans were conducted at the same testing location for both pre-and post-assessments. Subjects self-reported weight, weekly minutes of exercise, diet and prescription medications. RESULTS: Of the 26 subjects, 16 individuals demonstrated a significant reduction p<.05 (improvement in bone) in their mean DEXA score, while 6 had no significant change and 4 individuals showed a further degradation. Forces required to significantly improve bone were 2 - 10x multiples of body weight. Of those who continued for an additional year, 6 demonstrated additional improvements p<.05 while 3 were not significantly different.

CONCLUSIONS: These data suggest that a non-pharmacological exercise solution is available to individuals diagnosed with osteoporosis. Further study is required with larger sample sizes and more diverse demographics. Additional research is needed to validate this approach as a viable and safe strategy for bone reformation.
were registered with parallel electrocardiogram recording and the quality of life was self-reported in the SF-36 questionnaire, with a scale of 0-100, where a higher score indicates a better quality of life. The pre and post intervention differences were analysed using the Kruskal Wallis test Results: The %FAT had a decrease of 1.83 ± 2.33% with in GI (before = 38.70±7.62%; after = 36.87±6.92%) in relation to CG (before = 39.92±6.87;2; after = 41.48±5%; (p = 0.952). The values of cPWV increased 7,34± 3.79 in IG (before = 39.50±13.42 after 46.84±12.74) in relation to GC (before = 42.82±12.96; after = 45.35±11.14) (p=0.042) Regarding the self-reported quality of life, there were no significant differences (p=0.176) between GI (before = 39.50 ± 13.52 after = 46.84 ± 12.74) and the CG (42.82±12.96 after 45.35±11.14) . Conclusion: The results show that an integrational exercise program can reduce arterial stiffness in the elderly when compared to older people not involved in an exercise program.

biceps curl there were also age x load interactions (p<.05). Younger persons reached PP_{max} at 40%1RM and 50-60%1RM, respectively and older persons at 60-70%1RM and 70-80%1RM. Ten different lower body exercises, lower leg exercises and hip abduction showed a significant main effect for load (p<0.033) with optimal load at 60-70%1RM, 50-70%1RM, and 50-60%1RM, respectively. Hip adduction produced significant age x load (p=0.031) and sex x load interaction. 50-70%1RM was optimal for both age groups, but older persons produced significantly higher PP_{max} at 40%1RM. For load x sex, optimal load was 50-70%1RM for both sexes; however, PP_{max} occurred at 70%1RM for men and 50%1RM for women. Analysis for the calf raise showed a significant age x load interaction (p=0.001) where PP_{max} was 40-70%1RM for young and 50-80%1RM for older participants. CONCLUSIONS: Different optimal load ranges are required for individual plate-loaded exercises depending on age and sex. Younger persons and men optimize power at lower loads than older persons and women.

**RESULTS:** Sedentary habits were present in the 35% of adults and 24% of all students enrolled. Lack of time for exercise was the most frequently reported barrier for adults, followed by lack of energy and laziness. These barriers were well reported in young population too, especially in girls (48% lack of energy and laziness, 39% lack of time) compared with boys (25% lack of energy, 14% laziness, 23% lack of time). Surprisingly, fear for injuries was reported only by man. Prevalence of overweight of time) compared with boys (25% lack of energy, 14% laziness, 23% lack of time). Prevalence of overweight

**METHODS:** “Why Not” was a cross-sectional study conducted in 2018 in a high school (87 students, 19±1.0±4 years old) and in the Rectorate of University of Florence (106 adults, 48.4 ±12.2 years old). Personal anamnesis and information about the amount of weekly physical activity were collected. Barriers to Being Active Quiz (BBAQ), and Mediterranean Diet Score questionnaires were administered. Weight and height were measured according to standardize protocols.

**RESULTS:** Sedentary habits were present in the 35% of adults and 24% of all students enrolled. Lack of time for exercise was the most frequently reported barrier for adults, followed by lack of energy and laziness. These barriers were well reported in young population too, especially in girls (48% lack of energy and laziness, 39% lack of time) compared with boys (25% lack of energy, 14% laziness, 23% lack of time). Surprisingly, fear for injuries was reported only by man. Prevalence of overweight

**METHODS:** The participants were 19 community-dwelling elderly adults (7 males, 12 females, 69.4 ± 6.7 y), 21 older women (69.8 ± 7.9 y), 24 young men (21.0 ± 2.2 y) and 22 young women (20.7 ± 1.5 y) participated in two sessions of strength and power testing. They performed ten different plate-loaded exercises, to determine their 1RM, functional reach, and peak power output (PP). Power was tested at 40, 50, 60, 70 and 80% 1RM using a linear position transducer. PP was expressed relative to the highest power produced (PP_{max}). RESULTS: Significant sex x load interactions were seen for all upper body lifts (p<.05). Post hoc analyses showed that for multi-joint upper body exercises, men reached their highest power at the low end of the loading spectrum (PP_{max} = 40-60%1RM), while women’s highest PP_{max} was at higher loads (50-70%1RM). For single joint upper body exercises, the biceps curl and triceps extension showed no differences in PP_{max} across loads for men, while women’s optimal loads were at 50-80%1RM for both exercises. For shoulder press and

**CONCLUSIONS:** These results indicate that the SAIL program was successful at maintaining mobility and increasing upper and lower body strength of individuals over 5 years. These results suggest a potential decline in the risk of falling for SAIL participants.
were instructed to wear the accelerometer on their waistline all day. RESULTS: The participation rate of exercise classes and exercise practice was 90.0 ±11.0% and 76.5 ±14.4%, respectively. Significant changes were observed in the 10-min walking time (pre: 5.80 ±1.48 sec and post: 4.93 ±0.57 sec, p<.05), 10-m obstacle walk (pre: 4.56 ±0.82 sec and post: 3.88 ±0.66 sec, p<.05), and timed up and go test (pre: 4.83 ±0.59 sec and post: 4.33 ±0.53 sec, p<.05) performance after completion of the 10-week program. Furthermore, these changes were maintained at the 1-year follow-up. Although no significant change was observed in the 6-minute walk test after the 10-week exercise classes, a significant change was apparent at the follow-up (pre: 629.9 ±51.8 m and follow-up: 677.1 ±54.7 m, p<.05). CONCLUSIONS: Our results clearly indicated that even low-frequency, continuous exercise can help improve and maintain physical fitness. However, probably because the independent exercise practice simply continued the activities of the 10-week exercise program, we observed no further effects by the 1-year follow-up.

Older adults aged 60+ years are particularly vulnerable to the exposure and negative health consequences related to sedentary behavior (SB). There is limited evidence for the feasibility and effectiveness of SB interventions in older adults. PURPOSE: The purpose of this study is to explore the feasibility and acceptability of using a seated elliptical device (SED) to replace SB with a light-intensity physical activity (LPA) in the homes of older adults. METHODS: Twenty older adults (mean ± SD: 71.9 ±5.3 years) participated in this feasibility study. Each participant was outfitted with hip-mounted activity monitor and SED in the home for seven days. Participants were randomly assigned to one of four pedaling duration groups (15, 30, 45, and 60 min/day) and instructed to accumulate SED pedaling at a self-selected light-intensity during the 45 and 60 min group accumulated greater minutes per day of pedaling goal adherence and a significant linear group trend (p<.001) for minutes pedaled with no significant difference in total pedaling days SED-based LPA for each group. RESULTS: There was 100% adherence across all four pedaling duration groups with no significant difference in total pedaling days completed (p=.241) and a significant linear group trend (p<.001) for minutes pedaled per day. The 45 and 60 min group accumulated greater minutes per day of pedaling than the 15 and 30 min groups (p<.05) with no significant differences between the 45 and 60 min groups or the 15 and 30 min groups. Across groups there was a 4.3% ±11.3% reduction in daily SB (Cohen’s d: 0.72 to 1.57) and 8.3% to 23.6% increase in daily SB (Cohen’s d: 0.41 to 1.2) on pedaling days. Participants’ perceptions of using the SED were positive. CONCLUSIONS: Older adults were successfully able to exceed 60 minutes of daily pedaling without altering or interrupting their typical daily daily schedules. The long-term impact of these daily changes in LPA on health and function in aging populations are to be determined.

In young adults, a cadence (steps/min) threshold for relative intensity indicators in older adults

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PURPOSE: To investigate cadence thresholds associated with ACSM-defined indicators of moderate relative intensity (40-59% of heart rate reserve [%HRR], 64-76% of maximum heart rate [%HRmax] percentage, and a Borg scale rating of perceived exertion [Borg rate: 12-13]). METHODS: Thirty-seven older adults (mean±SD: age=68.5±4.7 years, BMI=26.3±3.9 kg/m²) completed a progressive treadmill walking protocol that consisted of 5-minute bouts increasing by 0.5 mph from 0.5 to 6.0 mph. The protocol ended following the bout where the participant naturally selected to jog or run, > 75% HRmax, or reported a Borg scale RPE ≥13. Intensity indicators were analyzed using Receiver Operating Characteristic (ROC) curves. Optimal cadence thresholds associated with moderate intensity were determined using Youden’s index.

RESULTS: Four participants did not reach moderate intensity based on %HRR, and three did not reach moderate intensity based on %HRmax. %HRR and %HRmax were both associated with moderate intensity cadence thresholds of 111 steps/min. %HRR had a sensitivity of 87%, and an area under the curve (AUC) of 0.76. %HRmax had a sensitivity of 75%, a specificity of 87% and an AUC of 0.75. Additionally, RPE was associated with a moderate intensity threshold of 104 steps/min, with 78% sensitivity, 80% specificity, and an AUC of 0.83.

CONCLUSION: Cadence thresholds associated with relative indicators of moderate intensity were consistently higher (4-11 steps/min) than the commonly reported heuristic value of 100 steps/min, although still within an obtainable cadence for ambulatory, healthy older adults. Relative indicators provide an opportunity to individualize cadence-based intensity prescription.

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There are countless benefits of exercising for older adults including a maintenance of bone density, muscle mass, and the preservation of muscular strength and endurance. Although older adults benefit from exercising it may be more convenient, more accessible, and of less a burden to exercise less times per week. PURPOSE: The purpose of this pilot study is to quantify if there are any added benefits to exercising three days a week compared to two days a week. METHODS: Participants included community dwelling adults (N=36, 69±7.4±7.91 years) who self-selected exercise frequency by joining a multi-component fitness class offered in their local community. Classes were held either two or three days per week depending on the location. The Functional Fitness Test and Short Physical Performance Battery were conducted two times 6 months apart at all locations. Results were analyzed using repeated measures ANOVA. RESULTS: A significant group-by-time interaction was observed for handgrip strength, F(1, 18) = 7.92, p = .01, with the two days per week group improving by 13% and the three days per week group decreasing by 1.9%. Interactions were not significant for chair stand test, arm curl test, 8 Foot Up-and-Go, or Gait speed, p = .05. There was a significant time effect for the chair stand test [F (1, 15) = 7.54, p = .01], gait speed [F (1, 19) = 7.91, p < .01], and hand-grip strength [F (1, 18) = 4.61, p = .04] with all tests indicating improvements from the first to second test. Univariate effect sizes indicated a trend toward greater improvements in the 2 d/wk group when compared to the 3 d/wk group with the exception of the arm curl which favors 3 d/wk. CONCLUSION: Although results are preliminary, this study indicates that handgrip strength was enhanced when participants were involved in a multi-component exercise program two days per week (13%). Chair stands test, arm curl test, 8 Foot Up-and-Go, and Gait speed increased regardless of the number of days per week of exercise. Notable limitations to the study are the number of males (N=6) compared to females (N=26) and participant’s self-selection of exercise frequency. Also, outside influences such as physical activity levels, health status, and history of disease. Future studies should confirm these results using an experimental design in a larger, more diverse sample.
Sleep disorders are one of the most prevalent changes in the elderly and this has been associated with a negative impact on health outcomes. Exercise to be a potential non-pharmacological treatment to improve sleep quality. However, the effects in older has been largely unexplored. PURPOSE: To evaluate the effects of exercise on sleep complaints in older adults residing in a nursing home. METHODS: A total of thirteen older adults (84.1±6.9 years) were according to the inclusion criteria. Socio-demographic data was collected using a structured questionnaire. Anthropometric measures were obtained using standardized techniques. Sleep quality was collected by self-report through the face to face Oviedo sleep questionnaire. The EQ-D5 was used to assess the health related quality of life. The training program included a multicomponent exercise intervention (9 weeks; 2 times per week) focused on mobility, strength and balance. Student paired t-test was carried out to detect any significant differences between the pre-test and post-test in any variable. The difference between variables was calculated using the effect size (ES) through Cohen’s d. The significance level was set at p<0.05. RESULTS: The EQ-D5 mean scores were similar for the four dimensions (post-intervention) including mobility, pain/discomfort, self-care and usual activities; however the dimension related with depression improved 31% at the end of the intervention. The t-test student and Cohen’s d showed a medium non-significant effect on sleep satisfaction (p=0.26; ES: 0.32; insomnia (p=0.37; ES: 0.38) and hypersomnia (p=0.09; SE: 0.52). CONCLUSIONS: A supervised exercise program has a moderately beneficial effect on sleep quality in terms of insomnia, hypersomnia and depression in older people.

Board #76 May 29 3:30 PM - 5:00 PM
The Effect Of A Multicomponent Exercise Program On Sleep Quality In Institutionalized Elderly
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Mobility limitations are linked with increased risk of disability and mortality among older adults with chronic disease. Physical activity (PA) has consistently been associated with the preservation of mobility and improvements in physical function in aging populations. Although accelerometry is accepted as the gold standard of objective PA measurement, knowledge of objectively-determined PA in free-living conditions and its association with mobility limitations among older adults with chronic disease remains limited. PURPOSE: To examine the association of objectively-determined PA and mobility performance (400 MWalk and Stair Climb tests) and mobility-related self-efficacy (MRSE) were examined from the baseline assessments of 3 prior lifestyle intervention trials in 156 older prostate cancer and knee osteoarthritis patients. Moderate-Vigorous (MVPA) and light (LPA) were measured using LC accelerometry in free-living conditions across 7 consecutive days. RESULTS: Results: Results of partial correlation analyses controlling for age revealed that total weekly MVPA was significantly correlated with 400 MWalk (r = -.36; p < 0.1), Stair Climb (r = -.29; p = .05), and MRSE (r = -.27; p = .01). LPA was also significantly correlated with 400 MWalk (r = .39; p < 0.01), Stair Climb (r = .40; p < .01), and MRSE (r = -.38; p < .01). CONCLUSIONS: The present findings demonstrate that objectively-determined PA measured using the LC accelerometer are associated with mobility performance and MRSE in older adults with chronic disease. The results also provide evidence further supporting the validity of accelerometry as a measure of mobility limitations among older prostate cancer and knee osteoarthritis patients. Given the established complexity of objective PA assessment in aging populations, the present findings have implications for PA interventions in the preservation of mobility among older adults with chronic disease.

Purpose: To describe and analyze the trend of adiposity-related correlations of non-sedentary women between 1998 and 2017 Methods: The present study is part of the Mixed Longitudinal Project of Physical Fitness and Aging of SCS, developed by CELAFICS, since 1998, in Brazil - SP. Sample comprised only female subjects, 50 years-old and older, and who were involved in a PA program and participated in at least one evaluations between 1998 and 2017, totaling a sample of 6367 individuals. The circumference analyzed were waist, hip and WC to hip ratio (WHR). To analyze the trend, the sample was divided into age groups: 50 to 59 years, 60 to 69 years and 70 years and over. Statistical analysis: Polynomial regression models were estimated. In the modeling process, the mean of each one of the anthropometric variables was considered as dependent variable (Y) and the years of evaluation as independent variable (X). For each variable, the model with the highest statistical significance (p) and the best accuracy measure (r) was selected. Was considered significant model p < 0.05. Results: Waist circumference presented a negative trend in the three age groups analyzed. Hip circumference presented a negative trend in the age groups of 60 to 69 and 70 years and over, while WHR showed a negative trend in the age groups of 50-59 and 70 years and over. In the age group of 50 to 59 years, the mean WHR was 0.88 cm, with a decrease of 0.01 cm every year. In the age group of 60 to 69 years, the mean waist circumference was 83.90 cm, and there was a decrease of 0.05 cm in each year; the mean hip circumference was 98.82 cm, with a decrease of 0.02 cm every year. In the age group of 60 to 69 years, the mean waist circumference was 83.90 cm, and there was a decrease of 0.05 cm in each year; the mean hip circumference was 98.82 cm, with a decrease of 0.02 cm every year. The mean hip circumference was 98.82 cm, with a decrease of 0.02 cm every year. In the age group of 70 years and over, the mean waist circumference was 88.62 cm, with a decrease of 0.07 cm every year; the mean hip circumference was 88.62 cm, with a decrease of 0.07 cm every year; the mean hip circumference was 92.90 cm, with a decrease of 0.01 cm every year. Conclusion: Over the three decades analyzed, elderly active women of all age groups showed a tendency to decrease CV risk, although it still remained at a high risk, suggesting a positive impact of a PA program on CV risk.

There appears to be an undisputed strong relationship between isometric handgrip strength (HGS) and functional fitness test performance, ability to perform activities of daily living (ADLs), and mortality, but the extreme diversity in how HGS data are interpreted make it difficult to utilize the assessment in a meaningful way. PURPOSE: To simplify this interpretation by establishing a single and meaningful universal cutoff of HGS that would inform the test administrator whether or not additional functional fitness testing was warranted. It was hypothesized that subjects scoring above the HGS cutoff would exhibit fewer perceived and actual functional limitations. METHODS: Male (n = 24; Age = 62.3 ± 14.3 years) and female (n = 59; Age = 64.7 ± 13.0 years) subjects self-reported their perceived ability to complete the variety of ADLs included in the Composite Physical Function Scale (maximum score of 24 indicating no perceived functional limitations). They additionally completed a battery of functional fitness assessments, which included HGS, 30s-Chair Stand, 8-Up-and-Go, 10 lb and 25 lb lift and carry, and 400 m Walk Test. A self-developed cell phone application was used to produce more outcome scores using the CFF test, such as screening for hip flexion among the 400 m Walk Test. Independent sample t-tests were used to compare the perceived and actual functional fitness outcomes between subjects with grip strength > 30 kg and those with grip strength ≤ 30 kg. Additionally, positive predictive value (PPV), and negative predictive value (NPV), were calculated to investigate the accuracy of a 30 kg HGS cutoff to identify subjects with perceived or actual functional limitations.

RESULTS: Subjects with a HGS > 30 kg scored significantly higher on the CFF Scale, compared with subjects with a HGS < 30 kg (23.9 ± 22.4 vs. 3.3, respectively). Likewise, Subjects with a HGS > 30 kg performed significantly better on every functional fitness test outcome, compared with subjects with a HGS < 30 kg. The NPV (true negative) was excellent (≥ 90%) for all outcomes, while the PPV (true positive) was poor (< 50%) for all outcomes. CONCLUSIONS: A HGS ≥ 30 kg appears to be an appropriate cutoff to accurately rule out current functional limitations in males and females 40 years of age and older.

Purpose: The quantification of physical functional condition (CFF) in the elderly is an important indicator to define the state of health, the level of dependence and the quality of life in functional physical condition this population. The objective of this study was to establish the relationship of between and age in a group of elderly people residing in retirement home in the city of Bogotá.

Methodology: Cross-sectional descriptive observational study, which evaluated the functional physical condition (SFT) in 253 older adults (42.6% men and 57.3% women) institutionalized in the city of Bogotá. The CFF was evaluated through the senior fitness test, in the application the protocols proposed in the validation to Colombia were followed. The measure consisted of 6 physical tests: chair stand (repetitions), arm curl (repetitions), aerobic capacity in 2 minutes (repetitions), flexibility (cm); and 8 foot up and go (ms). A univariate descriptive analysis and a correlation analysis between age and physical condition variables were performed. An appreciative scale of the correlations was established as follows: weak for values ≤ 0.40; moderate, between 0.41 and 0.60; strong, between 0.61 and 0.80, and very strong, between 0.81 and 1.0.

Results: In all CFF tests, significant differences were found for all age ranges in both men and women (p < 0.01). The following correlations were identified between the CFF variables and age: chair stand (r = 0.850), arm curl (r = 0.928), trunk flexion (r = 0.928), back scratch (r = 0.862), 2-minute step (r = 0.914), 8 foot up and go (r = 0.877) in men. In the case of women, very strong correlations were observed in the aerobic capacity (r = 0.916), chair stand (r = 0.764), arm curl (r = 0.682), back scratch (r = 0.678), 8 foot up and go (r = 0.739) and moderate in trunk flexion (r = 0.458). Conclusion: There is a linear relationship between age and performance in CFF tests.
The LIFTMOR for Men trial was designed to compare the effects of multi-component exercise (MEG) and high-intensity resistance training (HiRIT) or bioDensity (bD) machine-based isometric exercise.

**METHODS**

Thirty-two young adults (Mean age=21.03) and thirteen older adults (Mean age=69.6) participated in this study and were instructed to stand or walk on a Motek instrumented treadmill integrated with a 180° VR projection screen. Participants performed three eight-minute physical activity conditions: standing, walking and fast walking. During the conditions, 60 red and 60 green objects appeared at random on the VR screen to replicate a Go/No Go cognitive task. Using gloves that had kinematic-motion capture markers, participants were instructed to strike the green objects. A motion capture system connected to the treadmill recorded reaction time and accuracy on correct object strikes for all conditions.

**RESULTS**

We used paired sample t-tests to verify that the physical activity conditions increase in intensity by comparing heart rate measurements between conditions. There was a significant increase in heart rate (bpm) between the standing and walking conditions (p<0.05) and between the walking and fast walking conditions (p<0.05) for both the young and older adults. T-tests determined that there were no significant differences in accuracy between the young and older adults during any of the three conditions (p>0.05). T-tests determined that young adults had a significantly quicker reaction time than older adults during all three conditions (p<0.05).

**CONCLUSIONS**

Surprisingly, older adults performed just as accurately as young adults during dual-task cognitive conditions carried out in a VR environment. VR may be an appropriate intervention to enhance cognitive stimulation to attenuate cognitive decline.

**Keywords**

Behavioral responses, Virtual Reality, Cognitive Task, Young and Older Adults.
However, the possibility of MPK improving vascular and muscular functions in aging is associated with declines in vascular and muscular functions. It is crucial to examine the effects of a MPK regimen on blood pressure (BP), wave reflection (AIx), and duration for static exercises (30 s to 60 s). Modified Parkour movements were to 5), sets and repetitions for dynamic exercises (3 to 4 sets and 8 to 20 repetitions) for weeks. MPK consisted of modified dynamic and static bodyweight exercises 3 and duration for static exercises (3 to 4 sets and 20 repetitions) and duration for static exercises (30 s to 60 s). Modified Parkour movements were progressed by increasing their complexity. Supine BP, AIX, and heart rate (HR), 30s chair stands (CHAST) and sit and reach (SITNR) scores were measured at baseline and after 8 weeks. RESULTS: There were significant group-bytime interactions (P < 0.05) for BP, AIX, CHAST and SITNR. There were significant decreases (P = .001), BMI (P = .002), and WC (P = .022) significantly improved from baseline to 3 months. There was also a significant effect of time for SCS (F1,30) = 3.190, p = .033) and CS30 (F1,30) = 6.956, p = .007). Post hoc analyses indicated CS30 scores significantly improved from baseline to 3 months and from baseline to 12 months (p = .007). There were no significant differences observed for any other outcome measure (p > 0.05).

CONCLUSION: The GLBP may be effective at improving weight and physical function measures in people with OA, but more research is warranted.

### 852 Board #86 May 29 3:30 PM - 5:00 PM The Effects of Modified Parkour Exercise on Arterial Health and Fitness Components in Elderly Individuals

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(No relevant relationships reported)

Aging is associated with declines in vascular and muscular functions. It is crucial to reduce the negative effects of aging on vascular and muscular health by implementing appropriate lifestyle interventions, such as exercise training. Modified Parkour Exercise (MPK) has been found to increase agility and balance in elderly individuals. However, the possibility of MPK improving vascular and muscular functions in the elderly is currently unknown.

**PURPOSE:** The purpose of this study was to examine the effects of a MPK regimen on blood pressure (BP), wave reflection (Alx), muscular strength and flexibility in elderly individuals. **METHODS:** Eighteen elderly individuals (age (69 ± 1 years); BP (126/78 mmHg) and body mass index (28.3 ± 1.6 kg/m2)) were randomized to either MPK (n=9) or no-exercise control group (n=9) for 8 weeks. MPK consisted of modified dynamic and static bodyweight exercises 3 x week. Training volume was progressed by increasing the number of exercises (2 to 5), sets and repetitions for dynamic exercises (3 to 4 sets and 20 repetitions) and duration for static exercises (30 s to 60 s). Modified Parkour movements were progressed by increasing their complexity. Supine BP, AIX, and heart rate (HR), 30s chair stands (CHAST) and sit and reach (SITNR) scores were measured at baseline and after 8 weeks.

**RESULTS:** There were significant group-bytime interactions (P < 0.05) for BP, AIX, CHAST and SITNR. There were significant decreases (P=0.05) in systolic BP (2.998, 40.566) = 4.826, p = .006). Bonferroni post hoc analyses indicated WT (p = .001), BMI (F(1,18) = 6.474, p = .010), and WC (F(1,18) = 4.826, p = .006). There were no significant differences observed for any other outcome measure (p > 0.05).

**CONCLUSIONS:** The attention does have low-to-moderate relationship with balance, attention; balance ability; elderly.

Note: * = p< .05.

**Conclusions:** The purpose of this study was to test the effects of a MPK regimen on blood pressure (BP), wave reflection (AIx), and balance and gait (POMA, Tinetti Index) and lower muscle strength (30-second Chair Stand) were assessed before and after 6 months of the experimental protocol. **RESULTS:** There were no significant differences compared to the CG. However, no statistically significant main effect was found for flexion, extension, external rotation and internal rotation. **CONCLUSIONS:** The GLBP may be effective at improving weight and physical function measures in people with OA, but more research is warranted.
Purpose: A decline in physical activity levels in older people is related with worsening of quality of life and a lower cardiorespiratory fitness level, which are associated with cardiovascular disease events and mortality from all causes. The aim of this study was to survey the level of self-reported physical activity in elderly people practicing different levels of physical activity program. An urban community of Sao Paulo was investigated. Methods: This was a community-based cross-sectional study of a cohort of 50 individuals aged 60 or over, participating in a 6-month structured physical exercise community program and a control group of 50 sedentary elderly individuals age-matched. The structured physical exercise community program adheres to the Position Stand of the American College of Sports Medicine, as it included combined aerobic exercise, muscle strengthening exercises, and flexibility exercises. Physical activity levels were evaluated using the International Physical Activity Questionnaire (IPAQ).

Results: The group participating in a physical exercise program had significantly higher levels of physical activity in the moderate activity (318.8 ± 561.8 vs. 238.5 ± 831.6 MET-min/wk, p < 0.001), vigorous (125.8 ± 245.7 vs. 66.2 ± 228.9 MET-min/wk, p < 0.002) and total activity (846.0 ± 951.1 vs. 691.0 ± 1239.1 MET-min/wk, p < 0.05). No differences between these groups were observed in walking activity (275.6 ± 289.8 vs. 320.1 ± 498.4 MET-min/wk, p = 0.6).

Conclusions: Our structured physical exercise community program proved effective in order to overcome the decline in physical activity levels in elderly population.

The associations between strength losses in lower limbs and functional limitations are high for older adults. It is necessary to know the effects of modalities such as power training (PT) and multicomponent training (MT) on muscle strength compared to traditional resistance training (TRT) in this population. Purpose: To investigate the effects of 20-weeks of PT, MT, and TRT using variable resistance (elastic bands with loops) on physical function in older women (OW). Methods: 136 sedentary OW (68.09 ± 4.78 yr) were randomized into PT (n=34), MT (n=34), TRT (n=34), and control groups (CG) (n=34). All exercise groups trained twice weekly for 20 weeks. PT performed 6 exercises, 3-4 sets of 10-12 repetitions, at a 4 rate of perceived exertion (RPE) in the first repetition and no more than 6 in the last. MT performed balance, muscular endurance (2 exercises, 3-4 sets of 15 repetitions at 7-9 RPE), aerobic, flexibility, and coordination exercises. The TRT performed 6 exercises, 3-4 sets of 6 repetitions at 7-9 RPE. Variables analyzed were static balance (Romberg), agility (Up & Go), gait speed (4m), muscle strength (30s chair stand), and aerobic capacity (6-minute walk test). Trial 2 by group (4) repeated measures ANOVA was used to determine differences regarding time and groups. Results: MT showed significant improvements (p<0.05; +56.8%) in static balance with significant differences between TRT and CG. PT showed significant improvements in all variables except static balance, with significant differences between MT and CG in muscle strength (PT: +29.20%; MT: +21.14%; CG: -2.69%), being the group with greatest improvements in 3 of 5 variables (agility: -14.26%; gait speed: -13.83%; muscle strength: +29.20%). PT, MT, and TRT showed significant improvements over time and between CG in agility, gait speed and aerobic capacity. No significant changes were observed for the CG. Conclusions: The improvements are effective in improving physical function in OW, although the PT program induces greater adaptations in lower limb muscle strength, gait speed, and agility, while MT had a larger influence on balance. The use of elastic bands with loops (CLX bands) can facilitate the application of these types of programs.
Changes in Fitness and Fatness Levels in Qatari Schoolboys Over the Last Decade

Pitre C. Bourdon, Christopher R. Brandner, Andrew R. Douglas, Mohammed Farooq, Saleh Al Marri, Esat Peltola, Nigel T. Cable. 1University of South Australia, Adelaide, Australia. 2Aspire Academy, Doha, Qatar. 3Aspetar - Orthopaedic and Sports Medicine Hospital, Doha, Qatar. 4University of Birmingham, Birmingham, United Kingdom.

PURPOSE: This study examined changes in anthropometric and cardiorespiratory fitness (CRF) characteristics of 26,325 Grade 6 (G6) schoolboys (11.0 - 12.9 yrs) living in the State of Qatar between 2003-2016. METHODS: Anthropometric measures included standing height (cm), body mass (kg) and body mass index (BMI, kg/m²). A multistage shuttle run test (MSRT, laps) was used to assess CRF. Comparisons between Qatari and non-Qatari boys were also conducted. RESULTS: The results showed a trend for decreasing CRF (less MSRT laps) and increasing fatness (higher BMI) across the study period, irrespective of nationality. Qatari students generally performed worse on the MSRT test and were fatter than their non-Qatari peers. Also, the Qatari students displayed bigger decreases in MSRT (10 vs 4 laps) and their body mass (2.5 vs 0.7 kg) and BMI (1.3 vs 0.6 kg/m²) increased more over the study period than their non-Qatari peers. Furthermore, the percentage of G6 schoolboys classified as overweight or obese increased over the study period for all nationalities, with Qatari boys showing a greater prevalence of overweight or obesity than their non-Qatari peers. For example, the percentage of Qatari boys classified as overweight or obese by Centers for Disease Control and Prevention (CDC) standards increased from an average of 40.1% between 2003-2006 to 49.3% between 2013-2016 while the average for non-Qatari boys increased from 32.6% to 39.9% for the same periods. CONCLUSIONS: These data support the need to establish a mechanism for the prevention and treatment of obesity and the development of physical activity strategies in the State of Qatar.

Participation in Physical Activity is Associated with Sexual Activity in Older English Adults

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Purpose: Physical activity (PA) is a potential modifiable correlate of the age-related decline in sexual function, but no studies have explicitly tested associations between PA and sexual activity. This study aimed to examine associations between PA, sedentary behaviour and sexual activity, problems and concerns in older adults.

Methods: A cross-sectional observational population study. Data were from the English Longitudinal Study of Ageing, a nationally representative sample of older men and women living in England. A total of 7,038 older men and women aged ≥50 years were included. PA and TV viewing time were self-reported. Sexual behaviour and concerns were assessed by validated self-completion questionnaire and analyses were weighted for non-response. Covariates included age, partnership status, socio-economic status, limiting long-standing illness, smoking status, alcohol intake and depressive symptoms. Adjusted logistic regression models were used to investigate associations between PA, sedentary behaviour and sexual activity, problems and concerns. Results: The odds of reporting any sexual activity were increased among individuals who participated in moderate (OR=1.64, 95%CI:1.24-2.15 in men, OR=1.21, 95%CI:0.97-1.52 in women) or vigorous (OR=2.06, 95%CI:1.50-2.84 in men, OR=1.42, 95%CI:1.09-1.85 in women) PA at least once a week. Erectile difficulties were less common among men who were active (OR=0.58, 95%CI:0.44-0.77 for vigorous PA). Results linking sedentary behaviour with sexual activity and function were less consistent, although women who watched ≥6 hours of TV/day had lower odds of thinking about sex frequently (OR=0.69, 95%CI:0.50-0.96) or, if they did not live with a partner, being sexually active (OR=0.40, 95%CI:0.22-0.72). Conclusions: Encouraging older adults to be more physically active could help to improve sexual relationships and, as a result, mental health and wellbeing.

Lower Aerobic Reserve is Associated with Poorer Physical Function in Community Dwelling Older Adults

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While age-related elevations in systemic inflammation may contribute to the accelerated loss of skeletal muscle mass, previous findings have been based on a limited number of biomarkers. Moreover, whether links between inflammation and muscle mass are independent of protein intake and habitual physical activity (PA) remain unknown. PURPOSE: The aim of the study was to explore links between skeletal muscle mass and inflammatory biomarkers in older women with different metabolic risk status, while accounting for adherence to guidelines on protein intake and PA.

Methods: Skeletal muscle mass index (SMI) was assessed in 112 women (67±1.5 years) by bioelectrical impedance together with the equation of Janssen et al. (2002) to obtain muscle mass expressed in relation to body weight. Fasting blood samples were obtained following standardized protocols. Acute-phase proteins C-reactive protein (CRP) and fibrinogen were determined, together with the following inflammatory biomarkers: Adiponectin, Oncostatin-M (OSM), Leukemia inhibitory factor-receptor (LIF-R), Interleukin-6 (IL-6), IL-8, IL-12, and IL-18. Protein intake and PA were determined during 6 days by food record and accelerometry, respectively. Classification of metabolic risk status was based on the metabolic syndrome. Multivariate regression models were used to explore links between SMI and inflammatory biomarkers while adjusting for adherence to PA and protein intake guidelines and metabolic risk status. RESULTS: Variations in SMI were inversely linked to levels of CRP (β-coefficient: -0.47; p< 0.05) and OSM (0.20 p< 0.05), whereas the OSM value was attenuated after further adjustment for PA. In contrast, positive links between SMI and adiponectin (0.19 p< 0.05) and LIF-R (0.24 p< 0.05) were observed, which both remained significant in fully adjusted models. Links to other biomarkers were not significant. CONCLUSIONS: Several inflammatory markers are linked to skeletal muscle mass in older adults, whereas detrimental or beneficial actions are indicated depending on the
bimarker. While adherence to PA guidelines moderates some of these links, others seem unaffected by either PA and protein intake or metabolic risk status. Further research is needed to elucidate mechanisms underlying these observations.

B-58 Free Communication/Poster - Physical Activity and Health I
Wednesday, May 29, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

The Relationship between Physical Activity and Physical Performance and Cognitive Abilities in the Chinese Elderly
Liu Ruidong, Chen Congming, Cao Chunmei. Tsinghua university, BEIJING, China. Email: 76369086@qq.com

PURPOSE: Decreased physical and cognitive ability have become seriously problematic in aging. Studies seldom describe the relationship between physical activity (PA), physical performance and cognitive abilities, most of which by measuring one or two specific abilities using questionnaires. The study was thus designed to examine the relationship between PA and physical performance and multiple cognitive abilities in the Chinese elderly.

METHODS: The design was a cross-sectional study. 148 people aged 65.15±7.79 were included from Guangxi Province in southern China. PA was measured by the Physical Activity Scale for the Elderly (PASE, Cronbach’s α=0.752; Test-retest reliability=0.980). Physical performance included coordination and lower limb strength, functional walking ability and the balance ability. Cognitive abilities were measured by computer-based tests, including simple reaction time and executive function (strop task and shifting task). The association between PA and the outcomes were examined using correlation matrix and linear regression.

RESULTS: 1) The average time spent on physical activity was 1.8h/d; 2) High levels of PA significantly associated with better gait speed (β=0.67, p<0.05), 30-a chair-stand test (β=0.72, p<0.05) and reaction abilities (β=0.89, p=0.05); 3) The gait speed significantly correlated with the accuracy of strop task (r=0.23, p=0.018) and shifting task (r=0.21, p=0.023), grip strength significantly correlated with the accuracy and the reaction time of the strop task (r=0.19, p=0.04 & r=0.19, p=0.04). However, other physical performance outcomes had no significant correlation with the cognitive abilities.

CONCLUSIONS: More physically active residents scored higher on physical performance outcomes. Positive associations were found between physical performance, executive function and reaction ability.

863 Board #97 May 29 2:00 PM - 3:30 PM
The Relationship between Physical Activity and Physical Performance and Cognitive Abilities in the Chinese Elderly
Liu Ruidong, Chen Congming, Cao Chunmei. Tsinghua university, BEIJING, China. Email: 76369086@qq.com

864 Board #98 May 29 2:00 PM - 3:30 PM
Cardiorespiratory Fitness and Body Mass Index with Gastroesophageal Reflux Disease in Older Adults
Joey M. Saavedra, Angélique Brellenthin, Duck-Chul Lee, FACSM. Iowa State University, Ames, IA. (Sponsor: Dr. DC-Lee, FACSM)
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Purpose: To examine the associations of cardiorespiratory fitness (CRF) and body mass index (BMI) with prevalence of Gastroesophageal Reflux Disease (GERD) in older adults.

Methods: This cross-sectional study included 566 older adults (57% women; 72 years old) who were without heart attack, stroke, or cancer in the past 5 years. CRF was assessed via a 400-meter walk test and the minutes to complete the test were divided into six-sex-specific quartiles (fourths). Participants were categorized into normal weight (<25 kg/m2), overweight (25-29 kg/m2), and obese (≥30 kg/m2) BMI groups. GERD cases were identified via self-report on a medical history questionnaire. Logistic regression was used to calculate the odds ratios (ORs) and 95% confidence intervals (CIs) of GERD among CRF quartiles and BMI groups while adjusting for sex, age, smoking, heavy alcohol consumption, meeting walking guidelines based on ≥7,500 steps/day, and BMI (in CRF analyses) or CRF (in BMI analyses).

Results: Of the 566 adults, there were 123 (22%) GERD cases. Compared with the first quartile of CRF (least fit), the ORs (95% CIs) of having GERD were 0.70 (0.40-1.22), 0.65 (0.37-1.16), and 0.46 (0.25-0.87) among those in the second, third, and fourth (fittest) quartiles of CRF, respectively, after adjusting for all confounders except BMI. However, these associations were not significant after adjusting for BMI. Compared with the normal weight group, the ORs (95% CIs) of having GERD were 2.67 (1.51-4.72) and 4.32 (2.30-8.09) among the overweight and obese groups, respectively, after adjusting for all confounders including CRF. In a joint analysis, compared with the unfit (first quartile of CRF) and obese, ORs (95% CIs) were 0.13 (0.03-0.48), 0.41 (0.17-0.96) and 0.17 (0.08-0.36), 0.44 (0.23-0.85), and 0.53 (0.26-1.07) for the unfit-normal weight, unfit-overweight, fit-normal weight, fit-overweight, and fit-obese, respectively, after adjusting for all confounders.

Conclusions: Although both CRF and BMI appears to be associated with GERD in this sample of older adults, BMI was found to be more strongly associated with GERD independent of CRF. Among obese individuals, having high CRF may be associated with lower odds of GERD, but more research is warranted.

Unsupported by unrestricted research grant by Biospace.

P209 Board #99 May 29 2:00 PM - 3:30 PM
Longitudinal Stability of Exercise Behavior Across Exercise Domains
Matthijs D. van der Zee, Denise van der Me, Meike Bartels, Eco J.C. de Geus. Vrije Universiteit Amsterdam, Amsterdam, Netherlands. Email: m.d.vander.ze@vu.nl

PURPOSE: Many previous studies that have assessed the tracking of leisure time exercise behavior focused on various parts of the life span, and have treated exercise behavior as a uniform construct. This study provides novel insight by assessing the longitudinal tracking of exercise in six different domains: (1)2 team-based versus solitary activities, (3) a competitive versus non-competitive, and (5) externally paced versus internally paced activities across the life-span (8-80 years).

METHODS: From the Netherlands Twin Register (NTR) all subjects with longitudinal exercise data were selected (N = 43,889) and used to analyse the tracking of exercise behavior over time. With this dataset, we were able to examine tracking as a function of baseline age (8 to 80 years) and tracking duration (2 to 22 year follow-up), taking into account sex differences using generalized estimating equations.

RESULTS: Two-year tracking coefficients for total volume of exercise across age at baseline, ranging from .38 to .77 with a median of .57. Tracking coefficients tend to decrease as the distance to follow-up increases, down to a median of .38 for the 22-year tracking coefficients. The patterns of tracking were largely similar for solitary, competitive, non-competitive, externally and internally paced activities. With the exception of team-based activities, tracking was seen to increase as a function of baseline age.

CONCLUSIONS: We conclude that exercise is moderate to highly stable across the lifespan, especially in late adulthood the tracking of exercise is high. This stability reinforces the existing evidence that exercise habits may be hard to change, but simultaneously suggests that successful intervention can lead to life-long habits.

Supported by unrestricted research grant by Biospace.

866 Board #100 May 29 2:00 PM - 3:30 PM
Parasympathetic Nervous Regulation and Prevalence of Lifestyle-related Diseases In Japanese: Waseda’s Health Study
Masayuki Konishi1, Susumu S. Sawada, FACSM1, Ryoko Kawakami1, Kunpei Tanisawa2, Hiroki Tabata3, Nobuhiro Nakamura3, Hyeon-Ki Kim4, Tomoko Ito5, Mitsuru Higuchi, FACSM1, Katshihiko Suzuki1, Suguru Torii1, I-Min Lee, FACSM1, Steven N. Blair, FACSM1, Koichiro Oka, Shizuo Sakamoto1. Waseda University, Saitama, Japan. 3National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan. 4Harvard Medical School, Boston, MA. 5University of South Carolina, Columbia, SC. Email: m.konishi@aoni.waseda.jp

PURPOSE: Limited data are available on the relationship of parasympathetic nervous regulation with the prevalence of lifestyle-related diseases in Japanese men and women. We conducted a cross-sectional study to investigate the relationship between diving reflex (DR) and heart rate recovery after exercise (HRR) - markers of parasympathetic nervous regulation - with the prevalence of hypertension, diabetes, and dyslipidemia among Japanese men and women in WASEDA’S Health Study.

METHODS: WASEDA’S Health Study is a cohort study which was launched in 2014. We used data collected at baseline in this study. Participants were 193 Japanese men [median (IQR) age 57 (48-67) years] and 81 women [median (IQR) age 52 (44-58) years] who completed a medical examination, maximal exercise test, and diving reflex test. The participants were divided into tertiles based on DR indexes and HRR indexes. DR indexes were the peak value of the R-R interval during the test (R-Rmax), the relative difference between the baseline and peak response due to the test (R-Rchange), and the latency of DR (Latency). Also, HRR indexes were defined as the reduction in parasympathetic nervous regulation with the prevalence of lifestyle-related diseases in Japanese men and women.

RESULTS: In this sample of older adults, BMI was found to be more strongly associated with GERD independent of CRF. Among obese individuals, having high CRF may be associated with lower odds of GERD, but more research is warranted.
intervals for the prevalence of lifestyle-related diseases were obtained using logistic regression models while adjusting for sex, age, body mass index, physical activity, family history of lifestyle related diseases, cigarette smoking, and alcohol intake. 

**RESULTS:** 119 participants had hypertension, 17 had diabetes, and 125 had dyslipidemia. Using the lowest DR indexes and HRR indexes as reference, we calculated odds ratios and 95% confidence intervals for the outcomes if interests. We found statistically significant dose-response relationships between R-Rmax and diabetes (P for trend = 0.016) as well as R-Rchange and diabetes (P for trend = 0.010). There was also a statistically significant dose-response relationship between Latency and dyslipidemia (P for trend = 0.013) and HRR3 and hypertension (P for trend = 0.047).

**CONCLUSIONS:** In cross-sectional analysis, the data suggest diving reflex may be promoted in order to provide cardioprotective effects. MVPA leading to higher fitness levels should be encouraged to improve cardiometabolic risk factors compared to physical activity. MVPA leading to higher fitness levels should be promoted in order to provide cardioprotective effects.

**Board #103 May 29 2:00 PM - 3:30 PM Sedentary Behavior in Cardiac Patients**

**Esmée A. Bakker**, Bram MA van Bakel1, Esther P. Meindersma1, Wim RM Aengevaren1, Maria TE Hopman1, FACSM1, Dick HJ Thijssen1, Thijis MH Eijsvogels1, Radboud university medical centre, Nijmegen, Netherlands. 2Rijnstate Hospital, Arnhem, Netherlands. 3Finnish Defence Forces, Helsinki, Finland. 4University of Jyväskylä, Helsinki, Finland.

**PURPOSE:** To examine the amount of self-reported SB among cardiac patients and whether SB changes following completion of a supervised CR program, and 2) characteristics of cardiac patients with high levels (≥8 hrs per day) of SB.

**METHODS:** To investigate aim 1, cardiac patients (n=84) were included upon enrolment of a Dutch CR program with supervised exercise training sessions. SB was objectively assessed during 7 consecutive days using the Acti6PaD3 micro. Data were collected at baseline, directly after and 2-3 months after completion of the CR program. For aim 2, characteristics of cardiac patients with high SB were compared to patients with lower levels of SB.

**RESULTS:** After adjusting for age and smoking, LIPA was associated with insulin (β=0.14, p<0.005), whereas MVPA was associated with HDL (β=−0.13, p<0.05). Aerobic fitness was inversely associated with blood pressure and serum lipids (β=−0.15 to −0.42, p<0.005), excluding HDL, which was positively associated with aerobic fitness (β=0.32, p<0.001). Muscular fitness was inversely associated with diastolic blood pressure, serum lipids and insulin (β=−0.10 – −0.26, p<0.05), and positively with HDL (β=0.20 p<0.001).

**CONCLUSIONS:** MVPA was positively related only to HDL concentration, whereas physical fitness was related to higher cardiometabolic risk factors. These findings emphasize the stronger relationship of physical fitness to cardiometabolic risk factors compared to physical activity. MVPA leading to higher fitness levels should be promoted in order to provide cardioprotective effects.

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Previous studies have shown that physical fitness is more strongly associated with cardiometabolic health outcomes than self-reported physical activity (PA). However, objectively measured PA may offer more precision in defining PA than self-report methods. Therefore it is of interest to determine associations of objectively measured PA with cardiometabolic risk factors.

**PURPOSE:** To assess associations of objectively measured PA, as well as aerobic and muscular fitness, with cardiometabolic risk factors.

**METHODS:** 415 young healthy adult men (28±6 yrs.) participated in the study. PA was measured with a tri-axial accelerometer (Hookie Am 20). Tramzeet Ltd, Espoo, Finland) to assess light intensity (LIPA, 1.5-2.9 METs) and moderate-vigorous (MVPA, ≥3.0 METs). PA physical fitness was measured with 1-min push-ups and sit-ups (reps/min) and standing long jump tests. In addition, maximal isometric force of the leg and arm extensors was measured. All muscular fitness results were converted into a muscular fitness index (z-score). Cardiorespiratory fitness (VO2max) was determined using an indirect graded cycle ergometer test until exhaustion. In addition, blood pressure was measured and blood samples were drawn after an overnight fast. The analyzed cardiometabolic risk factors consisted of serum lipids (total cholesterol, LDL, HDL, triglycerides) and plasma glucose, insulin and HbA1C.

**RESULTS:** After adjustments for age and smoking, LIPA was associated with insulin (β=0.14, p<0.005), whereas MVPA was associated with HDL (β=−0.13, p<0.05). Aerobic fitness was inversely associated with blood pressure and serum lipids (β=−0.15 to −0.42, p<0.005), excluding HDL, which was positively associated with aerobic fitness (β=0.32, p<0.001). Muscular fitness was inversely associated with diastolic blood pressure, serum lipids and insulin (β=−0.10 – −0.26, p<0.05), and positively with HDL (β=0.20 p<0.001).

**CONCLUSIONS:** MVPA was positively related only to HDL concentration, whereas physical fitness was related to higher cardiometabolic risk factors. These findings emphasize the stronger relationship of physical fitness to cardiometabolic risk factors compared to physical activity. MVPA leading to higher fitness levels should be promoted in order to provide cardioprotective effects.
CONCLUSION: Data on the relationship between self-reported and measured height, weight, and BMI values is sparse and limited. In this study, students were found to have poorer health, as indicated by lower aerobic fitness in and higher abdominal girth and BMI (p ≤ .015) and BMI (p ≤ .015).

Participants were divided into quartiles based on cardiorespiratory fitness and classified as high (≥ 85% of reference), moderate (76-84% of reference), low (68-75% of reference), and very low (≤ 67% of reference). The prevalence of hypertension, diabetes, and dyslipidemia was calculated for each quartile and compared to the prevalence in the reference group.

CONCLUSIONS: This study provides evidence for the association between muscle strength and BMI category. The results support the idea that BMI misclassification is more common among women than among men. The implications of this finding are significant, as it may lead to inaccurate classification of body composition and health outcomes. Understanding the relationship between muscle strength and BMI category is essential for the development of effective interventions to improve health outcomes and reduce the risk of chronic diseases.
unclear, especially among Chinese children. This study aimed to investigate the association of active commuting with sport time and outdoor play time in Chinese schoolchildren.

**METHODS:** A total of 441 children (49.7% boys, mean age = 8.3 ± 0.9 years) in grades 1 to 3 from four primary schools in Beijing participated in this study. Information of children’s walking trips, daily sport time, and daily outdoor play time was reported by parents using the modified Chinese version of the children’s leisure activities survey study. Children were categorized as either active (> 6 walking trips per week) or passive commuters (< 6 walking trips per week) based on the parent-reported number of trips walking to and from school. Children reported their own sex, age, and exercise self-efficacy. Children’s body weight and height were measured by researchers to calculate body mass index (BMI). Differences of daily sport time and outdoor play time between active vs. passive commuters were examined by the analysis of covariance (ANCOVA) adjusting for children’s age, BMI, and exercise self-efficacy. ANCOVA were conducted separately for boys and girls.

**RESULTS:** 42.7% of boys and 40.3% of girls were classified as active commuters. In boys, no difference was found for daily sport time between active and passive commuters (62.0 ± 46.7 min/day vs. 55.4 ± 41.4 min/day, P = 0.266), whereas active commuters had more time of outdoor play than passive commuters (194.8 ± 122.4 min/day vs. 153.7 ± 122.3 min/day, P = 0.041). For girls, neither daily sport time (64.1 ± 37.7 min/day vs. 54.1 ± 43.9 min/day, P = 0.110) nor daily outdoor play time (146.3 ± 129.6 min/day vs. 178.5 ± 141.4 min/day, P = 0.156) differed between active and passive commuters.

**CONCLUSIONS:** Boys who actively commute to school have higher levels of outdoor play time. Promoting active commuting may increase levels of physical activity in Chinese schoolchildren.

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**Board #109 May 29 2:00 PM - 3:30 PM Handgrip Strength and Congestive Heart Failure in Aging Adults: Getting a Grip on Heart Health**

Ryan McGrath¹, Duck-Chul Lee, FACSM², William Kraemer, FACSM¹, Brenda Vincent³, Donna J. Terbizon, FACSM¹. ¹North Dakota State University, Fargo, ND. ²Iowa State University, Ames, IA. ³The Ohio State University, Columbus, OH. ¹VA Ann Arbor Healthcare System, Ann Arbor, MI.

Handgrip strength is a powerful biomarker of aging that is linked to a variety of health conditions; however, it is not well understood how handgrip weakness factors into certain cardiovascular diseases such as congestive heart failure (CHF). **PURPOSE:** To determine the association between handgrip weakness on time to CHF for aging adults in the United States. **METHODS:** A discrete sample of 12,658 adults aged at least 50 years (age: 68.0±10.2 years at baseline) who participated in at least one wave of the 2006-2014 waves of the Health and Retirement Study were included. Interviews were conducted on participants biennially. Healthcare provider diagnosed CHF was self-reported at each wave. A spring-type hand-held dynamometer assessed maximal handgrip strength. Age- and race-specific maximal handgrip strength cut-points were used for determining weakness (Black men: ≤40-kilograms, Black women: <31-kilograms, White men: <35-kilograms, White women: <22-kilograms). A Cox proportional hazard regression model examined the association between handgrip weakness and time to CHF. Sex, race, age, body mass index, current smoking status, history, self-rated health, diabetes status, and previously reported heart conditions aside from CHF were controlled for in the analyses. **RESULTS:** For those included, 4,141 (32.7%) were weak and 252 (2.0%) developed CHF during the mean follow-up of 5.6±4.5 years. The covariate-adjusted Cox model revealed that those who were weak had a 35% higher hazard of CHF (hazard ratio: 1.35; 95% confidence interval: 1.02, 1.70), relative to those who were not-weak. **CONCLUSIONS:** Our findings suggest that handgrip weakness was associated with an increased risk of incident CHF for aging adults in the United States. Measures of handgrip strength should become more commonplace in clinical settings for assessing age-related weakness and risk for poorly clinically-relevant health outcomes such as CHF. Similarly, interventions aiming to prevent or treat CHF in aging adults should incorporate measures of handgrip strength. Engaging in muscle strengthening activities and behaviors earlier in life may help to preserve strength and lower risk for CHF during aging.

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**Association Between Grip Strength and Diabetes Prevalence in 45- to 60-Year Old Chinese Men**

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Several studies showed that grip strength is related to cardiovascular risk factors, but few on the relationship between grip strength and prevalence of diabetes, especially for Chinese people.

**PURPOSE:** To explore the associations between grip strength and fasting blood glucose of diabetes and diabetes prevalence in 45- to 60-year old Chinese men.

**METHODS:** All the subjects were recruited from three health management centers of hospitals in China, they finished the basic medical examination and grip strength test and VO₂max test. Diabetes was assessed by physical diagnosis or fasting blood glucose. Grip strength was tested in dominant hand, and VO₂max was measured by YMCA cycle test.

**RESULTS:** 1) There are 800 men recruited in this study, 82 of them are diabetes, the prevalence of diabetes is 10.25%. 2) The grip strength of diabetes patients is lower than that of other people [35.50±6.96] kg vs. 37.26±7.40] kg, P < 0.05), and the VO₂max is lower than that of other people [35.17±7.86] mL/kg/min vs. 32.72±6.06] mL/kg/min, P<0.05]. 3) In all men, the grip strength is negatively correlated with fasting blood glucose (r = -0.10, P < 0.05). In diabetes men, the grip strength is also negatively correlated with fasting blood glucose (r = -0.21, P < 0.05), after adjusted the age and BMI, the relationship is still significant (r = -0.233, P < 0.05). 4) If 5 kg increase in grip strength, the fasting blood glucose of diabetes men can decrease 1.165 mmol/L, and the prevalence of diabetes men will decrease 36.22%.

**CONCLUSIONS:** 1) The grip strength of diabetes men is related to fasting blood glucose; improving the grip strength can improve the blood glucose level of diabetes men and reduce the prevalence of diabetes. 2) Fasting blood glucose is negatively correlated with grip strength in men, which indicated that grip strength, a simple test index, could be as a predictor of diabetes in men. Supported by China Health Promotion Foundation CHFP2014-FITEX
PURPOSE: To investigate whether or not CRF mediates the relationship of comorbidities with health-related quality of life (HRQoL) in a representative sample of Korean older adults.

METHODS: Data from a total of 7,350 Korean older adults aged ≥60 years (58% women) who participated in the 2008-2011 Korean National Health and Nutritional Examination Survey were used in this analysis. HRQoL was assessed with the EuroQoL-5 dimensions (EQ-5D) index and EuroQoL visual analogue scale (EQ-VAS). Comorbidity was defined as physician-diagnosed chronic conditions. CRF was estimated with a non-exercise regression equation derived from sex, age, body mass index, and self-reported physical activity. The SPSS macro provided by Preacher and Hayes was used to test whether CRF mediated the relationship between comorbidity and HRQoL at statistical significance of p<0.05.

RESULTS: The total effect of the presence of comorbidities on HRQoL was significant (path c: β=3.091, p<0.001). The presence of comorbidities was negatively related to eCRF in HRQoL model (path a: β=-0.403, p<0.001). As illustrated in Fig.1, the effect of eCRF as a mediator on HRQoL was also significant (path b: β=1.574, p<0.001). The mediation analysis using the bootstrapping method (5,000 resamples) showed that eCRF mediated the relationship between the presence of comorbidities and HRQoL in Korean older adults (path a * b: β=0.635, 95% CI=0.746 - 0.524, Sobel test Z=11.029, p<0.001). In addition, a direct effect of the presence of comorbidities on HRQoL was also significant (path c': β=2.456, p<0.001).

CONCLUSIONS: The current findings suggest that CRF mediates the relationship between comorbidities and HRQoL in Korean older adults.

Supported by the National Research Foundation funded by the Korean Government (NRF-2018R1D1A1B07048153 and NRF-2016R1A6A3A11932432).

Fig. 1 The estimation of the direct and indirect effect of CRF on health-related quality of life.
were more physically active (aOR = 1.43, 95% CI: 1.36-1.50), and girls were less sedentary (aOR = 1.29, 95% CI: 1.24-1.34). The prevalence of PA, SED, or both all declined as age increased (p < 0.005). **CONCLUSIONS:** Very few children and adolescents showed active lifestyles, and this was significantly related to age. Effective interventions aiming to promote PA and concurrently to limit SED among children and adolescents should be implemented as early as possible.

**Board #115**  
May 29 2:00 PM - 3:30 PM  
**Association Of Cardiovascular Health Trajectories And Cardiorespiratory Fitness: The Cardia Study**  
Brittany S. Pope1, Jonathan J. Ruiz-Ramírez1, Jacob L. Barber2, Abbi D. Lane-Cordova2, Donald M. Lloyd-Jones1, Mercedes Carnethon2, Cora E. Lewis3, Pamela J. Schreiner4, Michael P. Bancks5, Stephen Sidney6, Mark A. Sarzynski7, FACSM8,  
1University of South Carolina, Columbia, SC.  2Northwestern University, Chicago, IL.  3University of Alabama at Birmingham, Birmingham, AL.  4University of Minnesota, Minneapolis, MN.  5Wake Forest University, Winston-Salem, NC.  6Kaiser Permanente Northern California, Oakland, CA.  7No relevant relationships reported

Ideal cardiovascular health (CVH) is a composite metric of seven health factors and behaviors. How cardiorespiratory fitness (CRF) is related to CVH is unclear. **Purpose:** To identify associations of CVH trajectories throughout adulthood with CRF in late-middle age. **Methods:** CVH components were measured in Black and White adults (N=2723, aged 18-30 yrs at baseline) in the CARDIA Study at seven in-person examinations over 20 years. Graded treadmill tests at years 0 and 20 were used to measure CRF (minutes duration). CVH was determined by assigning each metric a score of 2 (ideal), 1 (intermediate), or 0 (poor) and summing the scores (range 0-14). Latent class modeling was used to identify subgroups of individuals with similar CVH trajectories from young adulthood to middle age. Multivariable logistic Poisson regression was used to assess the association between 20-year CVH trajectories and race- and sex-specific quartiles of CRF at year 20. **Results:** Five distinct CVH trajectories were identified: high (n=485), high-moderate (n=666), moderate (n=805), low-moderate (n=663), and low (n=164). Compared to the high trajectory group, odd ratios for low fitness (bottom quartile) at year 20 were 3.2 (95% CI: 1.9-5.2) for high-low-moderate (n=603), and low (n=164). Compared to the high trajectory group, odds ratios for low fitness (bottom quartile) at year 20 were 3.2 (95% CI: 1.9-5.2) for high-moderate, 6.6 (4.1-10.7) for moderate, 9.7 (6.1-16.4) for low-moderate, and 14.0 (8.2-24.0) for the low CVH trajectory groups after adjusting for race, sex, examination, center, baseline CVH, and baseline CRF. **Conclusion:** Lower CVH trajectories throughout adulthood are associated with higher odds of low CRF in late-middle age.

**Board #116**  
May 29 2:00 PM - 3:30 PM  
**A Prospective Cohort Study of Physical Fitness and Incident Glaucoma: The Niigata Wellness Study**  
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There is limited evidence exploring the association between cardiorespiratory fitness and the incidence of glaucoma. However, associations between other components of fitness and incident glaucoma are still unknown. **Purpose:** To investigate the association between muscular and performance fitness and the incidence of glaucoma among Japanese workers in the Niigata Wellness Study. **Methods:** Participants included 26,183 workers (18,129 men) [median (interquartile range) age 50 (44-56) years] free of glaucoma who underwent physical examinations over 20 years. Graded treadmill tests at years 0 and 20 were used to measure CRF. CVH was determined by assigning each metric a score of 2 (ideal), 1 (intermediate), or 0 (poor) and summing the scores (range 0-14). AS was derived from carotid-femoral pulse wave velocity (cPWV), AtCor Sphygmocor XCEL). High AS was defined as cfPWV >10 m/s, which is an established threshold for cardiovascular disease. **Results:** Five distinct CVH trajectories were identified: high (n=485), high-moderate (n=666), moderate (n=805), low-moderate (n=663), and low (n=164). Compared to the high trajectory group, odd ratios for low fitness (bottom quartile) at year 20 were 3.2 (95% CI: 1.9-5.2) for high-moderate, 6.6 (4.1-10.7) for moderate, 9.7 (6.1-16.4) for low-moderate, and 14.0 (8.2-24.0) for the low CVH trajectory groups after adjusting for race, sex, education, center, baseline CVH, and baseline CRF. **Conclusion:** Lower CVH trajectories throughout adulthood are associated with higher odds of low CRF in late-middle age.

**Board #117**  
May 29 2:00 PM - 3:30 PM  
**Effects of Arterial Stiffness Between Objectively Measured Physical Activity and Domain-Specific Cognition in Older Adults**  
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(No relevant relationships reported)

**Purpose:** To examine the effects of arterial stiffness (AS) on the associations between objectively measured physical activity (PA) and domain-specific cognitive functioning in older adults. **Methods:** This cross-sectional analysis included baseline data from 415 older adults enrolled in the Physical Activity and Aging Study (PAAS). Cognitive functioning was measured by working memory using Digit Span Test and selective attention and processing speed using computerized Stroop Test. PA over 7 days was measured with Omron accelerometer-based pedometers and time engaged in light-, moderate-, and vigorous-intensity PA with FitBit Charge 2 wristbands. AS was derived from carotid-femoral pulse wave velocity (cPWV), AtCor Sphygmocor XCEL). High AS was defined as cPWV >10 m/s, which is an established risk factor of cardiovascular diseases. Multivariable linear regression was used to model the associations between PA, AS, and each cognitive-domain score. **Results:** Participants were a mean age of 72 (±6) years old and were well educated with 82% having a bachelor’s degree or higher. Participants were also cognitively healthy (Mean Score of Mini-Mental State Examination 29.2 [±1.29] out of 30). Participants with high AS (20.96%), n=87) accumulated fewer total steps per day (p=0.01), engaged in less light-intensity PA (p=0.01), and had worse precision on the Stroop test (p<0.01) compared to those with low AS. There were no significant group differences for other cognitive test scores. Light-intensity PA was associated with better performance on the digit span forward among those with high AS (p=0.01), but not those with low AS, after adjusting for age, sex, education, diabetes, hypertension, and current smoking status (p=0.01) from linear regression. However, no significant results were found in other PA variables regardless of AS status. **Conclusions:** These results suggest a possible association of increased light-intensity PA with better working memory, particularly among older adults with high AS who are at higher risk of developing cardiovascular diseases. Supported by unrestricted research grant by Biospace

**Board #118**  
May 29 2:00 PM - 3:30 PM  
**Benefits of Behavior: Exercise Enhances Perception of Physical Function Independent of Improvement Among Diabetic Patients**  
Shabnam A. Behin1, Cynthia Villalobos1, Nathaniel J. Holmgren1, Alexis C. King1, J. Mark VanVelders1, Paul D. Vosti1, Courtney D. Jensen1,  
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In the U.S., approximately 1.5 million new cases of diabetes arise each year. Although these patients commonly report lower quality of life (QOL) than those without chronic illness, much of the literature remains focused on the physical benefits of weight loss and blood glucose management. To deliver individualized care, practitioners must also evaluate psychological health, including patient perceptions. **Purpose:** To determine factors that affect perception of physical function in diabetic patients. **Methods:** 38 men and women with diabetes completed a 10-week, 20-exercise program that included both aerobic and resistance training components. At baseline and follow-up, we measured body fat percent (BF%), body mass index (BMI), and performance on
six standard functional tests. Subjects also completed a self-report QOL questionnaire in which perception of physical function was assessed. Linear regressions tested the effect of functional performance (baseline capability and 10-week change) on perception of function. RESULTS: Patients were 67.9±9.1 years of age, mean BMI was 31.5±6.1, and self-reported physical functioning ranged from 5.0 (very poor) to 100.0 (optimal); mean score was 54.7±26.8. At baseline, perception of physical functioning was not related to sex (r=0.73), age (r=0.405), BMI (r=0.610), or BE% (r=0.864). It was related to improved performances in six-minute walk (r=0.001), functional reach (r=0.046), timed up-and-go (r=0.080), chair stand (r=0.006), and sit-and-reach (r=0.024). At follow-up, perceptions of functioning improved by 13.8±24.5 points (25.7%; p<0.002) but there was no association with improvement in any anthropometric or functional tests: BMI (r=0.457), BE% (r=0.526), six-minute walk (r=0.131), functional reach (r=0.293), timed up-and-go (r=0.226), arm curl (r=0.966), chair stand (r=0.592), and sit-and-reach (r=0.001). CONCLUSION: 10 weeks of exercise improved perception of physical function by more than 25% in patients with diabetes. Improvement was unrelated to enhancement of any anthropometric or performance domain. Patients with diabetes seem to improve their perceptions via participation rather than progress. Thus, it may be important to incorporate the behavior of exercise into treatments, even if it fails to elicit physical improvement.

RESULTS: Participants on the OW-LF CRF group were more likely to have normal biomarkers compared to the OB-LF CRF group. Lower (LF) CRF on blood lipids and glycemic markers. We hypothesized that an OW-HF CRF group would have better glycemic control compared to the OB-LF CRF group. METHODS: To evaluate the effects of sedentary behavior and physical activity on BMI and biomarker concentrations, participants were recruited from 114 young children (71 boys) aged 3-6 years were recruited from a federal nursery feeding program. Baseline and follow-up data were collected. RESULTS: There were no significant differences in SB and PA between postural conditions. For the overall sample, there were no linear or quadratic trends found in the weighted mean of percentage by age and gender; (4) Obese (i.e., BMI ≥ 95th percentile by age and gender); (2) Overweight (i.e., 85th percentile ≤ BMI < 95th percentile by age and gender); (3) Normal weight (i.e., 5th ≤ percentile BMI ≤ 85th percentile by age and gender); and (4) Underweight (i.e., BMI < 5th percentile by age and gender). SAS (v. 9.3) and Stata (v. 12) were used to examine the temporal trends of physical activity among US high school students. Tests for trend over the years were performed using linear and quadratic-specific orthogonal polynomial coefficients. RESULTS: For the overall sample, there were no significant differences in self-reported physical activity from 2011 to 2017 (β = .15, p = .03). No significant cross-stratified differences were found for BMI or CRF among adults.
outcomes were presented in relative values (e.g., PA/waking hour). Linear mixed models were performed to determine the associations of nighttime sleep duration with PA, ST, and sit-to-stand transitions the following days, adjusting for age, sex, body weight status, parental educational attainment, and number of wear days. The repeated outcomes of sleep duration and activity patterns the following day nested within participants were treated as random effect.

RESULTS: Seventy children provided valid data of PA, ST, and sleep. On average, the children accumulated approximately 8.3 hours of PA, 1.8 hours of ST, and 9.72 hours of sleep (SD 0.97). Sleep duration in the preceding night was positively associated with daytime PA (β = 0.007; 95% CI, 0.002 to 0.012; p < 0.011) and sit-to-stand transitions (β = 0.573; 95% CI, 0.336 to 0.810; p < 0.001), while was negatively associated with ST (β = −0.016; 95% CI, −0.028 to −0.004; p = 0.008) the following day.

CONCLUSIONS: Longer nocturnal sleep duration was associated with more PA, frequent posture transitions, and less sitting time in the following day for preschool children. More work is needed to investigate how sleep parameters other than duration affect daytime activity behaviors.

This study was supported by Health and Medical Research Fund Research Fellowship Scheme from Food and Health Bureau of the Government of the Hong Kong Special Administrative Region of the PRC (#20160127).

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Board #124 May 29 2:00 PM - 3:30 PM
Diurnal and Circannual Variation in Body Temperature: Implications for Heat Illness Protocols

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As warm-season temperatures continue to rise, the incidence of heat illness is likely to increase. Although preventive protocols currently consider environmental risk factors, there may be reason to emphasize diurnal and seasonal effects. Data supporting seasonal fluctuation in body temperature are abundant in animals but limited in humans. PURPOSE: To examine circannual and diurnal patterns of body temperature in a patient population.

METHODS: We analyzed 2,184 men and women admitted to a major hospital in Indiana over 3 years. Demographic, anthropometric, and cardiometabolic variables were collected along with body temperature, month, and year of admission. The National Centers for Environmental Information’s National Climate Report was used to generate monthly and seasonal temperature data; there were clearly defined cold (October through April) and warm (May through September) periods. All patients received oral temperatures. We used t-tests and ANOVAs to detect differences in

body temperature by time conditions; we used linear regression to test the effect of chronological variables on body temperature, holding all measured confounders constant. RESULTS: Mean body temperature was 98.16 ± 0.75°F. The warmest period of the day was 6:00 to 10:00pm (98.27°F). The coldest period was 2:00 to 6:00am (98.05°F; p < 0.001). ANOVA revealed differences in body temperature by month (F = 2.525; p = 0.004) and by season (F = 3.656; p = 0.012). The strongest comparison was the cold vs. warm period (T = 3.835; p < 0.001). Patients admitted during the cold period (N = 1,139) had a temperature of 98.10 ± 0.81°F while patients admitted during the warm period (N = 1,045) had a temperature of 98.22 ± 0.63°F (p < 0.001). Lower temperatures were also found among patients ≥ 65 years (p < 0.001) and those with a positive blood alcohol test (p = 0.004). Holding all measured confounders constant, being admitted during the warmer months predicted an elevation in body temperature of 0.13°F (p < 0.001). CONCLUSION: These findings support diurnal and circannual variations in body temperature in the human population.

The association between higher physical activity levels and increased sunburn prevalence is a health behavior trade-off between the health benefits of physical activity and potential increased risk of skin cancer. Walking is a common form of physical activity accessible to most people yet has an unknown association with sunburn. This is important because risk of melanoma doubles with five or more sunburns. PURPOSE: To examine whether sunburn prevalence varied by walking behavior.

METHODS: This study used the 2015 National Health Interview Survey of adults (N=26,032, age18 years. We defined four exclusive categories of weekly walking: 1) those who reported no walking or less than ten minutes total; 2) only leisure walking; 3) only leisure walking; and, 4) both categories of walking. It was necessary to disaggregate walking into categories, as there are different behaviors and contexts associated with leisure and transportation walking. We estimated the adjusted prevalence of sunburn (one or more in the past 12 months) by walking category and separately for walking duration; we stratified by gender and sun-sensitivity (any reported skin burn when not protected from the sun for one hour).

RESULTS: The adjusted sunburn prevalence was not different between walking categories for women, but it was for men. Specifically, prevalence was lower for men who reported not walking, 34.1% (95% CI: 32.2%-36.1%) compared to 38.8% (95% CI: 36.9%-40.7%) for those who walked for at least 20 minutes per week. Specifically, prevalence was lower for men who reported not walking, 34.1% (95% CI: 32.2%-36.1%) compared to 38.8% (95% CI: 36.9%-40.7%) for those who walked for at least 20 minutes per week. PREVENTION: The adjusted prevalence of sunburn (one or more in the past 12 months) by walking category and separately for walking duration; we stratified by gender and sun-sensitivity (any reported skin burn when not protected from the sun for one hour).

RESULTS: The adjusted sunburn prevalence was not different between walking categories for women, but it was for men. Specifically, prevalence was lower for men who reported not walking, 34.1% (95% CI: 32.2%-36.1%) compared to 38.8% (95% CI: 36.9%-40.7%) for those who walked for at least 20 minutes per week. PREVENTION: The adjusted prevalence of sunburn (one or more in the past 12 months) by walking category and separately for walking duration; we stratified by gender and sun-sensitivity (any reported skin burn when not protected from the sun for one hour).
CONCLUSIONS: The results suggest that walking, unlike leisure-time physical activity, may not be generally associated with sunburn, except for the higher sunburn prevalence for men who walked for both leisure and transportation purposes. Research is needed into public health messages that encourage walking for physical activity and advise sun protection, with special attention to men.

983 Board #127 May 29 2:00 PM - 3:30 PM Relationship between Neighborhood Environment and Physical Activity in Freshmen from Tsinghua University in Beijing, China
Jiali Cheng, Hongjun Yu, Chenggang Zhang. Tsinghua University, Beijing, China. (Sponsor: James Fleming Sallis, Jr., FACSM)
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(No relevant relationships reported)
Neighborhood walking environment is an environmental issue affecting human health-related behaviors in China and worldwide. Few studies so far have researched the relationship between neighborhood environment walkability and physical activity among freshmen in China.

PURPOSE: We examined the relationship between neighborhood environment walkability and physical activity. METHODS: Neighborhood environment was measured using the Neighborhood Environment Walkability Scale for Youth (NEWS-Y). Physical activity data by the Global Physical Activity Questionnaire (GPAQ) were collected. The data were analyzed by Stata14.0. RESULTS: We conducted a cross-sectional questionnaire study on 3,411 freshmen from Tsinghua University in Beijing, China. Of the total sample size, 2,318 were male (67.96%), and 1,093 were female (32.04%). One of seven environmental attributes were significantly related to moderate and vigorous physical activity (MVPA) (MET-minutes/week): walking facilities (75.56 ± 5.36-145.76; p=0.005). Two of seven environmental attributes were significantly related to moderate physical activity (MPA) (MET-minutes/week): neighborhood aesthetics (168.64 [44.12-293.16]; p=0.008). One of seven environmental attributes were significantly related to vigorous physical activity (VPA) (MET-minutes/week): neighborhood aesthetics (151.57 [45.08-258.07]; p=0.005). Two of seven environmental attributes were significantly related to moderate physical activity (MPA) (MET-minutes/week): walking facilities (75.56 [5.36-145.76]; p=0.035) and neighborhood aesthetics (68.07 [5.31-132.62]; p=0.039). One of seven environmental attributes were significantly related to sitting time (minutes/week) in walking facilities (-18.64 [-32.57 -7.47]; p=0.001). CONCLUSIONS: A positive correlation between neighborhood environment walkability, especially neighborhood aesthetics and walking facilities, and physical activity was found.

984 Board #128 May 29 2:00 PM - 3:30 PM Factors Leading to Discrepancies in Accumulated Physical Activity During School Hours in Elementary School Students
Robert Booker1, Riley Galloway2, Megan E. Holmes3. 1Mississippi State University, Mississippi State, MS. 2Missouri State University, Springfield, MO.
(No relevant relationships reported)
Inconsistently implemented state physical activity (PA) mandates lack oversight and regulation. PURPOSE: This study quantifies sex and racial differences of in-school PA among fourth grade students. METHODS: Students (N=148) from eight rural, low socioeconomic schools were accelerometers during school for one week. Teachers recorded data related to PA setting and duration. RESULTS: Of the 148 students, only 12 met the 150 minutes of in-school moderate-to-vigorous physical activity (MVPA) per week, in accordance with the state’s mandate. Students spent a significant percentage of the total school day sedentary (75.7±5.5%, mean±SD). Males spent significantly more of daily recess engaged in MVPA than females (24.9% and 18%, respectively). White students spent a higher percentage of recess in MVPA than Non-White students (29.2±13.1% and 21.1±13.1%, respectively). Schools with a certified physical education instructor (n=2) participated in significantly more minutes of MVPA during recess (9.1±7.3) and physical education class (3.1±2.0) than other schools (5.2±2.7 and 2.5±1.8, respectively). CONCLUSIONS: Very few students achieved the state-mandated 30 minutes of MVPA per day during school hours; however, schools with certified physical educators achieved more MVPA throughout the school day. Recess PA contributed considerably to this discrepancy, highlighting the importance of encouraging active play and other types of PA during breaks in the school day.

895 Board #129 May 29 2:00 PM - 3:30 PM Title: Association of Sleep and Physical Activity with Cardiometabolic Risk in Older Women: A Compositional Analysis
Joowon Lee1, Maura E. Walker2, Karen A. Matthews2, Lewis H. Kuller2, Nalini Ranjit2, Kelley P. Gabriel, FACSM1. 1Boston University, Boston, MA. 2University of Pittsburgh, Pittsburgh, PA. 3University of Texas Health Science Center, Austin, TX. (Sponsor: Kelley Pettee Gabriel, FACSM)
Email: lee8690@bu.edu
(No relevant relationships reported)
PURPOSE: To investigate the effect of daily (24-hour) activity behaviors (sleep, sedentary, light and moderate physical activity [LPA and MVPA]) on cardiometabolic risk among older women, using a compositional data analysis approach. METHODS: Participants from the Healthy Women Study 2010-11 follow-up visit (N= 145, aged 73.3±1.7 years, white=91.5%) were analyzed. Actigraph GT1M accelerometer (hip) and an Actiwatch-2 (wrist) for 7 consecutive days, to objectively monitor physical activity and sleep. The estimated duration of sleep, sedentary, LPA, and MVPA, were averaged across valid wear days (≥4 days of ≥10 hours). For each participant a composite cardiometabolic risk score was calculated by transforming metabolic syndrome (MetS) components including waist circumference, blood pressure, fasting triglyceride, fasting high-density lipoprotein (HDL), and fast blood glucose into z-scores and summing z-scores to create a continuous MetS-z score. A 24-hour fixed component of activity behaviors was derived and isometric log-ratio multivariable linear regression was used to predict MetS-z score. Additional 24-hour compositions were created where a fixed duration of time was reallocated from one activity behavior to another (e.g., sedentary to LPA), while time spent in the remaining activities was unchanged. Reallocation was defined as 15 minutes for sleep, sedentary and LPA, behaviors; and 5 minutes for MVPA. RESULTS: Participants had a mean MetS-z-score -0.01 ± 3.22. Mean daily time (minutes) spent in activity behaviors was 403, 749, 282, and 7; for sleep, sedentary, LPA and MVPA, respectively. The 24-hour composition was a statistically significant correlate of MetS-z-score (P< 0.001). Reallocation of 5 minutes from MVPA to sleep, sedentary, and LPA, increased the predicted MetS-z score by 1.07, 1.07, and 1.06, respectively. The predicted MetS-z score was reduced by 0.88, 0.91, and 0.85 when 15 minutes of sleep, sedentary, or MVPA was replaced with MVPA. Reallocating 15 min of sedentary time to LPA reduced the predicted MetS-z score by 0.05. CONCLUSIONS: This cross-sectional study demonstrates the beneficial effect of MVPA on cardiometabolic risk among older women. The exchange of sedentary time for LPA may also reduce cardiometabolic risk in older women.

896 Board #130 May 29 2:00 PM - 3:30 PM Screen and Non-screen Sedentary Time in Older Adults Living in a Retirement Community
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(No relevant relationships reported)
PURPOSE: This study aimed to describe the magnitude and composition of screen (SST) and non-screen sedentary time (NSST) in older adults living in a retirement community (RC); documenting gender, mobility aid, chronic disease and exercise participation in screen and non-screen sedentary time variation. METHODS: One hundred subjects (84.7 ± 6.3 years; 70% female) were recruited from a RC located in the Midwest area of United States. Sedentary behavior (SB) was measured using a two-questionnaire specifically developed for the older adult population. The questionnaire comprises of 10 questions related to time spent in different activities (eight related to NSST and two related to SST). Based on the questionnaire, three metrics were calculated and expressed as hours per day: a) NSST, given by the sum of time spent in the eight out of 10 possible activities; b) SST, given by the sum of time spent in two activities (sitting and ST); c) total sedentary time (TST), given by the sum of the time spent in SST and NSST. RESULTS: The findings indicated that older overall adults living in a RC spend on average 10 hours per day in sedentary activities; being 6.5 in NSST and 3.5 hours in SST. Older males reported spending significant higher SST compared to their older female counterparts (4.5 vs. 3.1; P<0.05). Those not making use of a mobility aid reported significant higher SST (10.2 vs. 9.3) and NSST (6.8 vs. 5.6) compared to those using a mobility aid (P<0.05). Older adults presenting with ≥ 3 chronic diseases reported significant higher TST (10.6 vs. 9.5) and NSST (6.9 vs. 5.5) compared to those with less than 3 chronic diseases (P<0.05). No differences were observed for SST, NSST and SST between older adults engaged and not engaged in a regular exercise. The findings further indicated that activities such as TV watching and reading comprise nearly 45% of participants’ SST and computer use accounted for about 12%. CONCLUSION: The findings indicated that older adults living in a RC spend a large number of hours in sedentary activities and that 65% of this time is...
spend in NSST and 35% in SST. The findings further suggest that significant gender, mobility aid, and chronic disease variations exist in terms of TST, NSST and SST in this population. Supported by Dean’s Research Grant COE-NIU (2017-2018)

897  Board #131  May 29 2:00 PM - 3:30 PM  Geographical Effects In Familial Clustering Of Physical Activity, Adiposity And Metabolic Syndrome

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No relevant relationships reported

Metabolic syndrome (MetS) risk factors, adiposity and physical activity (PA) levels have a multifactorial etiology, comprising genetic and non-genetic factors. Notwithstanding the consistent findings about their aetiology, biological and behavioural traits do not explain the total variation and the increase of the metabolic disorders and physical inactivity over the past decade. Additionally, links may be identified between built and natural environments, namely PA environments, on adiposity, MetS and PA phenotypes, as well as the way they may affect different behavioural, especially within families. PURPOSE: The purpose of this study was to estimate the magnitude of genetic and environmental factors on adiposity, MetS risk factors and PA levels, and to investigate the role of PA environments on these traits.

METHODS: The sample comprised 259 nuclear families (781 individuals) from a rural city of Portugal. All PA facilities' locations and families' home addresses were geocoded and Euclidian distances were calculated. Percentage of total body fat was estimated by bioelectrical impedance. Systolic and diastolic blood pressure, waist circumference, fasting glucose, triglycerides and total cholesterol were measured. PA was estimated by the Baecke questionnaire. Quantitative genetic models were used and computations performed with AR software.

RESULTS: Genetic and shared environmental factors explained 22% and 38% of PA and body fat total variance, respectively. MetS risk factors were moderate-to-highly heritable, ranging from 26% to 73%. Spatially structured data of PA environments had significant effects on MetS risk factors, adiposity and PA phenotypes (p<0.05), except for waist circumference, contributing to low adiposity levels (p<0.05), increases in PA (p<0.05), and being protective against the development of MetS risk factors (p<0.05).

CONCLUSIONS: Taken together, these results have important implications for the design of intervention programs, which need to consider the familial context and PA environments to promote physically active lifestyles and their positive effects on health.

898  Board #132  May 29 2:00 PM - 3:30 PM  Objectively-Measured PA and Sedentary Behavior Across The Lifespan Of Individuals With and Without Metabolic Syndrome

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No relevant relationships reported

PURPOSE: To investigate whether PA and sedentary behavior (SB) differ across the lifespan of individuals with and without metabolic syndrome (MetS). Few studies investigating lifestyle behaviors in this population have utilized objective measures of PA or included youth.

METHODS: Participants from NHANES 2003-2006 (ages 6-85) were divided into 5 age categories: childhood (≤12 years) (N=6,672), adolescence (13-19 years) (N=5,938), early adulthood (20-40 years) (N=5,537), middle adulthood (40-64 years) (N=5,176), and late adulthood (≥65) (N=3,730). Classification of MetS was based upon waist circumference (men≥40”, women≥35”), triglycerides (≥150 mg/dL), HDL cholesterol (men≥40 mg/dL, women<50 mg/dL), plasma glucose (≥110 mg/dL or medicated), and blood pressure (≥130 mmHg or medicated).

Participants (N=27,053) wore Actigraph AM-7164 accelerometers on the right hip for 7 days and were included in analyses if they wore the device for ≥10 hrs per day for 4 days. Independent samples t-tests were conducted between each group at each stage on counts per min (cpm), sedentary minutes, and minutes of light PA and MVPA.

RESULTS: In this sample, MetS prevalence was 0% in children, 1% in adolescents, 4% in early adulthood, 13% in middle adulthood, and 17% in late adulthood. Pairwise comparisons of accelerometer values revealed no significant differences between groups in accelerometer values (p>0.05). However, groups diverged sharply in middle adulthood, where adults with MetS evidenced lower cpm (M=3161±150 vs. M=249±127), higher minutes of sedentary behavior (M=481±120 vs. M=504±121), and fewer minutes of light PA (M=259±70 vs. M=241±71) and MVPA (M=22±33 vs. M=13±18) (all p<0.01). Differences remained in late adulthood for cpm (p=3.473, p<0.001) and minutes of light PA (p=3.604, p<0.003) only.

CONCLUSION: No differences were identified during the first 40 years of life, suggesting that MetS at these ages may be less behaviorally based. However, beginning in middle adulthood there was a divergence in accelerometer-measured behaviors, which coincided with a spike in prevalence in this age group. Middle adulthood is characterized by increasing responsibility through roles as caregivers and bread winners and may be an appropriate target for PA interventions to prevent chronic disease.

899  Board #133  May 29 2:00 PM - 3:30 PM  Vitamin D Status And Muscular Strength In Youth: NHANES 2011-2014

Nicholas M. Pilli, Jaime N. Thomas, Jennifer L. Barnes, Kelly R. Laursen. Illinois State University, Normal, IL. (Sponsor: Dale Brown, FACSM)

No relevant relationships reported

Vitamin D is a critical component of musculoskeletal health in youth. While several studies have established the importance of vitamin D for bone development, research specific to muscle-strength is lacking. PURPOSE: To investigate the association between serum 25-hydroxyvitamin D (25OHD) status and muscular strength in a nationally-representative sample of U.S. youth. METHODS: The analysis included 1,706 boys and 1,644 girls from the National Health and Nutrition Examination Survey 2011-2014 between 6-18.9 years. Status of 25OHD was defined as severe/deficient ≤ 37.5 nmol/L, insufficient > 37.5 to < 50 nmol/L, and sufficient ≥ 50 nmol/L. Muscular strength was assessed via handgrip and expressed as age- and sex-specific percentiles of relative strength (kg strength/kg body mass). General linear models were used to quantify differences in strength percentile by 25OHD status. Logistic models were used to compare the odds of low strength (< 25th percentile) between 25OHD status.

RESULTS: Boys with sufficient 25OHD had a higher mean (SE) relative strength percentile than those in the insufficient or severe/deficient groups, 49.1 (0.8), 43.5 (2.2), and 40.7 (2.9), respectively (p<0.05). Relative strength percentile was also highest for girls with sufficient 25OHD compared to the insufficient or severe/deficient groups, 51.8 (1.9), 45.6 (2.4), and 41.1 (3.3), respectively (p<0.05).

CONCLUSIONS: Youth with less than sufficient levels of 25OHD were consistently found to have lower relative handgrip strength and were more likely to have strength values below the 25th percentile. These findings underscore the importance of vitamin D for muscular strength in youth and future prospective studies to elucidate the mechanisms would be of benefit.

900  Board #134  May 29 2:00 PM - 3:30 PM  Is Seasonal Affective Disorder A Symptom Of A Larger Collection Of Sedentary And Obesity-related Disorders?

Stephanie Tai¹, Nathaniel J. Holmgren¹, J. Mark VanNess¹, Alexis C. King², Lewis E. Jacobson³, Jonathan M. Saxe³, Courtney D. Jensen. ¹University of the Pacific, Stockton, CA. ²University of Illinois at Urbana-Champaign, Champaign, IL. ³St. Vincent Hospital, Indianapolis, IN.

No relevant relationships reported

Seasonal affective disorder (SAD) is a subtype of major depressive disorder (MDD) that occurs during cold and overcast months. Physical activity (PA) is known to counteract depressive symptoms; however, the relationship between seasonal changes in PA and MDD is largely unexplored. Physical inactivity and consequent weight gain may contribute to a host of cardiometabolic and cerebral complications, with SAD being one diagnostic feature. PURPOSE: To evaluate seasonal differences in MDD among obese and non-obese patients in conjunction with cardiovascular, metabolic, and cerebral diagnoses.

METHODS: We analyzed 2,306 consecutively-admitted patients at a Midwestern hospital over 3 years. Mean environmental temperature of the hospital’s city during each of the 36 months was computed. Patients were assessed for obesity, MDD, diabetes, hypertension, peripheral vascular disease, congestive heart failure, cerebrovascular accidents, and dementia. Logistic regressions tested the effects of season and temperature on all diagnoses.

RESULTS: Patients were ≥12 years old, 16.3% were obese, 1.1% had MDD, 14.3% had diabetes, 36.8% had hypertension, 0.7% had peripheral vascular disease, 0.6% had congestive heart failure, 3.6% had a cerebrovascular accident, and 4.6% had dementia. During March 1 and June 30, MDD incidence was 532.8% higher than it was during all other months (p<0.001). These were not the coldest months (mean temperature was 5.9°F higher during this
period; p<0.001), but it was the period of greatest obesity (33.3% higher incidence; p=0.003). Likewise, colder temperature was a poor predictor of MDD (p=0.465), but predicted elevated levels of seasonal incidence of depression (p=0.003), diabetes (p=0.034), hypertenstion (p=0.001), congestive heart failure (p=0.013), peripheral vascular disease (p=0.058), cerebrovascular accidents (p=0.003), and dementia (p=0.001). CONCLUSION: MDD diagnosis was highest at the end of the cold season, when obesity was at its peak; in turn, the likelihood of numerous obesity-related diagnoses was increased. This suggests a possibility that seasonal incidences of depression is not exclusively caused by diminished exposure to sunlight. Perhaps a colder environment limits engagement in PA; in turn, SAD is one component of a larger picture, which includes dysfunction of numerous systems.

901 Board #135 May 29 2:00 PM - 3:30 PM Muscular Strength and Whole-Body Bone Mineral Density in Older Adults With and Without Artificial Joints
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Purpose Artificial joints (AJ) are prevalent in older adults, yet commonly ignored in bone related studies. We examined the effect of AJ on the association between muscular strength (MS) and whole-body bone mineral density (BMD) in older adults.

Methods This cross-sectional study included 303 older adults (58% women) 765 years old from the Physical Activity and Aging Study (PAAS). MS (peak speed at 60°/sec) was assessed by leg extension (LE), leg flexion (LF), elbow extension (EE), and elbow flexion (EF) on the dominant limbs using isokinetic dynamometry (Biodex). Whole-body BMD (t-score) was assessed by dual-energy X-ray absorptiometry (DXA).

Low BMD was defined as t-score <-1.0. AJ status was identified via medical history questionnaire. Linear and logistic regression were conducted in stratified samples of AJ status (yes/no) and sex including MS, age, hormone therapy (women only), smoking, cardiorespiratory fitness (400-meter walk test), physical activity, and body mass index (BMI). Odds ratios (ORs) of low BMD by sex-specific tertiles of MS were calculated in each stratum.

Results Forty-five (15%) older adults had AJ. T-scores were higher in individuals with AJ compared with individuals without AJ in both men (0.6 vs. 1.9) and women (-1.4 vs. 0.6) (both p<0.01) since most materials in AJ (e.g., metals) are considered as bone tissues by DXA. LE, EE, and EF were positively associated with BMD in men without AJ (all p<0.05), but not in men with AJ after adjusting for the possible confounders including BMI. There were no associations between MS variables and BMD in women, regardless of AJ status (all p>0.05). Compared with the lowest (weakest) third of LF, ORs (95% confidence intervals) of low BMD for the middle and upper thirds of LF were 0.40 (0.15-1.08) and 0.27 (0.09-0.85) among men without AJ after adjusting for the possible confounders without BMI. We found similar results in LE. However, no associations were observed after further adjustment for BMI; possibly due to the confounding effects of BMI on both MS and BMD. Conclusion Higher MS appears to be associated with higher BMD and lower odds of having low BMD in men without AJ, but not in men with AJ. These results indicate that AJ status should be considered in studies of muscular strength and bone health in older men. Supported by unrestricted research grant by Biospace.

902 Board #136 May 29 2:00 PM - 3:30 PM Changes in Psychological State Measures After Green versus Suburban Walking Exercise: A Pilot Crossover Study
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Email: noguel03@umn.edu

Purpose: Green exercise may have psychological benefits. This study compared changes in anxiety, mood, directed-attention abilities, and stress after walking in green (i.e., nature-based) and suburban environments.

Methods: Twenty-three adults (4 males; 50±7 yr; BMI 31±8 kg/m²) participated in a crossover study comprised of once-weekly 50-minute moderate-intensity walking sessions. Participants walked for three weeks in each of two treatment conditions: green and suburban, separated by a two-week washout period. In the first treatment period, 11 participants were assigned to green walking and 12 to suburban walking. Previously validated psychological questionnaires measured pre- and post-walk values for: 1) Anxiety: assessed by the State-Trait Anxiety Inventory; 2) Mood: evaluated via the Positive and Negative Affect Schedule; 3) Directed-attention: measured with the visual Backwards Digit-Span (BDS) Test; and 4) Stress: assessed by the Perceived Stress Scale. Linear mixed models for repeated measures assessed pre- to post-walk changes between treatments. Baseline BDS scores were included as a covariate in the BDS outcome model to control for a learned effect.

Results: Pre-walk outcomes were similar between walking conditions. Results indicated that anxiety decreased after green walking and increased after suburban walking (-1.75 vs. +1.13 units, respectively; p<0.001). For mood, positive affect improved after green walking and decreased after suburban walking (+2.16 vs. -0.32 units, respectively; p<0.001) and negative affect decreased marginally after green and suburban walking (-0.59 vs. -0.04 units, respectively; p=0.06). Directed-attention abilities did not improve after green and suburban walking (-0.09 vs. -0.08 units, respectively; p>0.9). Stress levels were slightly but not significantly reduced after green and suburban walking (-0.91 vs. -0.69 units, respectively; p=0.5). There were no sequence effects. Finally, no carryover effects were observed - suggesting adequate washout between treatments.

Conclusion: Green exercise was effective in reducing anxiety and improving mood in this sample but not in improving stress and directed-attention. Future research should identify the optimal dose of green exercise for maximum psychological health gain.

903 Board #137 May 29 2:00 PM - 3:30 PM Relationship Of Physical Activity And Quality Of Life During ART Treatment Among People Living With HIV
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Email: MSUI@mailbox.sc.edu

Purpose: To study the relationship between PA and physical and mental components of HRQoL in people living with HIV (PLWH) in China. Methods: This cross-sectional study is based on an HIV disclosure intervention study in Guangxi Zhuang Autonomous Region which initially enrolled 791 PLWH in 2013. The participants completed a total of six follow-up surveys at 6 month intervals. The International Physical Activity Questionnaire (IPAQ) was added only after the 4th follow-up in 2015 in which 718 PLWH participated. After excluding those with missing PA data (n=199), those with PA outlier (n=24), and those not under ART treatment (n=49), we included 446 participants (40.4% women, mean age 39.8 years) in the final analysis. Participants with a MET-minutes/week≥50 were defined as active, and those <500 as inactive based on the current PA guidelines. The 12-item short-form health survey (SF-12) was used to measure HRQoL that is summarized by physical and mental component scores (PCS and MCS, respectively). Logistic regression was used to compare the odds of having a HRQoL component score above the norm between active and inactive participants. Results: The proportion of participants with a mean PCS and MCS 50 or above was 44% and 55%, respectively. More than 70% of participants met the current PA guidelines. Inactive individuals served as the referent group. After adjusting for age, gender, education, marital status, smoking, drinking, substance use, and body mass index, active participants had a 60% higher odds (odds ratio (OR), 1.60; 95% confidence interval (CI), 1.01-2.55) of MCS above the norm comparing with inactive participants. Additional adjusting for HIV duration did not change the association. However, no significant relationship was observed between physical activity and PCS.

Conclusion: Physically active PLWH from China have greater QoL in mental health domain. PLWH commonly experience long-term psychological sequelae and impaired QoL. Findings from this study highlight the importance of examining the influence of PA on mental health in this high-risk population.
Adolescence is often viewed as a critical window for the development of healthy behaviors which can prevent the development of metabolic risk factors and related comorbidities. Although there is evidence of the independent associations of physical activity with subject and contextual factors, few studies examined the joint longitudinal links of these factors. PURPOSE: We aim to model longitudinal changes in youth total physical activity (TPA) as a function of their biological maturation (BM), weight status, socioeconomic status (SES), physical fitness (PF), sleep habits, fruits and vegetables consumption and built environment. METHODS: This is a mixed longitudinal study and the data comprised 3715 adolescents (3621 girls) divided into four age cohorts (10 to 12, 12 to 14, 14 to 16 and 16 to 18 years) measured annually for three consecutive years. TPA was estimated with the Baecke questionnaire; BMI and vegetables consumption and built environment were obtained by questionnaire. Random effects mixed-regression. RESULTS: Adolescents with higher TPA trajectories either sex.

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Board #139 May 29 2:00 PM - 3:30 PM

Modeling Longitudinal Changes in Physical Activity Levels: Oporto Growth and Performance Study

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(No relevant relationships reported)

Board #140 May 29 2:00 PM - 3:30 PM

Additive And Interactive Effects Of Mvpa And Sitting Time On Metabolic Syndrome Risk Indicators

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(No relevant relationships reported)

Board #141 May 29 2:00 PM - 3:30 PM

Associations of Cardiorespiratory Fitness and Muscular Strength with Arterial Stiffness in Older Adults

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(No relevant relationships reported)

Board #142 May 29 2:00 PM - 3:30 PM

Effects Of Physical Activity For Relative Risk Of Falls And Fall-related Fractures In The Elderly

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(No relevant relationships reported)

Fracture is a common source of morbidity and mortality in the elderly, approximately 10% of falls resulting in fractures.

Purpose: To examine whether physical activity could reduce the risk of falls and fall-related fractures, which based on the epidemiological survey of older Chinese people.

Methods: Referring to the questionnaire by the Disease Control and Prevention Center of Jurong. The Han nationality elderly over 60 years old (including 60) was involved. 6117 questionnaires were collected and 161 invalid questionnaires were deleted. The MET value was referred to the IPAQ. According to Physical Activity Index, the physical activity level (PAL) was divided into “Low”, “Moderate” and “High”; Comparisons between different groups were performed through Two-way ANOVA.

Results: The significant difference was shown in height, weight, BMI and bone density between males and females (P<0.01). The height had significant differences between different PAL. Bone density increased significantly with the increase of PAL (Table1)
Hypertension is an important risk factor for cardiovascular disease. Under the previous hypertension guidelines, 29% of adults in the US aged 18-60 were hypertensive, with the highest prevalence (63%) in the 60+ age group. Prevalence in the 18-39 age group was the lowest at 7.5%. The newly revised American College of Cardiology/Hypertension Guidelines lowered the threshold for hypertension to systolic blood pressure (SBP) 120-129/<80 mmHg or hypertension (Stage 1, 130-139/80-89 mmHg). CONCLUSIONS: Under the recently-revised hypertension guidelines, the prevalence of elevated BP and Stage 1 and 2 hypertension was much higher than expected in this apparently healthy, physically-active college-aged group. It is a matter of debate if this group should be considered an important target for lifestyle modifications beyond physical activity, or if the new guidelines are applicable in this particular group.

Reviews of physical inactivity (PIA) have not consistently identified systematic determinants influencing such behavior. Associations in subjective rather than objective measures may be important to consider when designing effective policy targeting PIA. PURPOSE: To analyze predictive variables that could influence PIA and how these factors may inform PIA-reducing policy. METHODS: Data from the 2014 Special Eurobarometer 412 (n = 27,919) were analyzed, including 40 separate questions regarding the extent of agreement with statements about the area, provision of activities, and local governance. A logistic regression model with a likelihood ratio statistic and a backward stepwise method was used to identify what variables contributed to PIA, which was defined as a “low” level based on IPA score. PIA was used as the dependent variable (0 = PA and 1 = PIA). Beta values (β) and standard errors (SE) are reported and Nagelkerke R² is indicated. A priori alpha level was set at 0.05. RESULTS: The model for detecting PIA (β = 2.023; p < 0.001; R² = 0.153) was able to identify 10.7% of the inactive and 96.9% of the active people (74.5% of the total sample). The variables contributing to the detection of PIA were (p ≤ 0.01): having a disability or an illness (β = 0.521, SE = 0.052), not having friends to do sport with (β = −0.314, SE = 0.089), lacking motivation or interest (β = −0.407, SE = 0.04), and being afraid of the risk of an injury (β = −0.190, SE = 0.073). Additionally, totally agreeing, tend to agree, and tend to disagree regarding the extent of local providers offering enough opportunities to be more active also contributed to the model (β = 0.302-343, SE = 1.533-542). CONCLUSIONS: Overall, the model was effective for detecting PIA in the total sample. However, where PIA was detected, key subjective factors influencing PIA began to emerge. Greater insight into these subjective mediators will be helpful in drafting effective policy around active living, and therefore better correlates should be included in future public health surveillance efforts.

Despite the robust statistical association between waist circumference (WC) and cardiometabolic risk factors (hypertension, dyslipidemia), and outcomes (type 2 diabetes, cardiovascular disease (CVD)) there is little evidence exploring the addition of WC to risk factors commonly employed in CVD risk prediction models. PURPOSE: To assess the influence of adding WC to a CVD mortality risk model. METHODS: Data were obtained from the Aerobics Center Longitudinal Study. A total of 34,377 males (mean age 44.9 years; standard deviation (SD), 9.9 years) who were measured at the level of the umbilicus and expressed as a continuous variable. CVD mortality was the main outcome. Deaths among participants were identified from the National Center for Health Statistics’s National Death Index. Follow-up time of less than 1 year (baseline to December 31, 2003 or CVD mortality) were excluded.

Table 1. Characteristics of subjects in baseline

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>sex</th>
<th>PAL</th>
<th>Moderate</th>
<th>High</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>sex</td>
<td></td>
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<td></td>
<td></td>
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<td>M</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height(cm)</td>
<td>M</td>
<td>163.58(6.32)</td>
<td>164.52(6.44)</td>
<td>163.47(6.26)</td>
<td>0.003</td>
</tr>
<tr>
<td>F</td>
<td>152.71(5.78)</td>
<td>153.32(5.46)</td>
<td>153.36(5.31)</td>
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<td></td>
</tr>
<tr>
<td>Weight(kg)</td>
<td>M</td>
<td>64.92(10.70)</td>
<td>66.64(10.83)</td>
<td>64.31(10.39)</td>
<td>0.032</td>
</tr>
<tr>
<td>F</td>
<td>58.83(10.11)</td>
<td>59.35(8.98)</td>
<td>59.14(9.27)</td>
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<td></td>
</tr>
<tr>
<td>BMI</td>
<td>M</td>
<td>24.24(3.76)</td>
<td>24.60(3.73)</td>
<td>24.03(3.45)</td>
<td>0.238</td>
</tr>
<tr>
<td>F</td>
<td>25.18(3.76)</td>
<td>25.22(3.41)</td>
<td>25.13(3.61)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bone density(T value)</td>
<td>M</td>
<td>-0.57(0.81)</td>
<td>-0.48(0.75)</td>
<td>-0.40(0.76)</td>
<td>0.000</td>
</tr>
<tr>
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<td>-1.15(0.74)</td>
<td>-1.02(0.76)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The RR of falls of “Moderate” decreased significantly compared with “Low” (RR=0.83, 95%CI=0.59-1.16). The RR of fall-related fractures of “Moderate” and “High” decreased significantly compared with “Low” (RR=0.58 and 0.69, 95%CI=0.26-1.28and 0.37-1.27). (Figure 1)
RESULTS: A total of 645 CVD deaths occurred over a mean follow-up period of 13.6 years (SD 7.4 years), for a total of 467,213 person-years of follow-up. Mean WC of the cohort was 90.1±10.3 cm at baseline. In the Cox proportional hazards model, including age, total cholesterol, HDL cholesterol, systolic blood pressure, current smoking status, and diabetes, WC was independently associated with CVD mortality (p<0.0001). The Harrell’s C-index without WC in the model was 0.834, and 0.837 upon addition of WC to the model. CONCLUSION: In this large population sample of men, WC was significantly associated with cardiovascular disease mortality. Changes in WC are associated with changes in carotid artery elasticity index. However, the addition of WC to the model did not meaningfully improve our cardiovascular disease mortality risk prediction model.

More than 400 million adults have diabetes. Complications associated with diabetes poorly impact quality of life, including interactions between cardiovascular risk and depression. A diagnosis of diabetes associates with a three-fold increase in depression. The outcomes of low Hb values on increased depression among healthy populations are well defined; however, isolating the relationship within a diabetic population requires further investigation. PURPOSE: To explore the effect of diabetes on hemoglobin levels (Hb) and depression in a diabetic population. METHODS: 2,206 hospital patients, age 15-98 years old were sampled; 14.6% had a diagnosis of diabetes. Independent-samples t-tests characterized the differences between diabetes (n=1,884) and non-diabetics (n=322). One-way ANOVA examined group differences between categorical Hb values, Chi-Square determined the relationship between diabetes and hemoglobin category, linear regression determined Hb levels among diabetics, and logistic regression analyses predicted depression outcomes based on Hb levels. RESULTS: Patients with diabetes were older (p<0.001) and had lower hemoglobin (p<0.003) and oximetry levels (p<0.001). Non-diabetic patients had lower international normalized ratio (p<0.001), systolic blood pressure (p<0.001), mean arterial pressure (p=0.015), and pulse pressure (p<0.001). Hb categories differed in age, oximetry, international normalized ratio, pulse, diastolic blood pressure, mean arterial pressure, and pulse pressure (p<0.001); groups differed for systolic blood pressure (p<0.001). Additionally, chi-squared analysis demonstrated lower hemoglobin levels associated with increased diagnosis of diabetes (p<0.001). Linear regression, controlling for age, predicted a decrease in Hb among diabetic patients (β=0.460; p<0.001). Lastly, logistic regression determined with each additional g/dl of Hb, the odds of experiencing depression decreased by 31% (p<0.001). CONCLUSIONS: Diabetes diminishes cardiovascular health, particularly Hb levels, and this predicts depression within this population. Physical activity should be a first-line intervention to improve quality of life in patients suffering from diabetes.
the objective of this study was to verify if the effects of combined training on the body composition persisted over 1 year follow-up after training interruption in older breast cancer survivors undergoing aromatase inhibitor therapy. Methods: Thirty-six breast cancer survivors (50+ years of age) that participated in a clinical trial during 9 months [Exercise group (EG): n=18 and Control group (CG): n=18] were assessed for the 1 year follow-up. Body composition (total fat mass, percentage of fat mass, trunk fat and lean body mass) and bone mineral density were evaluated by DXA. The exercise group performed about 40 min of resistance training plus 30 min of aerobic training, three times per week during 9 months. Two-way repeated measure of ANOVA was used to compare groups and a Bonferroni’s post hoc test was conducted when a significant interaction was observed.

Results: There were a significant group x time interaction for total fat mass (Pre=30.7±7.7 vs Post=28.6±7.8 vs Follow-up=30.3±11.1 kg, F=4.864, p=0.012) and percentage of fat mass (Pre=45.4±5.1 vs Post=43.2±5.8 vs Follow-up=45.7±5.4 %, F=6.808, p=0.002). The Bonferroni’s Post hoc test showed a decreasing for fat mass only in the EG after 9 months of training but there was a regain over 1 year follow-up. There were no statistically significant interaction for lean mass, trunk fat and bone mineral density (p>0.05).

Conclusions: This study demonstrated the potential benefits of combined training (resistance plus aerobic) to decreased total and percentage of fat mass in breast cancer survivors undergoing aromatase inhibitor therapy, however, after training interruption there was a regain of body fat. Therefore, our results emphasize that is important to maintain an exercise training program over a prolonged period for this population.

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RESULTS: No significant differences were found in the peak torque values between groups (p = 0.95). The peak torque was 101.1 ± 26.79 N.m for the BCW group and 101.7 ± 26.98 N.m for the CNT group. Separating the volunteers according to the level of physical activity, no differences were found between the groups for the PT values.

CONCLUSIONS: Women with breast cancer undergoing chemotherapy treatment, between the third and fourth cycle of chemotherapy, did not present differences in measures of muscle performance when compared to apparently healthy women.

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CONCLUSIONS: Women with breast cancer undergoing chemotherapy treatment, between the third and fourth cycle of chemotherapy, did not present differences in measures of muscle performance when compared to apparently healthy women.
PURPOSE: This pilot study aims to determine the feasibility and acceptability of a remotely-delivered eHealth intervention that links physical activity and charity-based incentives to motivate young adult cancer survivors to initiate and maintain physical activity (PA). METHODS: Inactive cancer survivors (diagnosed between age 18-39) were recruited through hospital support groups and online forums across the western United States. Screening and informed consent were done online; activity was measured via activPAL for 7-days at baseline and again at 12-weeks. Participants were randomized into either a PA only or Physical Activity+Charity Incentive group. Participants in the PA only group received a Fitbit One, personalized step goals, and weekly behavioral change content via email. PA+Incentive participants received the PA intervention plus donations to a cancer charity of their choice if daily step goals were attained. The primary aim was to evaluate feasibility and acceptability and the primary outcome was 12-week-between-group changes in steps per day as measured by the activPAL. RESULTS: Seventy-six participants were screened of those, 54 (71%) were eligible and provided informed consent and 51 (94%) completed the baseline assessments and were randomized. Those randomized were 88% female, 54% with prior breast cancer, 56.9% Non-Hispanic White; and had a mean age of 36.8 years. Of those eligible to date to complete the 12-wk measure (N=47), retention was high for the PA only (22/25) and PA+Charity (23/26) groups. The majority of participants reported they were “satisfied or very satisfied” with the overall intervention experience. There was some evidence that the PA + Incentive group was more satisfied with the overall experience as a study subject compared to the PA only group (45% vs 30% reporting “very satisfied”). This also holds true for the level of contact with staff (27% vs 15%) and content of emails (23% vs 10%). Some participants (23%) wanted more contact with study staff or other participants. CONCLUSIONS: These preliminary findings show that a mail-based intervention among young adult cancer survivors is feasible and acceptable to participants. The next step will be to evaluate if there was a significant change in daily steps as a result of the intervention. Support by Frost Fund and Cal Poly RSCA.

PURPOSE: To examine the association between perceived breast cancer risk and aerobic physical activity among women. METHODS: We used cross-sectional data on women aged ≥18 years who participated in the 2015 National Health Interview Survey (n=17,967). Participants were asked to self-report whether they perceived themselves at less than average risk (ref), average risk, or higher than average risk for breast cancer. Aerobic physical activity was measured based on self-reported minutes of moderate-to-vigorous aerobic physical activity engaged in per week, then categorized into none (ref), some activity, and meeting the aerobic activity recommendation. Multinomial logistic regression models were fit, accounting for the complex survey design, to estimate associations between perceived risk of breast cancer with aerobic physical activity. Models were adjusted for age, education, race/ethnicity, and insurance. RESULTS: In adjusted models compared with women who perceived themselves at low risk for breast cancer, those perceiving themselves at higher than average risk had 14% lower odds to meet the aerobic activity guideline, relative to no activity (Odds Ratio [OR]: 0.86; 95% Confidence Interval [CI]: 0.76-0.97). Similarly, compared with women who perceived themselves at low risk for breast cancer, those perceiving themselves at average risk for breast cancer had 23% lower odds to meet the aerobic activity guideline (OR 0.77, 95% CI 0.65-0.91). CONCLUSIONS: Among women, higher perceived breast cancer risk was associated with a lower likelihood of engaging in aerobic physical activity. Since greater physical activity can reduce the risk of breast cancer, future studies should also use longitudinal designs to determine if increasing physical activity decreases perceived breast cancer risk. Results suggest a possible role for health promotion interventions linking perceived breast cancer risk with physical activity. Supported by NIH P20CA221697-02, P20CA221696-02, and P20CA221697-01S1.

SIDE EFFECTS OF GYNECOLOGICAL CANCER TREATMENTS ON QUALITY OF LIFE (QoL) - METABASE - Cochrane Database of Systematic Reviews (2019) 2019:3, CD006370; http://www.cochrane.org/CD006370

PURPOSE: To evaluate the effects of exercise therapy in randomized controlled trials (RCTs) on QoL in women during GCT. Secondary outcomes were the effects on body composition (BC), training modality, safety and physical activity (PA) behavior. METHODS: A systematic search in PubMed, Cochrane, EMBASE and SPORTDiscus was carried out to identify exercise training RCTs during GCT. Primary endpoint was the change in QoL from baseline (PRE) to after (POST) exercise intervention. Exclusion criteria was investigations with participants’ mean age <18 years, not written in English and not published in peer-reviewed journals. Meta-analysis of Standardized Mean Differences (SMD) and 95% Confidence Interval (95%CI) were performed. RESULTS: Seven RCTs were selected, including a total of 112 and 105 participants in the exercise therapy and the control group, respectively. Four studies underwent unsupervised, home-based (HB) exercise; one study received instructions for unsupervised HB training (walking and strength exercises); one study received a comprehensive care program (group education and self-help group support, relaxation and HB aerobic and strength exercises); one study underwent pelvic floor rehabilitation training supervised by a physiotherapist and instructions for HB exercise. After the exercise therapy an increase in PA has been reported for all included studies (SMD: 0.56, 95%CI: 0.38-0.74). Exercise therapy did not show any significant differences in waist circumference (PRE: 65.5±3.13 cm; POST: 64.9±3.13 cm; SMD=0.10, 95%CI: 0.78, 0.59), body mass (PRE: 105.6±7.4 kg; POST: 102.7±8.2 kg; SMD=0.09, 95%CI: 0.67, 0.50) or BMI (PRE:29.5±1.8 kg/m²; POST:30.9±1.2 kg/m²; SMD=0.01, 95%CI: -0.67, 0.70).
compared to the control groups. No adverse events were reported during the exercise intervention. **CONCLUSION:** Exercise therapy during CRT showed improvements in PA and QoL among various cancer types, but seems safe during CRT. Further research is needed to evaluate the effect of supervised exercise interventions on cardiorespiratory fitness, type, frequency, and training intensity.

922 Board #156 May 29 3:30 PM - 5:00 PM
Factors Affecting the Change in Quality of Life in Participants of a Cancer Exercise Program
Emanuel Schembri1, Friederike Rosenberger2, Karen Steinfort2, Joachim Wiskemann, FACSMM. 1University Hospital Heidelberg, National Center for Tumor Diseases (NCT) Heidelberg and Heidelberg University, Institute of Sports and Sports Sciences, Heidelberg, Germany; 2University Hospital Heidelberg and National Center for Tumor Diseases (NCT) Heidelberg, Heidelberg, Germany; 3German Cancer Research Center (DKFZ) and National Center for Tumor Diseases (NCT) Heidelberg, Heidelberg, Germany. (Sponsor: Joachim Wiskemann, FACS)
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Purpose: Anti-cancer treatment causes numerous cancer-related symptoms (CRS) which may influence quality of life (QOL). The purpose of this analysis was to determine how these symptoms and their presence at the start of the program may affect quality of life (QOL) in cancer patients participating three to four months in various exercise classes at a cancer-specific cancer center.

Methods: Data of 779 patients who participated between 2012 and 2017 in exercise classes at the National Center for Tumor Diseases (NCT) Heidelberg, Germany, were examined. Baseline characteristics assessed were anthropometric data, cancer diagnosis, peak power output (PPO) and, maximum peak oxygen uptake (VO2 peak) in a cycle ergometer test as well as CRS by a self-developed anamnesis questionnaire. QOL was assessed at the start of the exercise program (t0) and after three to four months (t1) using the European Organisation for Research and Treatment of Cancer’s Quality of Life Questionnaire (EORTC QLQ-C30, subscale global health status/QOL). CRS included fatigue, lymphedema, peripheral neuropathy, weight loss, pain, restricted mobility, and negative emotions (sleepiness, anxiety, and depression). A multiple regression analysis was performed to determine whether the relationship between CRS and the change of QOL (ΔQOL) from t0 to t1

Results: Participants’ (71% female, 29% male, n=779) mean age was 56±12 years (16-88 years, n=772), and body-mass-index was 25±5 kg/m² (15-57 kg/m², n=755). Most frequent diagnoses were breast cancer (44%), colorectal cancer (7%), and gynaecologic tumor diseases (6%) (n=779). PPO averaged 173±0.6 W/kg (n=3,5 W/kg, n=273) and VO2 peak averaged 25±5 ml/min/kg (6-47 ml/min/kg, n=273). ΔQOL was 1.75±16.02 (-50.0-50.0, n=105). Multiple regression analysis revealed that QRS explained 16% of the variance in QOL (R²=0.18, F(9,779)=2.60, p=0.05) (P=0.27, n=105). Restricted mobility (β=0.23, p<0.05) and weight loss (β=-0.26, p<0.05) significantly affected QOL.

Conclusion: Overall, QOL increased through exercise participation. Results indicated that participants who reported to have restricted mobility and weight loss at baseline tended to benefit more from exercise in terms of QOL. The results of this study can be used to understand how to modify the daily exercise sessions and focus on specific CRS to further improve QOL in cancer patients.

923 Board #157 May 29 3:30 PM - 5:00 PM
Home Exercise Program with Weekly Phone Calls Impacts Quality of Life in Cancer Survivors
Jill E. Mayer, Kayleigh Plumeau. Ithaca College, Ithaca, NY
Email: jmayer@ithaca.edu

(No relevant relationships reported)

Studies have proven exercise as an effective intervention for cancer survivors to improve quality of life (QOL). Less research has focused on the impact in a home setting, specifically for those in early phases of recovery. Limited evidence exists on techniques that can improve compliance to carry out home exercise programs (HEP).

**PURPOSE:** To determine the impact of weekly phone calls on QOL and adherence to an individualized HEP while simultaneously identifying motivators and barriers to completion. **METHODS:** This study was a case control of a heterogeneous sample of 16 participants with various cancer types in active treatment or less than 90 days since treatment. At physical therapy (PT) initial evaluation and following an 8 week program, participants completed the European Organization for Research and Treatment of Cancer QoL Questionnaire-Cancer 30 (EORTC). Participants were allocated based on blocked randomization and provided with an individualized HEP including strength and aerobic exercise. They were instructed to perform at a frequency consistent with the American College of Sports Medicine (ACSM) guidelines and maintain activity logs. The intervention group received weekly phone calls by a student PT.

**RESULTS:** Participants of a Cancer Exercise Program: 2. With growing support for establishing exercise programs for cancer survivors, it is important to determine sustainable and scalable delivery modalities. GBE may be more resource-conscious than PT, and this study suggests GBE can achieve comparable ExRx compliance to PT. Future exercise intervention studies in breast cancer survivors should examine how ExRx compliance affects health and/or fitness outcomes.

Purposes were: 1. To examine the association between perceived colorectal cancer risk and aerobic physical activity among US adults. **METHODS:** We used cross-sectional 2015 National Health Interview Survey (NHIS) data on participants 18 years of age and older (n=16,711). Perceived colorectal cancer risk was assessed based on measures to which participants responded whether they considered themselves at less than average risk, average risk, or higher than average risk. Aerobic physical activity was measured based on self-reported minutes of moderate-to-vigorous aerobic activity per week, which were categorized into none (0 min/week), some aerobic activity (≥0 min/week of activity but less than recommendation), and meeting the aerobic activity guideline (≥150 min of moderate-vigorous physical activity or ≥75 min of vigorous physical activity or 150 min of moderate physical activity/week). Multinomial logistic regression models that accounted for NHIS’ complex survey design were used to estimate associations

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between perceived risk of colorectal cancer (ref= less than average risk) with activity (ref= none). All models were adjusted for age, sex, education, race/ethnicity, and insurance.

RESULTS: After adjusting for covariates, compared with individuals who perceived themselves at less than average risk, those who perceived themselves at higher than average risk for colorectal cancer had 22% higher odds of engaging in some activity and 60% higher odds of meeting the aerobic activity guideline (Odds Ratio [OR] = 1.22, 95% Confidence Interval [CI] 1.01-1.46; OR = 1.61, 95% CI 1.37-1.86, respectively). In addition, those who perceived themselves at average risk for colorectal cancer had 25% higher odds of meeting the guideline (OR 1.25, 95% CI 1.07-1.47).

CONCLUSIONS: These findings suggest that perceived colorectal cancer risk may contribute to aerobic activity levels among adults. Although causal relations could not be established from these data, aerobic activity is known to aid in colorectal cancer prevention; therefore, those who are aerobically active may be accurately perceiving their risk relative to those who are inactive. Future studies should use longitudinal designs to examine mechanisms that underlie this link.

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926 Board #160 May 29 3:30 PM - 5:00 PM The Effect of Familiarization on the Reliability of Isokinetic Assessment in Breast Cancer Survivors
Filipe Dinato de Lima1, Sandra Nobre Chaves1, Lucas Ugliara1, Andrew Correa Formosa1, Jonathas Santana Sarandy1, Nataliá Leite Colombelli2, Claudio L. Battagliani, FACSM3, Martim Bottaro1. 1University of Brasilia, Brasilia, Brazil. 2University of North Carolina at Chapel Hill, Brasilia, Brazil. 3University of North Carolina at Chapel Hill, Brasilia, Brazil. (Sponsor: Claudio L. Battagliani, FACSM)
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(None relevant relationships reported)

Muscle function plays an important role in quality of life of breast cancer survivors (BCS). Hence, several interventions have been proposed to improve muscle function during and after treatment. Thus, the assessment of muscular strength is essential for understanding the performance capacity of a BCS. Isokinetic dynamometer has been considered a gold standard method for assessing muscle strength in different populations. However, many internal and external factors in the isokinetic dynamometer procedures can have an undesirable effect on the test results on BCS. PURPOSE: To assess the number of familiarization sessions required to test knee extensors strength and to state isokinetic dynamometer test-retest reliability to assess muscle function in BCS.

METHODS: Eleven breast cancer survivors (48.00 ± 6.25 years, 71.91 ± 11.55kg, 1.61 ± 0.06m) performed three isokinetic knee extension tests, separated by, at least, 72 hours. The isokinetic tests were composed by one warm-up set of 10 submaximal knee extensions at 120%, followed by two sets of four maximal knee extensions at 60%. All volunteers rested two minutes between sets. Muscle strength was determined as the greatest peak torque (PT) of each session. PT achieved in each session were compared with one-way ANOVA and Bonferroni adjustment. Significant and intraclass correlation coefficients (ICC3.1) between non-different measures were calculated to determine test-retest reliability.

RESULTS: Peak torque on the second session (119.18 ± 30.83 N.m) was significantly greater than first session (105.66 ± 30.21 N.m, p = 0.002). However, there was no difference between second and third sessions (121.30 ± 30.21 N.m, p = 0.885). Significant error and ICC, between second and third sessions were 3.08 and 0.97, respectively (95% ICC confidence interval: 0.92 to 0.99).

CONCLUSIONS: Isokinetic dynamometer is a reliable device to assess muscle function on BCS. However, to assess knee extensors strength on the isokinetic dynamometer, BCS require one familiarization session.

927 Board #161 May 29 3:30 PM - 5:00 PM Effects of a Smartphone Based Exercise Intervention on Quality of Life in Breast Cancer Survivors
Margaret F. Bedillion, Emily B. Ansell, Gwendolyn A. Thomas. Syracuse University, Syracuse, NY. Email: mfbedillion@syr.edu

(No relevant relationships reported)

A physically inactive lifestyle in breast cancer survivors elevates risk for recurrence, morbidity, and co-occurring chronic diseases. Exercise interventions, particularly those that combine both aerobic and resistance exercise, can help mitigate these risks and serve as an important pathway for promoting health and quality of life in breast cancer survivors. However, barriers to exercise may prevent adherence to recommended levels of activity. Smartphone based exercise programs may promote improvements in quality of life via a method that is both scalable and widely feasible for breast cancer survivors. PURPOSE: To determine the effects of a smartphone based aerobic and resistance exercise intervention on quality of life in breast cancer survivors.

METHODS: 34 women (age = 57.5 ± 6.7 years since diagnosis (YSD) were recruited through Army of Women, a national non-profit breast cancer organization, to complete a 6-week intervention remotely. They were provided with a Fitbit and a mobile application that provided prompts to complete aerobic and resistance exercise. Additionally, written and video instructions were provided for each resistance exercise workout on the app. Surveys on depression and quality of life (Center for Epidemiologic Studies Depression, Short Form Health Survey, and Functional Assessment of Cancer Therapy - Breast Cancer) were completed pre and post the 6-week intervention.

RESULTS: Regression analyses examined effects of aerobic and resistance exercise completed during the intervention on quality of life, controlling for YSD, race, stage, and BMI. Only resistance exercise was significantly associated with improvements in depression (β = 0.43, t=2.79, p = 0.01), social functioning as measured by the SF-36 (β = -0.378, t=-2.25, p = 0.03) and social well-being as measured by the FACT-B (β = -0.361, t=-1.95, p=0.06).

CONCLUSIONS: These findings demonstrate the unique effects of a brief resistance exercise program delivered via a mobile application in improving quality of life in breast cancer survivors. Mobile application based exercise interventions offer significant scalability and improved feasibility for breast cancer survivors who may have limited access to a supervised exercise program.

928 Board #162 May 29 3:30 PM - 5:00 PM The Long-term Effects Of A Physical Activity Behaviour Change Intervention On Cancer Survivors' Levels Of Depression, Fatigue And Mental Well-being
Mairedad Cantwell1, Briona Furlong1, Catherine Woods1, Noel McCaffrey1, Lisa Loughney1, Fiona Skelly1, Andrew McCarron1, Niall Moyna1, 2Dublin City University, Dublin, Ireland. 1University of Limerick, Limerick, Ireland. (Sponsor: Dr. Michael Harrison, FACSM)
Email: mairead.cooney@dcu.ie

(No relevant relationships reported)

PURPOSE: Exercise is known to increase cancer survivors' cardiopulmonary fitness and strength, assist in the management of treatment related side effects and reduce the risk of cancer recurrence and mortality. The aim of this study was to determine the long-term effects of the MedEx IMPACT (IMprove Physical Activity after Cancer Treatment) trial, a patient centred, evidenced-based and theoretically informed physical activity behaviour change intervention, on cancer survivors' long-term levels of depression, fatigue and mental well-being (MWB).

METHODS: Adults with an established diagnosis of cancer, who had completed their adjunctive therapy, were referred to a community-based exercise rehabilitation programme (CBERP) for survivors of cancer known as 'MedEx Move On'. Participants in the control group (CG) and intervention group (IG) attended two 60-min supervised exercise classes each week for 12 weeks. In addition, participants in the IG also received: i) a home-based exercise programme, ii) 4 PA information sessions and iii) a 1:1 exercise consultation. At baseline, programme completion (week 12) and 3-month follow-up, depression, fatigue and MWB were measured using the Patient Health Questionnaire (PHQ-8), Functional Assessment of Chronic Illness Therapy-Fatigue Scale (FACT-Fatigue) and the short Warwick-Edinburgh mental well-being scale (SWEMWBS), respectively.

RESULTS: One-hundred and ninety-one survivors of cancer were recruited (CG, n= 87; IG, n=104; mean age 56 ± 10 yrs, 73% female). Cancer diagnoses were breast (60%), colorectal (16%), prostate (13%) and other (11%). On average, participants attended 66% of the supervised exercise classes (CG= 67±22%; IG=65±27%). 97 participants (51%) completed the trial. Depression, fatigue and MWB significantly improved in both groups from baseline to week 12, and 3 month follow-up (p<0.001). There were no statistically significant differences between the CG and IG.

CONCLUSIONS: Participation in a 12-week CBERP has a positive long-term effect on cancer survivors’ levels of depression, fatigue and MWB. The inclusion of additional behaviour change strategies to the supervised exercise classes did not augment the benefits achieved.
PURPOSE: To examine the effects of an interdisciplinary 8-week supervised exercise program in pre-treatment cancer survivors on a college campus, hypothesizing that participants would improve in QOL and PF.

METHODS: Nine participants with various types of cancer, stages II-III, within 3 years of treatment were included in this pilot-study. QOL was measured using the Short Form-36 (SF-36). PF was measured using grip strength, 30 second sit to stand (30s STS), single limb stance, 6 minute walk test (6MWT), and sit and reach flexibility test. Measurements were taken at baseline and at the end of the 8 week program. Participants worked with ES and PT students at the campus fitness facility on an individualized program created by the pair with faculty oversight. Participants were encouraged to meet American College of Sports Medicine guidelines for cardiorespiratory endurance, muscular fitness, and flexibility. Results were analyzed using descriptive statistics.

RESULTS: Seven participants completed the study. The greatest gains in PF were demonstrated in the 6MWT, flexibility, 30s STS, and grip strength. Overall, 86% of participants improved in the majority of PF tests. QOL improved in 71% of participants for physical function but only in 43% of participants for general health subscales.

CONCLUSIONS: This is the first known study design to combine an interdisciplinary approach (ES and PT) to exercise care for cancer survivors in an academic setting. This supportive and collaborative environment allowed for an individualized program and participant monitoring from both disciplines. Furthermore, it permitted learning opportunities for students and fitness opportunities for cancer survivors to enhance the continuum of care.

Cancer treatments including surgery, chemotherapy, radiation, and hormone suppressant therapy have greatly improved the survival of breast cancer patients. Although these treatments have been successful in reducing breast cancer mortality, they are accompanied by long-term side effects that include accelerated losses in muscle mass and gains in fat mass. These changes lead to losses in strength and physical function. While resistance training programs have been shown to attenuate these negative changes in body composition, strength, and physical function, there is a lack of research examining the effects of resistance training combined with high impact training or a low impact yoga program to maintain or improve these measures.

PURPOSE: To examine the effects of functional impact training (FIT) and yin yoga (YY) on body composition, strength, and physical function in breast cancer survivors (BCS). METHODS: Forty-four BCS (60.3 ± 8.3 yrs) were assigned to a 24-week FIT intervention (resistance+high impact exercises) or YY intervention (stretching+relaxation) 2x/wk. Pre- and post-body composition measurements were assessed via dual energy X-ray absorptiometry. Upper body strength was measured by a one-repetition maximum chest press test. Measurements were taken at baseline and at the end of the 8 week program. Participants worked with ES and PT students at the campus fitness facility on an individualized program created by the pair with faculty oversight. Participants were encouraged to meet American College of Sports Medicine guidelines for cardiorespiratory endurance, muscular fitness, and flexibility. Results were analyzed using descriptive statistics.

RESULTS: Seven participants completed the study. The greatest gains in PF were demonstrated in the 6MWT, flexibility, 30s STS, and grip strength. Overall, 86% of participants improved in the majority of PF tests. QOL improved in 71% of participants for physical function but only in 43% of participants for general health subscales.

CONCLUSIONS: This is the first known study design to combine an interdisciplinary approach (ES and PT) to exercise care for cancer survivors in an academic setting. This supportive and collaborative environment allowed for an individualized program and participant monitoring from both disciplines. Furthermore, it permitted learning opportunities for students and fitness opportunities for cancer survivors to enhance the continuum of care.
A wealth of evidence suggests exercise as a complementary therapy for breast cancer (BC), by reducing the expression of oncogenes and atrophy genes, inducing antioxidant defense pathways and helping combat chronic inflammation. However, exercise appears not to be adequately incorporated in the therapeutic strategy of cancer.

**PURPOSE:** This study assessed the physical activity (PA) levels and quality of life (QoL) of women under different BC treatment strategies and compared them with those of age-matched healthy females.

**METHODS:** 141 women were recruited, 76 women with BC under chemotherapy or radiotherapy (age: 53.3 yrs, height: 1.61m, mass: 71.3kg, BMI: 26.7 kg/m²) and 65 healthy women who served as control group (age: 49.6 yrs, height: 1.65m, mass: 69.0kg, BMI: 25.3 kg/m²). Levels of PA were self-estimated with the International Physical Activity Questionnaire (IPAQ) and QoL with the SF-36 Health Survey questionnaire.

**RESULTS:** All BC women refrained from high-intensity PA, while 49.30% of the control group participated in high-intensity PA. However, 50.55% of women under radiotherapy, 44.43% under chemotherapy and 35.70% of women subjected to both therapies participated in moderate-intensity PA. They selected brisk walking as the preferred form of PA by 87.33%, 90% and 83.50%, respectively. In the control group, 50.70% of the individuals participated in moderate-intensity PA and 98.40% of the same used to walk. Moreover, BC patients accumulated 8-10.3 h per day of sedentary lifestyle in contrast with the control group that spent 2 h per day sitting. When BC patients estimated their QoL, 15.30% of them assessed it as excellent, 60% as very good, 23.07% as average and 1.50% as poor. Similarly, 10.30%, 55.17%, 29.30% and 3.40% of the control group evaluated their QoL as excellent, very good, average and poor, respectively. **CONCLUSIONS:** Our findings revealed that BC patients didn’t engage in high-intensity PA, however they estimated their QoL as very good. PA levels of moderate-intensity were similar in the two groups, indicating that BC patients were willing to exercise but refrained from doing more intense activities, possibly because of their cancer-related fatigue. Moreover, patients subjected to both therapies exhibited lowered rates of PA, potentially due to the overall burden of the therapeutic intervention.

**Self-efficacy (SE) beliefs in one’s ability to successfully satisfy the demands of planning and engaging in health behaviors are integral to successful exercise and dietary (EX+D) behavior change. Emerging evidence suggests lifestyle EX+D interventions result in improvements in a variety of clinically relevant outcomes in prostate cancer (PCa) patients undergoing androgen deprivation therapy (ADT). However, studies delineating the effects of EX+D interventions upon changes in key SE outcomes remain limited. **PURPOSE:** The purpose of the single-blind, randomized controlled Individualized Diet and Exercise Adherence-Pilot (IDEA-P) trial is to evaluate the preliminary efficacy of a combined exercise and dietary (EX+D) intervention, implementing a group-mediated cognitive behavioral (GMCB) approach, relative to standard of care (SC) treatment among PCa patients undergoing ADT. In the current study, we evaluated the effects of the EX+D intervention on select SC outcomes at the end of the intensive phase of the intervention. METHODS:** A total of 32 PCa patients (M age = 65 years) on ADT were randomly assigned to the EX+D (n = 16) or SC (n = 16) interventions. Measures of select SE outcomes were obtained at baseline and 2 and 3-month follow-up assessments. **RESULTS:** Results of intention to treat ANCOVA analysis of residualized change scores yielded a significant treatment main effects for (p < 0.05) for multiple SE outcomes. Post hoc analysis revealed that the EX+D intervention resulted in superior improvements in exercise (r = 0.62), coping (r = -0.68), and scheduling (r = -0.68) SE relative to the SC intervention at 3 months. Partial correlation analyses also revealed that scheduling and coping SE were significantly correlated with mobility performance (r < 0.01) and exercise participation (p < 0.01) at 3 months. **CONCLUSIONS:** Findings from the IDEA-P trial suggest that the EX+D intervention, implementing a GMCB approach, resulted in superior changes in select SE outcomes relative to SC approach. Additionally, greater SE was related to superior mobility performance and exercise participation across the trial. These results underscore the utility of a GMCB-based EX+D intervention for promoting meaningful improvement in key SE outcomes among PCa patients undergoing ADT.
and categorized into meeting physical activity guidelines (aerobic only; strength only; combined; and neither). Assessment was conducted at baseline, post-intervention, and 12-month follow-up.

RESULTS: Of 301 patients, 284 (94.4%) and 263 (87.4%) completed body composition and self-reported physical activity assessment at 12-month follow-up, respectively. There were no significant effects of the randomized interventions on body weight, lean body mass, body fat mass, and percent body fat at 12-month follow-up; and no significant changes within each group. Meeting the combined physical activity guideline at 1-year follow-up was significantly associated with higher lean body mass compared to meeting neither guideline (-0.9 kg; p = 0.017). Moreover, meeting the aerobic guideline only was significantly associated with a lower body fat percent compared to meeting the combined guideline (-1.3%; p = 0.049) and with a higher lean body mass compared to meeting neither guideline (-0.8 kg; p = 0.037).

CONCLUSIONS: Combined or higher dose aerobic exercise during breast cancer chemotherapy was not superior to a standard dose of aerobic exercise for body composition outcomes at 1-year follow-up. Meeting the combined or aerobic guidelines during follow-up, however, was associated with higher lean body mass and lower percent body fat, respectively which can have implications for breast cancer outcomes.

937 Board #171
May 29 3:30 PM - 5:00 PM
A Modified Participatory Action Research Process To Enhance Utilization Of A Co-located Exercise Oncology Clinic
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Exercise offers great potential as an adjunct therapy to reverse treatment-related side-effects and increase quality and quantity of life in people with cancer. Regardless, most patients do not exercise during treatment and it is often overlooked by clinicians as an important component of cancer care. Innovative implementation strategies are needed to overcome these barriers. A 5+ year partnership between the Exercise Medicine Research Institute at Edith Cowan University (ECU) and GenesisCare has demonstrated that co-locating an exercise clinic within a cancer treatment facility is a feasible solution, yet referrals and program uptake have been suboptimal.

PURPOSE: To investigate the barriers and facilitators to program referral and uptake and provide recommendations to optimize program utilization.

METHODS: A variation of participatory action research methodology was employed to understand the factors impacting exercise program referral and uptake, and to design solutions to improve both. A stakeholder advisory group (SAG) was convened to guide the process. Key stakeholders were identified as SAG members and a comprehensive mixed methods approach was used to gain feedback from all program users. Utilization and financial data were collected via clinic records.

RESULTS: This 6-month process successfully engaged key partner organizations and individuals, and led to the development of an implementation-ready program model. Multiple barriers and facilitators within and across the domains of the social-ecological model were revealed and accounted for in the model’s development. Logistics (e.g., finances, hours of operation, referral pathways), programming options, and issues around clear communication within the system were targeted as major areas for improvement. Leadership’s commitment to change and strong belief in the value and potential of the program were key to success.

CONCLUSION: The successful operation of a co-located exercise and cancer treatment facility requires leadership buy-in supported by a robust implementation plan that considers all domains of the social-ecological model. Stakeholders should be engaged throughout the process, using their input to create a clear vision that can be effectively communicated to all program users.

938 Board #172
May 29 3:30 PM - 5:00 PM
Feasibility And Adherence For Exercise During All Chemotherapy: EnACT
Kelsey G. Taylor, Erica A. Schleicher, Melanie Potiaumpei, Jessica Moyer, Natasha Bursie, Kathryn Schmitz, FACSM. Penn State Hershey College of Medicine, Hershey, PA. (Sponsor: Kathryn Schmitz, FACSM)
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Several national and international agencies recommend exercise following a cancer diagnosis. Current research suggests that exercise is safe and effective during adjuvant therapy and has been shown to improve fatigue, pain, physical function, symptom management, quality of life, depression and anxiety. Despite the evidence in favor of exercising during chemotherapy, the acceptability and feasibility of an exercise intervention among cancer patients receiving chemotherapy remains unknown.

PURPOSE: To determine if an individualized exercise intervention is accepted by cancer patients receiving chemotherapy and is feasible for them to complete.

METHODS: One hundred sixty-eight patients diagnosed with cancer actively receiving chemotherapy were recruited for an outpatient exercise intervention. Participants were prescribed an individualized home-based exercise program that included resistance, aerobic, flexibility and balance exercises. Exercise equipment included resistance bands, and adjustable dumbbells. Participants were in the study either the length of their chemotherapy regimen or for six months, whichever came first. An exercise physiologist followed-up with participants during their regularly scheduled infusions to document the progress of their exercises and make any necessary adjustments to the exercise prescription. RESULTS: Seventy-four participants (47F, 27M; 58.2 ±11.9 years) completed the entirety of the exercise intervention. Feasibility was defined as completing one third of prescribed exercises and adherence was defined as the number of completed exercise sessions divided by the number of prescribed sessions. Overall 86.5% of participants reached the feasibility threshold. Patients with non-metastatic cancer had higher feasibility at 89.4% compared to patients who with metastatic cancer at 81.5%. The adherence rate for aerobic, balance and flexibility training was 75%, while the resistance training adherence rate was 60%. Adherence rates were higher in the metastatic group, 76%, compared to the non-metastatic group, 70%. CONCLUSION: An exercise intervention for cancer patients receiving chemotherapy is feasible and the adherence rates are comparable to and even higher than those seen in previous exercise studies done with cancer patients.

939 Board #173
May 29 3:30 PM - 5:00 PM
Moving Medicine: Development Of An Exercise Oncology Tool For Clinical Practice
Rebecca Robinson1, Kush Joshi2, Hamish Reid1, Natasha Jones1, Mike Loosemore3, Kate Hornby2, Florence Newton1. 1Faculty of Sports and Exercise Medicine, Sheffield, United Kingdom. 2Faculty of Sports and Exercise Medicine, London, United Kingdom. (Sponsor: Kathryn Schmitz, FACSM) Email: rp Robinson@docotors.org.uk

The Moving Medicine Cancer resource translates exercise oncology evidence into a tool for everyday practice in healthcare. It was created by the Faculty of Sport and Exercise Medicine in partnership with Public Health England and Sport England.

PURPOSE
Evidence that Physical Activity (PA) can mitigate cancer-related fatigue, deconditioning and late effects, positively impacting physical function, quality of life and survivorship continues to grow. However most people living with cancer do not attain recommended PA levels and under 10% of HCPs provide PA advice. The Moving Medicine digital resource is designed to overcome barriers and integrate PA into every healthcare contact.

METHOD
Created in a knowledge-into-action framework, Moving Medicine Cancer is one of 9 themes promoting PA in non-communicable disease. Development comprised two phases:

1. Knowledge creation
A literature search yielding 34000 papers found 500 relevant for inclusion.
Evidence was graded and divided into pre, during and post treatment. An expert multidisciplinary panel was recruited for consultation. An iterative process refined and prioritized evidence into clinical context.

2. Action cycle
Delphi study and COM-B framework analysis drove action cycle creation. This enabled end-user driven design.

RESULTS
The online tool is a time-based framework with practical information reflecting clinical priorities and accessible embedded evidence. It presents infographics with a clinical priorities and accessible embedded evidence. It presents infographics with a

Abstracts were prepared by the authors and printed as submitted.
Nearly half of all cancer patients undergo chemotherapy. Many patients experience chemotherapy-related side effects, including decreased quality of life. The American College of Sports Medicine recommends exercise following a cancer diagnosis and current research suggests that exercise is safe during chemotherapy and can be used as a complementary strategy to manage symptoms. PURPOSE: To examine whether an individualized exercise program delivered during chemotherapy can improve chemotherapy-related symptoms. METHODS: One hundred sixty-eight patients diagnosed with cancer actively receiving chemotherapy were recruited for a home-based exercise intervention. Participants were prescribed an individualized exercise program focusing on resistance, aerobic, flexibility, and balance training. Participants were in the study for the length of their chemotherapy regimen or up to six months, whichever came first. At baseline and completion of the study participants were asked to complete the following questionnaires: Brief Pain Index (BPI), European Organization for Research and Treatment of Cancer Quality of Life (EORTC QLQ-C30), Patient-Reported Outcomes version of the Common Terminology Criteria for Adverse Events (PRO-CTCAE), and Fatigue Symptom Inventory (FSI).

RESULTS: An interim analysis included seventy-four participants (47F, 27M; mean age 52.3 ± 17.5 years). A Paired-Sample T-test analysis showed a significant increase in social functioning (MD= 9.18, SD= 27.3, p<0.03) and a significant decrease in fatigue in regards to relations with others (MD= -0.38, SD=2.80, p=.01). Additionally, severity of headaches (MD= -0.31, SD= 0.60, p=0.05) and frequency of nausea (MD= -0.47, SD=1.54, p=0.02) significantly decreased with exercise. Severity of neuropathy significantly increased (MD= 0.47, SD= 1.24, p=0.005), however, it did not significantly interfere with activities of daily living. Severity of pain and overall fatigue did not significantly change with exercise. CONCLUSION: These preliminary findings show that an individualized exercise program can improve chemotherapy-related symptoms and may help manage others.

941 Board #175 May 29 3:30 PM - 5:00 PM The Effects of Different Intensity Exercise on Lactate Metabolism of DEN-induced Hepatocellular Carcinoma.

Luo Cao, Zhengtai Qi, Shuzhe Ding. East China Normal University, Shanghai, China.

Email: 982371586@qq.com (No relevant relationships reported)

PURPOSE: Lactate is not only a waste product of glycolysis, but also an important signaling molecule regulating tumorigenesis. Lactate also is produced during exercise, but exercise can enhance body function to eliminate lactate. Whether exercise suppresses tumorigenesis by regulating lactate metabolism? So the primary purpose of our investigation is to compare the anti-tumor effect between different intensity exercise from the perspective of lactate metabolism.

METHODS: From 8 to 26 weeks of age, mice with DEN treatment run on the treadmill at different intensity. NC: injection saline only. DEN: injection DEN only. HIT: treatment DEN, running on the treadmill at 0.8 km/h for 40 minutes once a day, 5 days a week. ELISA, RT-PCR and WB were used to evaluate relative serum, relative mRNA and protein expression.

RESULTS: We found that tumor incidence was similar between DEN and HIT (66.7% vs. 62.5%); however, it was significantly smaller in ET compared to DEN (20% vs. 66.7%, 20% vs. 62.5%). The lactate in serum was significantly higher in HIT compared to DEN (25.817±2.696 vs. 18.668±1.086mmol/l, p<0.05); The pyruvate in serum was also significantly higher in HIT compared to DEN (17.136±1.354 vs. 13.545±0.545mmol/l, p<0.05). The lactate in mitochondria was significantly lower in ET compared to NC (0.543±0.707 vs. 0.703±0.066mmol/l, p<0.01), but there was no significant change in cytoplasm lactate dehydrogenase between two groups. Most importantly, we found that endurance exercise significantly increased the mRNA levels of COX1 in ET in liver, compared to NC and HIT (2.629±0.5 vs. 1.0±0.107, p=0.001, 2.629±0.5 vs. 0.884±0.154=0.001, 2.629±0.5 vs. 1.172±0.288=0.05). The mRNA levels of CYTB in ET in liver was significantly higher than NC and DEN (1.964±0.452 vs. 1.0±0.122, p=0.05, 1.964±0.452 vs. 0.829±0.140, p=0.05). The mRNA levels of ND1 in ET in liver was also significantly higher than NC and DEN (1.894±0.433 vs. 1.0±1.176±0.05, 1.894±0.433 vs. 0.654±0.069, p<0.01).

Current research shows that exercise during chemotherapy is safe, feasible, and effective at improving physical function and managing symptom severity and interference in a number of different cancer types. Despite the positive findings of exercise during chemotherapy, referral for exercise during treatment has not yet become standard of care. Additionally, there is a lack of information on the effectiveness of an institute-wide exercise program for patients receiving chemotherapy. PURPOSE: To evaluate changes in objectively-measured physical function in patients receiving chemotherapy after receiving a personalized exercise prescription. METHODS: One hundred sixty-eight subjects (65M, 103F; 39.3 ± 11.8 years) actively receiving chemotherapy enrolled in an out-patient exercise intervention. Participants were given home-based exercises that included resistance, aerobic, flexibility, and balance exercises. Exercise equipment included resistance bands and adjustable dumbbells. Physical function (PF), was measured using the 30-second chair stand (30CST), Timed-Up-and-Go (TUG), Hand-Grip Strength (HGS), and the 4-Stage Balance test (BAL). Data collection was performed prior to beginning the exercise program and following completion of their chemotherapy regimen (non-metastatic patients) or 6 months after starting EnACT (metastatic patients). RESULTS: Eighty two subjects completed physical function testing. A Paired-Samples T-test analysis showed a significant increase in the 30CST (MD= -7.4, SE= 3.4, p<0.03) and a significant decrease in TUG (MD= -0.14, SE= 0.19, p=0.03). There were no significant changes in HGS for either right or left hand. While the BAL also showed no significant changes after the exercise intervention, the Instep balance test showed a trend towards significant increases in performance time (MD= 0.31, SE= 0.17, p<0.06). CONCLUSION: These preliminary results indicate that integrating a personalized exercise prescription into standard of care is efficacious in improving physical function despite the rigorous burden of receiving chemotherapy. Improving the physical function of patients during chemotherapy may prevent future treatment-related decrements in functional capacity and the need for rehabilitative measures.
views possible). Conclusions: Total reach of the ExOnTC demonstrates the potential effectiveness of utilizing a Twitter conference as a platform to communicate the field of exercise oncology when considering the low financial and environmental costs, as well as the opportunity to increase scientific communication across populations. Twitter conferencing should be explored as a tool for scientific dissemination.

**444 Board #178 May 29 3:30 PM - 5:00 PM**

**Effects of TaiChi-Qigong Exercise On Qol of Nasopharyngeal Carcinoma Survivors**

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(No relevant relationships reported)

The incidence of nasopharyngeal carcinoma (NPC) in endemic areas is high. The long-term chemotherapy and radiotherapy cause bodily dysfunction and low quality of life (QoL) in NPC survivors. Complementary therapy especially mind-body exercise such as Tai Chi-Qigong becomes an option for NPC survivors to improve the QoL.

**Purpose:** To examine the effects of 10 weeks TaiChi-Qigong training and health education lectures on QoL of NPC survivors.

**Methods:** Thirty eligible participants were recruited and randomly assigned into either intervention or control group. 14 of NPC survivors (n=7 for intervention group; n=7 for control group) completed pre-post assessment of QoL satisfactorily. The intervention group practiced the active, low-intensity 18-form TaiChi-Qigong exercise for at least 3 times a week for 10 weeks plus three health education seminars during the 10-weeks intervention period. The control group engaged in the health education seminars only over the 10-weeks period. QoL was assessed by Functional assessment of cancer therapy - General (FACT-G) which included four subscales: physical well-being (PWB), social well-being (SWB), emotional well-being (EWB) and functional well-being (FWB).

**Results:** Significant differences were found on subscales of EWB (p=0.031), and the effects of TaiChi-Qigong on SWB is marginally significant (p=0.056).

**Conclusion:** The results of this study provide preliminary data to support that TaiChi-Qigong exercise, as a complementary therapy, may contribute to positive effects for NPC survivors in terms of improved QoL outcomes.

**495 Board #179 May 29 3:30 PM - 5:00 PM**

**Objectively Assessed Physical Activity And Sedentary Behavior In Patients With Advanced Renal Cell Carcinoma**

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**IPSEN SAS, Boulogne-Billancourt, Germany. 3St. Georg Hospital Eisenac, Eisenach, Germany.

Reported Relationships: P. Zimmer: Consulting Fee; IPSEN Pharma GmbH. Industry contracted research; IPSEN Pharma GmbH.

**Purpose:** Increased levels of physical activity are associated with decreased cancer risk and mortality in many cancer types. Moreover, physical activity is known to reduce several side effects of cancer and its treatment thereby improving patients’ quality of life. So far, most studies have focused on frequently observed types of cancer, such as breast, prostate, lung and colorectal carcinoma. Recent data from epidemiological studies also reported such relationships for renal cell carcinoma (RCC). Observational studies have included heterogeneous populations in view of stage of disease and type of treatment. Further, collected data on physical activity have based on self-reported assessments, representing a major limitation of these trials.

**Methods:** Against this backdrop we have initialized the multicenter observational CABOCARE trial in Germany and Austria. Patients with advanced RCC (n=105) are recruited after treatment decision for cabozantinib has been made. Cabozantinib is an inhibitor of receptor tyrosine kinases c-MET, VEGFR and AXL, which has proven to prolong progression free survival (PFS) compared to standard care with sunitinib. Patient characteristics, state of disease, occurrence of adverse events, quality of life (FACT NFKSI-19), self-reported physical activity (newly developed visual analogue scales) as well as objective physical activity, sedentary behaviour and sleep data (Actigraph® GT9X Link device) are recorded at baseline, and each three months thereafter. **Results/ Conclusions:** Thereby, CABOCARE (NCT03647878) will be the first observational trial collecting objective physical activity and sleep data and their association with PFS, adverse events and quality of life (P=0.01); the trial has opened in September 2018. Here we would like to present data of the first patients.
Board #182 May 29 3:30 PM - 5:00 PM Acute Effect of Aerobic Exercise on Arterial Stiffness in Breast Cancer Survivors: Preliminary Results

Georgios Grigoriadis,1 Brooks A. Hibner,1 Elizabeth C. Schroeder,1 Alexander J. Rosenberg,2 Garett Griffith3, Amanda V. Sardelli,2 Dana C. Danciu,1 Bo Fernhall, FACSM2, Tracy Baynard, FACSM2. 1University of Illinois at Chicago, Chicago, IL. 2University of North Texas Health Science Center, Fort Worth, TX. 3Northwestern University, Chicago, IL. (Sponsor: Tracy Baynard, FACSM)

(No relevant relationships reported)

Breast cancer survivors (BCS) who underwent chemotherapy treatment have increased risk of cardiovascular disease (CVD). Chemotherapy contributes to increased arterial stiffness. Acute aerobic exercise has been demonstrated to be effective in improving arterial stiffness in healthy individuals, however, it is unknown if BCS have a similar response to acute exercise. PURPOSE: To determine if arterial stiffness is different between BCS and healthy controls following acute aerobic exercise. METHODS: Seven BCS (48 ± 4 yrs; 26.0 ± 2.8 kg/m²) and seven female controls (43 ± 9 yrs; 22.7 ± 3.5 kg/m²) completed a 30-min bout of aerobic cycling exercise at 65% of their maximal aerobic capacity. Central arterial stiffness was evaluated by pulse wave velocity (PWV) via application tonometry at baseline, 5 and 30 min post exercise. Hemodynamic variables [cardiac output (Q), heart rate (HR), and mean arterial blood pressure (MAP)] were acquired with an automated ambulatory blood pressure monitor. Carotid arterial stiffness was determined using ultrasonography [β-stiffness index, pressure-strain elasticity modulus (Ep) and arterial compliance (AC)]. RESULTS: See Table. Both groups had similar increases in AC at 30 min compared to 5 min post-exercise (p=0.05). HR increased in both groups post exercise (p<0.05); however, BCS had an overall higher HR compared to the control group (p=0.05). There were no differences in PWV, β-stiffness index, Ep and AC responses following exercise between the groups. CONCLUSIONS: These results suggest that BCS have similar arterial stiffness responses compared to a healthy control group. Interestingly, PWV decreased (approached significance), while AC decreased following exercise, showing a possible differential response between the aorta and carotid artery, suggesting more investigation in this area.

<table>
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<th>Baseline</th>
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<td>PWV (m/s)</td>
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<td>Ep (kPa)</td>
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<tr>
<td>BCS</td>
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<tr>
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<tr>
<td>AC (mM/mHg)</td>
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<td></td>
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<td>74 ± 33</td>
<td>87 ± 32</td>
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<tr>
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</table>

Board #183 May 29 3:30 PM - 5:00 PM Do Taxane Based Chemotherapies Impair Improvements in VO2 in Female Cancer Survivors

Stephen LoRusso,1 Henry Piascik,2 Karen Wonders, FACSM2. 1Saint Francis University, Loretto, PA. 2Maple Tree Cancer Alliance, Dayton, OH.

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(No relevant relationships reported)

Purpose: To determine if female cancer patients who underwent taxane-based chemotherapies benefited from exercise as compared to those who received non-taxane based treatments. Methods: Retrospectively, 101 females (57.88 + 11.59), with female cancers (Breast (79), Ovarian (10), Endometrial (4), Uterine (2), and Cervical (1)) enrolled in a cancer rehabilitation program underwent a variety of fitness assessments, but only measures of VO2 are reported here. Each subject was provided an individualized mixed home (2 days) and facility based (1 day) 12 week exercise intervention. Results: A strong positive correlation between VO21-VO22 (r=0.802, p<0.001), a low to moderate negative correlation between VO21-age (r=-0.365, p=0.000), a low negative correlation between VO22-age (r=-0.215, p=0.036) were found. A significant change from VO21 to VO22 (F=5.372, p<0.001) was determined. While there were no differences between Taxane and Non-Taxane measures of VO2, there was a trend in percent change in VO2 (F=3.306, p=0.073). There were also no differences in any measure of VO2 between taxane and non-taxane treatments by cancer type. Regression analysis indicated only age (r=2.775 p=0.007) predicted percent change in VO2 values and VO2 1 values (r=3.606, p=0.001), while age and cancer type predicted VO22 values (r=2.117, p=0.037; r=2.217, p=0.029 respectively). Conclusion: The data does not support the hypothesis that taxane based chemotherapies result in lower VO2 values, as both age and cancer type had greater overall effects on VO2. Additionally, significant improvements in VO2 after the 12-week exercise intervention, regardless of treatment type, age, or cancer type supports the effectiveness of exercise-based cancer rehabilitation program to improve VO2 in a female cancer population.

Board #184 May 29 3:30 PM - 5:00 PM Taxane Based Chemotherapies Impact on Balance and VO2 in Female Cancer Survivors

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Purpose: The purpose of this study was to determine if taxane based chemotherapies have an impact on VO2 and or balance versus non-taxane based chemotherapies in female cancer survivors. Methods: Twenty-six females (Avg. 58.11 years 29-72), enrolled in a cancer rehabilitation program underwent a treadmill assessment of VO2 and four measures of balance (TUG, 4stage, sittostand, 6MWT). Results: No differences were found in measures of balance or VO2 between those who received taxane based chemotherapies vs. non-taxane based chemotherapies (p=0.05). Significant increases in HR (r=10.71, p<0.001) and Dyspnea (r=5.96, p<0.001) occurred with significant correlations between pre-exercise (r=-0.605, p=0.001) and post-exercise (r=-0.728, p=0.001) Dyspnea and RPE. Trends in associations between TUG and 6MWT (p=0.073), 4stage and VO2 (p=0.057), 6MWT at 4stage and p=0.08) were also observed. Significant positive correlation between 6MWT and VO2 (r=0.487, p=0.012) and a negative correlation between %change in Dyspnea and VO2 (r=-0.474, p=0.014) were found. A negative correlation between pre-exercise HR and 6MWT speed (r=-0.441, p=0.027) and strong positive correlation between 6MWT distance and 6MWT Speed (r=0.968, p=0.000). 6MWT distance moderately predicted VO2 (r=0.487, F=7.461, p=0.012). Conclusion: The data does not support the hypothesis that taxane based chemotherapies affect VO2 values, or measures of balance. However, trends suggest a larger population might detect an association among the balance measures and VO2 and therefore perhaps detect a difference. Expected changes and associations between RPE and Dyspnea were found, with lower scores likely associated with higher fitness as evidenced by negative correlation between %change in Dyspnea, 6MWT speed and pre-exercise HR and 6MWT speed and distance.

Board #185 May 29 3:30 PM - 5:00 PM The Effect Of Doxorubicin On Myocardial Extracellular Matrix Degradation

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(No relevant relationships reported)

Doxorubicin (DOX) is an effective anthracycline chemotherapy agent associated with several adverse side effects including cardiotoxicity. Although the mechanism responsible for the cardiotoxic effects of DOX has yet to be fully elucidated, the leading theory is that the generation of reactive oxygen species (ROS) damages cardiomycocytes and leads to cell death. ROS play a role in the expression and activation of matrix metalloproteinases (MMPs), a family of enzymes involved in extracellular matrix (ECM) degradation. Normally, MMP activity is regulated by tissue inhibitors of metalloproteinases (TIMPs). We hypothesized that DOX treatment would lead to overexpression of MMPs or underexpression of TIMPs, which would compromise the integrity of the myocardial ECM and disrupt cardiac function. PURPOSE: To investigate the effects of DOX on MMP-2, MMP-9, and TIMP-2 expression in rat cardiac tissue. METHODS: At 20 weeks of age, Sprague Dawley rats received a bolus injection of DOX (12 mg/kg; n=6) or saline (0.9%; n=8) as a control. Five days post-injection, cardiac tissue was collected from each animal, homogenized, and standardized for protein content. Samples were analyzed for expression of MMP-2, MMP-9, and TIMP-2 using western blotting with enhanced chemiluminescence. All results were normalized to GAPDH. Data were analyzed using a Student’s T-Test (α=0.05). RESULTS: Results showed significantly lower expression of MMP-9 in...
cardiac tissue from animals treated with DOX relative to the control (p = 0.0068). There was no significant difference in expression of MMP-2 (p = 0.8757) or TIMP-2 (p = 0.2256) between groups. **CONCLUSION:** These findings suggest that treatment with DOX significantly reduced the expression of MMP-9, contradicting our hypothesis. A potential explanation for these findings is that there is an intermediate factor affecting MMP-9 expression. Future studies should profile all components of MMP/TIMP signaling during DOX treatment.

Exercise and competition function as stress factors and may result in dysregulation in the neuroendocrine and cardiovascular systems. **PURPOSE:** The intent of the study was to evaluate neuroendocrine and cardiovascular response using salivary cortisol and heart rate/blood pressure respectively in junior track and field athletes across a season. **METHOD:** Fifty-One Jamaican junior level track and field athletes (26 females, 25 males) participated in the study. Data was collected throughout the athletic season over two main periods: (1) a preparation period and (2) a competition period which was further subdivided into two stages: development game stage and major game stage. Athletes delivered a saliva sample prior to bedtime (8 pm - 10 pm) during each phase of the season. Resting blood pressure and heart rate were monitored throughout the season. Data collected during the preparation and competition periods were compared using Friedman's test and Wilcoxon signed-rank test. **RESULTS:** There were significant changes in salivary cortisol across the season (p < 0.05). The concentration of cortisol increased during the development game stage (42%), then further increased in the major game stage (53%). With regard to cardiovascular response, there were significant differences in heart rate across the season (p < 0.05). However, there was no significant change in blood pressure across the season in the athletes. **CONCLUSION:** Overall, there was an increase in cortisol across the season. This could possibly be due to the accumulation of stress factors over the competitive season which might be due to improper training regimens. Resting heart rate and blood pressure may not be good indicators of stress in athletes.

**PURPOSE:** Nitric oxide (NO) is a strong vasodilator released by endothelial cells, and endothelial microparticles (EMP) are membranous vesicles released into the circulation from activated or apoptotic endothelial cells, both of whose level can reflect the endothelial function. But few research explored the effect of exercise on nitric oxide and endothelial microparticles. The purpose of the study was to evaluate the effects of acute moderate exercise with different duration on NO and EMP in young male patients with grade 1 hypertension. **METHODS:** Seventeen young male patients with grade 1 essential hypertension (SBP between 140-159 and/or DBP between 90-99 mmHg) who did not take antihypertensive drugs were recruited in this study. They randomly performed twice exercises on a bicycle ergometer at a moderate intensity of 40%-50% of their HR reserve; one was 20 min (E20 group), the other one was 40 min (E40 group); there was one week break between two exercises. The level of NO (nitrate/nitrite reduction) and EMP (flow cytometry) in plasma were detected before and immediately after exercise. CD31/CD42 events were defined as EMP and were expressed as events per ml plasma. **RESULTS:** The plasma NO level of E20 and E40 increased significantly after exercise (65.75 ± 23.97 μmol/L vs. 71.37 ± 25.18 μmol/L and 64.08 ± 23.13 μmol/L vs. 77.94±23.73 μmol/L, P < 0.01 for both). There was no difference in plasma NO level between the two groups before and after exercise, but the increase of NO level in E40 was greater than that in E20 (24.47% vs. 9.24%, P = 0.01). The plasma EMP level of E20 and E40 decreased significantly after exercise (1698.38 ± 399.40 vs. 1814.99 ± 388.25 and 1891.43 ± 334.15 vs. 1604.61 ± 351.61, P = 0.01 for both). There were no difference in plasma EMP level between the two groups before and after exercise, but the decrease of EMP level in E40 was greater than that in E20 (15.66% vs. 8.00%, P < 0.01). **CONCLUSION:** Both 20-min and 40-min acute moderate exercise can improve endothelial function by increasing nitric oxide and decreasing endothelial microparticles level in patients with hypertension, and the effect of 40-min is better than that of 20-min. Supported by Research on Prevention and Control of Major Chronic Non-communicable Diseases (2016YFC1300202).
measures, blood acid-base, muscle oxygenation and heart rate (HR) were determined. Exercise values and recovery intervals from 3rd to final repetition were compared between T1 and T2 intensity using two-way repeated measures ANOVA. RESULTS: Subjects reached 9±1 intervals during T1 (390±40 W) compared to 5±2 during T2 (390±40 W) due to fatigue. VO2 increased from 3.33±0.34 to T1 in 3.83±0.53 L.min−1 in T2 (p<0.006). Pulmonary ventilation (V̇E) increased from 77±31 in T1 to 117±27 L.min−1 in T2 (p<0.04). HR increased from 171±12 beats per minute (bpm) in T1 to 178±9 bpm in T2 (p<0.03). Although, blood lactate concentration (LA) increased and blood pH values decreased considerably during T2, they were similar to values at exhaustion in T1 test. None of the muscle oxygenation variables: oxygenhemoglobin (HbO2), deoxyhemoglobin (HHb) and total hemoglobin (HbT) changed significantly. CONCLUSION: The results of our study revealed that changes in blood acidosis and muscle oxygenation during tests were the limiting factors and not the VO2 uptake.

The average American consumes far more sodium than is recommended. Consuming high amounts of sodium may augment blood pressure (BP) responses to physical stress like exercise. Exaggerated BP responses to exercise are thought to be an early symptom of some cardiovascular diseases like hypertension. PURPOSE: This analysis contains two studies. The purpose of study one was to determine at what time point both blood plasma and serum sodium would be consistently elevated following sodium and water consumption. The purpose of study two was to examine if elevated plasma and serum sodium result in handgrip (HG) exercise and the cold pressor test (CPT). METHODS: Study 1: Eight participants drank 423 mL of normal saline (sodium 154 mmol/L) and had repeat blood draws every 30min for 3hr. Study 2: Sixteen different participants underwent two randomized data collection visits; an experimental (EXP) visit 90min following normal saline consumption and a control (CON) without saline consumption. At each visit beat-by-beat BP and heart rate were recorded during a 5min rest period followed by 2min of isometric HG at 30% maximal voluntary contraction. Two minutes of post exercise ischemia (PEI) were performed immediately following HG. After ≥10min rest, participants underwent a 2min CPT. RESULTS: Study 1: Both plasma volume (+6.8 ± 1.3 %∆) and serum sodium (+3.5 ± 1.3 %∆) were elevated (p<0.05) at or before the 90min time point and remained elevated throughout the 3hr follow-up period. Study 2: There were no significant differences in mean arterial pressure (MAP) during HG (EXP: 17.4 ± 2 mmHg; CON: 19.1 ± 1.5 mmHg), PEI (EXP: 16.9 ± 2.9 mmHg; CON: 16.9 ± 1.9 mmHg), or the CPT (EXP: 20.3 ± 2.7 mmHg; CON: 20.9 ± 2.9 mmHg) between conditions (P>0.05). MAP recovery from the CPT was significantly slower in the saline condition (1min recovery: EXP: 15.7 ± 2.0 mmHg; CON: 12.3 ± 2.2 mmHg, P<0.05). CONCLUSIONS: The current data found no significant differences in cardiovascular responses during handgrip or the cold pressor test conditions between groups. However, a modest delay in BP recovery was found following the cold pressor test during sodium and volume loading. This suggests acute salt and water consumption increases cardiovascular strain following an intense physical stressor.

Although aerobic exercise (AE) has been established as effective for lowering blood pressure (BP), little is known about the alterations in aortic BP after exercise. PURPOSE: To investigate the acute pulse wave reflection responses after moderate AE with different volumes in normotensive (NT) and hypertensive (HT) men. METHODS: We included 14 normotensives [age: 40.7±2.8 yr; body mass index (BMI): 25.7±0.9 kg/m2; maximal oxygen uptake (VO2peak): 3.13±1.6 mL·kg−1·min−1; 24-h ambulatory systolic/diastolic BP (SBP/DBP): 120.6±1.6/73.9±1.2 mmHg] and 10 hypertensive men [age: 39.2±2.3 yr; BMI: 29.3±1.0 kg/m2; VO2peak: 26.7±0.8 mL·kg−1·min−1; 24-h ambulatory SBP/DBP: 139±3.2/86±4.2 mmHg]. Participants underwent a maximal cardiopulmonary exercise test, an exercise-control session (CTL), and two cycling bouts at 50%VO2reserve (150±300 kcal) in a randomized order. Aortic systolic blood pressure (SBPa), aortic pulse pressure (PPa), augmentation pressure, and augmentation index were determined using applanation tonometry 10 min before and 30- and 70-min after CTL and the two exercise bouts (SphygmoCor v7). RESULTS: In NT, AE50%-150%kcal decreased SBPa in comparison with CTL, until 30 min of recovery (CTL: &91 7.5±3.3 mmHg; AE50%-150kcal: &91 5.2±2.8 mmHg (p<0.05)). However, in HT men, only AE50%-300kcal attenuated the SBPa increase observed in the CTL (CTL: &91 9.2±0.9 mmHg (p<0.001); AE50%-300kcal, &91 4.9±2.3 mmHg (p<0.07)). In addition, NT men showed a decrease in PPa after all AE bouts, without differences between conditions. In the HT group, both AE bouts attenuated the PPa increase observed in CTL (CTL: &91 4.3±0.1 mmHg (p<0.05); AE50%-150kcal, &91 0.3±0.3 mmHg (p=0.18)). Lastly, only AE50%-150kcal was able to reduce pulse wave reflection until 30 min of recovery in NT men. CONCLUSION: In NT, lower AE volume was able to reduce pulse wave reflection and central BP until 30 min of recovery. However, only the greater AE volume attenuated the increase in central aortic BP and PPa, with no difference in pulse wave reflection after any experimental protocol in the HT group.
Heart rate variability (HRV), blood pressure variability (BPV) and baroreceptor sensitivity (BRS) provides insight into cardiovascular regulation in different physiological settings. Pre-menopausal females have been shown to exhibit a cardioprotective autonomic profile compared to males following maximal exercise, but it is unknown if there are sex differences in autonomic recovery following submaximal aerobic exercise.

**METHODS:** Forty-three (males n=22, age = 22 ± 1 yrs, BMI = 25.9 ± 0.7 kg/m²) and forty-five min of submaximal aerobic exercise results in sustained recovery from aerobic exercise compared to age-matched males. METHODS: This study was designed as a single-blind, randomized, controlled trial. Eight men and a woman (height, 169.4 ± 8.0 cm; age, 22.4 ± 5.5 yrs; weight, 64.9 ± 9.8 kg [means ± SD]) volunteered to perform an incremental exercise test while inhaling two kinds of gases: 1% H2 gas (H2 trial) and air (control trial). The workload was gradually increased by 20 W every 1 min until peak achieved on the cycle ergometer. METHODS: This study was designed as a single-blind, randomized, controlled trial. Eight men and a woman (height, 169.4 ± 8.0 cm; age, 22.4 ± 5.5 yrs; weight, 64.9 ± 9.8 kg [means ± SD]) volunteered to perform an incremental exercise test while inhaling two kinds of gases: 1% H2 gas (H2 trial) and air (control trial). The workload was gradually increased by 20 W every 1 min until peak achieved on the cycle ergometer.

**RESULTS:** VO2peak achieved after the UWST (44.3 ± 8.0 mL/kg/min) and cycle ergometer (42.3 ± 7.2 mL/kg/min) did not differ significantly from each other (t=-0.59, df=13, p=0.563, d=0.21). HRpeak was significantly lower during the UWST (162.5 ± 18.4 bpm) (t=7.812, df=12, p<0.00, d=2.10) when compared to the cycle test (194.6 ± 11.6 bpm). The UWST time and PWC during the bike test were not significantly different from the cycle ergometer (t=1.271, df=12, p=0.230). 

**CONCLUSIONS:** The differences in VO2 data during the UWST and VO2peak protocol suggest the UWST is a valid method of determining VO2peak in highly trained artistic swimmers. A goal when selecting a VO2 protocol is to mimic the demands of the sport. In this population, the UWST is likely better than the cycle ergometer, as the modality of swimming with breath holding more closely matches the demands of an artistic swim routine.

**Table 1. Autonomic function variables at rest and 30,60, and 90 mins following aerobic exercise**

<table>
<thead>
<tr>
<th></th>
<th>Male (n=22)</th>
<th>Female (n=21)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>REST</td>
<td>P30</td>
</tr>
<tr>
<td><strong>HRV_LF</strong></td>
<td>4.87 ± 0.16</td>
<td>5.10 ± 0.18</td>
</tr>
<tr>
<td><strong>HRV_HF</strong></td>
<td>6.92 ± 0.23</td>
<td>6.55 ± 0.29</td>
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<tr>
<td><strong>HRV_LF/HF</strong></td>
<td>7.19 ± 0.21</td>
<td>7.05 ± 0.22</td>
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<tr>
<td><strong>BPV_LF</strong></td>
<td>1.91 ± 0.17</td>
<td>2.14 ± 0.18</td>
</tr>
<tr>
<td><strong>BPV_HF</strong></td>
<td>0.15 ± 0.14</td>
<td>0.10 ± 0.16</td>
</tr>
<tr>
<td><strong>Alpha_LF</strong></td>
<td>2.75 ± 0.13</td>
<td>2.57 ± 0.11</td>
</tr>
</tbody>
</table>

* P<0.05 Significant sex differences at rest for T-test; $ P<0.05 Significant main effect of sex for 2-way ANOVA; # P< 0.05 Significant main effect of time for 2-way ANOVA

It has recently been shown that molecular hydrogen (H2) ameliorates oxidative stress-induced tissue damage by scavenging reactive oxygen species and modifies mitochondrial function. However, studies on the effects of H2 during exercise in healthy humans are limited. PURPOSE: To investigate the effects of H2 gas inhalation on oxygen uptake (VO2) response during an incremental exercise test performed on a cycle ergometer. METHODS: This study was designed as a single-blind, randomized, controlled trial. Eight men and a woman (height, 169.4 ± 8.0 cm; age, 22.4 ± 5.54 yrs; weight, 64.9 ± 9.8 kg [means ± SD]) volunteered to perform an incremental cycling exercise test while inhaling two kinds of gases: 1% H2 gas (H2 trial) and air (control trial). The workload was gradually increased by 20 W every 1 min until volitional fatigue. Respiratory parameters were measured during the test using a metabolic gas analyzer. The peak VO2 (VO2peak) was defined as a 20-s averaged peak value of VO2 during exercise. Blood samples were collected from the subjects’ fingertips before, during, and immediately after exercise to evaluate the systemic mitochondrial function by measuring biological antioxidant potential (BAP) and diacron-reactive oxygen metabolites (d-ROMs).

**RESULTS:** The rate of repeated-measure two-way analysis of variance showed no significant trial-by-work rate interaction in carbon dioxide production (P = 0.64), respiratory exchange ratio (P = 1.00), minute ventilation (P = 0.81), and heart rate (P = 1.00) responses to the exercise. However, the H2 trial showed a significantly augmented VO2 response to exercise compared with that observed in the control trial (P < 0.05). Furthermore, the H2 trial showed a significantly increased VO2peak compared to the control trial (3705.4 ± 285.9 vs. 3398.7 ± 249.9 mL/min, means ± SE, P < 0.01, paired t-test). BAP/d-ROM responses, indicative of systemic redox status, tended to increase in the H2 trial compared to the response in the control trial (P = 0.05), suggesting that the H2 trial reduced oxidative stress or increased antioxidative activity. CONCLUSIONS: H2 gas inhalation significantly increased the VO2 response and VO2peak during incremental exercise, suggesting that H2 gas might affect mitochondrial function during exercise.
Heavy rope exercise is utilized as a means to increase power, muscle hypertrophy and maximal strength. However, the effects of heavy rope exercise on cardiovascular hemodynamics and arterial stiffness is not known. **PURPOSE:** To evaluate the effects of an acute bout of heavy rope exercise on cardiovascular hemodynamics and arterial stiffness. **METHODS:** Fifteen resistance-trained individuals volunteered to participate. Cardiovascular hemodynamics and arterial stiffness were collected at rest, 15 (Rec1), 30 (Rec2) and 60 (Rec3) minutes after an acute bout of heavy rope exercise. Cardiovascular hemodynamics were determined through the use of photoplethysmography, and included heart rate (HR), mean arterial pressure (MAP), cardiac output (CO), stroke volume (SV), and total peripheral resistance (TPR). Arterial stiffness was measured via carotid-femoral pulse wave velocity (cfPWV). The acute heavy rope exercise consisted of six, 15-second exercise bouts, using a double wave pattern, separated by 30-second passive recovery intervals; the pace of the exercise was set at 180rpm. One-way repeated measures analysis of variance were used to evaluate the main effect of time (rest, Rec1, Rec2, and Rec3) on all variables. Pairwise tests, with a Bonferroni correction, were used for post-hoc comparisons. **RESULTS:** There were no significant main effects of time for MAP or SV. There were significant (p=0.0001) main effects of time for HR (rest: 64±11bpm; Rec1: 86±10bpm; Rec2: 78±10bpm; Rec3: 72±9bpm), MAP (rest: 86±10 mmHg/ml/min; Rec1: 105±11 mmHg/ml/min; Rec2: 106±11 mmHg/ml/min; Rec3: 113±11 mmHg/ml/min). Before exercise, HR and CO were elevated at all times post-exercise, and were higher at Rec1 compared to Rec2, and Rec3, and were lower at Rec2 compared to Rec1 and Rec2. TPR was reduced at Rec1, Rec2 and Rec3 compared to rest. There was also a significant main effect of time (p=0.003) for cfPWV (rest: 5.6±0.8m/s; Rec1: 5.9±0.7m/s; Rec2: 5.5±0.7m/s; Rec3: 5.5±0.7m/s) such that it was attenuated at Rec3 compared to Rec1 and Rec2. **CONCLUSIONS:** These data demonstrate that heavy rope exercise increases cardiovascular workload for at least 60 minutes, as demonstrated by the augmentation of HR and CO for up to one-hour post-exercise.

### Cardiac Autonomic and Blood Pressure Responses to an Acute Session of Battling Ropes Exercise

**Board #198**

**May 29 2:00 PM - 3:30 PM**

**Cardiac Autonomic and Blood Pressure Responses to an Acute Session of Battling Ropes Exercise**

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(No relevant relationships reported)

Increased blood pressure (BP) and autonomic dysfunction are independent risk factors for cardiovascular disease. Heart rate variability (HRV) is used as a measure of cardiac autonomic function in many research settings, including the evaluation of the autonomic control during and after physical activity. A prolonged sympathetic predominance and a slow parasympathetic reaction contribute to a delayed BP and heart rate (HR) recovery after exercise which is thought to be associated with increased risk of acute cardiac events. Therefore, understanding the impact of various exercise modalities on the post-exercise autonomic modulation of HR and BP would allow for appropriate exercise prescription in susceptible populations. Battling ropes exercise (BRE) has become an extremely popular training modality for improving both anaerobic and aerobic fitness. However, the HRV and BP responses induced by an acute BRE bout are currently unknown. **PURPOSE:** To evaluate the effects of an acute session of BRE on HRV and BP responses in healthy young males. **METHODS:** 8 young healthy males [age ≥23 ± 1 years] completed a BRE or a no-exercise control trial in a randomized order. During the BRE trial, participants completed ten-30s sets of battling ropes waves followed by 1 min of rest. Low-frequency power (LF), high-frequency power (HF), the LF to HF ratio (LF/HF), HR, and BP were collected in the supine position at baseline, 3, 10 and 30 min after each trial. LF and HF were normalized to total power resulting in nLF, nHF and nLF/nHF. **RESULTS:** There were significant group-by-time interactions (P < 0.05) for nLF (sympathetic activity), nHF (vagal tone), nHF/nHF (sympathovagal balance), HR, systolic and diastolic BP. There were significant increases (P < 0.05) in nLF, nLF/nHF, and HR as well as significant decreases (P < 0.01) in nHF, systolic (–6mmHg) and diastolic (–4mmHg) BP for 30 min after BRE compared to no changes after control. **CONCLUSIONS:** Our findings indicate that BRE increases sympathovagal balance compared to no exercise and is a safe exercise activity for populations that might benefit from post-exercise hypotension. Further research is warranted to evaluate the potential clinical application of BRE in populations that might benefit from post-exercise hypotension.

### Hemodynamic and Pressor Responses to Combination of Yoga and Blood Flow Restriction

**Board #197**

**May 29 2:00 PM - 3:30 PM**

**Hemodynamic and Pressor Responses to Combination of Yoga and Blood Flow Restriction**

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Blood flow restriction (BFR) training has been increasingly incorporated into a more common activity of daily exercise (e.g., yoga). However, BFR may increase blood pressure and myocardial oxygen demand by augmenting vascular resistance. Yoga is characterized by deep slow breathing and isometric muscle contractions. This study investigated the hemodynamic and pressor responses of BFR training performed concurrently with yoga. **PURPOSE:** To determine the impact of a combination of yoga and BFR on cardiovascular responses. **METHODS:** Twenty young healthy participants (M=10, F=10) performed 20 yoga poses with and without BFR bands placed on both legs. Beat by beat blood pressure and heart rate were measured using finger photoplethysmography during the yoga exercise. Blood lactate concentration, flow-mediated dilation (endothelium-dependent vasodilation), and cardiac vascular index (arterial stiffness) were measured before and after the yoga exercise. **RESULTS:** At baseline, there were no significant differences in any of the variables between the BFR and no-BFR conditions. Systolic and diastolic blood pressure and heart rate increased significantly in response to the various yoga poses (p<0.01). However, there were no significant differences between the BFR and non-BFR conditions. In general, hemodynamic responses were more pronounced during more difficult yoga postures (e.g., Crescent Lunge, Half Moon, Chair Pose, and Downward Facing Dog). Rate-pressure products increased significantly during yoga exercises with no differences between the two conditions. Rating of perceived exertion (RPE) was different between the conditions. Blood lactate concentration was significantly greater after performing yoga with BFR bands (p<0.007). Cardiac vascular index decreased similarly after yoga exercise in both conditions while flow-mediated dilation remained unchanged. **CONCLUSION:** The use of blood flow restriction bands in combination with systematic isometric exercise like yoga did not result in marked hemodynamic and pressor responses.

### Renal Vascular Responsiveness to Sympathetic Activation Is Not Affected by Prior High Intensity Anaerobic Exercise

**Board #199**

**May 29 2:00 PM - 3:30 PM**

**Renal Vascular Responsiveness to Sympathetic Activation Is Not Affected by Prior High Intensity Anaerobic Exercise**

Jonathan Larson. University at Buffalo, Buffalo, Ny. (Sponsor: Zach Schlader, FACSM)

(No relevant relationships reported)

**Purpose:** Orthostatic hypotension is common following high intensity anaerobic exercise. The renal vasculature contributes to blood pressure regulation during orthostasis. Renal blood flow decreases during anaerobic exercise and remains depressed for up to 60 min following exercise cessation. The responsiveness of the renal vasculature to sympathetic stimulation, such as during orthostasis, following prior anaerobic exercise is unknown. We hypothesize that prior high intensity exercise attenuates increases in renal vascular resistance (RVR) during sympathetic activation. **METHODS:** Ten healthy adults (23 ± 3 y) completed two 2 min cold pressor tests (CPT). The CPT stimulates the sympathetic nervous system. A CPT was completed before and after a Wingate Anaerobic Test that consisted of 30 s of maximal effort cycling exercise at a resistance equal to 7.5% body mass. In both instances, the CPT was administered following 10 min supine rest. Heart rate (ECG), mean arterial pressure (Penaz method, MAP), and renal blood velocity (RBV) were measured pre-CPT, at 1 min and 2 min of the CPT, and 1 min post-CPT. RBV was measured via the coronal approach at the distal segment of the right renal artery with Doppler ultrasound. RVR was calculated as MAP/RBV. Data are presented as mean ± SD. **RESULTS:** Pre-CPT, heart rate was elevated after exercise (61 ± 5 vs. 87 ± 13 bpm, P<0.01) and RBV was lower (34 ± 7 vs. 32 ± 7 cm/s, P<0.02). However, MAP (85 ± 13 vs. 82 ± 13 mmHg, P=0.50) and RVR (2.4 ± 0.5 vs. 2.6 ± 0.7 mmHg/cm/s, P=0.08) were not different between before and after exercise. Before exercise, heart rate (at 2 min CPT: 66 ± 9 bpm, P<0.02) and MAP (at 2 min CPT: 108 ± 21 mmHg, P<0.05) increased during the CPT, returning to pre-levels 1 min post-CPT (P=0.22). Before exercise, RBV decreased during the CPT (at 2 min: 29 ± 7 cm/s, P=0.03), returning to pre-levels 1 min post-CPT (P=0.61). RVR increased during the CPT (at 2 min: 4.0 ± 0.7 mmHg/cm/s, P=0.01), returning to pre-levels 1 min post-CPT (P=0.28). Changes in heart rate, MAP, RBV, and RVR during the CPT did differ between before and after exercise (P<0.67). **CONCLUSION:** Increases in RVR invoked by sympathetic activation are not affected by prior high intensity anaerobic exercise. Therefore, the renal vasculature does not likely contribute to post-anaerobic exercise orthostatic hypotension.
The recording of heart rate variability (HRV) is a strategy for the rapid and non-invasive evaluation of the Autonomic Nervous System (ANS) activity. Previous studies have shown a rapid activation of the parasympathetic nervous system at the end of a physical effort and the association of this with the likelihood of developing cardiovascular disease. PURPOSE: Establish the relationship between recovery heart rate (RHR) after exercise and HRV at rest in apparently healthy men and women. METHODS: Quantitative, cross-sectional, exploratory research conducted in 50 subjects (25 men and 25 women) of 19 ± 2.34 years. Subjects were monitored by continuous electrocardiographic reading all throughout the different activities. The HRV was evaluated at rest for 5 minutes, using time, frequency and non-linear analyzes, cardiac vagal index (CVI) was calculated using Log10 (SD1/SD2). Subsequently, a physical test of 6 minutes on the bike was performed between 50 and 60% of the maximum reserve heart rate. In the end, the RHR was evaluated every 10 seconds during the last minute. Subsequently, the relationship between HRV and RHR was analyzed using the Pearson correlation coefficient (r). RESULTS: In all population, mean HR at rest and RHR had an inverse effect, finding the following correlations: 10s (r = -0.35 ± 0.01), 20s (r = -0.37 ± 0.007), 40s (r = -0.40 ± 0.004) and 60s (r = -0.65 ± 0.000). Additionally, in women exist a direct correlation between RHR and CVI with significant values in the following correlations: 40s (r = 0.41 ± 0.044), 50s (r = 0.52 ± 0.008) and 60s (r = 0.59 ± 0.002); however, in men this correlation was not significant. CONCLUSIONS: When performing stress tests in apparently healthy people, the decrease of the HR after exercise could be used to evaluate the activity of the ANS, specifically the activation of parasympathetic system demonstrated the significant correlations between RHR and HR at rest, as well as the correlation between RHR and CVI. Therefore, the activity in the first minute after ceasing the exercise shows that the evaluation of the parasympathetic nervous system could be implemented in the early diagnosis and prognosis of chronic diseases including cardiovascular disease.

Since nicotine-bearing cigarette smoking can induce acute cardiac autonomic imbalance, it may cause to persist sympathetic excitation, and delay vagal reactivation during post-exercise recovery. However, the effect of post-exercise cigarette smoking on cardiac autonomic nervous system is still uncertain; especially the difference between -cigarette and conventional cigarette smoking on autonomic balance after aerobic exercise. PURPOSE: Moderate-intensity Resistance Training (RT) has been recommended for blood pressure (BP) control by the main guidelines. However hypotensive effects of high intensity RT using higher loads to muscle failure in hypertensive patients is little known. Therefore, the aim of the study was to verify the behavior of BP after the session of high intensity resistance training in hypertensive women. METHODS: A randomized crossover design clinical trial was conducted with 10 controlled hypertensive women with age equal to: 58.9±6.8, body mass index equal to: 27.1±3.8. The participants performed two experimental protocols: a control session and RT session with 6 repetition maximum (RM) to muscle failure. The order of execution of the sessions was performed randomly by lot. The sessions of 6RM was performed with three exercises (lat pulldown, barbell bench press and 45° leg press) in three sets to momentary concentric failure. During the control session the participants followed 6 minutes of rest in the laboratory. Systolic blood pressure (SBP), diastolic blood pressure (DBP) were collected pre-immediately post, 1 h post and, 24 h post each protocol. Repeated measures ANOVA were used. RESULTS: The SBP decrease in 1 h (124.3 ± 10.8) and 24 h (126.2 ± 13.6) after the 6RM session to muscle failure when compared to pre (135.7 ± 14.1), (p < 0.05). SBP was higher for 6RM (144.7±16.4) than control (134.2 ± 18.1) immediately after session (p > 0.05). DBP were no differences for DBP among protocols (p > 0.05). CONCLUSIONS: The RT using higher loads to muscle failure promote SBP hypotension 1 h and 24 h after the session. No DBP changes were observed after the RT protocols. The high intensity resistance training can decrease the SBP acutely and help in control of blood pressure in hypertensive women.

Inflammation and oxidative stress can be potent modulators of vascular function. These factors may transiently respond to moderate-intensity steady state exercise (SSE) in a manner that improves post-exercise vascular function in healthy adults. Whether exercise imparts similar effects in adults with Stage 3 or 4 chronic kidney disease (CKD) remains understudied. Moreover, a comparison of SSE and high-intensity interval exercise (HIIE) may add to clinically-relevant findings for improving vascular function in mid-spectrum CKD. PURPOSE: To determine the influence of SSE and a comparable amount of HIIE on post-exercise inflammation and oxidative stress in patients diagnosed with secondary Stage 3 or 4 CKD. METHODS: Twenty participants (n = 10 men; n = 14 women; age 62.0 ± 9.9 years; weight 80.9 ± 16.3 kg; body fat 37.3 ± 8.5% of weight; VO2max 19.4 ± 4.7 mL/kg/min) completed 30 min of SSE at 65% VO2 reserve or HIIE by treadmill walking (90% and 20% of VO2 reserve in 3:2 min ratio) in a randomized crossover design. Both exercise conditions averaged ~ 65% VO2 reserve. Blood samples were obtained by the same technician under standardized conditions just before, 1 h after and 24 h after exercise. Total antioxidant capacity (TAC), paraoxonase1 (PON1), asymmetric dimethylarginine (ADMA), nitrotyrosine (NT) and intercellulin-6 (IL6) responses were analyzed using 2 (condition) by 3 (sample point) repeated measures ANOVAs. RESULTS: Relative to pre-exercise measures: TAC increased by 4.5% 24h after exercise (p < 0.012). PON1 was maintained 1h and elevated by 6.1% 24hr after SSE, but not HIIE (p < 0.035). When corrected for plasma volume shifts, ADMA increased 30 ng/ml at 1hr but was 58 ng/ml lower 24hrs after exercise (p = 0.0006). NT and IL6 remained stable in the hours after exercise (p > 0.05). CONCLUSION: Modest inflammatory and oxidative stress marker responses to either SSE and HIIE may contribute to improved vascular function in mid-spectrum CKD.
MEDICINE & SCIENCE IN SPORTS & EXERCISE

970 Board #204 May 29 2:00 PM - 3:30 PM Arterial Stiffness Response to High Intensity Interval Training in Young Healthy Individuals
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PURPOSE: To assess arterial stiffness response to high-intensity interval training (HIIE) controlled by rating of perceived exertion (RPE) and heart rate (HR) in young healthy individuals. METHODS: Twelve young (21 ± 2 yrs) sedentary or insufficiently active individuals were randomly assigned to perform HIIE prescribed and self-regulated by 6 to 20 RPE (HIIE(upreg) 25 min), HIIE prescribed and regulated by HR to cardiopulmonary exercise testing (HIIE(downreg) 25 min) and non exercise control (CON) session (25 min of seated resting). Arterial stiffness (carotid-femoral pulse wave velocity - PWV) were measured before (pre), immediately after (post) and 30 min after (recovery) each intervention with participants quietly in supine position. Two-way ANOVA with repeated measures (intervention x time) was used to identify significant differences were identified by Bonferroni. RESULTS: PWV was lower (P < 0.05) at post- than pre-intervention during both HIIE(upreg) and HIIE(downreg) vs CON. However, PWV remained lower at recovery only during HIIE(upreg) (0.300 ± 0.10/10 m/s, P < 0.05), returning to pre-intervention levels during HIIE(downreg) PWV did not change significantly during CON. CONCLUSION: These results suggest that HIIE promotes positive acute effects in arterial stiffness in young healthy individuals. Both exercise intervention reduced PWV at post-intervention, but only HIIE(upreg) maintained the reduction at recovery, demonstrating that 6 to 20 RPE scale is an accessible, simple and useful tool for prescribing and self-regulating HIIE and promote cardiovascular benefits in young individuals.

971 Board #205 May 29 2:00 PM - 3:30 PM The Effect of Sodium Supplementation on Postexercise Hypotension Following Acute Submaximal Aerobic Exercise
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PURPOSE: Acute submaximal aerobic exercise confers cardiovascular benefits including a prolonged reduction in blood pressure (BP) termed postexercise hypotension (PEH). PEH is thought to contribute to the chronic BP-lowering effects of aerobic training. Chronic sodium (Na+) supplementation expands plasma volume (PV) and may attenuate PEH. Therefore, this study tested the hypothesis that Na+ supplementation attenuates PEH following acute aerobic exercise. METHODS: Healthy young adults (n=11, age 26 ± 4 years; body mass index 23.5 ± 2.4 kg/m2) consumed a recommended Na+ diet (2,300 mg Na+ /d) for 10 days on two occasions; participants also consumed pills containing a total of either 4,000 mg Na+ or a placebo in random order. Participants collected their urine for the final 24 hours of each intervention to quantify urinary Na+ excretion. On day 10 of each intervention, participants completed 50 minutes of dynamic cycling exercise at 60% VO2 peak. Brachial BP was recorded via automated oscillometry before and every 10 minutes after exercise for one hour. The change in PV was estimated using hemoglobin and hematocrit following each intervention. BP responses following exercise were compared using a two-way repeated measures ANOVA. Urinary blood and measures and the nadir in BP after exercise were compared using paired t-tests. RESULTS: The mean VO2 peak of participants was 41.6 ± 8.8 mL/min/kg and mean power at 60% VO2 peak was 127 ± 40 W. Urinary Na+ excretion was increased following Na+ supplementation (277 ± 50 vs. 153 ± 73 mmol/24 hours, p<0.001). Na+ supplementation expanded PV approximately 10.2 ± 6.9%. Despite significantly greater Na+ excretion, serum Na+ concentration (141±1 vs. 140±1 mEq/L, p=0.38) and plasma osmolality (294 ± 4 vs. 295 ± 6 mOsm/kg H2O, p=0.22) were not different following Na+ supplementation compared to placebo. PEH was observed following both conditions (nadir systolic BP: -4.7 ± 3.8 vs. -4.6 ± 2.9 mmHg, p=0.91 and mean BP: -6.1 ± 4.3 vs. -5.0 ± 3.4 mmHg, p=0.58). However, when comparing Na+ supplementation to placebo, there was no significant diet effect regarding reductions in systolic BP (p=0.93) or mean BP (p=0.41) following exercise. CONCLUSIONS: These preliminary data suggest that Na+ supplementation does not attenuate PEH following acute aerobic exercise despite increased PV.

972 Board #206 May 29 2:00 PM - 3:30 PM Blood Chemistry Changes During an Ultra-marathon Competition
Junior E. Ciaanne1, Steven B. Hammer1, James W. Agnew2, Dana Mathew3, Indian River State College, Fort Pierce, FL. 2Brevard Physician Associates, Melbourne, FL. Email: shammer@irsu.edu (No relevant relationships reported)

PURPOSE: The purpose for this study is to assess venous electrolyte changes in ultra-marathon athletes. There are few studies on ultra-endurance activities reporting blood parameter changes and their potential effects, and those that are published have conflicting results. We speculate that plasma fluid shifts and the metabolic demands occurring during an ultra-marathon will result in significant changes in metabolites, electrolytes, hemoglobin and hematocrit levels that could be of risk to the runner’s health. METHODS: Consent was obtained from each participant the day before the Saint Sebastian 100, November 2017. The event was conducted over a repeated ten-mile loop in the Saint Sebastian Preserve, Florida. The environmental conditions were moderately warm and humid. Races consisted of 50 kilometers, 50 miles and 100-mile distances. Blood samples were collected from the antecubital vein with 1 cc insulin syringes. Blood was analyzed with an i-STAT Handheld blood analyzer with the CHEM8+ cartridge (© Abbott Point of Care; Princeton, NJ). Paired sample t-tests were used to compare pre and post-race values (mean±SD), p≤0.05, number of participants n=12. RESULTS: Significant changes pre to post race were found in the following: Potassium (3.97 ± 0.19, 4.27±0.48 (mmol/L), t(11)=-2.31; p=0.04); BUN (16.75±8.18, 25.25±7.28 (mg/dl), t(11)=4.89; p<0.001); Creatinine (0.85±0.13, 1.48±0.68 (mg/dl), t(11)=3.31; p=0.007); Hematocrit (44.7±5.31, 47.25±3.67 (%), t(11)=4.38; p=0.001); Hemoglobin (15.2±17.15, 16.07±1.24 (g/dl), t(11)=3.06; p=0.03); Sodium and glucose did not show significant changes pre to post race. Significant changes were not noted between different race distances. CONCLUSION: The results from this study show dehydration, muscle catabolism, and increased stress upon kidney function in the ultra-marathon athletes. These results demonstrate that electrolytes are altered post ultra marathon. The severity of these alteration is not known as various studies show opposing results. More research is needed to determine the extent of these changes and why some studies show changes when others do not. These changes could be of clinical significance to the runner’s health or possibly through training they have adapted to these stressful alterations.

973 Board #207 May 29 2:00 PM - 3:30 PM Electrocardiogram T-Wave Morphology and Amplitude Differences during an Ultramarathon Competition
Diamond Nicholas, James Agnew, Steven Hammer. Indian River State College, Fort Pierce, FL. Email: shammer@irsu.edu (No relevant relationships reported)

PURPOSE: The goal of this research is to study the effect of ultramarathon competition on T-wave morphology and amplitude changes. T-wave changes can be an indication of a vast number of conditions with many being of critical nature. This makes understanding where changes ultramarathons are undergoing critical for monitoring and understanding physiological changes associated with ultramarathons. METHODS: In this study, volunteer subjects Male n=25, Female n=20 signed an informed consent, then completed their ultramarathon distance. 12 lead EKGs were measured pre and post-race. EKGs were recorded and analyzed with ECG
Synchronous V1.3.1 and statistics were performed in SPSS V21. Paired sample t-tests were used to compare pre and post-race T-wave amplitude values (Pre/Post mean ± SD, p<0.05). Neural activity (i.e., respiratory movements) and blood flow were assessed using a plethysmographic device that was placed on the left hand. The device was calibrated for each participant and the average baseline value was used throughout the data collection period. The data was collected at rest and during exercise at workloads of 100, 125, and 150 watts for 5 minutes each.

RESULTS: IHE resulted in increased IAD in both males and females. Males demonstrated a greater increase in IAD compared to females. The increase in IAD was found to be correlated with increases in systolic blood pressure (BP) and heart rate (HR).

CONCLUSIONS: The results of this study suggest that IHE can increase IAD in both males and females. The findings have implications for the development of interventions to reduce IAD and improve cardiovascular health.

Board #211 May 29 2:00 PM - 3:30 PM
The Effects of a Vinyasa Flow Yoga Session on Arterial Stiffness
Alexander A. Piña, 1st, Adetola Fadeyi, 1st, James Shadiow, Anabel B. Sanchez, Stacy D. Hunter. Texas State University, San Marcos, TX.

(No relevant relationships reported)

Arterial stiffness (AS) is a marker of subclinical atherosclerotic disease associated with reductions in the buffering capacity of the central, elastic arteries. Previous research has demonstrated reductions in AS with a relatively short-duration, 8-week Bikram (hot) yoga practice. However, the acute effects of yoga on this measure have not been investigated. Vinyasa flow yoga is a style of hatha yoga which involves a higher intensity of movement and is known to improve overall cardiovascular fitness. As such, it may be an effective intervention to improve AS. The purpose of this study was to evaluate the acute effects of a Vinyasa flow yoga session on arterial stiffness in younger adults.

METHODS: Nine yoga practitioners (20 - 75) completed one 60-minute Vinyasa yoga DVD. Whole blood samples were obtained (after 8 hrs of fasting) and analyzed for total- and HDL-cholesterol, triglyceride, and glucose concentrations via reflectance photometry. Briefly, 35μL blood samples were applied to test cassette sampling wells and color changes of the reagent pads were converted to concentration values. LDL-cholesterol was calculated using the Friedewald equation.

RESULTS: After completion of the Vinyasa flow yoga session, a significant decrease in LDL-cholesterol (p < 0.01) was observed. Total cholesterol tended to decrease (p = 0.128) after the intervention, although not statistically significant. No changes occurred in fasting glucose (p = 0.769), HDL-cholesterol (p = 0.431), or triglyceride concentrations (p = 0.328). CONCLUSIONS: These results illustrate that a 1-hour session of Vinyasa flow yoga can improve LDL-cholesterol concentrations. These acute changes in lipid measures could lend support for the potential efficacy of yoga, an alternative exercise mode, in inducing positive changes in lipid profile and producing favorable changes in cardiovascular disease risk profile. This study was funded in part by Pure Action, Inc. Austin, TX, USA.
session via Spihogmocor application tonometry. AIx recordings included crude Aix, Aix at a heart rate of 75 beats per minute (AIx/s75), and peripheral Aix (P2/P1). Mood affect was assessed via PANAS 20-item survey.

**RESULTS:** After completion of the yoga DVD, significant reductions in Aix and peripheral Aix (P<0.05 for both) were observed. Although not statistically significant, Aix/s75 tended to decline (p=0.068) while cIPWV (P=0.459) was unaltered. No significant changes in positive or negative affect were observed although negative affect tended to decline (P=0.126).

**CONCLUSIONS:** These results highlight the efficacy of a single bout of hatha yoga in improving central and peripheral arterial stiffness measures and provide insight into the potential effects of yoga in mediating CVD risk.

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**Board #212**

**May 29 2:00 PM - 3:30 PM**

**Walking With Leg Blood Flow Restriction: Wide-rigid Cuffs Vs. Narrow-elastic bands**

Sten Stray-Gundersen, Savannah Wooten, Hirofumi Tanaka, FACSM. University of Texas at Austin, Austin, TX.

**Reported Relationships:** S. Stray-Gundersen: Other (please describe); Received BFR bands from company as a gift for research.

Blood flow restriction (BFR) training has become a popular form of exercise. The concept is that light exercise with BFR would elicit similar adaptations achieved with intense exercise. Walking exercise in combination with pressurized wide-rigid (WR) cuffs has been shown to elicit higher cardiac workload and a vascular dysfunction due presumably to reperfusion injury to the endothelium. In contrast, narrow-elastic (NE) BFR bands, similar to the original Kaatsu bands, may elicit different hemodynamic effects, as the limb is able to increase in diameter with increased blood flow accompanying exercise. **Purpose:** To compare two distinct forms of BFR bands during light-intensity exercise on cardiovascular responses. **Methods:** Six young healthy participants (M=4, F=2) performed 5 bouts of 2-minute walking intervals at 3.2 kph with a 1-minute rest and deflation period between bouts with either WR or NE bands placed on both upper thighs. Cuff pressure was increased to 160 mmHg in WR cuffs and 300 mmHg in NE bands. Beat-by-beat blood pressure and heart rate were measured continuously using finger plethysmography. Blood lactate concentration, rating of perceived exertion (RPE), flow-mediated dilation (index of endothelium-dependent vasodilation), and cardio-ankle vascular index (measure of arterial stiffness) were assessed before and after the walking exercise. **Results:** At baseline, there were no significant differences in any of the variables between the WR and NE conditions. Heart rate increased similarly in both conditions. Increases in systolic and diastolic blood pressure was greater (p<0.01) in the WR than the NE condition (160±13/92±11 mmHg vs. 127±9/71±16 mmHg, respectively). Double product, a function of heart rate and systolic blood pressure, increased to a greater extent in the WR than in the NE condition. Increases in RPE and blood lactate concentration from baseline were greater in the WR compared with the NE condition (p<0.05). **Conclusion:** Use of wide-rigid BFR cuffs resulted in a marked increase in pressor responses compared with narrow-elastic bands, suggesting that narrow-elastic bands may present a safer alternative for at-risk populations to perform BFR exercise.

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**Board #213**

**May 29 2:00 PM - 3:30 PM**

**The Hemodynamic and Metabolic Response to Maximal Susine vs Upright Cycle Ergometry**

John Wygand, FACSM, Michele Aquino, Jessica Diaz, John Pettizzo, Jacob Virginia, Ryan Mullin, Casey Spor, Peter Byrne, Robert M. Otto, FACSM. Adelphi University, Garden City, NY.

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Performance comparisons between supine (S) and upright (U) cycling have been reported to range from similar responses to as much as 150% greater for U conditions. In part, differences in performance have been attributed to a greater muscle perfusion pressure in the upright position resulting from an enhanced hydrostatic pressure in the lower extremities. **Purpose:** The purpose of this study was to determine the hemodynamic and metabolic response to a maximal workload performed in a supine and an upright cycling position.

**Methods:** 15 healthy college students (age 20.9 ± 1.3 yr, ht. 172.3 ± 8.5 cm, body mass 76.9 ± 12.6 kg, 8♂) volunteered to participate in two randomly assigned GXT trials preceded by 5 minutes of rest, and followed by a progressive exercise protocol. Gas exchange, vastus lateralis deoxygenation (HHb) and VO2 max were measured.

**Results:** At baseline, there were no significant changes in VO2 max, Ve, HR, %αHHb, RER and P2/P1 between S and U trials. The participant completed the challenge with a total exercise time of 142 h. On a mid-point (day 13), pre/post penultimate point (day 24), and at 48 h post-challenge.

**Conclusion:** Attainment of a greater workload in the U trial (+23%), may, in part, be attributed to enhanced peripheral perfusion, familiarity with the U testing, and greater sympathetic drive. Despite a theoretical advantage for venous return in the S position, Q and SV did not differ between positions. Energy requirements of 12.4 vs 13.3 mL/O2/ min for U vs S, respectively, confirms S to be less efficient than U.

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**Board #214**

**May 29 2:00 PM - 3:30 PM**

**Menstrual Phase Differences In The Physiological Resolution Of Periodic Breath-holding During Heavy Intensity Fartlek Exercise**

Calaina Brooke1, Jordyn Smith2, Glen R. Belfry1. 1Western University, Ontario, Toronto, ON, Canada. 2Western University, London, ON, Canada.

**Reported Relationships:** (No relevant relationships reported)

**Purpose:** Fluctuations in ovarian hormones have been shown to affect the physiological responses to heavy-intensity exercise. These responses may be exacerbated during backstroke swimming during the underwater push-off phase where swimmers are required to perform breath holds (~5 s) while kicking to the surface. The purpose of this study was to compare the singular and combined effects of repeated cycles of 5 s breath holds (BH) and hi-power output (HPO), every 30 s, during heavy-intensity (HIVY) exercise during follicular (FOL) and luteal (LUT) phases.

**Methods:** Eight eumenorrheic women (22 ± 1 yr, VO2max 2.36 ± 0.4 L/min) performed 4–6 min exercise bouts on a cycle ergometer at a power output of 50 % of the difference between ventilatory threshold and VO2max (±5%) in the FOL and LUT. A continuous HVY (CONT) with free breathing, and 3 intermittent conditions including, repeated cycles of 5 s free breathing and 5 s BH (BH), repeated cycles of 25 s at ±50% and 5 s at peak aerobic power (HPO) and combining the BH and HPO (BH-HPO) perturbations were performed. Gas exchange and vastus lateralsis deoxygenation (HHb) were recorded during all trials.

**Results:** Mean Ventilation (Vt) and total [hemoglobin] were higher in all conditions during LUT vs FOL (LUT: 78.0 ± 10.7; FOL: 75.1 ± 10.7 L/min and VO2max: 2.0 ± 2.2 μmol; LUT: 2.9 ± 1.9 μmol respectively p<0.05). Carbon dioxide production (VCO2) was higher during LUT BH-HPO (FOL: 2.41 ± 0.18 L/min; FOL: 2.19 ± 0.24 L/min respectively p<0.05). Whereas %HHb was greater during the 5 s BH vs the 25 s free-breathing period in both LUT (25s: 87 ± 9 %; 5s: 89 ± 8 % p<0.05) and FOL (25s: 86 ± 15 %; 5s: 89 ± 13 % p<0.05) phases. Further, %HHb %soVO2 was greater during BH (6%) and HPO-BH (7%) during the 5s BH vs the 25s free-breathing in both phases (FOL: 46.0 ± 18 %; LUT: 45 ± 14 % and FOL: 44 ± 18 %; LUT: 44 ± 15 % respectively p<0.05).

**Conclusion:** Low PO2 in the area of investigation (i.e. vastus lateralis) during heavy intensity exercise has been shown to increase CO transport by increasing the affinity of CO2 to Hb (Haldane effect). Moreover, the increased pulmonary diffusion capacity during the LUT phase suggested elsewhere would facilitate the observed increase in VCO2 and %VO2 during the BH-HPO protocol of the present study. Finally, females showed increased local muscle deoxygenation in both KH conditions during both the FOL and LUT phases.

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**Board #215**

**May 29 2:00 PM - 3:30 PM**

**Integrative Physiological Responses To A 25-day Ultra-endurance Exercise Challenge**

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**Purpose:** This case-report characterised the respiratory, cardiovascular, and nutritional/ gastrointestinal (GI) responses of a trained individual to a novel ultra-endurance exercise challenge. **Methods:** A male athlete (age 45 y, mass 80.7 kg, stature 1.71 m, VO2max 54.8 mL·kg·min−1) summited 100 mountains on foot (all elevations >600 m) in 25 consecutive days, and cycled between five base-camps throughout the UK. Laboratory measures of pulmonary function (spirometry, whole-body plethysmography, single-breath rebreath), respiratory muscle strength (maximum static mouth pressures), and cardiovascular structure and function (echocardiography, electrocardiography, large vessel ultrasound, flow-mediated dilation) were assessed at baseline and at 48 h post-challenge. Dietary intake (4-d food diary), self-reported GI symptoms, and plasma endotoxin concentrations were assessed at baseline, pre/post mid-point (day 13), pre/post final point (day 24), and at 48 h post-challenge.

**Results:** The participant completed the challenge with a total exercise time of 142 h (5.3±2.8 d), distance of 1141 km (42.3±43.9 km·d−1), ascent of 33804 m (1252±807 m·d−1), and energy expenditure of 80460 kcal (2980±1451 kcal·d−1). Relative to
baseline, there were post-challenge decreases in pulmonary volumes and capacities (6 - 32%), expiratory flows (9 - 28%), maximum expiratory mouth-pressure (19%), and maximum volume loss (42%). Heart rate variability had diminished, manifesting in a 48% decrease in the root mean square of successive differences (RMSSD) and a 70% increase in the low-frequency/high-frequency ratio (LF/HF). There were no notable changes in any other index of cardiovascular structure or function. Pre- to post-challenge endotoxin concentrations were elevated by 60%, with a maximum increase of 130% after a given stage, congruent with an increased frequency and severity of GI symptoms. Conclusions. This is the first study of the integrative physiological responses to an ultra-endurance exercise challenge. The findings extend our understanding of the limits of physiological function and may inform medical best-practice for personnel supporting ultra-endurance events.

Cardiorespiratory fitness (CRF) is a crucial performance requirement of specialized military occupations. Age and physical activity (PA) are established predictors of CRF, but it is not clear how these predictors combine with each other and/or with genetic predisposition. Purpose: To derive inclusive explanatory models of CRF in U.S. Navy Explosive Ordnance Disposal (EOD) operators, synthesizing conventional (e.g., age, body composition, and PA) and novel influences (e.g., genetic variance), was performed. Methods: Forty male, active duty EOD operators completed a graded exercise test to assess maximal oxygen consumption and ventilatory threshold (VT) using the Bruce protocol. Aerobic performance was further quantified via time of test termination and at which VT was achieved. Body composition was determined via dual-energy x-ray absorptiometry, and PA was assessed by self-report. Genetic variants underlying human stress systems (SHTTPLR, BclI, -2C/G, and COMT) were assayed. Results: In univariate regression models, age, body composition, PA, and SHTTPLR consistently predicted CRF and/or aerobic performance (R² range 0.07-0.55). Multivariate regression models routinely outperformed the univariate models, explaining 36%-62% of variance. Conclusions: This study signifies a shift toward inclusive explanatory models of CRF and aerobic performance, accounting for combined roles of genetic, physiologic, and behavioral influences. These findings have toward inclusive explanatory models of CRF and aerobic performance, accounting for.

CONCLUSIONS: To test the hypothesis that the magnitude of CV drift and accompanying decrement in VO₂max is greater during the LP of the menstrual cycle vs. the follicular phase (FP).

Methods: Seven women (mean±SD; age=24±5 y) completed a graded exercise test (VO₂peak) at the aerobic threshold (AerT) and at peak exercise (VO₂peak) using breath-by-breath gas analysis. Values were expressed in both absolute terms and normalized by body mass and fat-free mass. The AerT was identified using the V-slope technique and as the lowest respiratory equivalent for oxygen. Results: The VO₂ at the AerT was higher in men than females when expressed in absolute terms (1184±222 vs 942±202 ml/min, p=0.015) and normalized by body weight (16.9±2.2 vs 16.4±3.1 ml/kg/min) but the trend was inverted when VO₂ was normalized by body fat mass (20.3±1.9 vs 21.57±3.26 ml/kg/min). The same trend was observed at peak exercise. CV drift was higher in the LP than in the FP (-13%; p<0.001) and VO₂ was higher (p<0.05) for men (666 W, 8.8 W/kg) than women (50 ± 5.7 vs 41.4 ± 8.0 ml/kg/min). Male adolescents exerted higher power than females both at the AerT (63 ± 13 vs 57 ± 20 watts) and peak effort (198 ± 40 vs 160 ± 20 watts, p<0.001). Conclusions: This study provides reflection on whether VO₂ should be normalized by total mass or FFM in adolescent males and females.

Cardiovascular drift (CV drift) is related to reduced maximal oxygen uptake (VO₂max) during heat stress. Whether this relationship is modified by elevated core temperature during the luteal phase (LP) of the menstrual cycle remains unknown. Purpose: To test the hypothesis that men experience a greater increase in heart rate (HR) and decrease in stroke volume (SV) accompanied by a greater reduction in VO₂max during prolonged exercise in a hot environment compared to women at the same relative metabolic intensity. Methods: Seven men (mean±SD: mass=76.2±8.8 kg, VO₂max=47.5±5.0 ml/kg/min) and 7 women (mass=58.9±9.4 kg, VO₂max=42.0±2.9 ml/kg/min) performed a graded exercise test in °C to determine VO₂max. Then on separate, counterbalanced occasions participants cycled at 60% VO₂max for either 15 or 45 min in °C, immediately followed by graded exercise to elicit VO₂peak. CV drift was measured between 15 and 45 min during the 45-min trials. The separate 15- and 45-min trials were necessary to measure VO₂max during the same time interval that CV drift occurred. Women were tested during the follicular phase of the menstrual cycle. Results: Because of differences in aerobic fitness and body size, Hrest was higher (p<0.05) for men (666 W, 8.8 W/kg) than women (402 W, 7.1 W/kg), but the increase in rectal temperature from 15 to 45 min was not different (men:1.06±0.4 °C; women:0.7±0.2 °C; p=0.25). Likewise, CV drift was not different between groups (men: 14% increase in HR and 12% decrease in SV; women: 9% increase in HR and 11% decrease in SV; all p<0.05). VO₂max decreased between 15 and 45 min, but men (+13%) and women (-13%) were not different (p=0.95). Conclusion: Despite exercising at a higher Ḣ last larger, more aerobically fit men did not experience greater CV drift and concomitant reductions in VO₂max during heat stress compared to smaller, less fit women.
**B-62** Free Communication/Poster - Oxygen Uptake Kinetics

Wednesday, May 29, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

Scientific literature suggests that oxygen consumption (VO$_2$) variability during cardiopulmonary exercise tests results mainly from ventilation (VE) irregularities. Gas sampling intervals (GSI) redistribute VE irregularities to unveil the underlying metabolic rate, however, large GSI may obscure the true maximal rate. Despite the many used GSI, few studies have investigated the simultaneous effect of altering GSI on ventilation and VO$_2$-peak.

PURPOSE: The purpose of this study was to determine the degree to which GSI affects VE variability and the correlation with simultaneous changes in VO$_2$-peak.

METHODS: Participants included 36 healthy male adults (12 male, 2 female, 23.9 ± 7.9 years) completed a Bruce treadmill test. Eight GSI from previous literature were chosen. VE data was taken from the last minute of the last full stage completed by the participant. VE variability was reported as standard deviation (VSD) and normalized standard deviation (VENS, SD divided by number of values used to determine SD). VO$_2$-peak for each GSI was defined as the single highest VO$_2$ value. One-way ANOVA measures ANOVAs were used to determine GSI differences in VE variability and VO$_2$-peak. Pearson’s correlations were used to determine the strength of relationship between VSD and VENS with VO$_2$-peak for each subject, then averaged for the group.

RESULTS: ANOVAs showed significant differences for VSD (max: 15-second block, 5.5 L*min$^{-1}$; min: 15-breath moving, 0.1 L*min$^{-1}$) between (p < 0.001, η$^2$ = 0.801) and within subjects (p < 0.001, η$^2$ = 0.337). ANOVAs showed significant differences for VENS (max: 30-second block, 2.3 L*min$^{-1}$; min: 15-breath moving, 0.1 L*min$^{-1}$) between (p < 0.001, η$^2$ = 0.827) and within subjects (p < 0.001, η$^2$ = 0.644). VO$_2$-peak was significantly different between GSI (max 7-breath median 62.7 ± 10.6 ml*Kg$^{-1}$*min$^{-1}$; min 30-second block 58.7 ± 11.7 ml*Kg$^{-1}$*min$^{-1}$; p < 0.001, η$^2$ = 0.577). The average individual Pearson’s correlations for VO$_2$-peak vs VSD and VENS were 0.083 and -0.484, respectively, with only one individual reaching significance in VENS (p < 0.05) and three reaching significance in VENS (p < 0.05). CONCLUSIONS: VE variability appears to be subject dependent. Within-subject VE variability did not correlate well with VO$_2$-peak. VE variability does not appear to play a role in the change in VO$_2$-peak that occurs with a change in GSI.

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**S-204 Vol. 51 No. 5 Supplement**

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**Board #220** May 29 2:00 PM - 3:30 PM

**Sedentary Behaviors Modulates Metabolic and Inflammatory Biomarkers in Healthy Males**

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(No relevant relationships reported)

**Purpose**: Sedentary behavior (SB) has emerged rapidly as a serious health problem globally. This study examined the relationship between time spent in SB and metabolic and inflammatory biomarkers in healthy males.

**Methods**: Thirty-five healthy male adults participated in this cross-sectional study (age: 21.8 ± 2.8 yr; body height: 171.9 ± 6.4 cm; body weight: 61.7 ± 5.6 kg; % body fat: 15.6 ± 4.3%; body mass index (BMI): 20.9 ± 1.5 kg/m$^2$; waist circumference: 75.5 ± 5.2 cm; heart rate (HR): 69.4 ± 7.8 bpm; systolic blood pressure (SBP): 108.7 ± 9.4 mmHg; diastolic blood pressure (DBP): 69.7 ± 8.3 mmHg). Subjects were required to wear the activPAL™ to continuously monitor their 24-hour activities for 7 days without any removal. Based on their SB, subjects were divided into high SB group (HSB, N=18) and low SB group (LSB, N=17). Blood samples were collected in the morning after overnight fast and no exercise was performed over the past 24 hours. Serum inflammatory biomarkers, including tumor necrosis factor alpha (TNFα), interferon-γ (IFNγ), interleukin 1 β (IL-1β), monocyte chemoattractant protein 1 (MCP1) were measured by Flow Cytometry, while total cholesterol (TC), triglycerides (TRG), high-density lipoprotein (HDL), low-density lipoprotein (LDL) were analysed by mark™ Microplate Absorbance Spectrophotometer at 500.0nm. Blood glucose (GLU) was measured by Alere Cholestech LDX® Analyzer. Independent-Samples T test and bivariate correlate were applied to analyze the differences between two groups and correlations among various biomarkers using SPSS version 23.

**Results**: Sedentary time of subjects in HSB group was higher than LSB group (19.9 ± 9.9 vs 17.3 ± 12.1 hr; p<0.01). No difference was found between two groups in MPVA and anthropometric results. An inverse relationship was observed between body mass index (BMI) and sedentary time ($r = -0.342, p<0.05$). TNFα was negatively associated with TRG ($r = -0.343, p<0.05$), whereas IL-1β was negatively associated with TRG ($r = -0.395, p<0.05$). In addition, TRG and GLU were higher in the HSB group ($p<0.05$), while HDL was lower in the LSB group ($p<0.05$).

**Conclusions**: The results suggest that a close relationship exists between sedentary time and inflammatory and metabolic biomarkers.

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**Board #221** May 29 2:00 PM - 3:30 PM

**Prevalence Of Fluctuated Heart Rate Recovery In Healthy Adults Undergoing Repeated Exercise Stress Tests**

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(No relevant relationships reported)

**Background**: Heart rate (HR) at 1 minute during the recovery from an exercise stress test (EST) of less than 18 beats per minute (b/min) is regarded as “pathologic” and is associated with poor prognosis. We previously showed the inconsistency of HR recovery (HRR) in patients referred for diagnostic EST.

**Purpose**: To investigate the prevalence of HRR in healthy individuals undergoing routine ESTs. In addition, we examined the autonomic function of HR variability measures prospectively in “Normal”, “Pathological” and inconsistency / “Fluctuated” HRR subjects undergoing EST.

**Methods**: We collected ESTs data from healthy subjects (n=66) undergoing annual checkups at the Institute for Medical Screening, Sheba Medical Center. We also examined the autonomic function prospectively in individuals (n=29) undergoing EST. Autonomic function was calculated using power spectral analysis. Independent T-Test and analysis of variance with repeated measures (ANOVA) were performed and a p-value ≥ 0.05 was considered significant.

**Results**: 40% of individuals demonstrated “fluctuated” HRR, 57% demonstrated “normal” HRR (> 18 b/min), and 3% demonstrated “pathological” HRR (≤ 18 b/min) during 17 years (average of 5.39 ± 1.65 tests). HRV indices showed no significant differences between the 3 groups either at rest, peak exercise or during the recovery period.

**Conclusion**: Our results demonstrate that HRR is not a constant value, and fluctuate between “normal” to “pathologic” among individuals undergoing routine and repeated ESTs. No differences were found in autonomic function indices. These data may question the clinical significance of HRR post exercise.

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**Board #223** May 29 2:00 PM - 3:30 PM

**Chronic Adaptations On The Oxygen Uptake Kinetics In Trained Older Adults With Coronary Artery Disease**

Rita Pinto1, Joana Reis2, Vitor Angarten1, Madalena Lemos Pires1, Mariana Borges1, Vanessa Santos1, Xavier Melo2, Paula Sousa1, Jose Machado Rodrigues3, Francisco Alves4, Helena Santa-Clara1, 1Faculdade de Motricidade Humana - Universidade de Lisboa, CIPER - Centro Interdisciplinar de Estudo da Performance Humana, Lisboa, Portugal. 2Universidade Europeia, Lisboa, Portugal. 3Ginásio Clube Português, GCP Lab, Lisboa, Portugal. 4Centro Hospitalar Lisboa Norte, EPE/Hospital Pulido Valente, Lisboa, Portugal. Email: mrpinto@campus.ul.pt

(No relevant relationships reported)

Previous studies have reported that slower VO$_2$ kinetics typically observed in healthy older individuals can be prevented by long-term endurance training interventions. However, the chronic adaptations on the VO$_2$ kinetics and muscle deoxygenation ([Hb]) kinetics response in trained older adults with coronary artery disease (CAD) remains unknown.

**Purpose**: To compare VO$_2$ and [Hb] kinetics response in moderate exercise in older adults with CAD and a control group (CG) of healthy active age- and gender-matched individuals. Both groups did at least 6 months the following exercise training (ET) prescription, 3 d.wk-1 x 60-min: 30 min at 60-70% heart rate reserve + 2 x 8-12 repetitions in 6 major muscle groups.
CONCLUSION: Long term ET in CAD participants had lower measured VO\textsubscript{2} peak and work load compared to age- and gender matched. However, both pulmonary and muscular oxygen kinetics were not slower in older adults with CAD compared to their training-matched counterparts. These findings support the importance on the referral of elderly patients to community-based cardiac rehabilitation ET program to maintain their submaximal pulmonary and muscle [HHb] kinetics to continue their ability to perform daily activities.

992 Board #226 May 29 3:30 PM - 5:00 PM Limb Stiffness Is Lower In Those Who Rupture Contralateral Non-ACLR Knee Post Primary ACL Surgery

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(No relevant relationships reported)

Purpose
The aim of this study was to identify biomechanical differences during jump and CoD testing 9 months after ACL reconstruction (ACLR) between those that went on to injure their non-ACLR limb and those that did not at 2 year follow up.

Methods
Nine months after ACLR, 105 males athletes who were returning to pre-injury sport participation (55 going on to suffer contralateral ACL injury/60 matched subjects with no second injury at 2 years post op) were prospectively assessed using isokinetic strength testing and 3D biomechanical analysis of double leg drop jump (DLDJ), single leg drop jump (SLDJ) and planned and unplanned 90\degree change of direction (CoD) as well as an IKDC questionnaire. Differences in IKDC, strength and jump height measures on the non-ACLR side and in limb symmetry index between groups were analysed with statistical parametric mapping (SPM, 0D unpaired t-test). Biomechanical differences in peak joint moments and CoM data on the non-ACLR side and in symmetry between groups were analysed with SPM (Id, unpaired t-test). Effect size was calculated using Cohen’s D for all analyses.

Results
There was no difference in IKDC score between groups. There was a small effect size difference in quadriceps strength on the non-ACLR side in the group that went on to injure that limb (ES 0.39) with no difference in LSI or across the hamstring strength and jump height tests. There was no difference in measures of biomechanical symmetry between groups for any of the tests and no difference on the non-ACLR side for the CoD tests. There were large overall mean data showed no difference between rVO\textsubscript{2} (18.5 ± 7.1 s) and rQ (19.3 ± 7.3 s). No significant correlations were found between rVO\textsubscript{2} and rQ in trained (r=0.34), untrained (r=0.47), or when considering the two conditions together (r=0.37).

CONCLUSION: This study demonstrated the dynamic adjustment of Q to exercise transition within the moderate intensity domain does not differ amongst trained and untrained individuals, even in the presence of training induced speeding of the VO\textsubscript{2} kinetics. These data support the notion that mechanisms other than central delivery of O\textsubscript{2} such as improved blood flow redistribution within the active tissues and/or intracellular components are responsible for controlling the rate of adjustment of VO\textsubscript{2}.

991 Board #225 May 29 2:00 PM - 3:30 PM Case Study of Physiological Measurements during Yoga Asana Practice


(No relevant relationships reported)

PURPOSE: To conduct a preliminary case study to evaluate real time physiological changes and responses to meditation, Hatha yoga, inversion (experimental) and standing postures (control) and to determine the feasibility, reliability and validity of oxygen consumption and rate pressure product measured by a wearable metabolic device.

METHODS: A 500-hour registered yoga teacher (RYT) volunteered for this study and informed consent was obtained from the subject. A wearable metabolic device, calibrated according to manufacturer’s specifications, was worn for the duration of each session. We conducted three sessions for this study. Blood pressure (BP), Heart Rate (HR), Oxygen Consumption (VO\textsubscript{2}) and Respiratory Quotient (RQ) were monitored. Each session began with a two minute meditation in a cross leg pose, followed by a warm up consisting of Sun Salutations and ended with a cool down. In addition, the first session included Mountain Pose then Chair Pose held for two minutes each. For the third session, supported shoulder stand and headstand were performed in place of the standing postures, each for two minutes. Heart Rate and VO\textsubscript{2} were recorded every minute. We obtained BP during the last 30 seconds of each posture.

RESULTS: Overall, mean VO\textsubscript{2} was 3.1 ± 0.08 ml kg\textsuperscript{-1} min\textsuperscript{-1} for the meditative pose, while the inverted pose yielded a mean VO\textsubscript{2} of 19.5 ± 1.5 ml kg\textsuperscript{-1} min\textsuperscript{-1}. A t-test between meditation and inversion for VO\textsubscript{2} and HR was significant (p<0.05).

CONCLUSIONS: These results will be put into the broader aspects of yoga and physiological measurements discussed above with further trials and additional subjects. This will assist in the implementation of yoga and other meditative movement technologies to be implemented into exergame software applications that can be hosted on personal computers and smartphones.

990 Board #224 May 29 2:00 PM - 3:30 PM Dynamic Adjustment Of Beat-by-beat Cardiac Output And VO\textsubscript{2} Kinetics During Moderate Intensity Exercise Transitions

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(No relevant relationships reported)

The kinetic adjustment of oxygen utilization (VO\textsubscript{2}) to exercise transitions of higher metabolic demands is proposed to be affected by central and peripheral alterations within the O\textsubscript{2} transport system and/or intracellular mechanisms of control. Although limitations in O\textsubscript{2} availability within the microcirculation but not at the conduit artery level have been proposed, knowledge is limited in relation to the contribution of the dynamic adjustment of cardiac output (Q) to the VO\textsubscript{2} kinetics, and how training status might modify this response. PURPOSE: This study aimed to compare the adjustment of muscle VO\textsubscript{2} (i.e., Phase II VO\textsubscript{2}), to that of central O\textsubscript{2} delivery as examined by the adjustment of Q during step transitions to moderate intensity exercise. METHODS: Sixteen young healthy male participants (35 ± 6 yrs) performed in place transitions from 20W to moderate-intensity cycling on a cycle ergometer to determine the beat-by-beat VO\textsubscript{2} and the beat-by-beat Q responses. Participants were separated into two groups: trained (n=9, VO\textsubscript{2}max=4.54 ± 0.40 L/min) and untrained (n=7, VO\textsubscript{2}max=3.49 ± 0.68 L/min). Phase II VO\textsubscript{2} and Q were modeled with a monoexponential model. Paired and unpaired t-tests and Pearson product moment correlations were used to compare the time constants of VO\textsubscript{2} (rVO\textsubscript{2}) and Q (rQ). Statistical significance was set at p<0.05. RESULTS: Mean rVO\textsubscript{2} was faster in the trained (13.9 ± 2.7s) compared to untrained (24.4 ± 6.4 s). rVO\textsubscript{2} was slower than rQ in the trained (18.5 ± 6.0 s) but not untrained (20.2 ± 9.2 s). No difference was found in the adjustment of VO\textsubscript{2} and Q kinetics. rVO\textsubscript{2} was faster in the trained (r=0.37) than in the untrained (r=0.34). CONCLUSIONS: These findings support the importance on the referral of elderly patients to community-based cardiac rehabilitation ET program to maintain their submaximal pulmonary and muscle [HHb] kinetics to continue their ability to perform daily activities.
ACSM May 28 – June 1, 2019
Orlando, Florida

993 Board #227 May 29 3:30 PM - 5:00 PM 
Gait Asymmetry Can Predict Functional Performance 
Post ACL Reconstruction: A Pilot Study
Yasar Alshehri, Marcio Santos, Scott Mullen, Bryan Vopat, Paul Schroppel, Jeffrey Randall, Milind Phadnis, Wen Liu. University of Kansas Medical Center; Kansas City, KS.
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CONCLUSIONS: These results suggest that individuals with ACLR are capable of maintaining lower extremity joint symmetry with respect to walking at an incline and decline. Future studies will investigate differences in lower extremity joint contributions between individuals with ACLR and a healthy, age-matched control group.

ACLR reconstructed (ACLR) individuals have unequal lower extremity loading during bilateral landing. Post-trial feedback may be used to alter landing mechanics in both healthy and ACLR populations. PURPOSE: Determine how post-trial feedback of vertical ground reaction force (vGRF), loading asymmetry (LA), and frontal-plane video (FPV) of control and ACLR groups can be used to alter these variables during single- and dual-task landing performances using a low-cost custom portable system in female athletes. METHODS: 24 female athletes were placed in a control (n=12) or ACLR (n=12) group. Single-task (ST) or dual-task (DT with/without jumping for a ball) drop landing trials were performed from a 50 cm height in blocks of 3 ST and 6 DT (pre-tests), 6 ST and 6 DT with post-trial visual feedback, and 3 ST and 6 DT post-tests. Peak vGRF, LA, and frontal plane knee-to-ankle ratio between task (ST or DT) and overall time (pre-test, feedback, post-test) were compared using a three-way repeated measures ANOVA. RESULTS: Peak vGRF decreased (4.43±0.81 vs. 3.64±0.44 vs. 3.44±0.48 BW, p<0.001) and improved knee-to-ankle ratio (0.90±0.13 vs. 1.01±0.12 vs. 1.05±0.12, p<0.001) occurred over time (pre-test, feedback, post-test). ACLR group LA was larger compared to controls (0.16±0.08 vs. 0.09±0.08, p=0.043). CONCLUSION: Peak vGRF and knee-to-ankle ratio improved over time for both groups. The ACLR group had higher LA compared to controls. Post-trial feedback may produce immediate changes in peak vGRF and knee-to-ankle ratio, however more post-trial feedback in LA may be necessary to produce changes in asymmetry in ACLR populations.
Dexterity of the Lower Limb Coordination In ACL Injured Athletes

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PURPOSE: Regaining the “dexterity” in lower limb control is important for successful return to sports after ACL injury. The purpose of this pilot study is to evaluate the dexterity of the ACL-injured limb from the viewpoint of the complexity, smoothness, and accuracy of the inter-joint coordination. METHODS: Three male volunteers who had histories of ACL rupture participated in this study (One had already reconstructed, and the other had not reconstructed yet at the test day). The motor task was the lower limb target pursuit with the custom-made smart leg press device. As a target, the vertical bar, which sinuosoidally up and down with the 0.5 Hz frequency, was presented on the PC screen. The volunteers were asked to control the vertical position of the mouse cursor with the leg press device and follow the target as precise as possible. The ankle, knee, and hip joint angles in the sagittal plane were calculated from 3D motion capture data. To quantify the complexity, the approximated entropies (ApEn) of those joint angles and cursor movement were calculated. The smoothness of the movement was evaluated with the root mean squared jerk (RMSJ), and the accuracy was quantified with the root mean squared error between target and cursor (RMSE). Those three performance variables were presented as the involved/uninvolved ratio.

RESULTS: The ACL-reconstructed limb showed high complexity, less smooth, and moderately accurate pattern as compared to uninvolved limb. The non-reconstructed limb showed low complexity, less smooth, and not accurate patterns (Fig. 1). CONCLUSIONS: The complex and less smooth, but the accurate pattern in the reconstructed limb may suggest that the ACL reconstruction contributed on regaining fine inter-joint coordination which creates precise end-effector control based on the various combination of joint angles. The ACL reconstruction may help not only rebuilding the ligamentous structure but also regaining a dexterity of the movement.

Altered Somatosensory Cortex Activation in ACLR Patients during Single-Legged Balance Task

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Recent studies have suggested that an anterior cruciate ligament reconstruction (ACLR) causes neuroplastic changes in the brain associated with muscle coordination. However, it remains unclear how an ACLR patient’s brain responds during postural control, which is a good clinical indicator for muscle coordination, when compared to healthy controls. PURPOSE: To examine differences in brain activity during a single-legged postural control testing between ACLR patients and healthy controls. METHODS: In this preliminary data, four healthy controls (CONT; 21.8±2.2yrs, 84.7±8.9kg, 179.8±11.7cm) and four ACLR patients (ACLR; 28.5±10.7yrs, 99.7±24.9kg, 180.8±10.5cm) volunteered. Frontal theta (Fz, 4-8Hz) and Parietal theta (Pz, 8-12Hz) electrocortical activations (V2Hz) were quantified using a mobile electroencephalograph (EEG) during one-legged postural stability testing. Independent t-tests were used to determine electrocortical activation differences between groups. RESULTS: The ACLR had a lower Alpha-2 power at P≤0.05 compared to the CONT (32.7±1.33 V2Hz vs. 38.7±6.24 V2Hz, p=0.041) during the single-legged postural control. No difference in frontal Theta power (Fz) existed between the groups (38.46±1.02 V2Hz vs. 41.63±3.34 V2Hz, p=0.205). CONCLUSIONS: Our findings reveal less parietal Alpha-2 power in the ACLR patients compared to the healthy controls, while no different frontal theta power between groups during the postural control. As less Alpha-2 power represents less inhibition of sensory and attention to or movement in space, our findings suggest that ACLR patients may have increased cortical activation in the somatosensory cortex to compensate for altered proprioception following a surgical repair, when compared to healthy controls. During critical decision making, such as high intensity athletic...
Kinematic lower limb asymmetries in individuals post-ACLR have been identified during a variety of tasks such as walking, hopping and landing. However, there is limited understanding of whether limb kinematic asymmetries exist during a multidirectional high-risk task such as cutting. PURPOSE: To assess kinematic asymmetry between ACLR and non-surgical limbs during a cutting task. METHODS: Twelve participants (7 females, 5 males) who had undergone an ACLR and returned to full activity participated in this study. Twenty-one lower extremity markers and six marker clusters were placed on participants who ran down a 7-meter runway, planted their foot, and performed a 45° angle cutting task. Cutting tasks were performed to the right and the left of the runway. For left cutting tasks, the right limb was the planting limb and vice versa. Five successful trials were collected for each limb using an 8-camera 3D motion capture system. Joint kinematics were calculated and variables of interest included peak hip and knee flexion, ankle dorsiflexion, and combined sagittal-plane joint excursion. Differences in kinematics between limbs were calculated using paired t-tests with the alpha level set to 0.05. RESULTS: Peak hip flexion was greater in the non-surgical limb (non-surgical: 145.11 ± 14.97°, ACLR: 141.68 ± 16.62°, p = 0.029), and a trend for greater peak knee flexion was found in the non-surgical limb (non-surgical: 51.9 ± 8.04°, 49.44 ± 8.88°, p = 0.068). Combined sagittal-plane joint excursion was greater in the non-surgical limb during the cutting task (non-surgical: 146.28 ± 15.90°, ACLR: 133.66 ± 16.02°, p = 0.01). CONCLUSION: Subjects post-ACLR exhibited greater utilization of their non-surgical limb in the sagittal plane during a cutting task. This movement pattern suggests an avoidance behavior of their ACLR and suggests that further rehabilitation is necessary in these individuals post-ACLR in an effort to reduce their risk of re-injury.

**Conclusions:**

- Kinematic lower limb asymmetries were found during a cutting task.
- Participants with ACLR exhibited greater utilization of their non-surgical limb in the sagittal plane.
- This movement pattern suggests an avoidance behavior of their ACLR and suggests further rehabilitation is necessary in these individuals post-ACLR.

**Keywords:**

- Kinematics
- Cutting task
- ACLR
- Lower limb asymmetry

**References:**


**Conclusion:**

This study highlights the importance of further rehabilitation in individuals post-ACLR to mitigate kinematic asymmetries during cutting tasks.
Reconstruction Does Not Improve Running Mechanics

Michelle Rehm, Cale A. Jacobs, Christian Lattermann

PURPOSE: To compare somatosensory function between limbs in individuals with ACLR and evaluate associations between somatosensory function of the ACLR limb and gait biomechanics.

METHODS: Sixty-eight individuals with unilateral ACLR participated in this cross-sectional study. Somatosensory function was assessed as active motor threshold (AMT) and peak knee extension moment (KEM) and peak knee flexion moment (KFM).

RESULTS: AMT was not associated with sagittal plane knee kinematics in the ACLR limb during walking (angle at HS r = -0.13, P = 0.47; peak knee flexion angle r = 0.22 P = 0.22; knee flexion excursion r = -0.19 P = 0.29). CONCLUSIONS: No associations were found between quadriceps corticomotor excitability and sagittal plane knee kinematics during walking for ACLR individuals.

Board #240 May 29 3:30 PM - 5:00 PM
Somatosensory Function and Gait Biomechanics in Individuals With Anterior Cruciate Ligament Reconstruction

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Abstracts were prepared by the authors and printed as submitted.

= 376.56, SD = 156.86; female = 17.52, SD = 9.87; p = 0.049), and there is no significant gender difference in hip flexion angle in affected side. Among the Average the mean amplitudes for all periods, the gluteal muscle play an important role in this action.

CONCLUSIONS: Changing about range of motion and stability of hip joint with affected side is greater than unaffected. The knee flexion angle is affected by gender in the presence of foot-landing-landing process, and knee flexion angle of female knees is smaller than that in males, but in muscle stimulation rate, women are more dependent on thigh muscle strength rather than gluteal muscle.

1004 Board #238 May 29 3:30 PM - 5:00 PM
Associations Between Knee Kinematics During Gait And Quadriceps Corticomotor Excitability Following Anterior Cruciate Ligament Reconstruction

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(No relevant relationships reported)

Impaired quadriceps function is associated with a more extended knee throughout the stance phase of gait in individuals with anterior cruciate ligament reconstruction (ACLR). This stiffened knee strategy may alter tibiofemoral loading and hasten joint breakdown and osteoarthritis development. Altered quadriceps corticomotor excitability may influence knee kinematics during gait; yet it is unknown if quadriceps corticomotor excitability associates with gait kinematics.

PURPOSE: To determine associations between quadriceps corticomotor excitability and sagittal plane knee kinematics during walking for ACLR individuals.

METHODS: Thirty-three individuals with unilateral ACLR participated in this cross-sectional study (72% female, 22.2 ± 3.5 years; 72.5 ± 17.2 kg; 1.7 ± 0.1 m; 94 ± 40.4 months post-ACLR). Quadriceps corticomotor excitability was assessed as active motor threshold (AMT) from the vastus medialis of the ACLR limb using transcranial magnetic stimulation. Three-dimensional biomechanics were collected during over-ground walking at a self-selected speed and extracted from the first 50% of stance. We evaluated sagittal plane knee kinematics for the current study including (knee flexion angle at heel strike [HS]; peak knee flexion angle; knee flexion excursion [peak angle - HS angle]). Partial Pearson product-moment correlations were used to assess associations between kinematic variables and corticomotor variables in the ACLR limb controlling for gait speed (r = 0.05).

RESULTS: AMT was not associated with sagittal plane knee kinematics in the ACLR limb during walking (angle at HS r = -0.13 P = 0.47; peak knee flexion angle r = 0.22 P = 0.22; knee flexion excursion r = -0.19 P = 0.29). CONCLUSIONS: No associations were found between quadriceps corticomotor excitability and sagittal plane knee kinematics during gait in individuals with ACLR. Central pattern generators, and not cortical excitability, may more strongly influence gait kinematics. Further work is necessary to determine the influence of altered corticomotor excitability on other gait outcomes including kinetics and knee load muscle activity patterns.

1005 Board #239 May 29 3:30 PM - 5:00 PM
Hyaluronic Injections after Anterior Cruciate Ligament Reconstruction Does Not Improve Running Mechanics

Nicholas P. Baumann¹, Alexa K. Johnson¹, Nicholas R. Heebner², Caitlin E-W Conley¹, Cale A. Jacobs¹, Darren L. Johnson¹, Mary L. Ireland, FACSM¹, Christian Lattermann¹, John P. Ablt, FACSM¹. ¹University of Kentucky, Lexington, KY. ²Harvard Medical School, Boston, MA. (Sponsor: John Ablt, FACSM)
Email: npb2222@uky.edu (No relevant relationships reported)

Mitigating inflammation early after anterior cruciate ligament reconstruction (ACLR) may help strength and biomechanical outcomes further in rehabilitation. PURPOSE: The purpose of this study was to determine if hyaluronic injections (HI) administered early after surgery improves strength and running mechanics six months after ACLR. METHODOGS: Nineteen individuals (Table 1) who suffered an ACL tear during sport participation were enrolled in a randomized double-blind controlled trial to test a post-operative intraarticular HI compared to a placebo one week after surgery (one patient screen failed, and one withdrew after surgery). Six months post-surgery individuals completed isokinetic quadriceps strength (IKQS) at 60°/second and a biomechanical analysis of overground running using 3D motion capture and force plates. Visual 3D was used to calculate bilateral lower extremity biomechanics including knee excursion (KEX) from initial contact to peak knee flexion, and peak vertical ground reaction forces (VGRF). Inverse dynamics were used to calculate internal peak knee abduction moments (KAM), and peak knee extension moments (KEM). A repeated measures analysis of variance was used to determine differences between groups (injection vs control) and limb (involved and uninvolved). An alpha value of 0.05 was used.

RESULTS: There were no significant differences between the injection group and the control group in peak IKQS or running mechanics, and there was no significant group x limb interaction. In both the injection group and the control group, the involved limb exhibited significantly lower IKQS and KEM, less KEX, and lower peak VGRF (Table 1) compared to the uninvolved limbs. CONCLUSION: The individuals who received the HI post-surgery did not present with improved strength or running mechanics six months post ACLR compared to control subjects. Future research should investigate further benefits of neuromuscular and physiological factors from a HI.

Table 1

<table>
<thead>
<tr>
<th>Group</th>
<th>Control Mean ± SD</th>
<th>Hyaluronic Injection Mean/SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Female = 4, Male = 4</td>
<td>Female = 6, Male = 3</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>18.88 ± 3.78</td>
<td>18.40 ± 2.17</td>
</tr>
<tr>
<td>Mass (kg)</td>
<td>87.41 ± 17.36</td>
<td>81.45 ± 24</td>
</tr>
<tr>
<td>Height (m)</td>
<td>1.78 ± 0.09</td>
<td>1.74 ± 0.13</td>
</tr>
</tbody>
</table>

1006 Board #240 May 29 3:30 PM - 5:00 PM
Somatosensory Function and Gait Biomechanics in Individuals With Anterior Cruciate Ligament Reconstruction

Nicholas P. Baumann¹, Alexa K. Johnson¹, Nicholas R. Heebner², Caitlin E-W Conley¹, Cale A. Jacobs¹, Darren L. Johnson¹, Mary L. Iredale, FACSM¹, Christian Lattermann¹, John Ablt, FACSM¹. ¹University of Kentucky, Lexington, KY. ²Harvard Medical School, Boston, MA. (Sponsor: John Ablt, FACSM)
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(No relevant relationships reported)

Somatosensory function of the knee is reportedly altered following anterior cruciate ligament reconstruction (ACLR), potentially influencing the risk of osteoarthritis (OA). Poorer somatosensory function is associated with altered gait biomechanics in individuals diagnosed with knee OA, but this relationship has not been evaluated following ACLR. PURPOSE: To compare somatosensory function between limbs in individuals with ACLR and evaluate associations between somatosensory function of the ACLR limb and gait biomechanics. METHODS: Sixty-eight individuals with unilateral ACLR (72% females; age 21 ± 3 yr; time since ACLR 27 ± 15 mo) volunteered. Somatosensory function was assessed bilaterally as the ability to replicate a specified knee flexion angle during a joint position sense task (i.e. joint position sense error – JPSE). Gait outcomes were assessed during the first 50% of stance including vertical ground reaction force (vGRF), instantaneous loading rate, internal extension moment, and internal valgus moment. RESULTS: There was no difference in JPSE between the ACLR limb and the contralateral limb (2.9 ± 1.2° vs 2.8 ± 1.7°, p = 0.71). Additionally, there was no correlation between the ACLR limb JPSE and vGRF (r = -0.095, p = 0.44), instantaneous loading rate (r = -0.121, p = 0.33), internal extension moment (r = -0.018, p = 0.88), or internal valgus moment (r = -0.073, p = 0.55). CONCLUSIONS: JPSE did not differ between the ACLR and contralateral limbs, and JPSE in the ACLR limb was not associated with gait biomechanics. The mean time since ACLR in our sample was approximately 2 years, thus somatosensory adaptations may have occurred bilaterally at time of testing. Moreover, neuromuscular function of the contralateral limb is also influenced by ACLR, potentially confounding a comparison of JPSE between limbs that may have both undergone changes post-
operatively. These findings suggest the need to compare somatosensory function to a healthy cohort. Furthermore, the small magnitude and limited variability of JPSE likely minimized its ability to predict gait outcome. Future research is necessary to determine whether somatosensory deficits emerge at later time points post-ACLR compared to a healthy cohort and if they influence knee OA risk.

1007 Board #241 May 29 3:30 PM - 5:00 PM
The Relationship Between Body Composition and Quadriceps Function Following Anterior Cruciate Ligament Reconstruction
Christopher D. Johnston, Hope Davis, Brian Pietrosimone, FACSM, Troy Blackburn. University of North Carolina at Chapel Hill, Chapel Hill, NC.

Anterior cruciate ligament reconstruction (ACLR) and obesity are primary risk factors for posttraumatic knee osteoarthritis (PTOA). ACLR leads to quadriceps dysfunction, and greater fat mass may exacerbate this dysfunction as adipose tissue negatively influences strength and muscle activation. Deficiencies in quadriceps function may result in reduced capacity to attenuate energy at the knee, potentially contributing to aberrant joint loading that contributes to PTOA.

**Purpose:** To determine the relationship between body composition and quadriceps function in individuals with ACLR.

**Methods:** Thirty-five (20 F, 15 M; 71 ± 12 kg; 23.7 ± 2.8 BMI; 48 ± 35 months since ACLR) and 6 soccer players with a HG ACLR (age, 26.83 ± 3.25 years; height, 1.73 ± 0.04 m; weight, 70.91 ± 8.00 kg, BMI, 23.64 ± 3.29 kg/m²) individuals at least 6 months removed from unilateral ACLR volunteered for the study. Total body fat percentage (BF%), limb fat mass (LFM), and limb lean mass (LLM) were obtained bilaterally using dual x-ray absorptionmetry (DXA). LLM and LFM were normalized to total body mass. Quadriceps function was assessed bilaterally from maximal voluntary isometric contractions (MVIC) and a single hop limp (SLH) task. Peak torque (PT) was averaged from 2 MVIC trials and normalized to body mass. Maximum hop distance was averaged from 3 hop trials. Associations between measures of body composition and quadriceps function were analyzed via Pearson Product Moment correlations.

**Results:** In the ACLR limb, PT was associated with BF% (r = −0.656, p = 0.001), LFM (r = −0.525, p = 0.001), and LLM (r = 0.552, p = 0.001). Hop distance in the ACLR limb was also associated with BF% (r = −0.698, p = 0.001), LFM (r = 0.441, p = 0.008). PT and SLH distances for the contralateral limb were also significantly related to BF%, LFM, and LLM. Body mass index (BMI) was not significantly related to PT or SLH distance in either limb.

**Conclusion:** BF%, LFM, and LLM are related to measures of quadriceps function following ACLR. The negative associations between functional outcomes (PT and SLH distance) and measure of adipose composition (BF% and PT) indicate that greater fat tissue may contribute to exacerbated quadriceps dysfunction after ACLR. Continued research is needed to evaluate body compositional changes following ACLR and how it influences other factors related to the development of PTOA.

1008 Board #242 May 29 3:30 PM - 5:00 PM
Landing Biomechanics Following Patellar And Hamstring Tendon Anterior Cruciate Ligament Reconstruction
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(No relevant relationships reported)

Individuals with an ACL reconstruction (ACLR) have different landing adaptations depending if they received patellar (PG) or hamstring tendon (HG) graft reconstruction. No study has evaluated landing biomechanics following these procedures in soccer players.

**Purpose:** To compare landing biomechanics between soccer players following PG or HG ACLR during planned and unplanned landing tasks.

**Methods:** Six soccer players with a PG ACLR (age, 25.83 ± 4.44 years; height, 1.73 ± 0.04 m; weight, 70.91 ± 8.00 kg, BMI, 23.64 ± 3.29 kg/m², time since surgery, 4 ± 3.38 years) and 6 soccer players with a HG ACLR (age, 26.83 ± 3.25 years; height, 1.69 ± 0.08 m; weight, 67 ± 6.16 kg, BMI, 23.40 ± 2.08 kg/m² time since surgery, 5 ± 2.89 years) participated in the study. Planned landing (PL) included jumping forward and landing on two force plates, whereas unplanned landing (UL) included jumping forward to head a soccer ball and landing on the force plates. Participants performed 4 trials of each landing task. Outcome measures included peak flexion angles and extension moments of the hip, knee, and ankle joints, and electromyography of gluteus maximus, quadriceps, hamstrings, and gastrocnemius muscles. A 2 × 2 ANOVA (group x landing) was performed for each measure.

**Results:** There were no significant group x landing interactions for any of the outcomes. Significant main effects of landing were found. The UL showed smaller hip flexion (F (1,10) = 47.87, p = 0.001), smaller knee flexion (F (1,10) = 28.02, p = 0.001), and lower ankle plafaxerflexion moments (F (1,10) = 46.48, p = 0.001). Significant main effects for group for quadriceps muscle and hip extension moments were found showing that the PG group landed with reduced quadriceps activity (F (1,10) = 11.72, p = 0.007), and greater hip extension moments (F (1,10) = 14.69, p = 0.003).

**Conclusion:** The UL showed greater injury predisposing factors compared with the PL. Although the PG group showed nearly similar landing biomechanics to the HG group during both maneuvers, they (PG) demonstrated a protective landing pattern by reducing quadriceps activity and increasing the demand on the hip extensors. These findings reinforce the clinical emphasis on improving the use of hip and knee joints during landing to reduce the risk of consequent injuries in soccer players following PG ACLR.

1009 Board #243 May 29 3:30 PM - 5:00 PM
Improvements in Somatosensory Function with Vibration do not Influence Gait Biomechanics in Individuals with Anterior Cruciate Ligament Reconstruction
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(No relevant relationships reported)

Anterior cruciate ligament reconstruction (ACLR) incurs somatosensory deficits that potentially alter gait biomechanics and contribute to knee osteoarthritis (OA) risk. Individuals diagnosed with knee OA also display somatosensory deficits, and improving somatosensory function in this population improves gait biomechanics linked to OA progression. Vibratory stimuli potentially improve somatosensory function and may be an effective approach for reducing knee OA risk following ACLR.

**Purpose:** To evaluate the effects of vibration on somatosensory function and determine if improving somatosensory function influences gait biomechanics in individuals with ACLR.

**Methods:** Gait biomechanics and somatosensory function were assessed in 68 individuals with unilateral ACLR (72% females; age 21 ± 3 yr; time since ACLR 27 ± 15 mo) prior to and following one session of a whole body vibration (WBV), local muscle vibration (LMV), or control (CON) intervention. Gait outcomes included the peak vertical ground reaction force (vGRF) and its instantaneous loading rate, peak internal knee extension and valgus moments, and knee flexion displacement during the first 50% of stance. Somatosensory function was assessed as the ability to reproduce a specified knee angle (active joint position sense error - JPSE) by calculating the difference between the target and reproduced angles.

**Results:** WBV (3.0 ± 0.3° vs. 2.0 ± 0.2°, p = 0.001) and LMV (3.1 ± 0.3° vs. 2.2 ± 0.2°, p = 0.045) decreased JPSE, but no effect was noted with CON (2.8 ± 0.3° vs. 2.8 ± 0.2°, p = 0.927). However, the change in JPSE was not correlated with changes in knee flexion displacement (r = −0.169, p = 0.175), vGRF (r = −0.474, p = 0.076), loading rate (r = −0.058, p = 0.643), or internal knee extension (r = −0.194, p = 0.120) or valgus (r = −0.034, p = 0.789) moments. **Conclusions:** Vibration improved somatosensory function, but this enhancement did not influence gait biomechanics. A ceiling effect potentially limited the influence of gait biomechanics as evidenced by the small magnitude and limited variability of JPSE. Additionally, a single exposure to vibration may be insufficient to permit somatosensory enhancement that manifests as improvements in gait biomechanics. Future work is necessary to evaluate the relevance of somatosensory deficits to knee OA risk following ACLR.
individuals with ACLR. Pairwise comparison functions were used to compare time-normalized vGRF waveforms in controls and the involved and uninvolved limbs at 6- and 12-months.

**RESULTS:** Thirty individuals with ACLR (50% female, 21.6±3.4 years, body mass index (BMI)=24.2±3.2 kg/m²) and 48 controls (67% female, 20.3±1.6 years, BMI=23.1±3.3 kg/m²) completed the current study. At 12-months, both the involved and uninvolved limbs demonstrated lesser vGRF (~3% BW) during the first peak (13-28% of stance) and greater vGRF (~2% BW) during mid-stance (46-66% of stance) compared to 6-months. Over time, the involved limb demonstrated lesser vGRF (~2 to -4% BW) at the first (13-28% of stance) and second (77-87% of stance) peaks compared to the uninvolved limb. Healthy controls demonstrated greater vGRF at the first (6-months: -8% BW, 13-32% of stance; 12-months: +10% BW, 1-33% of stance) and second peaks (6-months: ±5% BW, 69-91% of stance; 12-months: ±4% BW, 72-92% of stance) and lesser vGRF in mid-stance (6-months: ±2% BW, 39-54% of stance; 12-months: ±3% BW, 38-64% of stance) compared to the involved limb at both 6- and 12-months.

**CONCLUSIONS:** Individuals may achieve more symmetrical loading over time by lowering vGRF of the involved limb between 6- and 12-months following ACLR. Future gait retraining programs may seek to achieve optimal loading in both the involved and uninvolved limbs, as well as symmetrical loading between limbs in individuals with an ACLR.

**B-64** Free Communication/Poster - Jumping and Landing

Wednesday, May 29, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

**1011** Board #245 May 29 3:30 PM - 5:00 PM Effects of Arch Type of the Propulsion Mechanics of Jumping and Hopping Tasks

Christopher M. Wilburn, Brandi E. Decoux, Randy T. Favcett, Portia T. Williams, Nicholas H. Moore, Wendi H. Weimar. Auburn University, Auburn, AL.

Email: csw0043@auburn.edu

**Results**: The structural alignment of the medial longitudinal arch has an influential role in generating the locomotive mechanics in bipedalism. Evidence suggests healthy arch types exhibit foot function advantageous in forward propulsion. Further, studies indicate that any compositional alterations may result in accessory motion and dysfunction of the foot. However, recent anecdotal assumptions propose that such compromised foot architecture may develop biomechanical characteristics beneficial for propulsive patterns in the medial and lateral directions. The purpose of this study was to examine the influence normal arch (NA) and low (LA) arch types have on propulsive mechanics during directional-specific locomotive tasks.

**Methods**: Twenty-two male collegiate athletes, eleven NA and LA, participated in the study. The Arch Height Index Measurement System was utilized to obtain foot anthropometric measurement for arch height classification. Participants performed three complete trials of lateral hopping (one-leg ski jumping; LJ), unilateral forward hopping (FH), and unilateral stationary hopping (SH), at a self-selected speed. Normalized peak mediolateral ground reaction forces (mGRFs) were collected during the propulsion phase of each task. **Results**: A 2 (arch type) × 3 (jumping/ hopping tasks) mixed-factorial ANOVA were performed to determine the effects of arch height on the propulsion phase of each condition. A significant main effect across conditions was observed ($F(1, 258, 25.154) = 11.526, p = 0.001, n^2 = 0.366$). Follow-up pairwise comparisons indicated that LJ yielded significantly greater lateral force, when compared to FH ($p = 0.011$) and SH ($p = 0.001$). Additionally, a significant difference was observed between arch height ($F(1, 20) = 4.502, p = 0.047, n^2 = 0.184$), indicating LA produced larger lateral forces when compared to the NA individuals. However, there was no significant interaction between arch height and the conditions ($F(1, 258, 25.154) = 1.756, p = 0.019$). **Conclusion**: While the differences amongst conditions were expected, the results revealed that LA displayed larger mGRFs when compared to NA. These findings of this study may suggest that the altered foot positioning of the LA, specifically the everted posture, may act as a beneficial source for directionally specific tasks.

**1012** Board #246 May 29 3:30 PM - 5:00 PM Effect of Sex on Linear and Nonlinear Kinematic Variability during a Stop Jump

Alex Peebles, Shane Ross, Robin Queen, FACSFM. Virginia Tech, Blacksburg, VA.

Email: apeebles@vt.edu

(No relevant relationships reported)

Women are 4 to 6 times more likely to sustain a non-contact ACL injury compared to men. Sex differences in lower extremity landing mechanics are believed to be associated with this increased risk. However, no previous studies have examined sex-specific differences in the variability of lower extremity mechanics during a landing. Variability may provide unique information regarding movement control which pertains to injury risk. **Purpose**: To compare variability in hip and knee kinematics during a stop jump between men and women. **Methods**: 22 male and 20 female healthy uninjured individuals completed seven bilateral stop jumps while lower extremity kinematics and kinetics were collected. Hip and knee joint 3D kinematics were calculated from initial contact to toe off of the first landing and time normalized using Visual 3D. Linear variability was quantified as the standard deviation of peak knee flexion and peak knee abduction across the seven trials, then as the average standard deviation during ground contact. Joint couples were created between knee flexion and knee abduction, hip flexion and knee abduction, hip rotation and knee abduction, knee flexion and knee flexion velocity, and knee abduction and knee abduction velocity, all isolated to the landing phase. Vector coding variability and divergence of nearest neighboring trajectories was quantified for each couple and divergence was quantified for knee flexion and knee abduction angle time series. All variability outcome measures were compared between sex for the dominant limb only using independent t-tests. **Results**: There were no sex-based differences when looking at any linear variability measures. Women had increased vector coding variability for the knee abduction/knee abduction velocity coupling (F(3,6) = 12, M: 20 ± 7$°$/m, p = 0.004), indicating LA produced larger lateral forces when compared to the NA. No other sex-specific differences were observed. **Conclusion**: Women have increased knee kinematic variability during landing than men, particularly when looking at knee abduction. Linear methods of quantifying variability may be insensitive for identifying sex differences in landing variability.

**1013** Board #247 May 29 3:30 PM - 5:00 PM The Effect Of Video And Verbal Biofeedback In Landing Mechanics Parameters During Drop Vertical Jump.

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(No relevant relationships reported)

The video and verbal feedback, could offer a quick, simple and effective alternative to training programs for altering high-risk movement patterns during landing tasks such drop vertical jump. **Purpose**: To investigate the effect of verbal and video biofeedback on height, power, flight time and contact time during drop vertical jump. **Methods**: Twenty-two recreationally trained women (22 ± 4 yrs; 72 ± 3.9 kg; 172 ± 2.9) performed the drop vertical jump (DVJ) using a 40 cm box on three different protocols: control set (CS) – three DVJ were performed without any feedback; video feedback (VF) – the participant watched the video of the CS and were instructed to improve the stability or power in the next trials; verbal feedback (VBF) – the researcher provide instructions regarding landing, lower limb alignment and knee stabilization after CS. Three-minute rest were adopted between trials. A randomized order was adopted between protocols. The DVJ was assessed using a OPTOGAIT System. The jump height, relative power, flight time and contact time were measured during DVJ. **Results**: Regarding the DVJ height (CS = 18.6 ± 7.5cm, VF = 20 ± 6.3cm, VBF = 20.1 ± 5.3cm), no main effects for protocols was noted (F2,26 = 1.647; p = 0.198). Similar results were observed for relative power (CS = 14.9 ± 4.1 kg/; VF = 15.2 ± 3.2 kg; VBF = 15.1 ± 2.7 kg; F2,26 = 0.95; p = 0.424) and flight time (CS = 0.37 ± 0.08 sec; VF = 0.39 ± 0.05 sec; VBF = 0.37 ± 0.06 sec; F2,26 = 2.776; p = 0.081). However, a significant main effect for protocols was noted for contact time (CS = 0.64 ± 0.11 sec; VF = 0.69 ± 0.08 sec; VBF = 0.72 ± 0.09 sec; F2,26 = 3.996; p = 0.031). **Conclusion**: The increase in contact time noted under VF and VBF protocols would lead to a decrease in the rate of loading experienced by the hip, knee and ankle joints during the initial landing of DVJ, therefore decreasing injury risk.
Table 1—Drop vertical jump parameters between biofeedback protocols.
* Significant difference for control set (p < 0.05).

<table>
<thead>
<tr>
<th></th>
<th>Control Set</th>
<th>Video</th>
<th>Verbal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (cm)</td>
<td>18.6 (7.5)</td>
<td>20 (3.3)</td>
<td>20.1 (5.3)</td>
</tr>
<tr>
<td>Power (Watts/kg)</td>
<td>14.9 (4.1)</td>
<td>15.2 (3.2)</td>
<td>15.1 (2.7)</td>
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<tr>
<td>Flight time (sec)</td>
<td>0.37 (0.08)</td>
<td>0.39 (0.06)</td>
<td>0.39 (0.05)</td>
</tr>
<tr>
<td>Contact time (sec)</td>
<td>0.64 (0.11)</td>
<td>0.69 (0.08)*</td>
<td>0.72 (0.09)*</td>
</tr>
</tbody>
</table>

The interactions between neuromuscular and metabolic processes can produce muscular contraction; thus, the sympathetic nervous system takes special relevance because of its contribution in the autonomic control, which participates in the energetic supply of the muscular fibers and in the neuromuscular performance. This performance can be evaluated by using the vertical jump test, and its relationship with autonomous regulation is determined by the analysis of heart rate variability (HRV).

**CONCLUSIONS**: The aim of this study is to describe correlations between HRV and jump performance in young female professional soccer players. Additionally, negative correlations were observed in CMJ concentric force and Stress Index (P=0.001, r²=0.41), average HR (P=0.002, r=0.58) and minimum HR in supine position (P=0.005, r=0.52) and SJ peak concentric velocity and LF/HF index in orthostatic postural change (P=0.0453, r²=0.2739).

**CONCLUSIONS**: There is an inverse correlation between concentric contraction force and sympathetic modulation. Likewise, a positive association was found between some parameters related to neuromuscular power and variables of sympathetic activity, evidencing the existence of an influence of sympathetic system in explosive sports. According to this correlation, we suggest the use of HRV parameters that reflect sympathetic activity in the monitoring of training loads.

Gymnastics has one of the highest rates of lower extremity (LE) ligamentous injuries even among contact sports. Excessive frontal plane motion of the LE during landing from a DVJ is linked to injury at the hip, knee, and ankle. In addition, sagittal plane motion plays a key role in absorption of forces upon landing. Frontal and sagittal plane motion of the LE during DVJ tasks are often used to screen injury risk in field sport athletes. However, no gymnastics-specific screening tool exists.

**PURPOSE**: To evaluate the differences in landing biomechanics during the DVJ and a sport specific landing during the roundoff back handspring (ROBHS) among gymnasts.

Anterior cruciate ligament (ACL) injuries are common during athletic landing activities especially in females. The use of performance-based feedback may be used to alter landing mechanics. **PURPOSE**: Provide vertical ground reaction force (vGRF), loading asymmetry (LA), and qualitative frontal-plane video (FPV) as post-trial feedback of each landing task using a low-cost custom portable system to evaluate landing performance in female collegiate athletes.
and train female collegiate athletes during single- and dual-task landing performances. METHODS: 65 female collegiate athletes participated. Trials were either single-task (ST) drop-landings or dual-task (DT) landings with/without jumping for a suspended ball. These were performed from a 50 cm drop height in blocks of 3 ST and 6 DT pre-tests, 6 ST and 6 DT with post-trial visual feedback (peak ≥GRF in bodyweight (BW), LA, and FPV), and 3 ST and 6 DT post-tests. Peak vGRF and frontal plane knee-to-ankle ratio during landing task (ST or DT) and over time (pre-test, feedback, post-test) were compared using a repeated measures ANOVA. RESULTS: There was a decrease in the peak vGRF (4.29±0.93 vs. 3.55±0.75 vs. 3.44±0.66 BW, p<0.001) as well as an improvement in knee-to-ankle ratio (0.97±0.15 vs. 1.01±0.12 vs. 1.04±0.13, p<0.001) over the time course of the blocked trials. A main effect showed ST to have lower peak vGRF than DT (3.71±0.82 vs. 3.81±0.83 BW, p<0.002), with the greatest difference in the post-test (3.35±0.57 vs. 3.53±0.73 BW, p<0.001). CONCLUSION: Peak ≥GRF was different between ST and DT landing but improved with immediate post-trial feedback. Knee-to-ankle ratio was not different between ST and DT landing but improved with post-trial feedback. Post-trial feedback appears to produce immediate short term changes in landing performance in female collegiate athletes within a single training session.

CONCLUSION: Cognition Matters: Brain Function May Explain Deficiencies In Unanticipated Single-leg Landing Quality

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It has been speculated that cognitive performance may play a role in injury risk during sports-related movements such as jump landings. However, there is a paucity of research concerning this hypothesis. PURPOSE: The present study aimed to elucidate the potential association between brain function and biomechanical stability as well as decision-making success in an unanticipated jump-landing task. METHODS: Twenty healthy male participants (27±4 years) performed 70 counter-movement jumps with single-leg landings (n=35 anticipated/unanticipated each) on a pressure plate. In the anticipated condition, the required landing leg was indicated already before take-off. For the unanticipated jumps, this information was presented only during the flight phase. Biomechanical landing quality was estimated from vertical peak ground reaction force (pGRF), time to stabilization (TTS), center of pressure path way (COP), and standing errors (i.e. falls, touching the ground with the free leg). Decision-making accuracy was assessed as the amount of landing errors (wrong/both feet). Differences between conditions as well as their associations with several measures of cognitive function were analyzed controlling for relevant covariates.

RESULTS: Unanticipated landings resulted in higher COP values (S88 vs. 516mm, p<0.01, d=−1.85) and more standing errors (n=2 vs. 0, p<0.01, d=2.14) compared to anticipated trials. While the biomechanical deficit was not related to cognitive function (p>0.05), there was an unexpected correlation between the increase in standing errors and higher cognitive flexibility (r=−0.48, p=0.037) as well as better working memory capacity (r=−0.52, p=0.026). An opposite pattern was found for the landing errors occurring in the unanticipated condition: poor decision-making was associated with deficits in cognitive flexibility (r=0.699, p<0.001) and working memory (r=−0.50, p<0.05).

CONCLUSIONS: Cognitive function may be an important but understood moderator of unanticipated jump landing safety. Further research should be dedicated to the development of specific training methods aiming to improve movement-related decision-making under time constraints.

Board #252 May 29 3:30 PM - 5:00 PM Risk Factors Associated With Medial Tibial Stress Syndrome In Military Cadets During Basic Training

Jonathan R. Malaver1, Jenner R. Cubides2, Rodrigo Argothy3, Daniel D. Cohen1, 4Universidad de Santander (UDES), Bucaramanga, Colombia. 1, 4Room: CC-Hall WA2

Medial Tibial Stress Syndrome (MTSS) is one of the most frequent pathologies in military personnel. As the muscles of the lower extremity contribute to the attenuation of impact forces in activities such as running and jumping, neuromuscular performance deficiencies and asymmetries may be associated with an increased risk for musculoskeletal injuries. PURPOSE: To determine the kinetic risk factors associated with MTSS through the bilateral countermovement jump (CMJ) in army cadets. METHODS: Ethical approval was granted by the General José María Córdova Military School of Cadets where the study was conducted. This observational study was executed in a cohort of 123 cadets (followed for 24 weeks) who entered to the military school in 2017. Anthropometric, demographic data and MTSS history were recorded. Jump height (cm), concentric mean force (N*kg), peak landing force asymmetry (%), concentric mean force (N*kg), concentric mean force asymmetry (%), eccentric deceleration rate of force development (EDRFD [N*kg/s]) and EDRFD asymmetry (%) were evaluated through the bilateral CMJ on a pair of uniaxial force platforms. After the follow-up, the cadets with MTSS were determined through the clinical history. RESULTS: The incidence of MTSS was 13% (n=16). In the bivariate analysis, height, EDRFD asymmetry, sex (female; RR=2.84; 95% CI=1.16-6.94), provenance (rural; RR=2.65; 95% CI=1.04-6.72), and MTSS history (yes; RR=5.71; 95% CI=2.23-14.62), were significantly associated with MTSS (p<0.05). In the logistic regression, EDRFD asymmetry (OR=1.03; 95% CI=1.00-1.07), sex (OR=4.91; 95% CI=1.38-13.37), and provenance (OR=4.82; 95% CI=1.04-6.72), were significantly associated with MTSS (p<0.05). MTSS history was significant for p<0.1 (OR=8.95; 95% CI=0.68-118.73). The predictive model was significantly associated with MTSS (p<0.01), had a sensitivity of 31.3% and a specificity of 99.1% (overall prognostic of 90.2%). CONCLUSIONS: While we identified important non-modifiable risk factors for MTSS in cadets during basic training, we also found that higher CMJ EDRFD asymmetry was a significant risk factor. This suggests that the bilateral CMJ may be a useful tool for pre-entry screening in and that high EDRFD asymmetry could be a potential target of pre-basic training risk reduction conditioning.

Board #254 May 29 2:00 PM - 3:30 PM A Comparison Of On- And Off-Duty Physical Activity In Career Firefighters

Allison M. Barry1, Katie J. Lyman2, Nathan D. Dicks3, Kassiani D. Landin1, Christi R. McGeorge4, Tanis J. Walsh1. 1Pittsburg State University, Pittsburg, KS. 2University of North Dakota, Grand Forks, ND. 3University of North Dakota, Grand Forks, ND. (Sponsor: Donna J. Terbizan, FACSM)
Email: abarry@pittstate.edu

Physiological inactivity coupled with increasing obesity levels in firefighters plays a critical role in accumulating cardiovascular events. PURPOSE: To examine differences in career firefighters’ objectively measured physical activity (PA) levels while on- and off-duty. METHODS: Twenty-nine career firefighters (age: 34.4±7.15 y; BMI: 28.97±5.22 kg·m−2) participated in a non-experimental, within-subjects study. Firefighters wore an accelerometer during waking hours of their nine-day tour, which included three, 24-hour on-duty days and six, off-duty days. Accelerometers assessed PA intensity using Freedson (1998) cut points and step count. Height and weight were also measured to calculate BMI. Dependent t-tests, independent t-tests, and Pearson product-moment correlations were used to analyze the data in SPSS (v24). RESULTS: Firefighters (overweight=20; obese=9; normal weight=0) met the ACSM PA guidelines more often while on-duty (n=17) compared to when they were off-duty (n=9). While on-duty, firefighters attained an average of 35.5±19.2 minutes of moderate-to-vigorous physical activity (MVPA) compared to 27.82±18.91 minutes (p=0.055, d=0.40) when off-duty. Firefighters engaged in significantly more light PA during on-duty days (351.11±59.90 minutes) compared to off-duty days (315.83±86.90 minutes) (p=0.026, d=0.47). There were significant correlations between on- and off-duty days for sedentary behavior (r=−0.53, p<0.001), moderate PA (r=−0.37, p<0.05), and MVPA (r=−0.41, p<0.05). CONCLUSION: As a group, firefighters in this study did not meet ACSM PA guidelines, especially when off-duty, which may place them at greater risk for a cardiac event. Firefighters must rely on their cardiovascular health to perform the physiologically demanding tasks that their job requires. In the future, researchers need to collaborate with fire departments across the country to assess and develop ways to enhance PA levels in firefighters with the goal of improving their overall health and well-being, which ultimately may decrease the risk of cardiac events.
Low handgrip muscular strength (HMS) is associated with increased morbi-mortality. HMS has been shown to predict some firefighters’ job-related task performance. However, little is known about firefighters’ HMS descriptive values and there is no specific fitness categories for grip strength for firefighters. PURPOSE: To describe HMS in Brazilian military firefighters in association with gender and job experience. METHODS: We evaluated 290 firefighters (70% men) with mean age of 28.9±6.4 yrs. HMS was measured using a calibrated handgrip dynamometer (SachanCorp, Korea). Volunteers performed to maximally maximal contractions with each hand, holding the dynamometer in line with the forearm in the upright position (ACSM 10th ed guideline). Final score was the sum of the highest values on each hand and categorized by ACSM guideline. Fair or poor HMS were classified as suboptimal, all other categories (excellent, very good and good) were classified as good strength. Data are presented as median (min-max) values due to nonparametric distribution (Kolmogorov-Smirnov test). Chi-square (of Fisher) test was used to compare classification. Job experience was classified as rookie (those who have just finished training academy) and as veteran. Mann-Whitney test was used for comparisons. RESULTS: Absolute HMS was higher in men as compared to women: 100 (61-156) vs 64 (45-97) kgf (p<0.05). However, the proportion of volunteers in each category was similar among genders (p=0.26). Proportions of HMS categories are shown on Table 1. CONCLUSION: This cross-sectional study showed that about 25% of volunteers showed suboptimal HMS and that male veterans had higher strength than rookies. Data support the recommendation for upper limbs strength training among firefighters, mainly among those joining the corporation.

Table 1: Handgrip strength classification among male and female firefighters by job experience

<table>
<thead>
<tr>
<th>Sex</th>
<th>Strength Classification</th>
<th>Rookie</th>
<th>Veteran</th>
<th>p value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Good</td>
<td>101 (63.1%)</td>
<td>35 (83.3%)</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Suboptimal</td>
<td>59 (36.9%)</td>
<td>7 (16.7%)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>Good</td>
<td>58 (73.4%)</td>
<td>7 (77.8%)</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>Suboptimal</td>
<td>21 (26.6%)</td>
<td>2 (22.2%)</td>
<td></td>
</tr>
</tbody>
</table>

*: Chi-square or Fisher test

Wildland firefighters (WLFF) are required to work long hours in extreme environments resulting in high daily rates of total energy expenditure (TEE) (Ruby; 2002, Cuddy, 2015). Increasing the number of eating episodes throughout the workshift and/or providing rations that better promote convenient nutrient delivery (Cuddy, 2007; Montain, 2008) has been shown to augment self-selected work output on the fireline. Regular consumption of supplemental carbohydrate (CHO) has also demonstrated enhanced work output, particularly during the shifts’ latter hours (Cuddy, 2007). However, it remains unclear how current feeding strategies of WLFF compare to more frequent nutrient delivery. PURPOSE: The aim of the current study was to determine the self-selected field total energy intake (TEI), composition and patterns of WLFF feeding during wildfire fire suppression shifts. METHODS: 86 WLFF (16 female, 70 male; 27±5.6 yrs) were deployed to 12 different wildland fire assignments across six regions of the US during the 2018 fire season. Pre- and post-shift food inventories were collected at WLFF basecamp and provided item-specific nutrient content (calories [kcal], CHO, fat, protein). Workshift nutrient consumption (TEI; feeding frequency [total number of and interval between feeding episodes), feeding episodic composition) was monitored in real-time by field researchers on the fireline via observational data capture in mobile tablets. RESULTS: Workshift length averaged 14±2.1 h. Meghan was similar among genders (p=0.26). Proportions of HMS categories are shown on Table 1. CONCLUSION: This cross-sectional study showed that about 25% of volunteers showed suboptimal HMS and that male veterans had higher strength than rookies. Data support the recommendation for upper limbs strength training among firefighters, mainly among those joining the corporation.
Previous research also suggests that the overall dynamic balance ability of firefighter recruits increases as they progress through their firefighter recruit training academy, but then decreases during the transition into active-duty service. However, longitudinal changes in single-leg dynamic balance asymmetries during and after firefighter recruit training academies have yet to be examined. **PURPOSE:** To describe longitudinal changes in single-leg dynamic balance asymmetries among firefighter recruits.

**METHODS:** Twenty-seven male firefighter recruits (mean ± SD, age = 29.9 ± 4.1 yrs; height = 179.8 ± 4.6 cm; body mass = 87.2 ± 9.7 kg) enrolled in the same training academy volunteered to participate in the current study. The SEBT$_{nog}$ was conducted bilaterally at the beginning (W1) and end (W14) of their firefighter training academy, as well as at the end of the probationary period of their active-duty service (W38). All SEBT$_{nog}$ data were recorded in cm and right vs. left SEBT$_{nog}$ asymmetries were defined as: < 4 cm and ≥ 4 cm. A Cochran’s Q Test was utilized to examine for changes in the frequency of balance ability are most predictive in MSKI risk among this cohort population.

**CONCLUSION:** There are significant changes in dynamic balance ability among firefighter recruits as they progress through their firefighter recruit training academy and begin active-duty service, similar significant changes in single-leg dynamic balance asymmetries were reported main duties performed on a log. SB was evaluated by the vector magnitude using <200 counts/min as cut-off point. We compared SB and daily steps during 3 periods of the day: morning (08:00-11:59) afternoon (12:00-17:59) and evening (18:00-23:59). Night period (00:00 to 05:59) was excluded due to insufficient data. We compared SB and daily steps during the day and between those who participated or not at least one episode of wildland fire suppression (Mann-Whitney test). Friedman test with a Wilcoxon post-hoc test (p-value <0.02) were used to compare the 3 moments. Data are shown as median (min-max).

**RESULTS:** WF spent 73 (15-142) min in the morning, 131 (17-192) min in the afternoon and 109 (13-193) min in the evening on SB. They accumulated 3,508 (1,322-12,237) steps in the morning, 4,105 (963-18,450) in the afternoon and 5,499 (571-13,883) in the evening. Those who participated or not at least one episode of wildland fire suppression showed similar SB and daily steps (p=0.05). SB pattern throughout the day are show on Figure 1. **CONCLUSION:** WF achieved similar daily steps in the 3 periods of the day. Time spent in SB was higher in the evening as compared to the morning. Our results suggest that WF remain little time in SB as compared to other professions and achieved a high daily steps count (>10,000) during a 24-h routine work.

![Figure 1. Sedentary behavior by different moment on day among on-duty firefighters](image)

**ABSTRACT:** Firefighters are susceptible to work-related fatigue due to long and strenuous shiftwork. Work-related fatigue can be linked to the majority of the fatal and non-fatal injuries in the fire service. **PURPOSE:** The purpose of this study was to examine the influence of isometric strength, body mass index, and age on perceived work-related fatigue in career firefighters. **METHODS:** Thirty-two firefighters [29 males, 3 females; age: 33.7±9.2 years (20-50); stature: 177.2±7.6 cm (153.0-190.5); mass: 94.5±20.8 kg (64.0-152.0)]; volunteered for this investigation. Participants completed an occupational fatigue questionnaire that measured three dimensions of work-related fatigue: acute fatigue (AF), chronic fatigue (CF), and inter-shift recovery (IR).

Participants performed 3-4 leg extension isometric maximal voluntary contractions (MVCs) on a custom-built calibrated load-cell dynamometer with a two minute recovery period in between each contraction. Maximal strength, or isometric peak force, was calculated as the highest 100ms value during the MVC plateau. Local firefighters work three 24-hr shifts on-off over one rotation followed by four days of rest. Maximal strength testing was completed pre-rotation and post-rotation (five days apart). Percent change in maximal strength [%∆PF = (Post-Pre)/Pre × 100] was calculated. Stepwise regression analyses were conducted for each dimension of fatigue: Predictor variables were %∆PF, body mass index, and age. An alpha level was set a priori at 0.05 for all analyses. **RESULTS:** The stepwise analyses suggest that age alone significantly contributed to AF (R²=0.274, P=0.001) and CF (R²=0.280, P=0.001). Age and %∆PF combined significantly contributed to IR (R²=0.269, P=0.004). BMI failed to significantly contribute to any of the stepwise regression models. **CONCLUSION:** These findings suggest that older firefighters experience greater levels of perceived acute and chronic work-related fatigue. Furthermore, older firefighters with greater maximal strength losses experience poorer perceived IR. While age is non-modifiable, interventions aiming to mitigate strength loss across shiftwork may be helpful at enhancing IR. Supported by the National Institute of Occupational Safety and Health (T420H0108672)

**ABSTRACT:** Wildland firefighters’ (WF) routine involves long displacements and intense physical demands, interspersed with sedentary behavior (SB). Little is known about SB and daily steps pattern of WF during routine work. **PURPOSE:** We analyzed the SB and total daily steps of Brazilian WF during a 24-hour shift-work. **METHODS:** We evaluated 22 WF, aged 35.9±6.4 yrs, BMI of 25.3±2.9 kg/m², during the dry season. Volunteers wore an accelerometer (ActiGraph-GT3X+) during a 24h shift work and reported main duties performed on a log. SB was evaluated by the vector magnitude using <200 counts/min as cut-off point. We compared SB and daily steps according to 3 periods of the day: morning (08:00-11:59) afternoon (12:00-17:59) and evening (18:00-23:59). Night period (00:00 to 05:59) was excluded due to insufficient data. We compared SB and daily steps during the day and between those who participated or not at least one episode of wildland fire suppression (Mann-Whitney test). Friedman test with a Wilcoxon post-hoc test (p-value <0.02) were used to compare the 3 moments. Data are shown as median (min-max).

**RESULTS:** WF spent 73 (15-142) min in the morning, 131 (17-192) min in the afternoon and 109 (13-193) min in the evening on SB. They accumulated 3,508 (1,322-12,237) steps in the morning, 4,105 (963-18,450) in the afternoon and 5,499 (571-13,883) in the evening. Those who participated or not at least one episode of wildland fire suppression showed similar SB and daily steps (p=0.05). SB pattern throughout the day are show on Figure 1. **CONCLUSION:** WF achieved similar daily steps in the 3 periods of the day. Time spent in SB was higher in the evening as compared to the morning. Our results suggest that WF remain little time in SB as compared to other professions and achieved a high daily steps count (>10,000) during a 24-h routine work.
Firefighting is a hazardous profession. Occupational hazard may negatively impact quality of life (QoL). Firefighters’ job-related activities result in vigorous physical effort that requires considerable cardiorespiratory fitness (CFR). The National Fire Protection Association (NFPA) recommends a CFR =/> 42 ml·kg⁻¹·min⁻¹ (12 METs) as the minimum level of fitness that requires considerable cardiorespiratory fitness (CFR). The National Fire Protection Association (NFPA) recommends a CFR =/> 42 ml·kg⁻¹·min⁻¹ (12 METs) that requires considerable cardiorespiratory fitness (CFR). The National Fire Protection Association (NFPA) recommends a CFR =/> 42 ml·kg⁻¹·min⁻¹ (12 METs) and for women we used its corresponding value from the Cooper Fire Department completion of a submaximal Step-Test (SUB) and maximal Tower Climbing Test (MAX). RPE_MAX and RPE_SUB were collected following each test and expressed as a percent of maximum possible response. HR was the average HR from each test and expressed as a percent of estimated maximum. A 2x3 repeated measures ANOVA was performed to determine the effect of test (SUB, MAX) on response (RPE_MAX, RPE_SUB, HR). An alpha of p<0.05 determined statistical significance with an adjusted alpha level of 0.017 for follow-up tests. RESULTS: The 2x3 ANOVA indicated a significant interaction between test type and response (F(1,463,64)=41.626, p<0.001). Follow-up paired t-tests revealed that for each response, SUB was significantly (p<0.001) lower than MAX. There were non-significant differences between RPE type for the SUB (F(2,463.64)=3.2; p=0.049) and MAX (RPE_MAX=76.8 ± 17.6%; vs. RPE_SUB [76.7 ± 15.2%]; p=0.949) tests. For the SUB test, HR (69.9 ± 5.3%) was significantly (p<0.001) higher than both RPE types, whereas for the MAX test HR (86.0 ± 4.7%) was not different from RPE_MAX (p=0.059) or RPE_SUB (p=0.036).

CONCLUSIONS: The absence of a difference between RPE and HR during MAX suggests that RPE may be a suitable alternative to heart rate monitors to monitor intensity in FF recruits during maximal tasks. The significant differences between RPE_MAX and RPE_SUB and HR during SUB suggests that FF recruits may underestimate the intensity of a SUB task. Practitioners should use caution when relying solely on subjective feedback from SUB tasks as RPE may understate actual intensity.

Despite upwards of 40-50% loss of heat through the head during exercise, little regard has been given to the role of the wildland firefighter (WLF) helmet in uncompensable heat stress. PURPOSE: To investigate factors of heat stress with and without a standard issue WLF helmet. METHODS: Eleven male subjects (age = 25.2±4.9 yrs) were recruited with a VO2_max of 48.3±9.2 ml·kg⁻¹·min⁻¹. All participants received a WLF helmet. A randomized crossover design was implemented, with a minimum two week washout period. Blood flow to the head and neck (SBFH; SFHN), head heat (HH), skin temperature on chest and neck (Tskc; Tskn), HR, PSI, RPE, perceived head heat (PHH) and skin temperature were recorded during trials. A 2x3 ANOVA was used to analyze SBF, and 2x4 ANOVA was used to analyze HH, CT, ST, HR, PSI, RPE, and PHH. One-way ANOVA was used to analyze sweat rate.

RESULTS: Nine of the 11 subjects were able to finish the 90 minute exercise protocol in a heat chamber (35°C and 30% RH), with a standard WLF para-aramid shirt and pants, cotton t-shirt, and either with or without a WLF helmet. A randomized crossover design was implemented, with a minimum two week washout period. Blood flow to the head and neck (SBFH; SFHN), head heat (HH), skin temperature on chest and neck (Tskc; Tskn), HR, PSI, RPE, perceived head heat (PHH) and skin temperature were recorded during trials. A 2x3 ANOVA was used to analyze SBF, and 2x4 ANOVA was used to analyze HH, CT, ST, HR, PSI, RPE, and PHH. One-way ANOVA was used to analyze sweat rate.

CONCLUSION: These data (HH, SBFH, and PHH) suggest that the current WLF helmet causes heat accumulation and resultant respiration of blood flow to the head. While some physiological factors (Tskc, Tskn, PSI, and sweat rate) did not reach significance between trials; trends existed for PSI (p=0.09) and RPE (p=0.09). The design of the WLF helmet hinders ventilation, which from these data, may result in metabolic alterations, and perceived discomfort. Funded by the USFS (14-CR-1113820-009).

Table 1: Median (min - max) values of QoL among 104 female and 686 male firefighters compared by CFR

<table>
<thead>
<tr>
<th>Women</th>
<th>Women</th>
<th>Men</th>
<th>`12 METs</th>
<th>`12 METs</th>
</tr>
</thead>
<tbody>
<tr>
<td>n = 34 (32.7%)</td>
<td>n = 70 (67.3%)</td>
<td>n = 289 (42.1%)</td>
<td>n = 397 (57.9%)</td>
<td></td>
</tr>
<tr>
<td><strong>PHYD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67.9 (28.6–96.4)</td>
<td>78.6 (50.0–100)</td>
<td>71.4 (17.9–100)</td>
<td>78.6 (21.4–100)</td>
<td></td>
</tr>
<tr>
<td><strong>PSYD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70.8 (29.2–100)</td>
<td>75.0 (50.0–95.0)*</td>
<td>70.8 (20.8–100)</td>
<td>75.0 (16.7–100)*</td>
<td></td>
</tr>
<tr>
<td><strong>RSD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64.0 (37.5–87.5)</td>
<td>75.0 (33.3–100)</td>
<td>75.0 (25.0–100)</td>
<td>75.0 (16.7–100)*</td>
<td></td>
</tr>
<tr>
<td><strong>ENVD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68.8 (53.1–90.0)</td>
<td>75.0 (16.7–100)</td>
<td>62.5 (25.0–100)</td>
<td>68.8 (15.6–100)</td>
<td></td>
</tr>
</tbody>
</table>

Previous literature has established that numeric ratings of perceived exertion (RPE) are associated with heart rate (HR) during a task. Recently, the use of a 100 mm visual analog scale (RPE-VAS) has been used as an alternative to RPE NUM. Prior FF research has not concurrently examined RPE_NUM, RPE_VAS, and HR during tests of varying intensity. If RPE_NUM and RPE_VAS are not different from an objective measure such as HR during tasks of varying intensity, then RPE may represent a low cost method to determine the level of exertion following a FF task. PURPOSE: To determine the influence of test (submaximal and maximal) on RPE_NUM, RPE_VAS, and HR. METHODS: Seventeen FF recruit volunteers (20.63 ± 0.5yr, 178.01 ± 8.2em, 84.89 ± 14.82kg) from an urban fire department completed a submaximal Step-Test (SUB) and maximal Tower Climbing Test (MAX). RPE_NUM and RPE_VAS were collected following each test and expressed as a percent of maximum possible response. HR was the average HR from each test and expressed as a percent of estimated maximum. A 2x3 repeated measures ANOVA was performed to determine the effect of test (SUB, MAX) on response (RPE_NUM, RPE_VAS, HR). An alpha of p<0.05 determined statistical significance with an adjusted alpha level of 0.017 for follow-up tests. RESULTS: The 2x3 ANOVA indicated a significant interaction between test type and response (F(1,463,64)=41.626, p<0.001). Follow-up paired t-tests revealed that for each response, SUB was significantly (p<0.001) lower than MAX. There were non-significant differences between RPE type for the SUB (F(2,463.64)=3.2; p=0.049) and MAX (RPE_MAX=76.8 ± 17.6%; vs. RPE_SUB [76.7 ± 15.2%]; p=0.949) tests. For the SUB test, HR (69.9 ± 5.3%) was significantly (p<0.001) higher than both RPE types, whereas for the MAX test HR (86.0 ± 4.7%) was not different from RPE_MAX (p=0.059) or RPE_SUB (p=0.036).

CONCLUSIONS: The absence of a difference between RPE and HR during MAX suggests that RPE may be a suitable alternative to heart rate monitors to monitor intensity in FF recruits during maximal tasks. The significant differences between RPE_MAX and RPE_SUB and HR during SUB suggests that FF recruits may underestimate the intensity of a SUB task. Practitioners should use caution when relying solely on subjective feedback from SUB tasks as RPE may understate actual intensity.

Firefighters’ Quality of Life is Positively Associated With Cardiorespiratory Fitness Both on Mem and Women

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(No relevant relationships reported)
PB-66 Free Communication/Poster - Military Physiology
Wednesday, May 29, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

Commercial Footwear with Lateral Torsional Stiffness that May Reduce Injury Risk in Army Basic Trainees
Jesse Hall1, Erin M. Miller1, Donald L. Goss2. 1University of New England, Biddeford, ME; 2Baylor University-Keller Army Community Hospital Division I Sports Physical Therapy Fellowship, West Point, NY.

PURPOSE: The purpose of this study was to determine the effects of exercise within personal protective equipment microclimate leading to rapid head acquisition on mental processing and decision making in different age populations. METHODS: The study was factorial in design and included 15 male participants with an age range from 19-54 who were divided into 2 groups: 30 years old and above group (+30) (n=8), and 29 years old and below group (-29) (n=7). Each group preformed a Go/No-Go test while wearing a Museum headband to obtain P300 ERP’s, prior to post exercise in firefighting turnout gear (PPE) and t-shirts and shorts while wearing a backpack matched in mass to the gear worn in PPE (CON). Subjects completed a graded exercise test until core temperature had rose 39.5 °C, or voluntary max had been achieved. The muscle data was collected/analyzed by Peer-Analytics and later tested within Excel by a 2 tailed T-test between: +30 and -29, and CON and PPE conditions. RESULTS: There was no significant differences between the +30 and -29 P300 ERP’s or within each groups CON/PPE conditions. However, both groups made significantly more errors (p<0.05) post-PPE than pre-PPE (+30: µmean = 18.375, µsd = 5.625 -29: µmean = 25.143, µsd = 10.714) while only the 30 showed significant difference between post CON/PPE trails (µmean = 18.375, µsd =12.5). There was no difference between -23 and -30 when comparing post-PPE errors. CONCLUSION: Exercising within a personal protective equipment microclimate will negatively affect executive function of decision making regardless of age.

1032 Board #266 May 29 2:00 PM - 3:30 PM
Changes in Body Composition during U.S. Army Basic Combat Training

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(No relevant relationships reported)

The last major investigations of body composition in Basic Combat Training (BCT) were in 1989 and 1993, before training was integrated for men and women. The data demonstrated that, with BCT, most individuals gained lean mass and the fittest individuals lost the greatest amount of fat mass. Current Army accession standards are derived from the changes observed during BCT for this earlier generation of recruits. PURPOSE: To assess changes in body composition in current-day Army recruits. METHODS: Trainees (n=109 women, W, and 254 men, M), aged 17-38, body mass index 24.0±2.7 kg/m² (W, mean±SD) and 25.0±3.5 kg/m² (M), were assessed for body composition (DXA, Prodigy, GE Lunar) in the first week of BCT and during the final week (wk 8). Repeated measures ANOVA were used to assess changes in body mass (BM), body fat (%BF), and lean mass (LM). RESULTS: Average BM at entry was 62.9±8.5 kg (W), 77.1±12.2 kg (M), with changes by wk 8 of 0.3±1.1 kg (W) (p=0.29) and 1.2±4.5 kg (M) (p<0.01). Women started with 31.8±5.3% BF and lost 3.8%±2.2% BF; men began with 22.4%±6.2% BF and lost 3.3%±2.9% (p<0.01 for both). Women began BCT with 41.5±7.2 kg LM and gained 2.5±1.7 kg; men began with 58.2±7.0 kg LM and gained 1.7±2.1 kg (p<0.01 for both).

CONCLUSIONS: Compared to a national sample (NHANES), Army recruits are leaner than the US population, especially female recruits. During BCT, further gain in LM and loss of fat, especially in women, were masked in small or nonsignificant changes in BM. These pilot data provide up-to-date descriptions of the entry body composition of Army recruits and the magnitude of change that occurs with BCT; further analyses of the larger cohort including musculoskeletal injury, fitness testing, and long term service outcomes will help validate and redefine Army entry standards. The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army.

One goal of Basic Combat Training (BCT) is to improve the general fitness of recruits to successfully meet the demands of military activities. Previous studies have focused on the aerobic fitness responses to BCT. In contrast few investigations have examined the changes in whole body power production following BCT and if these changes may be modified by various pre-BCT factors. More specifically, do all recruits show similar training responses in terms of muscular power production as measured by vertical jump (VJ) testing? PURPOSE: To examine the relationship of sex and physical activity history on changes in VJ power output following BCT. METHODS: Four hundred fourteen recruits (298 men; 116 women; (mean ± SD) age: 21 ± 3 y; height: 172 ± 9 cm; body mass: 73.0 ± 13.4 kg) performed maximal VJ testing before and after 8 weeks of U.S. Army BCT. Body mass and VJ height were used to estimate VJ peak power using the Harman equation. Recruits filled out a survey on their prior physical activity during the 2 months prior to entering BCT. Logistic regression was used to calculate odds ratios showing whether sex or physical activity prior to BCT is predictive of changes in a recruit’s VJ power output. RESULTS: Females were 2.1 times more likely to show an increase in VJ power than males (p=0.01). Recruits that performed running training 3-4 times per week were 1.8 times more likely to improve their VJ power than recruits that only ran 0-2 times per week (p=0.01). Recruits that had an average running mile time from 7:00-7:59 (min:sec) were 1.6 times more likely to improve VJ power compared to those running at a sub 7:00 minute mile time (p=0.03).

CONCLUSION: Recruits showed differential changes in VJ performance following BCT, depending on sex, prior running training experience, and average 1-mile running time. DISCLAIMER: The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government. Supported by the U.S. Army Medical Research and Materiel Command.
U.S. Army basic combat training (BCT) is designed to improve the general fitness of recruits. However, little scientific data exists to describe the effects of BCT on muscular power capabilities. Existing data indicates BCT has little or even a net negative effect on vertical jump (VJ) performance. This finding is concerning given the positive correlation between muscular power and military occupational task performance.

**PURPOSE:** To describe the effects of BCT on VJ performance in men and women.

**METHODS:** Four hundred fourteen recruits (298 men; 116 women; mean ± SD age: 21 ± 3 y; height: 172 ± 9 cm; mass: 73.0 ± 13.4 kg) performed maximal VJ testing before and after 10 weeks of BCT. Body mass and VJ height were used to estimate VJ peak power using the Harman equation. Comparisons were made using a sex by time repeated-measures ANOVA and Fisher LSD post hoc tests.

**RESULTS:** A significant (p < 0.05) sex by time interaction existed for body mass, VJ height, and VJ peak power (Table 1). Men decreased body mass and VJ ability, while women maintained body mass and slightly improved VJ ability. A negative effect on VJ performance. This finding is concerning given the positive relationship between muscular power capabilities and military occupational task performance.

**CONCLUSIONS:** Men and women demonstrated differential responses to BCT; however, the changes were extremely small, indicating that BCT is not an effective stimulus to improve VJ performance. Supported by the U.S. Army Medical Research and Material Command. Disclaimer: The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or as reflecting the views of the Army, the Department of Defense, or the U.S. Government.
to achieve energy balance in arduous military training environments. DXA measurements. Future work should explore how dietary intake may be optimised the acute demonstration of negative energy balance in both men and women, there the higher TEE, and should be considered when designing feeding strategies. Despite CONCLUSION: The gold-standard method for measuring free-living Total Energy expenditure (TEE) was measured over each 10 d sampling period using doubly labelled water. Body composition was measured by DXA at the start of training and at the end of each term. RESULTS: Average daily energy intake (3160 ± 568 vs 2609 ± 568 kcal d⁻¹) and TEE (4552 ± 534 vs 3365 ± 416 kcal d⁻¹) were higher for men than women, respectively (both P < 0.005). Both sexes demonstrated negative average daily energy balance, with a greater deficit in men compared to women (-1333±965 vs -756±826 kcal d⁻¹, respectively, P > 0.016). There was no difference in average daily carbohydrate (4.3±1.1 vs 4.7±1.5 g kg⁻¹ d⁻¹, respectively; p>0.01), protein (1.5±0.4 vs 1.7±0.5 g kg⁻¹ d⁻¹) or fat intake (1.5±0.4 vs 1.7±0.5 g kg⁻¹ d⁻¹) between men and women, respectively (P > 0.167). Lean and fat mass did not differ in either sex over time (all P > 0.336). CONCLUSION: The observed greater energy deficit in men is predominantly due to the higher TEE, and should be considered when designing feeding strategies. Despite the acute demonstration of negative energy balance in both men and women, there were no differences in lean or fat mass in either sex at our measured timepoints. This finding may reflect an underestimation of energy intake, or the limited frequency of DXA measurements. Future work should explore how dietary intake may be optimised to achieve energy balance in arduous military training environments.

United States military service members are required to maintain a requisite level of physical fitness. Women in the US Army are exempt from fitness standards for the 1st 6 months postpartum. While many women successfully meet the minimum standards 6 months postpartum, the time course necessary to re-attain pre-pregnancy fitness levels is unknown. Purpose: To determine the time course necessary to re-attain pre-pregnancy physical fitness, as determined via the Army Physical Fitness Test (APFT), in a cohort of postpartum US Army women. METHODS: 236 primiparous active duty Army women who delivered at Tripler Army Medical Center between 1 Jan 2011 and 31 March 2017 were eligible for inclusion. APFT data (push-up and sit-up repetitions, 2 mile run time) were obtained from the Digital Training Management System; the last test prior to and all available tests postpartum were used for analysis. Data were analyzed with repeated measures ANOVA and Fisher's exact test. Results: The number of postpartum APFTs available for analysis ranged from 1 to 6 per individual. Follow-up time ranged from 4.5 to 72 months postpartum. During the last pre-pregnancy APFT push-up, sit-up and 2 mile run scores were 39.2±11.6 reps, 66.2±11.5 reps and 17.1±1.8 min, respectively. 6 months post-partum, push-up and sit-up scores were lower and run time was significantly longer (34.1±11.1, 61.5±12.5 and 18.0±1.8, respectively; p<0.01 for all). While scores gradually progressed towards pre-pregnancy levels, pre-pregnancy fitness was not re-attained during the study period. By 30 months postpartum push-up reps, sit-up reps and run times were 36.7±12.4, 66.6±12.8 and 17.7±1.7, respectively; p<0.01 for pre-pregnancy and all. The failure rate for the APFT was 3.8% pre-pregnancy, 14.2% at the first postpartum APFT and ranged from 7.7-9.9% for all time points thereafter. Conclusions: These data indicate that the postpartum US Army servicewoman fails to return to pre-pregnancy fitness levels, pre-pregnancy fitness was not re-attained during the study period. By 30 months postpartum push-up reps, sit-up reps and run times were 36.7±12.4, 66.6±12.8 and 17.7±1.7, respectively; p<0.01 for pre-pregnancy and all. The failure rate for the APFT was 3.8% pre-pregnancy, 14.2% at the first postpartum APFT and ranged from 7.7-9.9% for all time points thereafter. CONCLUSIONS: The observed greater energy deficit in men is predominantly due to the higher TEE, and should be considered when designing feeding strategies. Despite the acute demonstration of negative energy balance in both men and women, there were no differences in lean or fat mass in either sex at our measured timepoints. This finding may reflect an underestimation of energy intake, or the limited frequency of DXA measurements. Future work should explore how dietary intake may be optimised to achieve energy balance in arduous military training environments.

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Military operations lasting several months may cause negative changes in aerobic fitness of deployed soldiers. Despite the well-known benefits of physical training on soldier readiness, intervention studies focusing on endurance performance during military operations are lacking. PURPOSE: To investigate inter-individual variation in training adaptations of endurance performance during deployment. METHODS: 91 male soldiers (50±8 y) volunteered for the baseline tests including assessments of body composition, physical performance (3000-m run, max. isotropic leg and arm extension, 1-min push-ups and sit-ups, and standing long jump), as well as a military simulation test (MST). Training was monitored using diaries. After the 19-week follow-up, the available data was divided into two groups based on the change in endurance performance: Responders (n=25) decreased their 3000-m run time while non-responders (n=24) maintained or increased their 3000-m run time. RESULTS: The responders initially had higher fat mass (12.8±3.6 vs 9.6±5.7 kg, p<0.001), lower muscle mass (38.0±3.9 vs 40.3±4.1 kg, p<0.046), poorer standing long jump (227±16 vs 242±27 cm, p=0.016) and MST performance (156±23 vs 143±24 s, p=0.028) compared to non-responders. Both groups performed a similar volume of endurance training during the follow-up (1.7±0.8 vs 1.9±2.8 times/week, p=0.22). During the operation, the responders maintained their training frequency at the level of pre-deployment (0.1±0.1 vs -1.2±1.9 times/week, p=0.012). In addition, they performed lower body strength training with lower average volume load (1435±6676 vs 19489±6228 kg week, p=0.001). However, their fat mass decreased (-7.6±11.7 vs 14.2±20.4 %, p<0.001) and MST time improved (-13±6.6 vs -7.5±6.5 %, p=0.006) more when compared to the non-responders. Conclusions: Soldiers who initially demonstrated lower physical fitness and higher fat mass improved their physical performance more than their non-respondent counterparts. Positive training responses in non-responders might have been achieved using higher volume and / or intensity of endurance training. In addition, it is obvious that more individualized strength and / or endurance training should be emphasized during prolonged military operations.
The Effect of Body Mass on Physical Performance in Naval Special Warfare Operators

Dallas Wood1, David Swain, FACSM, 2, Naval Special Warfare, Virginia Beach, VA. 1Old Dominion University, Norfolk, VA.

Purpose:

This retrospective study looked to determine if there is body mass bias in the HPP performance assessment and if an optimum body mass for each performance test could be determined. METHODS: Data from 333 subjects (age: 28.4 ± 5.0 yr; height: 178.4 ± 6.2 cm; mass: 86.0 ± 9.2 kg) were analyzed to compare body mass to performance on the eight performance tests: standing long jump, Pro-Agility test, weighted pull-up, body weight bench press, 1-RM deadlift, 274-m shuttle run, 4.83-km run, and 800-m swim. Linear regression analysis was used to analyze the relationship of body mass to performance; a 2nd degree polynomial was utilized to determine best-fit curves for each of the physical performance tests; ANOVA was utilized to examine differences in performance between body mass quartiles. RESULTS: Significantly better performance for lighter subjects was found in the Pro-Agility test, weighted pull-up, body weight bench press, 274-m shuttle run, and 4.83-km run. Heavier subjects performed better in the 1-RM deadlift. Second-degree polynomial regression revealed optimum body mass for the Pro-Agility test, 274-m shuttle run, and 4.83-km run to be somewhat heavier than the lowest body mass. CONCLUSION: These findings could help professionals better assess and train operators of varying body size. The views and opinions expressed are the authors’ and do not reflect those of Naval Special Warfare Command, the US Navy or the Department of Defense.

Minimalist Style Military Boot Improves Running Economy Under Load In Trained Males

Eric K. O’Neal1, Montia T. Pace1, Jonathan C. Swain1, Ryan T. Albino1, James M. Green, FACSM1, Lauren G. Killen1, Jeffrey D. Simpson2, Harish Chandler1, 1University of North Alabama, Florence, AL, 2University of West Florida, Pensacola, FL.

Purpose:

Minimalist style boots (MIN) may improve running economy for soldiers under load versus the traditional boot type (TRD). However, running economy (RE) under load with MIN has not been examined. METHODS: In this study, male participants (n = 14) completed a VO2 peak test (46.6 ± 7.3 mL/kg/min) under load (16 kg) while wearing their normal athletic shoes. Treadmill speed for RE tests was determined by the slowest pace in which participants completed a full stage with (16 kg) while wearing their normal athletic shoes. Treadmill speed for RE tests was determined by the slowest pace in which participants completed a full stage with truck bar dead lift (TBDL); adjusted R² = 0.84 for SPI. Correlation between the two PAT’s; r = 0.91, adjusted R² = 0.83. Criterion cut points (70% of USSAC’s best scores; or top 10 performers) for both SPI and CC.

Factors Impacting Soldier-Athletic Performance of U.S. Service Academy Cadets

Todd A. Crowder, Dan A. Jaffe, Jennifer K. Hewit. US Military Academy, West Point, NY.

Purpose:

Early identification of factors impacting soldier-athletic performance can assist in designing training programs & selection of key personnel. PURPOSE: Investigate factors via selected physical assessment tests (PAT’s); Soldier Performance Index (SPI); Cadet Combine (CC)) which identify overall soldier-athletic performance of U.S. Service Academy cadets (USSAC’s). METHODS: 66 fit subjects (42 men; 24 women) participated in a 19-hour lecture/lab course over a 2-month period which included 2 embedded PAT’s examining combat readiness components of strength, endurance, mobility, power/speed. Specific data analysis & criterion determination was used on the 0-368+ point SPI & 0-137.5 point CC. RESULTS: Multiple regression analysis indicated push-ups (PU) & 400 meter run; adjusted R² = 0.83 for CC, while PU, 500 meter row & reps to failure of 220-lb trap bar dead lift (TDKL); adjusted R² = 0.84 for SPI. Correlation between the two PAT’s; r = 0.91, adjusted R² = 0.83. Criterion cut points (70% of USSAC’s best scores; or top 10 performers) for both SPI & CC revealed a stable metric in identifying higher end physical performance cadets. Descriptive data:

Effects Of Core Stability Exercise On Subjective Rating Of Low Back Pain In ROTC Cadets

Tunde Szivak, Kevin Richard, Jamilia Almonte. Merrimack College, North Andover, MA.

Purpose:

While previous research has investigated lower extremity injuries and low back pain in Soldiers during basic training, little research has investigated load carriage and low back pain in Reserve Officer Training Corps (ROTC) program participants. Thus the purpose of this study was to investigate the effects of a core stability program on subjective rating of low back pain and overall physical function during load carriage exercise. METHODS: Subjects (age: 19.75 +/- 1.15 years) included cadets enrolled in the ROTC program at the University of Massachusetts (Amherst) (n=10) who were randomly assigned into a core stability or a non-core stability group. All subjects completed a 1.5 hour ruck march with 35lb load at volitional pace once per week over a 3-week period. At baseline and upon completion of the 3-week intervention period, subjects completed a 3-mile timed ruck march. Immediately prior to each 1.5 hour ruck march session, the core stability group performed a series of core stability exercises. Subjective low back pain score (Visual Analog Scale) was obtained immediately after completion of each ruck march session. RESULTS: The core stability group showed a significantly lower average low back pain score (mean score = 1.90) over the course of the intervention period compared to the control group (mean score = 3.00). No significant difference (p = 0.49) was found between pre- and post-intervention 3-mile ruck march completion times between groups. CONCLUSIONS: The core stability program resulted in significant decreases in subjective rating of low back pain associated with load carriage in ROTC participants. Study results suggest that implementing a core stability program in military personnel during basic training or tactical operations involving load carriage may thus provide benefit in preventing low back pain.
Sleep is a critically important component of health, but is often restricted in a military environment as a stressor in training and in preparation for operations. Following the recent opening of combat roles to women serving in the UK military, quantifying the sex differences between the sexes. The implications of inadequate sleep, and the mechanisms for the reported sex difference, warrant further examination to optimize performance and reduce injury risk in arduous military basic training.

Sleep Patterns During Arduous Military Training in Men and Women
Fiona N. Manderson Koivula, Sophie L. Wardle, Rebecca L. Double, Robert M. Gifford, David R. Woods, Rebecca M. Reynolds, Sally Handford, Jennifer Wright, Thomas J. O’Leary, Julie P. Gheeves, 1Army HQ, Andover, United Kingdom. 2University of Edinburgh, Edinburgh, United Kingdom. 3Leeds Beckett University, Leeds, United Kingdom. Email: Fiona.Koivula028@mod.gov.uk

Purpose: To quantify sleep duration and efficiency in male and female Officer Cadets over 7 days of arduous basic military training.

Methods: Twenty-six Officer Cadets (mean ± SD; 9 men; age: 23 ± 3.2 y; height: 1.83 ± 0.07 m, weight: 84.7 ± 7.2 kg; and 17 women; age: 24 ± 2.5 y, height: 1.71 ± 0.04 m, weight: 66.5 ± 5.9 kg) were wrist-based tri-axial accelerometers (GeneActiv, UK) continuously for 7 days, during the first term of British Army Officer Training at the Royal Military Academy, Sandhurst, UK. Data were processed using commercially-available software (GeneActiv, UK) to derive: time in bed (min); time asleep (min) and sleep efficiency (%). Results: Officer Cadets spent an average of 412 ± 140 min (6 h 52 min) in bed, and 329 ± 80 min (5 h 29 min) asleep, giving a mean sleep efficiency of 83% ± 14%, over 7 days. Compared with men, women spent longer in bed (433 ± 149 (7h 13 min) vs 370 ± 108 min (6h 10 min), respectively, P<0.01). Conclusion: Officer Cadets slept less than the 7.9 hours per night recommended by The National Sleep Foundation. This may have implications for musculoskeletal and immune health during arduous training. Women slept more than men, however it is unclear whether this is due to physiological or behavioural differences between the sexes. The implications of inadequate sleep, and the mechanisms for the reported sex difference, warrant further examination to optimise performance and reduce injury risk in arduous military basic training.

1045 Board #279 May 29 2:00 PM - 3:30 PM
Sleep Patterns During Arduous Military Training in Men and Women
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(no relevant relationships reported)

1046 Board #280 May 29 2:00 PM - 3:30 PM
Symptomatic Nervous System Response During Close Quarters Combat in Elite Military Men
(no relevant relationships reported)

Combat is physiologically stressful and associated with alterations and declines in several performance domains vital to the success of ground combat elements (GCE) operators. Acutely, the body responds to stress via the “fight-or-flight” system, which alters activity of the autonomic nervous system (ANS) and can be monitored via heart rate variability (HRV). Currently, it is not well understood if ANS plays a role in the shooting performance of GCE operators. PURPOSE: To determine if HRV is correlated to shooting performance, elite physical performance, and neuromuscular control in landing strategies and muscular activation. Future research should assess prospectively potential neuromuscular changes following concussion and determine if these changes increase the risk of subsequent musculoskeletal injuries and concussion.

Methods: Active duty CONCUSSED (n = 18) and CONTROL (n = 4) military personnel were recruited to participate in a 21-day close- quarters combat (CQC) training program. Measures of HRV, marksmanship, and tactical/safety violations (errors) were recorded prior to (anticipation), during (execution), and immediately after (recovery) a similar shooting task on Day 1 and Day 21 of training. RESULTS: Heart rate was significantly less at every time point on Day 21 when compared to Day 1 (anticipation: −8.9%, execution: −11.5%, recovery: −8.6%; p < .05). The mean normalized low frequency power (LFnu)—a measure of sympathetic modulation—was 14.9% higher in Day 21 compared to Day 1 (p < .05). In addition, the HFnu was 17.7% lower in the recovery compared to the execution phase (p < .05). The mean ratio of LF to HF (LF/HF) power was not different between days (p > .05), but it was significantly higher during recovery (35.4%) when compared to the execution phase (p < .05). Pearson product-moment correlation analysis revealed there was also a positive correlation between the LF/HF power ratio during the anticipation phase and the number of errors committed during execution on Day 1 (r = −.635, p < .05). CONCLUSION: There is a positive correlation between sympathetic drive, during the anticipation phase of CQC training, and error rate at the onset of CQC training. These data suggest that those with a lower sympathetic tone perform better than those with a higher sympathetic tone.

Concussions are common in military personnel and may result in an increased risk of musculoskeletal injury. The underlying mechanisms for this increase risk are unknown and warrant additional research. One plausible explanation may be that neuromotor deficiencies may enhance injury risk following concussion through altered muscular activation or contraction timing. PURPOSE: To compare military personnel with at least one concussion during the past 1 month to 2 years (CONCUSED) to military branches, age- and Special Forces groups matched controls (CONTROL) on physiological, musculoskeletal and biomechanical performance. METHODS: A total of 48 (24 CONCUSED, 24 CONTROL) male Air Force Special Operators and Naval Special Warfare Officers aged 19 to 34 years participated in the study. Participants provided self-reported demographics and injury history and the following assessments: 1) physiological- body composition, anaerobic power and capacity, aerobic capacity and lactate threshold; 2) musculoskeletal- isokinetic strength testing of the lower extremity, including time to peak torque for each muscle group, and balance using the Neurocom system; and 3) biomechanical- single-leg jump and landing task, including landing kinematics of the hip, knee and ankle. A C.5.0 decision tree algorithm and one-way ANOVA were used to compare the two groups on the physiological, musculoskeletal, and biomechanical outcomes. Results: No differences were demonstrated using one-way ANOVA. The C.5.0 algorithm revealed CONCUSED demonstrated quicker time to peak flexion angle during the single-leg landing task (r=−0.170; CONCUSED: n=22 vs. CONTROL: n=14), longer time to peak torque in knee extension isokinetic strength testing (<500 mips; CONCUSED: n=18 vs. CONTROL: n=4) and larger knee flexion angle at initial contact (<7.7°; CONCUSED: n=18 vs. CONTROL: n=2). Conclusion: The findings supported the hypothesis that CONCUSED military personnel would demonstrate altered neuromuscular control in landing strategies and muscular activation. Future research should assess prospectively potential neuromuscular changes following concussion and determine if these changes increase the risk of subsequent musculoskeletal injuries and concussion.

Abstracts were prepared by the authors and printed as submitted.
Effects Of Exercise And Sanqi Ginseng Interventions On Mtss Of Swat Trainees

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PURPOSE: To investigate the therapy effects of exercise and Sanqi Ginseng, a Chinese herbs, and their combination on medial tibial stress syndrome (MTSS) of the special weapons and tactics (SWAT) trainees.

METHODS: 162 SWAT trainees with MTSS were divided randomly into 3 groups: exercise (E), Sanqi ginseng tablets group (S), and their combination (ES). Participants in E-group maintained the original training, including jumping and all of other training exercise (E), Sanqi ginseng tablets group (S), and their combination (ES). Participants in E-group maintained the original training, including jumping and all of other training exercise (E), Sanqi ginseng tablets group (S), and their combination (ES). Participants in E-group maintained the original training, including jumping and all of other training exercise (E), Sanqi ginseng tablets group (S), and their combination (ES). Participants in E-group maintained the original training, including jumping and all of other training exercise (E), Sanqi ginseng tablets group (S), and their combination (ES).

RESULTS: The healing rates of E, S and ES groups were 63.0, 88.9, 96.3% before and after the intervention.

CONCLUSIONS: A combination of exercise and Sanqi ginseng could effectively reduce the NRS during training process, resulting in a better healing effect of MTSS.

Cardiovascular Risk Factors of Working Primary School Teachers

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In Hungary about 77000 people work as teachers in primary school. Generally, stressful work negatively affects health and can increase risk of noncommunicable diseases. Previous research revealed that teachers have better physical health status compared to the general population (Seibt 2011). Health status is often assessed using questionnaires, and as a result, there is a lack of research using objective measures of health in primary school teachers.

PURPOSE: To collect data about health status, body composition, blood pressure and arterial stiffness in primary school teachers and compare some results to the EHIS study results reported in 2014.

METHODS: 24 subjects (mean age: 46.8±7.4y.) were recruited from different primary schools using the snowball research method (Kalton2001). Data collected included body mass index (BMI) and body composition (BF%), information from a health behaviour questionnaire (eating habits, physical activity, smoking) (WHO 2010) and resting arterial stiffness measured via TensioMed arteriography (Illyés 2005). Descriptive statistical analysis and Chi square tests were used with SPSS Statistics program version 22.

RESULTS: The mean BMI was 26.9±5.5 and BF% was 26.9±6.5 in teachers, 50% were overweight or obese. According to the questionnaire 62% of the teachers ate breakfast regularly and only 20% were physically active ≥ 2.5h/week, 20% smoked, 22% had elevated blood pressure and 20% had elevated pulse wave velocity or augmentation index (Wilhjemsen et al. 2006). Compared to data from the European Heart Interview Survey (EHIS) (www.ksh.hu/docs/hun/xftp/stattukor/elef14. pdf) teachers in this study were the same active (41%vs.4.5%) and were the same overweight and obese (50%vs.54%) as Hungarians in the general population. The prevalence of smoking among teachers was significantly (p<0.05) less (20%) than the general population (29%).

CONCLUSIONS: Half of the investigated middle-aged teachers already had some health problems. The health-related concepts and mental health programs for teachers are essential to prevent chronic diseases and psychosomatic disorders.

Effects of Environmental Condition and Body Fat Percentage on Substrate Utilization during and following Exercise

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PURPOSE: To examine the effects of environmental condition and body fat percentage on substrate utilization during and following exercise.

METHODS: Recreationally active men consisting of 4 low-fat (LF; 10.9±2.5 %; 23.8±3.1 yrs; 183.2±7.1 cm; 80.7±4.5 kg); 4 moderate-fat (MF; 15.9±2.2; 23.3±1.9yrs; 180.9±4.3 cm; 76.9±5.9 kg; 3.6±0.13 %) and 4 high-fat (HF; 15.9% ± 2.2; 23.3±1.9yrs; 180.9±4.3 cm; 76.9±5.9 kg; 3.6±0.13 %) completed 6 experimental trials: a VO2max test and 5 cycling trials in 5°C/20%RH (LT), 22°C/45%RH (MTMH), 22°C/70%RH (MTHH), 35°C/45%RH (HTMH), and 35°C/25%RH (HTLH) in a counterbalanced fashion. During cycling trials, participants completed 60-min of cycling at 60% VO2max, a 15-min rest period, cycling at 90% VO2max until exhaustion (TTE), and a 60-min recovery (REC). AUC for absolute carbohydrate (CHO) utilization was calculated during cycling at 60% VO2max, TTE, and REC for each condition. Data were analyzed using a mixed-design ANOVA.

RESULTS: A condition x BF interaction was observed during cycling at 60% VO2max (F=2.907; p=0.048). Specifically, CHO utilization was greater during LT (496.1±83.43 kcal; p=0.015) compared to HTMH (416.12±73.91 kcal) in LF individuals, with no significant differences between conditions in HF individuals (p = 0.05). During the TTE, no condition x BF interaction was observed (F=0.410; p=0.799) however, a main effect of condition was observed (F=3.412; p=0.028). Specifically, CHO utilization was greater during MTMH (493.3±11.96 kcal; p=0.020) and MTHH (582.3±16.69 kcal; p=0.019) compared to HTMH (29.87±5.55 kcal). During REC a condition x BF interaction was observed (F=5.982; p=0.004). Post-hoc analysis indicated a main effect of condition in LF individuals (F=12.371; p=0.016). Specifically, absolute CHO utilization was significantly higher in LT (96.259±4.92 kcal/kcal) compared to HTLH (5.783±1.58 kcal/kcal). No main effect of condition was observed in the HF individuals (F=1.402; p=0.292).

CONCLUSIONS: Data suggests that individuals with a lower BF% may utilize greater absolute CHO during exposure to cold environments compared to those with higher BF%, during both moderate intensity exercise and resting conditions. Additionally, exposure to moderate compared to hot temperatures may result in prolonged TTE, likely due to a longer TTE.

Study partially funded by the Kent State University Research Council.
in the thermoneutral condition (p<0.001). No difference was observed for TMD between conditions (p=0.354), although a worsening mood following acclimation (19.96±42.00) compared to baseline (7.78±4.41) was observed. CONCLUSION: Future research should emphasize a focus on maintaining a lower core and skin temperature while focusing on enhanced mood under occupational and heat stress in order to improve physiological and motor performance.

The use of nonsteroidal anti-inflammatory drugs (NSAID) is common practice by participants in marathons and other endurance events. Previous research suggests that renal stress is apparent immediately following marathon completion. However, the potential exacerbating effect of NSAID use during a marathon is not well-understood. PURPOSE: Investigate the effect of NSAID use on biomarkers of renal stress following a marathon. METHODS: Twenty-two volunteer participants (14 males, 8 females; 38 ± 10.2y, 70.7 ± 10.1kg, 171.0 ± 7.7cm) at the Kansas City Marathon were recruited and assigned to either a control (n = 15) or NSAID (n = 7) group based on planned or habitual use. Pre-race NSAID ingestion was self-reported as 9.15 ± 4.62 mg/kg of ibuprofen (n=4) or 3.75 ± 1.73mg/kg naproxen sodium (n=3). Urine samples were collected pre-marathon, post-marathon, and 24h post-marathon. Samples were stored at -80°C and later analyzed for urinary neutrophil gelatinase lipocacin (uNGAL) and urinary cystatin C (uCyC). A robust two-way mixed ANOVA with trimmed means was utilized to account for potential outliers. When significant interaction or main effects were observed, pairwise comparisons were calculated using robust bootstrapped effect sizes with 95% confidence intervals. RESULTS: Immediately post-marathon, there was a significant increase in uNGAL (Cohen’s d = 0.47 95%C.I. [0.23,0.85]) but there was no longer a significant elevation by 24-h post-marathon (Cohen’s d = 0.16 95%C.I. [0.06,3.36]). There were no significant effects detected for Cystatin C. Further, NSAID ingestion did not affect uCyC or uNGAL values. CONCLUSION: Renal stress biomarkers suggest potential kidney tubular injury immediately post-marathon, but potential renal stress was negated by 24-h of recovery. Moderate NSAID ingestion before the marathon did not affect kidney stress biomarkers. The use of nonsteroidal anti-inflammatory drugs (NSAID) is common practice by participants in marathons and other endurance events. Previous research suggests that renal stress is apparent immediately following marathon completion. However, the potential exacerbating effect of NSAID use during a marathon is not well-understood. PURPOSE: Investigate the effect of NSAID use on biomarkers of renal stress following a marathon. METHODS: Twenty-two volunteer participants (14 males, 8 females; 38 ± 10.2y, 70.7 ± 10.1kg, 171.0 ± 7.7cm) at the Kansas City Marathon were recruited and assigned to either a control (n = 15) or NSAID (n = 7) group based on planned or habitual use. Pre-race NSAID ingestion was self-reported as 9.15 ± 4.62 mg/kg of ibuprofen (n=4) or 3.75 ± 1.73mg/kg naproxen sodium (n=3). Urine samples were collected pre-marathon, post-marathon, and 24h post-marathon. Samples were stored at -80°C and later analyzed for urinary neutrophil gelatinase lipocacin (uNGAL) and urinary cystatin C (uCyC). A robust two-way mixed ANOVA with trimmed means was utilized to account for potential outliers. When significant interaction or main effects were observed, pairwise comparisons were calculated using robust bootstrapped effect sizes with 95% confidence intervals. RESULTS: Immediately post-marathon, there was a significant increase in uNGAL (Cohen’s d = 0.47 95%C.I. [0.23,0.85]) but there was no longer a significant elevation by 24-h post-marathon (Cohen’s d = 0.16 95%C.I. [0.06,3.36]). There were no significant effects detected for Cystatin C. Further, NSAID ingestion did not affect uCyC or uNGAL values. CONCLUSION: Renal stress biomarkers suggest potential kidney tubular injury immediately post-marathon, but potential renal stress was negated by 24-h of recovery. Moderate NSAID ingestion before the marathon did not affect kidney stress biomarkers.
Shift work including rotating shift and night shift has been suggested to be associated with risk of adverse pregnancy outcomes due to disrupted circadian rhythms and neuroendocrine adaptations which may affect fetal growth and timing of parturition. PURPOSE: To evaluate the association between shift work and pregnancy outcomes.

METHODS: Five electronic databases and two grey literature sources were searched up to March 12, 2018 and the results underwent duplicate independent screening. Studies of all designs were included (except case studies), and contained information on the Population [women who engaged in paid work during pregnancy], Exposure [rotating shift work (working a pattern of days and nights) or fixed night shift, typical working day between 22:00 to 08:00]), and Outcomes [preterm birth, low birthweight, small for gestational age, miscarriage, gestational hypertension and pre-eclampsia]. Pooled odds ratio (OR) and 95% confidence interval (CI) were calculated using a random-effect, inverse variance method. Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework was used to assess the quality of evidence.

RESULTS: A total of 98 observational studies (N=145,671) were included. "Low" to "Very low" quality evidence from observational studies revealed that compared with fixed day shift, rotating shift was associated with an increased odds of preterm delivery (OR: 1.16, 95% CI: 1.03, 1.3, P=0.034) and having a small-for-gestational age baby (OR: 1.23, 95% CI: 1.08, 1.39, P=0.01). Fixed night shift was associated with an increase odds of preterm delivery (OR: 1.25, 95% CI: 1.01, 1.50, P=0.01), miscarriage (OR: 1.31, 95% CI: 1.09, 1.57, P=0.034) and gestational hypertension (OR: 1.22, 95% CI: 1.01, 1.48, P<0.05). When meta-analysis was restricted only to adjusted ORs, fixed night shift was associated with an increase in risk of miscarriage (OR: 1.34, 95% CI: 1.10, 1.63, P=0.003). Rotating shift or fixed night shift were not significantly associated with low birth weight or pre-eclampsia. CONCLUSIONS: Pregnant women who work with rotating shift or fixed night shift have an increased risk of adverse pregnancy outcomes.

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PURPOSE: Percussive massage therapy is a widely used modality for sports rehabilitation and recovery after intense exercise. Recent advancements in handheld vibration technology have further increased its popularity. While athletes, trainers, and therapists collectively tout its practical benefits for sports performance, the underlying mechanisms are largely unknown. To provide such insight, we assessed blood flow response and changes in fluid distributions after applying percussive massage therapy to the quadriceps muscles of each leg.

METHODS: Forty-one participants (23 female, 25.1 ± 3.0 years of age) with a range of body fat percentage (23.2 ± 7.9%) were tested. Percussive massage therapy was applied for 5 minutes by a study investigator. Two devices were used simultaneously, Theragun G2PRO and HyperIce Hypervolt, with similar speed setting (40 percussions per second) and randomly assigned to one of each participants’ legs. A thermal camera (FLIR C2) was used as a proxy for blood flow. All images were taken with participants seated and an ice-water slurry between their abducted legs as a control for temperature.

RESULTS: Immediately after the treatment, there was no difference in surface temperature compared to baseline in either thigh. However, the temperature in both thighs was greater than baseline in the 3rd to 8th minutes (~3°C; P < 0.006), indicating a delayed blood flow response. Temperatures returned to baseline by the 12th minute post-massage. Differences between devices were observed. The percent change from baseline was significantly greater in the G2PRO thigh than the Hypervolt thigh at minutes 5 (3.7% vs 3.2%), 6 (3.6% vs 3.2%), 7 (3.0% vs 3.1%), and 12 (1.9% vs 1.4%, respectively) post-massage (all P < 0.006). For ECW and ECW/TW, a significant decrease was observed only in the G2PRO leg between 2 and 9 minutes post-massage (P < 0.0167). However, there was no difference between legs.

CONCLUSIONS: Overall, the G2PRO and Hypervolt induce a delayed blood flow response; however, the G2PRO has a larger, longer-lasting effect. In addition, the G2PRO appears to influence fluid distributions, while the Hypervolt does not.

PURPOSE: For adolescent athletes with type 1 diabetes mellitus (T1DM), proper glucose management during and after prolonged activity could prove difficult because of the body’s response throughout the process of gluconeogenesis. Understanding their body’s glucose response to physical activity could aid in effectively addressing nocturnal hypoglycemia. Therefore, the purpose of this investigation was to examine the acute temporal associations between blood glucose and measures of moderate and vigorous intensity physical activity via an accelerometer in a sample of athletes with T1DM.

METHODS: 10 adolescent athletes with diagnosed T1DM between the ages of 13 - 17 and who were involved in competitive sports in the previous 12 months were recruited for this study. All participants wore an accelerometer and continuous glucose monitor (CGM) consecutively for a minimum of 2-weeks with a total of 168 patient-days of collected data. Nocturnal hypoglycemia was defined as a blood glucose reading <70 mg/dl during sleeping hours that lasted ≥ 10 minutes as indicated by the CGM.

RESULTS: Incidents of nocturnal hypoglycemia occurred 29% of the nights measured with an average duration of 52.3 ± 41.04 minutes. A multiple linear regression showed vigorous intensity to be a significant predictor of nocturnal hypoglycemia after controlling for all variables (β=0.169, p<0.02) with an average time of 26 minutes of vigorous intensity. CONCLUSIONS: Engaging in vigorous intensity physical activity increased the risk of prolonged nocturnal hypoglycemia in adolescent athletes with T1DM. Incorporating accelerometers into patient care could prove beneficial when making further recommendations for athletes by improving glucose management.

Funded by Children’s Hospital Foundation, Christensen Family, Norton Children’s Hospital, and University of Louisville.
PURPOSE: Visceral fat is related to cardiometabolic risk in athletes as well as non-athletes. Magnetic resonance imaging (MRI) estimates visceral adipose tissue (VAT) from a direct differentiation of VAT from subcutaneous adipose tissue. Recently, some validation studies of VAT assessment using dual X-ray absorptiometry (DXA) have been reported. This study aimed to compare DXA measurements of VAT with the gold standard MRI in athletes with wide ranges of body size.

METHODS: This study included 77 male collegiate athletes (age, 20 ± 2 yr; height, 175.1 ± 7.4 cm; body weight, 79.6 ± 17.4 kg; body mass index, 25.9 ± 5.3 kg/m²) from different sports (e.g. sumo, judo, liters, wrestlers, basketball, volleyball, swimming, etc.) Pairwise measurement of VAT was performed using MRI (Signa 1.5T; General Electric Co., Ltd., WI, USA) and DXA (Horizon A configured with software APEX 5.6, Hologic Inc.). MRI-VAT volume was calculated by integrating six 6-mm single MRI slices corresponding to the level of DXA-VAT volume measurement. Data were compared using Wilcoxon signed rank test and a Bland-Altman plot was used to assess systematic error. Data were shown mean ± SD for parametric data and median (Inter quartile range) for nonparametric data.

RESULTS: The VAT volumes of DXA (248 [212 - 298] cm³) and MRI (211 [180 - 269] cm³) differed significantly (p<0.01). Regression analysis showed a linear relationship between MRI and DXA-VAT volume measurement. Data were compared using Wilcoxon signed rank test and a Bland-Altman plot was used to assess systematic error. Data were shown mean ± SD for parametric data and median (Inter quartile range) for nonparametric data.

CONCLUSIONS: This study found that DXA and MRI provided equivalent estimations of VAT, although DXA overestimated VAT by 37 ± 50 cm³ compared with MRI-VAT volume, with no systematic error (p=0.75).
adequate, and varied between different sport disciplines. Water-sports athletes drank less than other athletes. Education and intervention should be conducted to improve athletes drinking behavior and hydration status.

**1072** Board #306 May 29 2:00 PM - 3:30 PM Medical Encounters, Cardiac Arrests and Deaths During a 109km Mass-Participation Cycling Event Involving 102251 Starters

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**PURPOSE:** Limited data are available on medical encounters, including serious life-threatening occurrences and deaths during cycling events. The purpose was to determine the incidence and nature of medical encounters during a community-based mass participation cycling event.

**METHODS:** This retrospective, descriptive study was conducted during the Cape Town Cycle Tour (109km) in South Africa over 3 years, and involved 102251 race starters. Medical encounters were recorded on race day each year and are reported as an incidence rate (IR per 1000 starters; 95% CI). Overall illness-related (by organ system) or injury-related (by anatomical region) encounters, and severity (mild, moderate, severe or life-threatening) were recorded. For serious life-threatening occurrences, sudden cardiac arrests and deaths, medical encounter time, length of stay, and cause were recorded.

**RESULTS:** In 3 years, 539 medical encounters were recorded (IR 5.27 [4.84-5.74]), with a significantly higher injury rate (3.23; 2.90-3.60) compared to illness-related encounters (2.10; 1.84-2.40; p<0.001). Incidence of serious life-threatening medical encounters was 0.49 (95% CI: 0.37-0.65) and 2 cardiac arrests and 1 death occurred (1:51225 and 1:102251 respectively). Injury incidence was highest in upper limb (1.85; 1.60-2.13), lower limb (0.96; 0.79-1.0) and head (0.77; 0.62-0.96) while illnesses incidence was highest for fluid/electrolyte abnormalities (0.59; 0.46-0.76) and the cardiovascular system (0.48; 0.36-0.63).

**CONCLUSIONS:** In a 109km community-based mass participation cycling event, 1 in 190 cyclists starting the race required medical assistance or evaluation by the medical team on race day. Injury-related (1 in 310 cyclists) encounters were higher than illness-related medical encounters (1 in 476) among race starters. Serious life-threatening medical encounters occurred in 1 in 2045 starters. Risk factors associated with medical encounters need to be determined to enable implementation of safer cycling strategies.

**1073** Board #307 May 29 3:30 PM - 5:00 PM Impact of Silver Ion Laundry Treatment on Athletic Gear and Environmental Pathogens and Athlete Health

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Community-acquired infections caused by *Staphylococcus* and MRSA can spread easily through sharing towels, gear and contaminated surfaces. The resulting skin infections can lead to athlete disqualifications, cancellations of competitions and potential impact on team performance. In this study, we evaluate a residual antimicrobial textile treatment as an environmental hygiene and infection control strategy through improved textile cleanliness and reduced athlete risk for infection.

**PURPOSE:** To determine the impact of silver-based residual antimicrobial textile treatment on *Staphylococcus* and MRSA levels on athletic gear, environmental surfaces, athlete infection rates and number of missed play days. **METHODS:** The study, conducted at a professional sports facility over a six-month period, included athletes’ shirts, shorts, jerseys, girdles and towels, athlete infection rates and number of missed play days. Medical encounters were recorded on race day each year and are reported as an incidence rate (IR per 1000 starters; 95% CI).

**RESULTS:** Prior to silver-ion treatment implementation, significant levels of *Staphylococcus* were measured on athlete textiles (average 75 CFU/100 sq. cm.) and on environmental surfaces (average 16 CFU/100 sq. cm.). Silver ion treatment of the textiles resulted in dramatic decreases in textiles (average 75 CFU/100 sq. cm.) and on environmental surfaces (average 16 CFU/100 sq. cm.) with MRSA. The overall bioburden levels continue to trend downward during the period of treatment. Significant levels of *Staphylococcus* were measured on athlete textiles (average 75 CFU/100 sq. cm.) and on environmental surfaces (average 16 CFU/100 sq. cm.) with MRSA. The overall bioburden levels continue to trend downward during the period of treatment.

**CONCLUSIONS:** The current results demonstrate that a normal laundry process augmented with an active antimicrobial treatment provide athletic gear and a locker room environment that are and stay cleaner. Final data related to cleanliness, infection rates and player days will be tallied at the close of 2018.

**1074** Board #308 May 29 3:30 PM - 5:00 PM Effects of Mistletoe Extract Supplementation on Inflammation Markers after Strenuous Exercise in Rowers

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**Purpose**

Excessive long-term training and extensive exertion during exercise can inflammatory cytokine expression. Various measures have been explored to minimize this, and dietary supplements having anti-inflammatory and antioxidant functions can help athletes recover from repetitive intensive exercises, thereby preventing reduced vitality.

**Purpose**

This study aimed to identify the effect of mistletoe extract consumption on inflammatory markers of university male rowing athletes for 8 weeks during the winter training period. **METHODS:** This study included 20 male rowing athletes divided into the Korean Mistletoe extract supplement group (KME, n = 10) and the control group (CON, n = 10). The KME group took 110 ml of mistletoe extract every morning and evening after meals (total of 220 mL) for eight weeks. Before and after taking mistletoe for eight weeks, 2,000 m rowing performance capabilities were measured, and KME group took 110 ml of mistletoe extract after recovery from the rowing exercise. Blood samples were collected during the rest, immediately after exercise, and after 30 min of recovery. Among inflammatory markers, IL-6 and TNF-α were analyzed. **Results:** Both groups showed a significantly reduced 2,000 m rowing time (KME: p<0.01, CON: p<0.01), and the total number of strokes were significantly fewer in the KME group than in the CON group (p<0.05). After supplementation the levels of IL-6 and TNF-α were lower in the KME group than in the CON group in all periods of the rest (p<0.001), immediately after exercise (IL-6: p<0.01, TNF-α: p<0.01), and after 30 min of recovery (p<0.01). **Conclusion:** Therefore, mistletoe extract intake can reduce the serum inflammatory cytokine levels (which are otherwise increased due to high-strength exercise) among active individuals, indicating improved anti-inflammatory activity.

**1075** Board #309 May 29 3:30 PM - 5:00 PM A Retrospective Analysis Of VPBs In Trained Bicuspide Aortic Valve Athletes.

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**Purpose**

Bicuspid aortic valve (BAV) represents a common congenital cardiac disease (1-2%) normally compatible with sports activity. In case of competitive sports, the eligibility can be otherwise limited by the presence of symptoms, aortic valve dysfunction or arrhythmias. The investigation aims to verify, in a large cohort of BAV athletes, the prevalence of ventricular arrhythmic events (VPBs) found at the maximal exercise test (ET) at the first sports medicine clinical evaluation. **Methods:** A sample of 356 BAV athletes, regularly followed at Sports Medicine Center of the University of Florence, since 10 years, was retrospectively evaluated for arrhythmic events found at the first check-up. The athletes (321 M and 35 F) were in the range of 8-50 years old (median 24±4.0) and practiced sports at high cardiovascular impact (predominantly soccer, basketball and track and field). Inclusion criteria were to undergo a 2D echocardiography and ET conducted at 85% of their maximal effort. VPBs were reported if they were ≥ 3 at rest and/or during the test. **Results:** Only 25 (7,02%) showed VPBs at the ET. The total amount was 403 single VPBs and 4 monomorphic couples; a polymorphic pattern was present in only 3 athletes and only 5 had induced-exercise VPBs at peak. None of them showed acute events or had major arrhythmias. The difference of the VPBs prevalence control in BAV athletes (VPBs in 6.25%) was not significant (p<0.05). **Conclusions:** Prevalence of VPBs is low in BAV athletes and it seems to be not different from athletes without BAV. In case of sports eligibility, BAV should not be considered as a cause of risk of major arrhythmic events. More data in this field could optimize the cost/effective ratio for the eventual ECG holter indications.
Previous studies reported sport was number one cause of heat illness for young people visiting the emergency department in Japan. However, information of athletes’ perception for exertional heat illnesses (EHI) is limited.

**Purpose:** To examine the current level of knowledge, attitude, and behavior of EHI in Japanese college athletes.

**Methods:** We distributed a questionnaire to 1386 students among 5 universities in Japan, and 556 athletes responded, resulting in a response rate of 41%. Knowledge was measured with 18 true/false questions, attitude was measured with 1 scenario toward playing through symptoms of EHI on 4-point Likert scale, behavior was measured with 3 questions on 4-categories modified based on the Transtheoretical Stages of Change (unaware, undecided to implement, decided to implement, implemented) about EHI. Descriptive statistics and Chi-Squared tests of association were conducted.

**Results:** Only 4 subjects correctly answered all of the knowledge questions. More than half of the subjects answered incorrectly to questions about the relationship between survival rate and duration of hyperthermia (60%, n=336), the best cooling method for EHI (91%, n=493), and heat acclimatization (56%, n=302). Thirty percent of subjects (n=160) reported they would play through symptoms of EHI. Thirty nine percent (n=205) of subjects were unaware that physical activities should be canceled if temperature exceeds 35°C, while 39% (n=206) undecided to implement, 11% (n=59) decided to implement, and 11% (n=58) had already implemented the recommendation. Twenty percent (n=104) of subjects were unaware ice should be prepared for workouts in the heat, while 13% (n=67) undecided to implement, 15% (n=80) decided to implement, and 52% (n=278) had already implemented the recommendation. Subjects who were undecided to implement the recommendation to cancel workouts when temperature exceeds 35°C were associated with continuing exercise despite having EHI symptoms (X^2=27.64 (df=6), p<.01).

**Conclusion:** Most of the respondents had not implemented the recommendation to cancel physical activities in extreme heat condition and the behavior was associated with an attitude toward the need to stop exercise when having EHI symptoms. The overall findings of this study show the need for improved education for Japanese athletes.

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**Body composition is an important consideration for athletes and coaches.** Air displacement plethysmography (ADP) is often preferred in this population due to relative ease of administration and accuracy of measurement. However, other methods may provide a quicker or more cost-effective way of determining body fat percentage (BF%).

**Purpose:** To compare BF% from various body fat estimators to the criterion of ADP in female Division-I collegiate athletes.

**METHODS:** Forty-eight female athletes (age: 18.0 ± 0.7 years, height: 146.3 ± 56.9 cm, weight: 55.9 ± 23.8 kg) underwent a body composition test battery consisting of: 1) hand-to-foot bioelectrical impedance spectroscopy (HF-BIS); 2) hand-to-foot bioelectrical impedance analysis (HF-BIA); 3) foot-to-foot BIA (FF-BIA); and 4) 3-site Jackson-Pollock skinfold (SF). All SF testing was performed by the same test administrator, and BF% was estimated using the Brozek body density formula. Mean comparisons were assessed using a one-way ANOVA against the criterion of ADP and all correlations were run using Pearson’s product moment correlations.

**RESULTS:** Significant, positive relationships were found between all variables when compared to ADP (HF-BIS: r = 0.68, p < 0.01; HF-BIA: r = 0.79, p < 0.01; FF-BIA: r = 0.76, p < 0.01; and SF: r = 0.84, p < 0.01). When compared to the criterion of ADP (22.2 ± 7.1%), only the HF-BIA (26.1 ± 5.4%) was found to significantly overestimate BF% (p < 0.03). No significance was noted with HF-BIS (25.5 ± 5.6%, p = 0.38), FF-BIA (22.1 ± 5.7%), or SF (24.6 ± 6.1%, p = 0.21). **CONCLUSION:** The results of this study suggest that a moderate-to-strong relationship exists between BF% estimated via ADP and other laboratory and field-based methods. Given the strength of its relationship to ADP, it appears 3-site SF analysis may provide a cheap, time-saving estimate of BF% in Division-I female athletes.

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**Athletes often develop athletic identities over time, which helps an athlete’s performance and self-esteem during sport participation but can have negative repercussions once an athlete retires.** Preparation for this loss is important in preventing negative mental health consequences and decreases in the quality of life.

**Purpose:** To examine overall quality of life and athletic identity (e.g., immediately after retirement and “now” in retirement) and determine differences across gender, sport type (team vs. individual), and number of years of participating in sport and number of years retired (e.g., 0-5, 6-10, 10-15 year, etc.).

**METHODS:** Retired athletes (n=125; ages: 29.1±11.1 years; males: n=51; females: n=74) were recruited via convenience sample to participate in an online survey. Each participant completed the Pittsburgh Sleep Quality Index (PSQI) and the PROMIS Pediatric Profile 37 QOL questionnaire. Standard PPE forms which included demographics, sports participation, and injury history were also completed by the participants. Based upon the self-reported sleep habits assessed during the PSQI, we grouped participants into poor (PSQI score ≥ 5) or good (PSQI score < 5). We compared QOL between groups using independent sample t-tests and Fisher’s exact tests. A series of multivariable linear regression models were then constructed to evaluate the independent association between PSQI and QOL ratings after adjusting for age and sex.

**RESULTS:** A total of 99 participants completed both the PSQI and PROMIS 37 questionnaires; 33 were classified as having poor SQ [mean PSQI: 6.8±2.0; mean age: 15.1±1.0; 56% female] and 66 were classified as having good SQ [mean PSQI: 2.2±1.3; mean age: 15.2±1.1; 59% female]. There were no significant demographic differences (age, sex, level of play, hours per week in sports, injury history) between the groups. While the two groups reported similar bed times, the poor SQ group reported taking significantly longer to fall asleep than the good SQ group (mean=25.7±18.6 vs. 11.2±5.5 minutes; p<.001), and woke up one hour earlier than the good SQ group (mean=6:10AM vs. 6:28AM, p<0.001). Multivariable regression analysis indicated that worse SQ was significantly associated with higher pain interference (β=0.42; 95% CI=0.14-0.70; p=0.004), anxiety (β=0.48; 95% CI=0.16-0.80; p=0.004), and depression (β=0.49; 95% CI=0.19-0.80; p=0.002), and fatigue (β=0.60; 95% CI=0.14-0.70; p=0.004) ratings.

**CONCLUSION:** Poor self-reported SQ among healthy adolescent athletes is associated with more anxiety and depressive symptoms, fatigue, and pain interference ratings. When treating youth athletes, clinicians should consider assessing sleep hygiene and patterns in order to provide guidance on issues pertaining to reduced QOL.
A large portion of the adult population suffers from night leg cramps (NLC); but there are few safe and effective treatment options. Magnesium oxide supplementation has been found ineffective; however, low pH topical foam with magnesium sulfate has not been examined. **Purpose:** Examine the effectiveness of a topical low pH foam with and without magnesium sulfate on NLC frequency, severity/pain and the effects on daily activities. **Methods:** A double-blind randomized trial of 36 females (27 ± 11.9 yrs.; weight: 94.8 ± 24.3 kg; height: 167.9 ± 9.0 cm; body fat: 39.8 ± 12.3%) who experienced a minimum of 3-NLCs per week were recruited from local medical clinics in southeast region. Participants were randomized into 2 groups (Control [C] or Intervention [INT]) and completed a 14 consecutive day home-based treatment (Theraworx Relief®). Participants were given 5 bottles of foam (C or INT) to rub on their lower limbs twice a day and in the event of a cramp for the 14 days and completed surveys to assess frequency of NLC, pain levels, restless leg syndrome quality of life questionnaire (RLSQL) and the multi-dimensional fatigue inventory to assess social and daily function, sleep quality, and emotional well-being which were turned in at the end of each week. **RESULTS:** The INT group had significant improvements in post-intervention: total social function (P = .02), total daily function (P = .03), and total RLSQL (P = .01). Regression models also demonstrated significant improvement within the INT group in emotional well-being (-1.3; P = .03), total number of NLCs (-1.9; P = .02), and severity x frequency (-12.8; P = .02). The C group had significant improvements in daily (-11.5; P = .03) and social function (-10.9; P = .04). **Conclusion:** Theraworx Relief® with magnesium significantly improved quality of life as measured by domains on the total RLSQL. Although there was no difference in frequency and severity of NLCs between groups, we did see a significant reduction in NLCs within the intervention group. Few evidence-based treatments options are available for NLCs. Given the high prevalence of this condition and potential impact on health and well-being this treatment has the potential to improve health outcomes in patients who suffer with NLCs.

**B-69 Free Communication/Poster - Diabetes**

**1080 Board #314** May 29 3:30 PM - 5:00 PM

**Effect of Low Ph Magnesium-sulfate Foam on Night Leg Cramps: A Double-blind Randomized Trial**

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(No relevant relationships reported)

A large portion of the adult population suffers from night leg cramps (NLC); but there are few safe and effective treatment options. Magnesium oxide supplementation has been found ineffective; however, low pH topical foam with magnesium sulfate has not been examined. **Purpose:** Examine the effectiveness of a topical low pH foam with and without magnesium sulfate on NLC frequency, severity/pain and the effects on daily activities. **Methods:** A double-blind randomized trial of 36 females (27 ± 11.9 yrs.; weight: 94.8 ± 24.3 kg; height: 167.9 ± 9.0 cm; body fat: 39.8 ± 12.3%) who experienced a minimum of 3-NLCs per week were recruited from local medical clinics in southeast region. Participants were randomized into 2 groups (Control [C] or Intervention [INT]) and completed a 14 consecutive day home-based treatment (Theraworx Relief®). Participants were given 5 bottles of foam (C or INT) to rub on their lower limbs twice a day and in the event of a cramp for the 14 days and completed surveys to assess frequency of NLC, pain levels, restless leg syndrome quality of life questionnaire (RLSQL) and the multi-dimensional fatigue inventory to assess social and daily function, sleep quality, and emotional well-being which were turned in at the end of each week. **RESULTS:** The INT group had significant improvements in post-intervention: total social function (P = .02), total daily function (P = .03), and total RLSQL (P = .01). Regression models also demonstrated significant improvement within the INT group in emotional well-being (-1.3; P = .03), total number of NLCs (-1.9; P = .02), and severity x frequency (-12.8; P = .02). The C group had significant improvements in daily (-11.5; P = .03) and social function (-10.9; P = .04). **Conclusion:** Theraworx Relief® with magnesium significantly improved quality of life as measured by domains on the total RLSQL. Although there was no difference in frequency and severity of NLCs between groups, we did see a significant reduction in NLCs within the intervention group. Few evidence-based treatments options are available for NLCs. Given the high prevalence of this condition and potential impact on health and well-being this treatment has the potential to improve health outcomes in patients who suffer with NLCs.

**1081 Board #315** May 29 3:30 PM - 5:00 PM

**Difference Between USI Humeralin Measured Joint Space Measurements Using Gravity-induced Vs. 3kg External Load Valgus Forces**

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(No relevant relationships reported)

**PURPOSE:** Injuries of the ulnar collateral ligament (UCL) are a common pathology in overhead athletes. Ultrasound imaging is becoming a more common diagnostic tool to diagnose UCL pathology. Ultrasound imaging protocols have been described using external mechanical valgus forces to evaluate medial joint space (MJS) opening as an indicator of joint instability and UCL insufficiency. However, this external mechanical force is often poorly tolerated by athletes with acute injuries. A gravity induced valgus force is often better tolerated, however this method may potentially result in lesser joint space opening. The purpose of this pilot study was to examine differences in joint space opening measurements between these two methods of applying valgus force while performing ultrasound imaging. **METHODS:** Nine asymptomatic NCAA Division I collegiate baseball pitchers (age 20.1 ± 1.3 yrs) participated in this study. Ultrasound images were obtained of the MJS at the participant’s throwing arm using a GE LOGIQ e ultrasound unit. Participants were placed supine with elbow position at 30 degrees, with a wedge placed underneath the humerus creating a gravity induced valgus force on the MJS. Ultrasound imaging measurements to evaluate MJS opening were performed from the apex of the trochlea to the apex of the ulna. A 3-kg valgus force, as measured by a hand-held dynamometer, was applied 20 cm distal to the medial epicondyle, and the imaging measurement was repeated. A paired t-test was performed to evaluate differences in joint space measurements between the two test protocols. **RESULTS:** There was no significant difference between the MJS measurements (mean difference +0.05cm, t = -7.43, p = .000) using the gravity-induced valgus method (mean opening 41.0cm, SD 8.71cm) and the 3kg external force method (mean opening 44.6cm, SD 9.47cm).

**CONCLUSIONS:** The results of this pilot study indicate that a gravity induced valgus force during ultrasound imaging of the UCL and MJS may yield similar joint opening compared to a mechanically induced 3kg external force. As external valgus force is often poorly tolerated in the presence of acute injury, gravity induced force may provide for an alternate method of evaluating medial joint space opening. Further research is recommended using larger sample size and symptomatic populations.

**1082 Board #316** May 29 3:30 PM - 5:00 PM

**Comparison of Two Diabetic Education Programs Designed to Tread Adult-Onset Diabetes Mellitus**

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(No relevant relationships reported)

**INTRODUCTION:** Diabetes mellitus or adult onset diabetes or type 2 diabetes, is the most common form of diabetes. Millions of Americans are diagnosed with type 2 diabetes every year, and many more are unaware they are at high risk. **PURPOSE:** The purpose of this study was to compare the diabetic education programs of two certified diabetic dietitians, one with a focus on diet and the other with a focus on exercise, over 6 months, to determine which program was more successful in the treatment of type 2 diabetes. **METHODS:** Forty participants were randomly selected and separated into two groups. The subject pool was limited to those using oral diabetic medications. All participants had an initial evaluation of body mass index (BMI), hemoglobin A1c, fasting blood sugar, waist circumference, and weight. These measurements were repeated again after three and six months of treatment for analysis. The exercise group and the diet group each included 10 males and 10 females. The exercise (E) group met with their trainer five times per week and the diet (D) group received information about choosing foods to limit impact on blood glucose. A 2 x 3 repeated measures ANOVA was used to determine the effects of an exercise vs diet program. **RESULTS:** All participants completed their respective programs. The exercise group (10 males, 10 females) were 62.4 ± 8.6 yrs and the diet group (10 males, 10 females) was of 65.1 ± 9.8 yrs. The exercise group (31.9 ± 4.5) had a significant decrease (P < .05) in BMI at 6 months when compared to the diet group (29.5 ± 4.32). Measurements of A1c (E=9.4 ± 0.7%; D=7.7 ± 1.1%), fasting blood glucose (E=132.2±13.4 mg/dl; D=132.2±16.0 mg/dl), waist circumference (E=40.4±4.5 in; D=45.2±6.5 in), and weight (E=207.9±43.1 lbs; D=222±43.8 lbs) decreased in both groups over the six month study, however, the changes were accelerated in the exercise group resulting in significantly lower values. **CONCLUSION:** After six months of either an intensive exercise regimen or diet regimen, there were significant decreases seen for all variables. However, the results for the exercise group were associated with accelerated decreases as compared to the diet group by a significant margin. Individualized exercise programs appear to be the most effective at controlling type 2 diabetes with the potential for decreasing the risk of other comorbidities.
differ between the CON and PMW groups during the first 7-day monitoring period. Compared to baseline, the PMW improved the 3-h-average glucose after breakfast (-0.35 mmol/L, p < 0.03) and lunch (+0.34 mmol/L, p = 0.01), enough to remain in target ranges for blood glucose (5.0 - 7.4 mmol/L). No difference was seen after dinner in the PMW group (+0.11 mmol/L, p = 0.22), due to reduced adherence (40%) to PMW after dinner. CONCLUSIONS: Preliminary data supports the notion that PMW can improve blood glucose levels after breakfast and lunch in women with GDM when adhered to, however the impact of dinner requires further research. PMW may be an effective adjunct to standard-care for the management of GDM in pregnancy.

**1084 Board #318**
May 29 3:30 PM - 5:00 PM
Accuracy Of A Handheld Blood Glucose Monitor During Exercise And An Oral Glucose Tolerance Test
James R. Peterson, Davoncic M. Granderson, Clayton L. Camic, Peter J. Chomentowski, Steven M. Howell, Emerson Sebastian. Northern Illinois University, DeKalb, IL. (Sponsor: Carl Foster, FACSM)
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(No relevant relationships reported)

**PURPOSE:** The purpose of the present study was to examine the validity and reliability of a handheld blood glucose monitor during an oral glucose tolerance test (OGTT) and 60-minute bout of exercise.

**METHODS:** A total of 30 subjects (mean age ± SD = 22.3 ± 1.9 yrs; body mass = 77.6 ± 14.2 kg, height = 171.3 ± 9.6 cm; physical activity = 6.2 ± 3.4 hr wk⁻¹) volunteered to participate in a single visit to the laboratory for an OGTT (n=15) or 60-minute treadmill exercise test (n=15). For the OGTT, the subjects were required to visit the laboratory on an empty stomach and refrain from exertion for 8 hours before the test. Blood glucose measurements were made from the fingertip at six different time points during the OGTT (0, 10, 20, 30, 60, and 90 min) and treadmill test (0, 5, 10, 15, 30, and 60 min). Each blood sample was analyzed four times at each time point, two by the reference method and two by the handheld monitor.

**RESULTS:** Our findings indicated that the blood glucose values provided by the handheld monitor were significantly (P < 0.05) greater than the reference method at all time points of the OGTT and treadmill test. In addition, the handheld device exhibited an overall mean absolute relative deviation (±SD) of 9.0 (±7.0) and did not meet the 95% accuracy requirements of ISO 15197:2013 (only 87.2% of all values met the criteria). The Bland-Altman plot for constant error (reference method - handheld monitor) versus the reference method indicated an average negative bias (CE = -3.2 mg dl⁻¹) that increased (r = -0.23) at higher blood glucose values. Intra-device reliability analyses for the handheld monitor on two consecutive measurements taken at the same time points demonstrated the intra-class correlation (ICC) was R = 0.99 and coefficient of variation (CV) =3.0%, with no mean differences between measurements.

**CONCLUSIONS:** The present findings indicated that the handheld monitor provided highly reliable, yet inaccurately high blood glucose values compared to the reference method during the dynamic conditions associated with an OGTT and exercise.

**1085 Board #319**
May 29 3:30 PM - 5:00 PM
Effects of IT-based Interactive Exercise Education Program on Exercise Duration in Gestational Diabetes Mellitus Patients
Ah Reum Jung¹, Yoon Hee Choi², Dae Tack Lee¹. 'Kookmin university, Seoul, Korea, Republic of. 'The Catholic University of Korea Seoul St. Mary's Hospital, Seoul, Korea, Republic of.
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(No relevant relationships reported)

**Purpose :** Adoption of Information Technology (IT) to promote and manage health behaviors in clinical settings is an emerging modality. This study investigates the effects of IT-based interactive exercise education program on exercise duration in Gestational Diabetes Mellitus (GDM) patients.

**Methods :** For 3 months long study, 49 pregnant women (33.6±3.3 yrs, 161±5 cm, 60.6±13.8 kg, and 23±4.5 kg/m², before pregnancy), who were diagnosed GDM at 24-28 weeks of gestation (100 g oral glucose tolerance test; 89±10, 186±26, 179±20, and 148±23 mg/dl, at 0, 60, 120, and 180 min, respectively), agreed to participate. Only those who met study criteria were included in the study. Prior to the study, they were educated how to use and record their on-line life log including exercise duration, intensity and types. They were recommended to participate in exercise program; aerobic activities for 20-30 min/d, a minimum of 150 min/week, at perceived exertion (RPE) of 11-13, and/or 40-60% of heart rate reserve, and strength training 2-3 d/week, 10-15 rep/set, and 2-3 sets. Based on the on-line communication frequencies, they were grouped as less frequent (LF, n=27, as <1 times/week) and highly frequent (HF, n=22, as ≥1 times/week). Statistical software SAS version 9.4 were used and statistical significance was set at p < 0.05.

**Results :** A total of 5,947 life log from 49 participants were acquired. Approximately 88.5% of participants preferred walking as an aerobic exercise mode, and they walked at RPE of 11-13. The communication frequency was 4.5±4.3 times for LF and 24.3±19.4 times for HF (p<0.001). The daily exercise duration was 25±12.6 and 51.9±41.9 min/day (p<0.05), and weekly exercise duration was 164±177 and 356±271 min/week in LF and HF, respectively (p<0.05).

**Conclusion :** They met exercise recommendations in terms of exercise duration, intensity, and type. The frequent interactive communications between GDM patients and exercise professionals thru on-line using IT-based exercise behavior data may be effective for the GDM patients to exercise longer.

**B-70 Free Communication/Poster - Exercise Testing I**
Wednesday, May 29, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

**1086 Board #320**
May 29 3:30 PM - 5:00 PM
Exercise Stress Echocardiography and Myocardial Perfusion Testing in Pediatric Patients with Coronary Artery Anomalies
Malloree Rice, Wayne Mays, Sandy Knecht, Justine Shertz, Andrea Grzeszczak, Devin Tinker, Adam Powell, Samuel Wittekind, Clifford Chin, Tom Kimball. Cincinnati Childrens Hospital Medical Center, Cincinnati, OH.
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(No relevant relationships reported)

**Introduction:** Exercise stress echocardiography (echo) detects ischemic wall motion abnormalities. Exercise stress nuclear imaging (Mibi) detects perfusion abnormalities. We present results of Cardiopulmonary Exercise testing (CPET) with simultaneous echo and Mibi in pediatric patients with coronary artery anomalies, including those with other congenital heart disease. **Purpose:** To determine the yield of CPET electrocardiography with two simultaneous imaging techniques (echo and Mibi) in the detection of exercise-induced myocardial ischemia. **Methods:** Retrospective review of CPET with echo and Mibi results in patients with coronary abnormalities (CAA). CAA group was age, gender, and size matched to normals (Control) undergoing CPET only. CPET performed with a ramped cycle protocol with echo and Mibi images obtained at rest and peak exercise. Oxygen consumption (VO2), carbon dioxide production (VCO2) and respiratory minute volume (VE) were measured throughout exercise. Respiratory exchange ratio (RER), oxygen uptake efficiency slope (OUES), VE/VCO2 slope and VE/VO2 equivalents were calculated at anaerobic threshold (AT) and peak exercise. **Results:** No significant difference was seen in peak VO2, VE/VCO2 slope and OUES at AT and VE/VO2, VE/VCO2 equivalents and VE/VCO2 slope at peak exercise. At peak, CAA group had 1 patient with significant ST segment depression, another had significant wall motion abnormalities and a third had a perfusion defect. No significant ST depression in the control group.

**CPET Results**

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<th>AT</th>
<th>Peak</th>
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<tr>
<td>VE/VCO2 Slope</td>
<td>OUES</td>
<td>VE/VO2</td>
</tr>
<tr>
<td>Normal (n=9)</td>
<td>20 ± 6</td>
<td>2672 ± 1164</td>
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<tr>
<td>CAA (n=9)</td>
<td>*27 ± 7</td>
<td>*167 ± 580</td>
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**Inter-group comparisons were made using an unpaired student t-test. **P**<0.05, **P**<0.01

**Conclusion:** Both groups had similar exercise intensity. There were significant differences in VE/VO2, VE/VCO2 equivalents and VE/VCO2 slope at peak exercise suggesting aerobic and ventilatory inefficiency in CAA patients. There was a significant frequency of ischemic response to exercise uncovered equally by each testing modalities. Combined use of Mibi and echo improves diagnostic yield in CAA patients with ischemia.
Estimation of Ventilatory Thresholds in Physically Active Subjects During an Incremental Treadmill Test

Romeu C. Silva, Jr, Robson Spolans, Domingos R. Pandelo, Jr, Alexandre Correia Rocha. FFESJ / CAP, Santos, Brazil.

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Purpose: The aim of the present study is to develop equations to estimate ventilatory thresholds (VT) 1 and 2 in physically active subjects. Such equations can be very useful for training prescription, since most physical education professionals and athletes do not have access to ergospirometric tests.

Methods: Fifteen physically active men, age 32.53 ± 11.83 years, with VO2peak of 45.17 ± 11.74 ml/kg/min participated in the study. All volunteers underwent a progressive ergospirometric treadmill test, which was maintained at a one percent slope (to simulate the friction of a run on the street) and speed was increased by 1 km/h each stage (p < 0.03).

Conclusions: The incremental equation may differ between IB and other bronchietasis etiologies. IB pediatric patients demonstrated preserved efficiency in this population. Longitudinal studies are needed to better study exercise capacity in different etiologies of pediatric bronchiectasis.

The slope of the relationship between ventilation rate (V̇E) and rate of carbon dioxide production (V̇CO2) known as ventilatory efficiency (V̇E/V̇CO2), is associated with mortality in clinical populations and may have prognostic utility in apparently healthy adults. Despite its prognostic potential, there is currently no standardized method for calculating the V̇E/V̇CO2 slope in apparently healthy adults. PURPOSE: To compare how different methods of data averaging influence the calculation of the V̇E/V̇CO2 slope from a maximal cardiopulmonary exercise test (CPX). METHODS: Two hundred seventy-two apparently healthy adults (49% female, age 44 ± 20 years, body mass index 27.1 ± 5.6 kg/m², VO2peak 33.3 ± 12.5 ml/kg/min) performed a maximal CPX to determine cardiorespiratory fitness. For each test, the V̇E/V̇CO2 slope was determined by commercially available metabolic software (ParvoMedics TrueOne 2400) calculating CPX data using time averages of 60, 30, 20, 15, and 10s, and also by averaging every 4 breaths. Pearson correlations and one-way analysis of variance with Dunnett’s multiple comparison tests were used to examine differences between averaging methods. The criterion method was the 20s average. RESULTS: The different data averaging methods were all significantly correlated to the criterion (all P < 0.001; r = 0.99). However, in comparison to the criterion mean (29.6 ± 4.6), all other methods were significantly different (60s: 29.2 ± 4.6; 15s: 29.7 ± 4.7; 10s: 29.7 ± 4.7; 4-breath: 30.4 ± 4.9; all P < 0.0001), with the exception of 30s averaging (29.5 ± 4.6; P = 0.22). The greatest difference from the criterion occurred with the 4-breath averaging method (mean difference -0.9; CI -1.0, -0.8). CONCLUSIONS: The calculation of ventilatory efficiency is impacted by varying methods of data averaging. However, the differences between data averaging methods is small and future research is needed to determine if these differences influence the prognostic utility of ventilatory efficiency in this population.
Twelve-lead ECG and Echocardiography Evaluation in Division II College Athletes

Ludmila C. Cosio-Lima, Emily Grammer, Cameron Addie, Marisa Strbaugh, Lauren Adlof, Jeffrey Simpson, Youngil Lee, Amy Crawley, University of West Florida, Pensacola, FL

The presence of cardiac abnormalities due to ventricular mass and volume has been documented in elite and Division I college athletes. Due to limited resources, cardiovascular screening among Division II College athletes is scarce or non-existent.

PURPOSE: To examine ventricular remodeling through electrocardiographic (ECG) characteristics and focused echocardiography (FECH) in Division II college athletes.

METHODS: Thirty-six athletes (males = 18; females = 18) of different ethnicities (Caucasian = 60%, African American = 40%) from basketball (48%), soccer (27%), volleyball (9%) and football (16%) completed cardiovascular screening with a resting 12-lead ECG and focused echocardiography analysis. ECG abnormalities were compared with race, gender, and sports using a mixed model ANOVA. RESULTS: Although sports teams were not predictors for an abnormal ECG, 20% of the athletes presented with abnormal ECGs. The highest independent predictor of abnormal ECGs was found in African American males, when compared to Caucasians (65% vs. 32%; p = 0.035). African American male athletes had, on average, higher left ventricular mass indexes (72.8 ± 8 vs 66.2 g/m², p = 0.008), higher mass/volume ratio (1.01 ± 0.11 vs 0.98 ± 0.07 g/ml, p = 0.002), and higher QRS vector magnitudes (2.9 ± 0.5 vs 2.4 ± 0.4 mV, p = 0.002) than Caucasian male athletes. In addition African American athletes demonstrated a significantly greater prevalence of left ventricular hypertrophy compared to Caucasians male athletes (68% vs. 32%; p = 0.04) and all female athletes (72% vs. 21%; p = 0.001). CONCLUSIONS: African American male athletes at the Division II level present with increased concentric ventricular remodeling and ventricular volume in comparison to Caucasian athletes of both genders. This highlights the need for a greater emphasis to be placed on cardiovascular screenings, specifically for African American males in Division II athletics, as a diagnostic tool to detect early warning signs of cardiovascular irregularities.

Hemodynamic Responses to an Exercise Stress Test in Parkinson’s Disease Patients without Orthostatic Hypotension

Kirk B. Roberson1, Joseph Signorile2, Carlos Singer2, Kevin Jacobs, FACSM3, Moataz Eltoukhy4, Nicolette Ruta2, Nicole Mazzeli3, Andrew Buskard1, Stetson University, DeLand, FL.

1University of Miami, Coral Gables, FL. 2University of Miami, Miami, FL. 3FACSM. (Sponsor: Dr. Kevin Jacobs, FACSM)

The presence of postganglionic sympathetic denervation is well established in Parkinson’s disease (PD). Denervation at cardiac and peripheral blood vessel sites may lead to abnormal cardiovascular and hemodynamic responses to exercise.

PURPOSE: The aim of the present investigation was to examine how heart rate (HR) and hemodynamics are affected by an exercise test in PD patients without orthostatic hypotension.

METHODS: Fourteen individuals with PD and sixteen age-matched healthy controls performed an exercise test on a cycle ergometer. HR, blood pressure, and other hemodynamic variables were measured in a fasted state during supine rest, active standing, exercise, and supine recovery. RESULTS: Peak HR and percent of age-predicted maximum HR (HRmax) achieved were significantly blunted in PD (MD=9, p<0.05; MD=5, p<0.01). HRmax remained significantly elevated in PD at minutes five (MD=7, p=0.03) and ten (MD=6, SE=2, p<0.05) of recovery, compared to controls. Systolic, diastolic, and mean arterial pressures were significantly lower at multiple time-points during active standing in PD compared to controls, but not a peak exercise. Systemic vascular resistance (SVR) decreased significantly at the onset of exercise in PD compared to control (Stage 1: MD=335.9, p<0.03), and remained significantly lower during exercise (Stage 2: MD=338.6, p=0.01) and the first minute of supine recovery (MD=328.6, p<0.02). End diastolic volume (EDV) was significantly lower in PD during supine rest (MD=10.2, p<0.04) and at minutes one (MD=9.7, p=0.01) and five (MD=7.1, p<0.04) of recovery. CONCLUSIONS: Our results indicate for the first time that normal hemodynamics are disrupted during orthostatic stress and exercise in PD. Despite significant differences in EDVI at test and during recovery, and SVRI during exercise, cardiac index was not affected. Our finding of significantly blunted HRmax and HR recovery in PD patients has substantial implications for exercise prescription and recovery guidelines.
1095 Board #329 May 29 3:30 PM - 5:00 PM
Dichotomy In The Mechanism Of Ramp-incremental Exercise Intolerance In Chronic Heart Failure
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(No relevant relationships reported)

Chronic heart failure (CHF) is a complex multifaceted disease that has wide ranging detrimental effects on each step in the delivery and utilization of O2 irrespective of CHF etiology. Aerobic capacity (VO2peak) is reduced and exercise tolerance is limited by fatigue and/or dyspnea. Exercise intolerance is the strongest predictor of mortality in CHF. Whether fatigue or symptoms is the primary mechanism of exercise intolerance in CHF is unknown.

PURPOSE: To use an innovative ramp-incremental cardiopulmonary exercise test (RI-CPET) to investigate whether fatigue or symptoms predominate as the mechanism of exercise limitation in CHF.

METHODS: Sixteen CHF patients (left ventricular ejection fraction (LVEF) = 28 ± 8 %) completed RI-CPET to intolerance that ended with measurement of maximal voluntary isokinetic power (MVIP) at VO2peak. MVIP was measured during 4-5 s of maximal effort. At VO2peak comparison of MVIP with peak RI-work rate (RI-WRpeak) identified fatigue (inability to increase MVIP above RI-WRpeak) or symptoms (MVIP > RI-WRpeak) as the primary mechanism of exercise intolerance.

RESULTS: Subjects weighed 81.2 ± 48.5 kg, 107 m during the 6-MWT. 6-MWW averaged 38816 ± 23.7 kg, were 61.5 ± 13 years old, and covered 485 ± 107 m during the 6-MWT. 6-MWW averaged 38816 ± 12190 kg·m and cost 1.89 ± 0.68 L of O2/min of activity. The correlation coefficient (r) between estimated VO2peak and 6-MWW was 0.479 and 0.758 respectively. Correlation coefficients between gender and 6-MWD and 6-MWW were similar and moderate in males (0.517 and 0.537 respectively) and disparate in females (0.482 and 0.871 respectively).

CONCLUSIONS: The strong correlation between VO2peak and 6-MWW suggests that this derived outcome measure provides a more clinically useful biomarker of physiologic status in a population of cancer survivors than 6-MWD. Because 6-MWD is a well-recognized biomarker of physical functional status, clinicians might report both 6-MWD and 6-MWW to create a more complete assessment of their patients with a history of cancer. The strength of these associations supports developing a predictive equation for VO2peak based on 6-MWW. However, the gender disparity in r values supports the direct assessment of aerobic capacity rather than relying on a surrogate measure such as the 6-MWW.

1096b Board #331 May 29 3:30 PM - 5:00 PM
Cancer Exercise Rehabilitation Training - A Case Study
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(No relevant relationships reported)

Cancer exercise therapy has been shown to increase physical function, reduce fatigue and build self-confidence. There is a gap in the research pertaining to the implementation of a cancer therapy program in a setting that would be effective and easily replicated. PURPOSE: The purpose of this study was to show the effectiveness of the implementation of cancer exercise therapy with a breast cancer survivor in a local fitness facility. METHODS: The Rocky Mountain Cancer Rehabilitation Institute (RMCFI) (Colorado, USA) has developed a protocol for the assessment and implementation of a cancer exercise rehabilitation program. RMCFI’s protocol utilizes a “phase” system to guide the exercise prescription for each participant very similar to cardiac rehabilitation treatment plans. The guidelines were implemented by the exercise physiologist who conducted this research. Additionally, the researcher also sat for and passed the ACSM’s Certified Cancer Exercise Trainer certification exam prior to conducting the training. The exercise session consisted of 60 minutes of resistance and flexibility exercises specifically prescribed for the patient. The patient’s heart rate and oxygen saturation were monitored during each session. The study was for 16 weeks three times per week. RESULTS: A pre and post fitness assessment was administered to the patient. The largest improvements were found in balance, muscular strength, core stability, and cardiorespiratory fitness. Balance improved by 75%, core stability improved by 100%, and cardiorespiratory endurance (VO2peak) improved by 16.7%. There were also large percent increases in 1RM for leg extension (70%), leg press (68%), shoulder press (64%), and chest press (29%). QOL index measures also increased 33% during the intervention. CONCLUSIONS: The results of this case study suggest that successful implementation of an exercise therapy program can be effective in a health and fitness center. With the growing number of cancer survivors there will an increased need for the development of cancer exercise training that is easy to implement in a local fitness facility. This study shows the relative ease of implementation in a community based fitness facility.

1096 Board #330 May 29 3:30 PM - 5:00 PM
6-minute Walk Work (6-mww) Better Correlates With Vo2peak Than 6-minute Walk Distance (6-mwd)
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PURPOSE: Results from the 6-Minute Walk Test (6-MWT) are often used clinically as a surrogate measure of physiologic function (aerobic capacity) despite the fact that distance alone is not a determinant of work performed and hence not a measure of energy expenditure (Chung et al. Respir Med. 2001; 95: 618). Therefore, we hypothesized that expressing the distance covered during a 6-MWT relative to body weight (6-minute walk work, 6-MWW) would be more closely associated with VO2peak than 6-MWT distance (6-MWD) alone.

METHODS: 187 adult survivors of a variety of cancer types (115 females) underwent the validated University of Northern Colorado Cancer Rehabilitation Institute (UNCCRI) maximal exercise test, exercising to volitional fatigue. VO2peak was estimated using ACSM walking equations. A week later subjects completed the 6-MWT as described by the American Thoracic Society (Ann J Respir Crit Care Med. 2002;166:111). 6-MWW (m-kg) was calculated (6-MWD (m) X body weight (kg)). Means and standard deviations were generated for the variables of interest. Correlational analysis was performed to explore the relationship between 6-minute walk outcomes and estimated VO2peak.

RESULTS: Subjects weighed 81.2 ± 23.7 kg, were 61.5 ± 13 years old, and covered 485 ± 107 m during the 6-MWT. 6-MWW averaged 38816 ± 12190 kg·m and cost 1.89 ± 0.68 L of O2/min of activity. The correlation coefficient (r) between estimated VO2peak and 6-MWD and 6-MWW were 0.479 and 0.758 respectively.

ACSM May 28 – June 1, 2019 Orlando, Florida
Low energy availability (LEA) may be prevalent in both male and female recreational athletes and can be a catalyst for negative health consequences. Purpose: Examine the prevalence of LEA and macronutrient intakes (protein [PRO], carbohydrate [CHO], and fats) and differences between gender in recreational athletes. Methods: Data from a cross-sectional study was used to examine recreational athletes (n=103, age: 29 ± 1.3 years; males: n=91, height: 180 ± 6 cm, weight: 75 ± 9 kg; females: n=12, height: 165 ± 6 cm, weight: 62 ± 5 kg). Athletes were categorized into LEA (26 ± 10 vs. 16 ± 3 kcal/kg/FFM) and non-LEA groups. Results: 36% (n=37) of athletes consumed fats above the recommendation. Most male athletes demonstrated LEA and macronutrient intakes (protein <1.2 g/kg/day; CHO <5 g/kg/day) and the majority of female athletes consumed fats above the recommendation. Conclusions: Male and female athletes are at risk for LEA and macronutrient intakes. Male recreational athletes are at higher risk compared to female athletes.
**PURPOSE:** The purpose of this investigation is to evaluate the validity and reproducibility of the BEVQ-15 for determining habitual beverage intake in collegiate athletes.

**METHODS:** National Collegiate Athletic Association (NCAA) Division I collegiate athletes from a variety of sports from two universities in Virginia were recruited to participate. The study consisted of three sessions on consecutive days within 2 weeks. At each session, the participants completed a 24 hr dietary recall, which was analyzed via NDSR. At the first and third sessions, participants completed the BEVQ-15. Validity was assessed using a Spearman’s correlation analysis; reproducibility was assessed using a Pearson’s correlation analysis.

**RESULTS:** Eighty-five collegiate athletes (65% female) participated in the study. Mean water and total beverage intake were 80.0±89.5 fl oz and 112.9±95.4 fl oz, respectively. Total beverage intake (fl oz, kcal) between the average of three 24-hr recalls, and the recalls was associated (fl oz: r=0.51; kcal: r=-0.36, both p<0.01). Correlations between the two BEVQ-15 administrations were significantly associated for water (fl oz: r=0.80; p<0.01) and total beverage intake (fl oz, kcal: r=0.74 & 0.77, respectively; p<0.01).

**CONCLUSIONS:** These results suggest that the BEVQ-15 is a valid and reproducible method to assess water and total beverage intake in collegiate athletes. The BEVQ-15 is a practical tool (<5 minute completion time) which may be used to measure collegiate athletes’ beverage intake. Additional research is needed to determine if the BEVQ-15 is sensitive to detect changes in athlete’s beverage intake over time.

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**PURPOSE:** Recent evidence suggests that different beverages promote similar fluid recovery but alter nutrient provision when consumed voluntarily with food post-exercise (Campagnolo et al., 2017; McCartney et al., in Press). However, when preparing to undertake another bout of exercise, individuals may exhibit different dietary behavior (e.g. to reduce gastrointestinal distress, optimize performance). This study investigated the effect of consuming water or a carbohydrate (CHO)-electrolyte sports beverage (‘Sports Drink’) as ad libitum with food during a 4h recovery period on fluid restoration, nutrient provision, and subsequent endurance cycling performance.

**METHODS:** On two occasions, 16 trained cyclists, 8 male (M) (age: 31±9y; VO_{2max}: 4.6 L·kg^{-1}·min^{-1}) and 8 female (F) (age: 33±8y; VO_{2max}: 3.8 L·kg^{-1}·min^{-1}), lost 2.3±0.3% and 1.6±0.3% of their body mass (BM) (respectively) during 1h of fixed-intensity cycling. Participants then had ad libitum access to either Water or Sports Drink (103kJ·fl oz^{-1}·CHO·H2O·L^{-1}) and food for the first 15min of a 4h recovery period. At the end of the recovery period, participants completed a cycling performance test (45 min fixed-intensity pre-load and an incremental test to exhaustion [peak power output, PPO]). Beverage intake; water/nutrient intake; and indicators of fluid recovery (BM, urine output, plasma osmolality [P_Osm]) were assessed throughout trials. RESULTS: Participants returned to a similar state of positive fluid balance prior to recommencing exercise, regardless of the beverage provided (Water: +0.4±0.5 L; Sports Drink: +0.3±0.3 L, p<0.05). While Sports Drink increased post-exercise energy (M: +1.3±0.5 MJ; F: +1.1±0.5 MJ) and CHO (M: +84±25g; F: +65±25g) intake (p<0.0001), this did not affect subsequent endurance cycling performance (Water: 33±7 kcal [M] and 28±7 kcal [F]; Sports Drink: 38±15 kcal [M] and 28±10 kcal [F], p=0.28).

**CONCLUSIONS:** Recovery beverage recommendations should consider the post-exercise environment (i.e. availability of food), an individual’s tolerance for food/fluid, the immediate requirements for refueling (e.g. CHO demands of subsequent activity) and the athlete’s overall dietary goals.

and educating athletes can result in a substantial improvement in blood iron levels. Performance. Lastly, meeting the recommended guidelines for iron is vastly important, especially runners who are greatly dependent on oxygen for their performance. Deficient, were significantly improved. Iron is a significant mineral for athletes, exercise training in Gerofit. Weight changes in Veterans with a diagnosis of diabetes who completed one year of Center (BV AMC) since 2013. Veterans receive individualized exercise programs and developed at the Durham VA Medical Center and offered at the Baltimore VA Medical Center (BV AMC). PURPOSE: Gerofit is a clinical exercise program for Veterans ≥65 years, originally modified to include pre-program A1C ≤10%. Veterans could attend Gerofit exercise training. Clinical chart reviews were conducted to determine A1C and weight one week of pre-season practice in Division I male (N = 26) & female (N = 20) cross country runners. Athletes were classified as low iron if the males were below 13.0mg/dL, and 12.0mg/dL for the females. If subjects were classified as low, they received a nutritional pamphlet as an intervention, and were retested five weeks later. RESULTS: The researchers classified 26.9% of males as iron deficient, and 5.00% of females as deficient. After retesting the deficient subjects, a paired t-test was utilized to determine if significant improvements in blood iron occurred following the five week intervention. A p-value of 0.002 (2-tail) was yielded showing a significant improvement in hemoglobin levels from preseason in comparison to 5e eeks following the intervention (12.28 ± 1.09; 13.0 ± 0.25, respectively). CONCLUSIONS: After a five week intervention, iron levels in those previously deficient, were significantly improved. Iron is a significant mineral for athletes, especially runners who are greatly dependent on oxygen for their performance. Thus, making sure cross country runners are educated on good nutritional habits, allowing them to maintain the said desirable blood iron levels is key to optimize their performance. Lastly, meeting the recommended guidelines for iron is vastly important, and educating athletes can result in a substantial improvement in blood iron levels of Gerofit. On average, both weight and A1C increased in the year prior to initiating Gerofit (A1C 7.2 ± 1.2 to 7.4 ± 1.5%, weight +1.2 lbs.). Overall A1C declined to 7 ± 1.1% (p = 0.001) and weight by 4.5 ± 0.3 (p = 0.001) yes later. The group that decreased A1C at 1 year started with a significantly higher A1C at time of enrollment compared to those that increased A1C at 1 year (7: 1.6% vs: 6: 12%). Conclusion Diabetic Veterans who participated in one year of Gerofit overall demonstrated a reverse trajectory of rising A1C and weight. Overall, the decline in A1C approached the clinically significant reduction of 0.5%. Those Veterans with a higher A1C at time of enrollment demonstrated a statistically and clinically significant reduction; reducing potential diabetes complications. Results demonstrate the importance of advocating for participation in a low level, multi-component exercise program for weight and diabetes management.
across control (n=22), exercise responders (n=14), and a control non-responders (n=28 using generalization estimating eq. tions). RESULTS: Compared to controls, both responders and non-responders had significant improvements in carotid intima-media thickness (responders: β=-3.54 [CI -6.0-0.68], non-responders: β=-5.59 [CI -9.18, -2.01]) and peripheral arterial stiffness indices, such as carotid to distal posterior tibial artery pulse wave velocity (responders: β=-0.16 [CI -0.28, -0.04], non-responders: β=-0.13 [CI -0.24, -0.03]) on and on the distensibility coefficient (responders: β=0.99 [CI 3.10e-5, 5.00], non-responders: β=0.00 [CI 1.41e-6, 0.00]). While only responders improved carotid arterial stiffness (carotid pulse wave velocity, β=0.06 [CI -0.11, -0.01]). No improvements in the remaining vascular indices and hemodynamic variables were observed. CONCLUSIONS: Regardless of increasing CRF, a 1-year exercise intervention entails significant benefits for vascular function in patients with T2DM.

### 1147 Board #5 May 30 9:30 AM - 11:30 AM Effects of Novel Compression Exercise Technology on Glycohemoglobin Levels and Weight in Type II Diabetics


The most potent lifestyle intervention for treatment of Type II Diabetes (T2D) is consistent exercise. However, for many patients with the condition, other comorbidities such as osteoarthritis, hypertension, and high body mass indices prevent them from being able to exercise intensively and consistently enough to experience optimal metabolic benefits. Recent research has supported the use of compression exercise in physically limited populations and demonstrated physiologic responses at lower intensities (10-20% one repetition maximum vs. 70% for hypertrophic response). The combination of compression technology and core cooling further lowers the exertional requirements and has been used in conventional resistance exercise (i.e., compression and cooling contributes to a reduction in biometabolic markers of diabetes). This intervention has promise in contributing to effective management of T2D with a low physical burden.

### 1146 Board #4 May 30 9:30 AM - 11:30 AM Influence of High Intensity Body-Weight Circuit Training in Adults with Type II Diabetes.

Brian Kliszczerwicz, FACSIM, Robert Buresh, FACSIM, Emily Bechle. Kennesaw State University, Kennesaw, GA. Email: bkliszczer@kennesaw.edu

(REported relationships reported)

POtUSe: To determine the effectiveness of a 15-week intervention of a minimal dose high-intensity bodyweight circuit (HIIBC) program in persons with type 2 diabetes (T2D) on markers of metabolic function, autonomic balance, and body composition. METHODS: Three females (57 ± 12 yrs) and two males (64 ± 14 yrs) with T2D underwent assessments of glycosylated hemoglobin (HbA1c) and fasting plasma glucose (FG), insulin (INS), and lipids. Body composition was determined using dual-energy x-ray absorptiometry, aerobic fitness (submaximal treadmill test), blood pressure (SBP/DBP), and resting heart rate (RHR) were assessed. Participants completed 15 weeks of bodyweight circuit training (10 banded bodyweight squats, 5 modified pull-ups, 5 modified push-ups, 10 abdominal crunches). Participants completed as many cycles as possible in each session. Session duration progressed from 30 minutes, as tolerated, and session frequency progressed from 3-4 sessions per week. All assessments were repeated after 15 weeks of training. RESULTS: Body composition: Pre and Post changes in mean weight (p = 0.39), body fat % (p = 0.623), lean mass (p = 0.372). Aerobic fitness: estimated VO2max (p = 0.232), SBP (p = 0.08), DBP (p = 0.9), RHR (p = 0.27) - Metabolic biomarkers: FG (p = 0.9), HDL (p = 0.27), LDL (p = 0.8) - HbA1c (p = 0.80) - INS (p = 0.8). CONCLUSIONS: HIIBC may be an appropriate and appealing intervention for those with T2D.

### 1148 Board #6 May 30 9:30 AM - 11:30 AM Impact of Short-term Exercise Training And Diet On Glucose Effectiveness Between Prediabetes Phenotypes

Kara C. Anderson, Natalie Z.M. Eichner, Nicole M. Gilbertson, Emily M. Heiston, Steven K. Malin, FACSIM. University of Virginia, Charlottesville, VA. (Sponsor: Steven K. Malin, FACSIM)

(REported relationships reported)

POtUSe: Although exercise improves glucose effectiveness (GE) in adults with type 2 diabetes, the influence of exercise on GE across the prediabetes phenotypes is unknown. Additionally, the impact of dietary intake on GE after an exercise intervention is limited. The purpose of this study was to examine the effect of short-term exercise training and habitual dietary intake on GE in adults with impaired fasting glucose (IFG) compared with IFG plus impaired glucose tolerance (IFG+IGT). METHODS: Female subjects (Age 58 ± 12 yrs; BMI 31 ± 5 kg/m²) were screened for IFG (n=7; FG ≥ 103.8 mg/dL; 2-hr glucose ≥ 110 mg/dL) and IFG+IGT (n=10; FG ≥ 7.5 mg/dL; 2-hr glucose ≥ 13.9 mg/dL) using ADA criteria (120 min OGTG). Subjects underwent 12 bouts of exercise at ~ 70% of HRpeak for 60 min/d over 2-weeks. A 7-d in an 3-d food logs was used to collect glucose and insulin to determine GE via a validated equation model before and after training. VOpeak and body composition (BIA) were also tested. Energy expenditure during training was calculated using a linear regression equation based on VO2 and heart rate. Subjects were also asked to record their diet before and after the intervention using 3-d food logs. RESULTS: Exercise training reduced BMI (P < 0.05), but had no effect on lean body mass (LBM) or VOpeak; and there was no difference in exercise energy expenditure in either group (P = 0.2). However, adults with IFG+IGT increased GE post-training (within effect; P < 0.02), and this increase in GE tended to be greater in IFG+IGT than IFG (0.23 ± 0.08 vs. 0.00 ± 0.08 mU/mL; P < 0.05). Increased GE correlated with elevated LBM (r = 0.8, P < 0.05) but not reduced BMI (r = 0.8, P < 0.05). While dietary protein reduction was linked with increased GE (r = -0.1, P < 0.05), no association was seen between GE and body carbohydrates (r = 0.24, P = 0.37), fat (r = 0.17, P = 0.5) or total kcal (r = 0.23, P = 0.4). CONCLUSION: Independent of weight loss and fitness, short-term exercise training increased GE in adult women with IFG+IGT but not those with IFG. The results also suggest dietary protein may modulate the exercise effect on GE. Future work is needed to examine how nutrition can optimize exercise induced glucose regulation in individuals with prediabetes.

### 1149 Board #7 May 30 9:30 AM - 11:30 AM Effect of Weight Loss on Physical Function in Overweight and Obese Individuals

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(REported relationships reported)

Impaired physical function is a major health concern in obesity across the adult life-span. Reducing weight and improving body composition may be critical for improving physical function in overweight and obese adults. PURPOSE: Investigate physical function before and during weight loss and study the relationships of body composition with changes in physical function. METHODS: Data were obtained from women (n=127 age 8±12, body weight 101.8±51 kg; BMI 33±11 kg/m2) and men (n=17 age 8±10 years; weight 131.9±31 kg; BMI 30±9 kg/m2) enrolled in a medical supervised comprehensive weight loss program at Wake Forest Baptist Health Weight Management Center. Mean follow up was 8 months. Body composition, grip strength, gait speed, chair rise time, and submaximal VO2max were determined before and at the end of follow-up. Paired samples t-tests analyzed changes between baseline and follow-up. Pearson correlations examined relationships between pre-and post functional performance tests and fat free mass (FFM), and fat mass (FM). RESULTS: Meand weight loss was 11.8 ± 7.9 kg. Approximately 8% of weight loss was from FM (FM: 8±15 kg vs. baseline and 3±3 kg at 1 follow-up, p<0.01) and FFM (FM: 10.4±2 kg at baseline and 10.4±2 kg at follow-up, p<0.01). Grip strength (29±8 vs. 23±1 kg, p<0.01), chair rise time (8±2 vs. 2.5±1 s, p<0.01), gait speed (1.2±0.2 to 1.3±0.2 m/s, p<0.01), and submaximal VO2max (32.7±3 to 34.5±6 mL/kg/min at p<0.01) all improved from baseline to follow-up, respectively. Gait speed
Sex-Specific HbA1c Responses to Structured Exercise Among Patients with Type 2 Diabetes
Diana Devitskaya1, Cynthia Villalobos2, J. Mark VanNess3, Paul D. Vosti1, Alexis C. King1, Courtney D. Jensen3, University of the Pacific, Stockton, CA. 2St. Joseph’s Medical Center, Stockton, CA. 3University of Illinois at Urbana-Champaign, Champaign, IL.

**Purpose:** To evaluate sex-specific glycated hemoglobin (HbA1c) changes to structured exercise among males and females with Type 2 diabetes.

**Methods:** Subjects were assigned to “completers” (N=39) or “non-completers” (N=28) based on adherence to the exercise program involving aerobic activity, resistance exercise, and flexibility training. At the initial evaluation, participants underwent a health history exam, multiple assessments of physical fitness, cardiometabolic testing, and an assessment of HbA1c. Following 10 weeks of bi-weekly exercise sessions, participants that remained active in the program were reassessed. A repeated measures ANOVA with Greenhouse-Geisser correction of bi-weekly exercise sessions, participants that remained active in the program were reassessed. A repeated measures ANOVA with Greenhouse-Geisser correction compared HbA1c levels at baseline and follow-up between sexes.

**Results:** Subjects were assigned to “completers” (N=39) or “non-completers” (N=28) based on adherence to the exercise program. At baseline, HbA1c levels did not differ between completers and non-completers (p=0.234). Sex was not related to completion of the intervention exclusive to the participants’ sex. To characterize the relationship.

**Conclusions:** RESULTS: ΔHbA1c during CPET was strongly correlated with peak workload (0.881, p=0.0003) and VO2 peak (0.59p= 0.0001). The polynomial model explaining the relationship was significant (Adj R2=0.81, F (6 = 2, p= 0.009); however, the point estimates were not . The semi-linear regression model was better able to characterize the overall trend (Adj R2=0.9, p= 0.0002) and the drop in ΔHbA1c at the higher ends of MW, and indicated that VO2 peak had a significant effect (β=54.9, p=0.019), and interacted with MW (β=0.157, p=0.04).

**Conclusion:** These preliminary results show that the linear increase in ΔHbA1c with incremental workload appears to attenuate and slightly decrease at greater MW, especially for those with higher exercise capacity. Supported by NIH Grant K01HD08-01A1.

**During a ramp-incremental (RI) cycling exercise, the measurement of oxygen uptake (VO2) at the level of the mouth has a time delay from the onset of exercise, which is defined as the mean response time (MRT). It has been shown that the MRT is best calculated using the steady-state VO2 from a bout of moderate-intensity exercise prior to the RI test, and then matching this VO2 to the time at which this metabolic rate occurs during the RI test. Previous research has used RI slopes of 25 and 30 W·min⁻¹ to measure the MRT. In this context, it is known that the VO2 to work rate relationship is affected by the slopes of the ramp, which might affect the duration of the MRT. However, there is no empirical data to support this assumption. PURPOSE: To determine the influence of different RI slopes on the MRT.

**METHODS:** Six healthy young men (age: 28 ± 10 years; height: 179 ± 6 cm; weight: 72 ± 5 kg; VO2 peak: 4.0 L·min⁻¹) performed six RI cycling tests with slopes of 5, 10, 15, 25, 30, and 100 W·min⁻¹. The ramp-incremental test was preceded by a moderate-intensity step-transition (i.e., 5min in at 20 followed by 6min in at 100 W), from which the steady-state VO2 could be determined before the ramp VO2 vs power output relationship was established. The difference between the power output at the steady-state VO2 and the ramp-specific power output at a similar VO2 was transformed into time to calculate the MRT.

**RESULTS:** The MRT for 5, 10 (16 ± 6), 15 (10 ± 6), 25 (14 ± 7), 30 (12 ± 13) and 100 (28 ± 10) W·min⁻¹ showed a significant main effect (P=0.001). Post-hoc comparisons showed shorter MRT for 5 compared to 25 (P=0.028) and 30 (P=0.001) W·min⁻¹, and for 10 compared to 30 (P=0.015) W·min⁻¹.

**Conclusion:** Different ramp-incremental slopes directly influences the MRT, where it appears that MRT progressively becomes greater with steeper ramp slopes, until a certain level is reached (~25 W·min⁻¹) where there was no further lengthening of the MRT. From a practical perspective, less steep RI slopes will result in smaller adjustments in power output due to the shorter MRT. Thus, in RI slopes of 5 and 100 W·min⁻¹ the power output adjustment would be ~1 and ~6W, respectively.

**Abstracts were prepared by the authors and printed as submitted.**
Obstructive sleep apnea (OSA) is associated with persistent and progressive nighttime sympathetic nervous system (SNS) arousal strain in response to both hypoxia and apnea events. This repetitive strain of nighttime activation of the SNS may promote downstream adaptations possibly limiting muscle vascular reactivity.

**PURPOSE:** The purpose of this study was to examine the on-kinetic profile of muscle deoxygenation during sub-maximal walking in adults with OSA.

**METHODS:** Twelve adults with OSA (age = 40 ± 10 years, BMI = 29 ± 5 kg/m²) completed a 2-day passive stretch protocol. The 1st day of stretching consisted of a 10 min passive stretch protocol, followed by a single rest day and completion of the second stretch protocol on day 2. Five volunteers also completed a control visit in which they completed a single resting day without stretching. Following either stretch protocol, all subjects completed a 60 min constant-load exercise (30% VO₂max) in randomized order and with similar muscle fiber recruitment.

**RESULTS:** Following the second stretching protocol, there was a significant increase in VO₂max (p = 0.002) and reduced peak HR when compared to the control visit (R = 0.21, p = 0.02). Moreover, the inter-subject variability in peak VO₂ was reduced by the second stretching protocol when compared to the control visit (R = 0.10, p = 0.02). In addition, the duration of muscle deoxygenation was delayed following the second stretching protocol (p = 0.002).

**CONCLUSION:** Acute and chronic stretching protocols lead to a significant increase in VO₂max and reduced peak HR. Moreover, there was an improvement in the duration of muscle deoxygenation following the second stretching protocol.
Oxygen Utilization During The Contraction-relaxation Of Isometric Knee Extension Exercise

Camryn N. Webster, Shane M. Hammer, Andrew M. Alexander, Kaylin D. Didier, Lillie M. Huckaby, Thomas J. Barstow, FACSM. Kansas State University, Manhattan, KS.

(Purpose statement)

Purpose: Sufficiently high intramuscular pressures during contraction can lead to increased resistance to perfusive oxygen delivery and therefore increased fractional oxygen extraction in order to maintain muscle VO2. Near-infrared spectroscopy (NIRS) has been used to estimate fractional oxygen extraction via deoxygenated heme concentrations (deoxy-[heme]) and changes in microvascular hematocrit via changes in total heme concentrations (total-[heme]). We tested the hypotheses that during severe and extreme intensities 1) deoxy-[heme] would decrease during contraction compared to relaxation and 2) total-[heme] would be unchanged during the contraction-relaxation cycle.

Methods: Four subjects (2 men, 20 ± 3.3 yr s, 8.9 kg, 16: 10.2 cm) completed two isometric knee extension tests at failure at 0% (severe) and 0% (extreme) MVC. NIRS was placed on the right vastus lateralis to continuously measure deoxy-[heme] and total-[heme] during contraction and relaxation. Deoxy-[heme] and total-[heme] were averaged during the final 5 contraction-relaxation cycles and compared using paired t-tests.

Results: Average deoxy-[heme] during contraction and relaxation at 0% was 8 ± 31.8 um and 44.4 ± 31.6 um, respectively. Average deoxy-[heme] during contraction and relaxation at 70% was 41.9 ± 24.5 um and 40.1 ± 23.6 um, respectively. Average total-[heme] during contraction and relaxation at 40% was 127.0 ± 106.4 um and 124.2 ± 105.2 um, respectively. Average total-[heme] during contraction and relaxation at 70% was 116.0 ± 89.4 um and 115.0 ± 90.5 um, respectively. Although statistical significance was not detected (p=0.06), all four subjects demonstrated an increase in deoxy-[heme] at 70% MVC, but not at 40%.

Conclusions: These data suggest that the contraction-relaxation cycle may result in fluctuations in fractional oxygen extraction during extreme but not severe isometric exercise. Furthermore, the contraction-relaxation cycle does not appear to alter microvascular hematocrit.
**METHODS**

We used data from the 2015 Cancer Control Supplement of the National Health Interview Survey (NHIS) to assess adults’ past week participation in transportation and leisure walking for ≥10 minutes (n=33,672). NWI scores were linked to HHS data based on the block group of the respondent’s residence. NWI scores were categorized into national level quartiles. Logistic regression analyses were used to describe the association between NWI quartiles and transportation and leisure walking.

**RESULTS**

NWI quartiles exhibited significant linear and quadratic trends (p<0.05) with transportation walking and a significant linear trend (p<0.05) with leisure walking. Prevalence of transportation walking increased 23 percentage points and leisure walking increased 3 percentage points from least to most walkable communities (see Table).

**CONCLUSIONS**

NWI is a free and publicly available standardized tool to measure community walkability. Our findings suggest NWI is positively associated with transportation and leisure walking, although, the association was stronger for transportation walking.

**RESULTS**

Research-grade wearable accelerometers (RGA) are valuable tools to monitor steps. They can detect change in steps in free-living settings. This device can be employed for interventions designed to increase walking behavior.

**CONCLUSIONS:** These data show that RGA’s worn on the wrist and hip are sensitive in detecting change in steps in free living settings and both detect changes in steps in free-living settings. This device can be employed for interventions designed to increase walking behavior. Funded by: NIH: F31HL1282

**PURPOSE:** To determine the psychometrics of the walkability questionnaire, including their construct, validity, and reliability. **METHODS:** Using keywords “walkability,” “measurements,” “scales,” “NEWS,” etc., a comprehensive literature search was conducted, and identified questionnaires were reviewed and analyzed. **RESULTS:** Over 200 research publications were found and 24 questionnaires, including 14 different versions of Neighborhood Environment Walkability Scales (NEWS), focusing mostly on urban settings, were used for the final analysis. Ten key components were found in forming the construct of walkability, including residential density, land use mix-density, land use mix-access, street connectivity, walking/cycling facilities, aesthetics. Furthermore, 29b subcomponents were nested within the key components; e.g., “Residential Density” is consist of subcomponents of detached single-family residences, townhouses, apartments with different floors and so on. For validity, about 80% of the questionnaires have reported it. The most used validation method (about 70%) was the “contracted groups”, in which various levels of walkability and conditions neighborhoods were compared, with an effect size ranging from 0.8 to 3.8, if followed by the correlational (with objective environmental attributes) approach (20%), with the validity coefficients ranging from 0.45 to 0.87. Finally, intra-rater/test-retest reliability was often (about 5%) computed for the reliability of the questionnaire, with a range from 0.23 to 0.9. **CONCLUSION:** A set of 42 questionnaires with sound psychometric questionnaires has been developed to assess the walkability in urban settings and more tools to evaluate walkability in a small community, rural settings are urgently needed.

**Board #4 May 30 9:30 AM - 11:30 AM A Research-grade Accelerometer Is Sensitive In Detecting Step Changes In Free-living Settings**

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(No relevant relationships reported)

Research-grade wearable accelerometers (RGA) are valuable tools to monitor steps. Despite the broad appeal of such devices, there is limited evidence as to how well RGA detect change in steps in free-living settings. **PURPOSE:** To determine the sensitivity of RGA in detecting change in steps compared to changes in observed steps (criterion) in free-living settings. **METHODS:** Thirty-two participants were directly observed and video-recorded on three separate days for 2-hours each day in free-living settings. Participants wore commonly used hip- and wrist-worn RGA’s. Criterion steps were assessed using a research-grade accelerometer (RGA) in detecting change in steps compared to changes in directly observed steps. **RESULTS:** The same classification method was applied to the RGA’s and percent agreement between the two methods was then calculated.

**CONCLUSIONS:** These data show that RGA’s worn on the wrist and hip are sensitive in detecting change in steps in free-living settings and both detect changes in steps in free-living settings. This device can be employed for interventions designed to increase walking behavior.

**Board #5 May 30 9:30 AM - 11:30 AM Assessing Walkability By Questionnaires: Construct, Validity, And Reliability**

Jingyuan Zhu, Zezhao Chen, Weimo Zhu, FACSM. University of Illinois at Urbana-Champaign, Urbana, IL.

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(No relevant relationships reported)

**Board #6 May 30 9:30 AM - 11:30 AM The Effect of Environmental Changes on Hospital Employee Walking Duration**

Ryan Doyel, Joseph Dadabo, Prakash Jayabalan. Northwestern University Feinberg School of Medicine / Shirley Ryan AbilityLab, Chicago, IL.

(No relevant relationships reported)
Purpose: Few Canadian studies have examined whether associations between neighbourhood walkability and physical activity differ by gender. We estimated associations between perceived neighbourhood walkability and physical activity among urban Canadian men and women.

Methods: This study included cross-sectional survey data from the ‘Alberta’s Tomorrow Project’ (2008 n=901), in which the International Physical Activity Questionnaire captured weekly physical activity and the Neighbourhood Environment Walkability Scale abbreviated version (NEWS-A) captured self-reported neighbourhood characteristics. NEWS-A subscale scores were standardized and overall walkability scores computed. Sociodemographic characteristics were also captured. Covariate-adjusted generalized linear models estimated the associations between physical activity participation and minutes (transportation walking: TW, recreational walking: RW, moderate-intensity: MPA, and vigorous-intensity: VPA) and walkability scores. Odds ratios (ORs) were estimated for participation and beta coefficients (Bs) were estimated for minutes of physical activity, with 95% confidence intervals (95CIs).

Results: Overall walkability was positively associated with participation in TW (OR 1.05 $\pm$ 1.01), RW (OR 1.02; 95CI 1.01, 1.03), MPA (OR 1.02; 95CI 1.01, 1.03) and VPA (OR 1.02; 95CI 1.01, 1.03) and minutes of TW (B 1.16 $\pm$ 0.91). In men, positive associations were found between lack of parking and MPA participation (OR 1.16 $\pm$ 1.06) and residential density and TW minutes (B 1.2 $\pm$ 0.8). In women, RW participation was associated with land use mix diversity (OR 1.11; $\beta$ 1.14) and infrastructure and safety for walking (OR 1.15 $\beta$ 1.09) and MPA participation associated with traffic safety (OR 0.91; 95CI 0.86, 0.96). Notably, residential density was negatively associated with RW minutes among women only (B -3.8 $\beta$ -0.9). 

Conclusions: Neighbourhood walkability is associated with participation and time spent in different physical activities for men and women. Modifying perceptions, possibly via improving neighbourhood urban design, has the potential to increase physical activity in Canadian adults.

Vision Zero is defined by a systems perspective to equitably reduce fatalities and serious injuries from road traffic crashes to zero. Recently, United States’ (US) cities began developing Vision Zero plans to address safety for all road users, including pedestrians/bicyclists. PURPOSE: We described the content of these plans to identify areas for improvement and facilitate creation of new plans. METHODS: We identified, collected, and analyzed 14 US Vision Zero plans published from 2014-2017. An extensive qa nitive and qa itative coding tool was developed to identify elements of high qa ity plans. RESULTS: In total, 13 municipal and 1 county plan were abstracted. Nine of 14 ans described public participation in plan development, with thol ding public meetings, 11 ing surveys, 11 ing map mark-ups, and 1 using social media. Most (n=13) plans had a vision statement and included goals/ objectives to achieve the vision (n=12), but few included timelines to accomplish the goals (n=3). The goals to reach zero fatalities/serious injuries targeted the year 2020 (n=1), 2025 (n=3), 2028 (n=1), and 2030 (n=8), while 3 plans did not set a target date. All plans described the number of local-area crashes, but only half (n=7) reported the crash type, including involvement of a pedestrian/bicyclist. Plans included policy (11 traffic calming, 10 walking/bicycling to school, 9 Complete Streets, 5 no right turn on red), engineering (9 low zones, 3 shared space for all road users), and educational (12 school education on pedestrian/bicyclist safety, 11 mass media/ educational campaign on safety/speeding, 2 crosswalk ambassadors) strategies to address safety of pedestrians/bicyclists. Three of 14 ans proposed funding strategies for their implementation activities. Nine plans mentioned an evaluation plan for measuring progress, but most evaluation descriptions were brief. CONCLUSION: The assessment of US Vision Zero plans indicates that improvements could be made by involving the public more deliberately in plan development, including a clearer vision statement with connection to a target goal date and evaluation plan, and identifying funding sources for implementation activities. A number of target strategies could improve safety for pedestrians/bicyclists and should eventually be evaluated for their impacts.

C-10 Thematic Poster - The Spine and Spinal Cord Injury

Thursday, May 30, 2019, 9:30 AM - 11:30 AM
Room: CC-104B

Muscle atrophy and neuromuscular impairment are consequenc es of spinal cord injury (SCI) that impede quality of life and functional recovery. PURPOSE: To examine time course changes in muscle fiber type distribution, fiber cross-sectional area (fCSA), and other histologic characteristics of muscle pathology occurring in rats in response to moderate-severe contusion SCI. METHODS: Twenty-four 4 month old male Sprague-Dawley rats received SHAM surgery or T9 amnesticity plus moderate-severe (28 ki lodyne) contusion SCI by a computer-guided impactor. Body weight and Basso-Beattie-Bresnahan (BBB) hindlimb locomotor rating scores were measured weekly. Animals were euthanized and soleus were harvested at 2-weeks, 1-month, 2-months, and 3-months post-surgery. Soleus fiber-type distribution, ICSA, and muscle-nerve bundle morphology were assessed by immunofluorescent staining, imaging used an epifluorescent microscope, and quantified with semi-automatic muscle analysis using segmentation of histology (SMASH). RESULTS: At 1-week post-surgery, SCI animals exhibited near-complete hindlimb paralysis (indicated by BBB scores $\sim$3), with minimal improvement in voluntary hindlimb locomotor function thereafter. Body weight, soleus mass, and median ICSA were significantly lower in SCI vs SHAM animals (p<0.01 at all timepoints). A slow-to-fast fiber-type shift was observed in SCI animals, with a progressive $\sim$20% decrease in the number of type I fibers, $\sim$8% increase in type Ila fibers, and $\sim$5% increase in hybrid type I/IIa fibers at each consecutive timepoint, along with the emergence of unstained type IIx/b muscle fibers ($\sim$30% of total) at 3-months. In addition, muscle fiber splitting was present in SCI animals at 2-months, as well as reduced

Abstracts were prepared by the authors and printed as submitted.
neuromatifation staining in SCI muscle-nerve bundles. Furthermore, evidence of growth related remodeling occurred in SHAM muscles from increased centrally nucleated fibers across all time points, but not in SCI.

CONCLUSION: Deterioration in motor ability accompanying SCI produced muscle atrophy and progressive impairments in muscle oxidative capacity that may have resulted from repetitive denervation-reinnervation cycles. These factors may have contributed to muscle pathology resulting in limited capacity for muscle growth and remodeling.

1170 Board #2 May 30 9:30 AM - 11:30 AM
Does Reduced Blood Flow Affect the Rate of Muscle Loss in Rats Post Spinal Cord Injury

(Music related relationships reported)

Muscle atrophy is a major sequela occurring after spinal cord injury (SCI) that results from disuse. Additionally, other secondary complications of SCI (e.g., alterations in muscle blood flow) may contribute to muscle loss. PURPOSE: To determine the time course of muscle blood flow changes in relation to muscle atrophy in a rodent severe contusion SCI model. METHODS: Sixty-three 4-months-old (skelletally-mature) male Sprague-Dawley rats received SHAM surgery (T9 laminectomy) or severe (28 kdyne) contusion surgery using a computer-guided impactor. At 1-, 2-, and 4-weeks (wk) post-surgery, an intravascular catheter was implanted into the tail vein of SHAM and SCI animals. Colored microspheres (18 μm diameter) were then infused into the circulation, allowing for the measurement of regional blood flow (mL/min g tissue mass). Subsequent, the animals were euthanized and the mass of the dissected right hindlimb muscles and plantaris was taken. Concentrations of the colored microspheres within each muscle were determined via spectrophotometry, following chemical digestion of the muscle. Muscle blood flow calculations were then averaged across the contralateral hindlimbs for the aforementioned muscles. SCI vs SHAM comparisons were made at each time point using independent samples t-test and Pearson’s correlation coefficients. RESULTS: SCI animals exhibited 23% lower soleus mass, 17% lower gastrocnemius mass, and 16% lower plantaris mass vs SHAM, at all time points (p<0.001). Soleus and gastrocnemius blood flow (corrected for soleus mass, 17-27% lower gastrocnemius mass, and 16-29% lower plantaris mass vs SHAM, at all time points). Additionally, a positive relationship between soleus blood flow and muscle mass, 17-27% lower gastrocnemius mass, and 16-29% lower plantaris mass vs SHAM, at all time points (p<0.001). Soleus and gastrocnemius blood flow (corrected for soleus mass, 17-27% lower gastrocnemius mass, and 16-29% lower plantaris mass vs SHAM, at all time points) were also reduced at 1-wk only. Furthermore, a positive relationship was found between soleus blood flow (corrected for muscle mass) and ATP concentrations at 1-wk (r=0.68, p<0.01). No significant alterations in plantaris blood flow were identified at any time point. CONCLUSION: Hindlimb muscle atrophy and reduced muscle blood flow occurred within 1-wk of severe contusion SCI. Thereafter, muscle blood renormalized in comparison with SHAM animals. Further research is needed to determine whether the reductions in muscle blood flow occurring after SCI contribute to muscle loss and/or whether prevention of blood flow deficits preserves muscle mass.

1171 Board #3 May 30 9:30 AM - 11:30 AM
Effects of Activity-Based Rehabilitation on Cancellous Bone Loss Following Contusion Spinal Cord Injury in Rats

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(Muscle related relationships reported)

Severe cancellous bone loss occurs after spinal cord injury (SCI), which increases fracture risk. Bodyweight-supported treadmill training (TM) and passive Cycle training are activity-based rehabilitation therapies that improve neuromuscular plasticity after SCI. However, the skeletal treadmill adaptations to these therapies remain unknown.

PURPOSE: Determine whether TM or Cycle training alter the rate of cancellous bone loss in a rodent severe contusion SCI model. METHODS: 16 wk old male Sprague-Dawley rats received: 1) SHAM surgery (T9 laminectomy) (n = 9), 2) T9 laminectomy plus severe contusion SCI (n = 8), 3) SCI+TM (n = 18), or 4) SCI+Cycle (n = 7). TM and Cycle were initiated 1-wk post-SCI and consisted of 20 min bouts/day for 3 wks. For TM, 8% bodyweight support was provided and the paralyzed hindlimbs were manually positioned into plantar stepping (3 m/ min, increasing 0.1 m/min/day). For Cycle, the paralyzed hindlimbs were secured to a pedal on a motor-driven bike and moved passively through a cycling motion that mimicked normal gait patterning (12 rotations/min). Distal femur cancellous bone was quantified before surgery (baseline), and at 2- and 4-wk post-surgery via in vivo microCT. Outcomes are reported as percent change from baseline. RESULTS: Across all groups, cancellous bone volume (cBV/TV) was reduced 52-75% at 2-wk and 54-84% at 4-wk, compared with baseline (p<0.01). cBV/TV loss was 22% greater in SCI at 2-wk and 29% greater at 4-wk vs SHAM (p<0.01), characterized by 28% lower trabecular number (Tb.N) and 9% higher trabecular separation (Tb.Sp) (p<0.01) and a higher trabecular pattern factor (Tb.Pf) (p=0.05) that indicates a less connected trabecular network. At 2-wk, neither TM nor Cycle prevented SCI-induced bone deficits. However, at 4-wk SCI+Cycle displayed 25-30% higher cBV/TV, 23-24% higher trabecular thickness (Tb.Th), 17-22% higher Tb.N, and lower Tb.Sp vs SCI and SHAM (p<0.01). Ultimately, no differences in cancellous bone outcomes were present between SCI+Cycle and SHAM at 4-wk, except for 16% higher Tb.Sp in SCI+Cycle (p=0.02). cBV/TV data indicate Cycle better attenuated cancellous bone loss in rodents after severe SCI. The higher cBV/TV and Tb.Th in SCI+Cycle at 4-wk also suggests that this modality stimulated bone formation; although, further investigation is needed.

1172 Board #4 May 30 9:30 AM - 11:30 AM
Trabecular Bone Integrity at the Proximal Tibia Following a Contusion Spinal Cord Injury in Rats
Aaron S. Gomez, Christine F. Conover, Ean G. Phillips, Taylor E. Bassett, Micah Flores, Russell D. Wnek, Joshua F. Yarrow. Malcom Randall VA Medical Center, Gainesville, FL.

(Muscle related relationships reported)

Bone loss following spinal cord injury (SCI) is a major contributor to bone fracture risk, particularly at the proximal tibia. PURPOSE: To determine longitudinal changes in trabecular bone integrity at the proximal tibia in a rodent contusion SCI model. METHODS: 16 week old male Sprague-Dawley rats (n = 28) were randomized to receive no surgery (Non-Surgical Controls), T9 laminectomy (SHAM), or T9 laminectomy plus severe (28 kdyne) contusion surgery using a computer-guided impactor and were euthanized 2- or 4-wks (w) post-surgery. Hindlimb locomotion was assessed weekly using the BBB locomotor scale and trabecular bone integrity at the proximal tibia was assessed using in vivo microCT. Comparisons were made using one-way ANOVAs and Tukey’s honest significant difference (HSD) tests when appropriate. RESULTS: SCI animals exhibited significant losses in hindlimb locomotor function (BBB score < 0.21 scale; p<0.01 vs SHAM at all time points). Percent cancellous bone volume (cBV/TV) was 32% lower at 2-w and 42% lower at 4-w in SCI vs SHAM animals (p<0.01). This bone loss was exacerbated by progressively lower trabecular thickness (Tb.Th) and trabecular number (Tb.N) at 2- and 4-w (p<0.01) and higher trabecular separation (Tb.Sp) (p<0.01 at 4-w only). No differences in trabecular pattern factor (Tb.Pf), an inverse indicator of trabecular network connectedness, were present at 1-w. However, Tb.Sp was higher at 2- and 4-w in SCI vs SHAM (p<0.01). Structure model index (SMI) was highest at 2- and 4-w in SCI vs SHAM (p<0.01), indicating transition from rod- to plate-shaped trabecular spicules. Similarly, in SCI animals, cBV/TV was 48-75% lower, Tb.Th was 15-27% lower, Tb.N was 36-62% lower across the 4-w period in comparison with Non-Surgical Controls (p<0.01 for all), while Tb.Sp was progressively higher in SCI animals (p=0.09 for 2- and 4-w). Higher Tb.Sp and SMI were also found in SCI vs Non-Surgical Controls at all time points (p<0.05). Only cBV/TV was lower in SHAM vs Non-Surgical Controls across the 4-w period (p<0.01). CONCLUSION: Our findings indicate that trabecular bone integrity at the proximal tibia was significantly impaired in rats following a severe contusion SCI due to both bone loss and diminished bone qty. As such, our rodent model may be useful to examine effectiveness of strategies intended to prevent SCI-induced bone loss.
PT-6°, PT-9°, PT-18°, and T. IR for each group were similar following the 16 week intervention. **CONCLUSION:** Mechanical stress induced via RT combined with TRT maximizes enhancements of muscle quality when compared to TRT interventions alone in men with complete SCI. Our study shows that TRT-RT increases both muscle size, strength, and also improves muscle contractile properties.

### Intervertebral Disc And Vertebral Health In Long-term Runners

**Ulríke H. Mitchell, Robert E. Larson, Jennifer A. Bowden, Bruce Bailey. Brigham Young University, Provo, UT. (Sponsor: Allen Parcell, FACSM)**

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(No relevant relationships reported)

Intervertebral disc (IVD) and bone health is strongly associated with nutrient flow and loading. Running places repeated substantial axial forces on the lower back, which likely influence its tissue health. Two theories exist: 1) cyclic loading is correlated to improved IVD and vertebral health parameters, because it brings about hypertrophic changes that make the tissue stronger, and 2) mechanical overload produces localized trauma and tissue damage, which outpaces the tissue’s ability to repair itself and leads to accelerated degradation. Both theories are based on sound research, but the implications contradict. **PURPOSE:** To determine if long-term runners exhibit different IVD and bone health parameters compared to matched sedentary controls. **METHODS:** 10 male runners with an average of 2.5 ± 2 years of running (average £80 km/week) and 5 age and sex-matched sedentary controls received Magnetic Resonance Imaging (MRI) and DXA scans. MRI T1 and T2 imaging techniques were used to obtain morphological characteristics, including the level of disc degeneration (Fhrmann grading system). Diffusion-weighted imaging was used to calculate the apparent diffusion coefficient (ADC). This research is the first to determine how IMF affects disc morphology, and how it relates to bone density. **RESULTS:** The sample size exceeds that used by previous studies, thus allowing for claims of uniqueness and causality. The runners had a statistically significant difference in height and weight, but this was not significant in the MRI scans. The runners exhibited a higher number of degenerative changes, which was of a consequence. The runners had a statistically significant difference in height and weight, but this was not significant in the MRI scans. The runners exhibited a higher number of degenerative changes, which was of a consequence.

### Thorax and Spine Abnormalities in Health Sciences Students

**Sergio Marquez-Gamio, Karla S. Vera-Delgado, Cipriana Caudillo-Cisneros, Fernando Sotelo-Barroso, Montserrat G. Vera-Delgado. Universidad de Guanajuato, León, Mexico.**

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(No relevant relationships reported)

**PURPOSE:** To evaluate trunk and thorax alterations prevalence in health sciences students. **METHODS:** 29 recently admitted students to the Health Sciences Division of the University of Guanajuato, in Central Mexico, were clinically assessed for scapular girdle, spine alignment and thorax deformities. **RESULTS:** In 208 women, and 85 men no previous diagnostic, symptomatology nor orthosis use were detected. Two of the participants had thorax asymmetry, corresponding to 0.9%. By contrast, 1.8% (4) presented dorsal hump. Also, the scapular girdle exhibited higher alterations indexes. For example, the shoulder blades were asymmetric in 10.2%, and 3.1% (9) for the right and left sides, respectively. Shoulders descended occurred in 23.3%, 11.13, and 0.7% (2) (right, left, and both, in order such). Lumbar hump was observed in 1.8% of students. No scoliosis was detected.

**CONCLUSIONS:** The structural problems detected involved the upper body and are quite important due to its implications for low back pain development. In fact, they can progressively evolve to cause nerve compression and its derived musculoskeletal conditions (MEC). In their practice, health professionals are exposed to risk behaviors for MEC, between others long standing periods, abnormal postures, patient’s mobilization, etc. The information obtained can support new ways to train and physically fit the health sciences students as preventive measures for MEC development.

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**C-11 Free Communication/Slide - Mental Health, Affect and Pain**

**Thursday, May 30, 2019, 9:30 AM - 11:30 AM**

**Room: CC-306**

**Board #6 May 30 9:30 AM - 11:30 AM**

**Intervertebral Disc And Vertebral Health In Long-term Runners**

**Ulríke H. Mitchell, Robert E. Larson, Jennifer A. Bowden, Bruce Bailey. Brigham Young University, Provo, UT. (Sponsor: Allen Parcell, FACSM)**

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(No relevant relationships reported)

Evidence has supported positive effects of acute aerobic exercise and exercise training among adults with analogue and clinical Generalized Anxiety Disorder (GAD). However, the effects of acute resistance exercise (RE) are untested. **PURPOSE:** This study investigated the effects of acute RE compared to quiet rest (QR), on worry among young adults with analogue GAD (AGAD) and otherwise healthy young adults (OH). **METHODS:** Twenty-three young adults (25.1 ± 3.2 yrs; 13 female, 8 male) were randomly assigned to AGAD status (Psychiatric Diagnostic Screening Questionnaire GAD subscale score ≥6, and Penn State Worry Questionnaire (PSWQ) ≥45) to acute RE or 30-min QR. RE consisted of two of 8-12 repetitions of eight exercises performed at moderate intensity in a laboratory, supervised by a researcher. Appropriate resistance for each exercise was determined following three weekly familiarization sessions prior to the acute RE. Worry was assessed at baseline and pre-post condition with the PSWQ. Two AGAD status X two Condition X two Time RM-ANOVA examined differences between RE and QR. Significant interactions were decomposed with simple effects analysis. Hedges’ g effect sizes quantified magnitude of change. Potential moderation by sex, depression status, and sleep quality was also explored. **RESULTS:** As expected, baseline worry was significantly greater among AGAD participants (p < 0.001). There were no baseline differences between conditions. The three-way interaction for worry was statistically significant (F(1,19) = 18.50, p < 0.01). Decomposition of the interaction showed a significant reduction in worry from pre- to post-RE for AGAD (mean difference = -2.86, p < 0.04), and a significant increase in worry from pre- to post-QR for AGAD (mean difference = +4.17, p < 0.01). Compared to QR, RE resulted in a large magnitude improvement (d = 0.9) among AGAD participants. Among OH participants, there were no significant changes in worry in either condition. Worry response to RE was not significantly moderated by sex, depression status, or sleep quality (all p > 0.05). **Conclusion:** Preliminary findings support both positive effects of acute RE on worry, the hallmark symptom of GAD, and the need for future investigations of the acute and chronic effects of RE among analogue GAD.

**C-11 May 30 9:30 AM - 11:30 AM**

**The Effectiveness of Acute Resistance Exercise Training among Young Adults with Analogue Generalized Anxiety Disorder**

**Brett R. Gordon, Mark Lyons, Matthew P. Herring. University of Limerick, Limerick, Ireland.**

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(No relevant relationships reported)

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**Board #7 May 30 9:30 AM - 11:30 AM**

**Thorax and Spine Abnormalities in Health Sciences Students**

**Sergio Marquez-Gamio, Karla S. Vera-Delgado, Cipriana Caudillo-Cisneros, Fernando Sotelo-Barroso, Montserrat G. Vera-Delgado. Universidad de Guanajuato, León, Mexico.**

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(No relevant relationships reported)

**PURPOSE:** To evaluate trunk and thorax alterations prevalence in health sciences students. **METHODS:** 29 recently admitted students to the Health Sciences Division of the University of Guanajuato, in Central Mexico, were clinically assessed for scapular girdle, spine alignment and thorax deformities. **RESULTS:** In 208 women, and 85 men no previous diagnostic, symptomatology nor orthosis use were detected. Two of the participants had thorax asymmetry, corresponding to 0.7%. By contrast, 15.4% (41) presented dorsal hump. Also, the scapular girdle exhibited higher alterations indexes. For example, the shoulder blades were asymmetric in 10.2%, and 3.1% (9) for the right and left sides, respectively. Shoulders descended occurred in 23.3%, 11.13, and 0.7% (2) (right, left, and both, in order such). Lumbar hump was observed in 1.8% of students. No scoliosis was detected.

**CONCLUSIONS:** The structural problems detected involved the upper body and are quite important due to its implications for low back pain development. In fact, they can progressively evolve to cause nerve compression and its derived musculoskeletal conditions (MEC). In their practice, health professionals are exposed to risk behaviors for MEC, between others long standing periods, abnormal postures, patient’s mobilization, etc. The information obtained can support new ways to train and physically fit the health sciences students as preventive measures for MEC development.
RESULTS: At pre-training, state anxiety was significantly increased ($t_{17} = 2.34$, $p < 0.032$) and worry engagement was significantly decreased ($t_{17} = 3.14$, $p = 0.006$) following a single mood state- to-mood state reductions were found for worry engagement ($d = 0.37$) and worry ($d = 0.18$) and a small-to-medium magnitude increase was found for state anxiety ($d = 0.36$). No statistically significant changes were found for state anxiety, worry, or worry engagement following ST (all $p > 0.23$); however, small magnitude reductions were found for state anxiety ($d = 0.11$), worry ($d = 0.28$), and worry engagement ($d = 0.21$). Following SI T, a statistically non-significant small magnitude attenuation ($d = 0.14$) of state anxiety response to a single sprint was found.

CONCLUSION: Findings provide proof of principle that even a single high-intensity sprint can acutely perturb state anxiety and improve worry. Short-term SI T may elicit significant small magnitude attenuation ($d = 0.26$), and worry engagement ($d = 0.21$). Following SI T, a statistically non-significant small magnitude reduction was found for state anxiety ($d = 0.11$), worry ($d = 0.28$), and worry engagement ($d = 0.21$). Following SI T, a statistically non-significant small magnitude attenuation ($d = 0.14$) of state anxiety response to a single sprint was found.

1179
May 30 10:00 AM - 10:15 AM
The Effects of a Physical Activity Program on Mood States in College Students
Lisa D. Powell, Erin J. Reifsteck, Pam K. Brown, Diane L. Gill. FACS M. 1 University of North Carolina, Greensboro, NC. 2 University of North Carolina at Greensboro, Greensboro, NC. Email: lisa.powell@ncu.edu (No relevant relationships reported)

College students are at risk for adverse mental and physical health. Physical activity (PA) can reduce risks and promote positive mental health; however, less than half (33%) of college students meet the ACSM recommendations for PA (American College Health Association, 2017, reporting barriers such as lack of motivation, energy and time. Evidence-based, person-centered PA programs can overcome such barriers to enhance mood states and overall health.

PURPOSE: To implement and evaluate a PA program (#crubwell) designed to enhance mood states and promote continued PA in college students.

METHODS: College students (n=10) participated in #crubwell for 5 wks. Subjects completed pre and post measures of perceived health, PA (Godin), intrinsic motivation (IMI), and mood states (POMS2) and a program evaluation. Additionally, participants recorded Feeling Scale (FS) and Felt Arousal Scale (FAS) ratings before, during and after weekly PA session. RESULTS: Participants experienced significant (p<0.05) increases in positive feelings (FS) and energy levels (FAS) during each of the #crubwell PA sessions. Intrinsic motivation increased from pre (M=34.8) to post (M=37.4), but the difference was not significant (t=0.9, p=0.37).

CONCLUSION: PA has potential to improve mood states in college students; however, future research is needed to better understand the mechanisms of effect. Findings provide proof of principle that even a single high-intensity sprint can acutely perturb state anxiety and improve worry. Short-term SI T may elicit significant small magnitude attenuation ($d = 0.26$), and worry engagement ($d = 0.21$). Following SI T, a statistically non-significant small magnitude reduction was found for state anxiety ($d = 0.11$), worry ($d = 0.28$), and worry engagement ($d = 0.21$). Following SI T, a statistically non-significant small magnitude attenuation ($d = 0.14$) of state anxiety response to a single sprint was found.

1180
May 30 10:15 AM - 10:30 AM
The Relationship Between Self-reported Lifestyle Habits and Depressive Symptoms in Older Adults ‘At Risk’ for Dementia
Bonnie A. Tran, Loren Mowszowcki, Haley M. LaMonica, Sharon L. Naismith, Shantel L. Duffy. The University of Sydney, Sydney, Australia. Email: bonnie.tran@sydney.edu.au (No relevant relationships reported)

PURPOSE: Depressive symptoms are now well-established as an independent risk factor for dementia, however the association between health-related lifestyle habits and depressive symptom severity remains unclear. As such, this study aimed to investigate the relationship between self-reported physical activity levels, sleep behaviour and diet quality, and self-reported depressive symptoms in older adults ‘at risk’ for dementia.

METHODS: Participants aged ≥50 years were recruited from the Healthy Brain Ageing Clinic at the Brain and Mind Centre, The University of Sydney, and underwent comprehensive psychiatric, medical and neuropsychological assessments. Self-reported symptoms of depression were assessed via the 18 item Geriatric Depression Scale. Participants completed questionnaires to quantify volume of physical activity, and to characterise sleep behaviour and diet quality. RESULTS: A total of 90 participants (mean age=74.9 ± 4.3) with subjective cognitive or objective cognitive impairment were recruited. Depressive symptoms were correlated with somnolence ($r_{17} = 0.32$, $p = 0.001$), greater symptoms of insomnia ($r_{17} = 0.29$, $p = 0.010$), larger meal portion size ($r_{17} = 0.23$, $p = 0.029$), and a lower intake of protective foods ($r_{17} = 0.35$, $p < 0.05$).

Conclusion: Active older women were able to discriminate between different prescription instructions designed to produce low, moderate and hard exertion. Interestingly, the spontaneous and self-selected intensities elicited similar walking speeds as the prescribed moderate exertion session. Public health strategies may use simple exertional cues to help guide individuals in producing moderate intensity exercise, which may lead to health-fitness benefits. The pleasurable feeling associated with this intensity may in turn improve exercise adherence.
but not yet studied in U.S. Navy Explosive Ordnance Disposal (EOD) Technicians. Characterizing EOD and understanding these interactions is a key aspect of managing warfighter health and performance.

**PURPOSE:** The primary purpose is to assess bodily pain and medication (med) use in EOD Technicians. The secondary purpose is to evaluate associations between bodily pain and biobehavioral correlates, such as depression, anxiety, and posttraumatic stress disorder (PTSD).

**METHODS:** Eighty-four EOD Technicians self-reported bodily pain (0-10 scale), pain depression, rumination, and symptoms of depression, anxiety, and PTSD. One-way analysis of variance evaluated the relationship between med type and bodily pain. Pearson product-moment correlations examined associations between pain and biobehavioral measures. **RESULTS:** Self-reported bodily pain: none = 79, mild = 6, moderate = 22.2%, severe = 1.6%, x̄ = 10.4 for bodily pain. Of those reporting pain, 35% were taking meds, which represents 58% of all participants. Higher pain was reported in those taking prescription meds compared to over-the-counter meds or no meds [F(1, 82) = 2.2, p < .01]. Positive relationships were found between pain and depression (r = .34, anxiety (r = .33), and PTSD (r = .35) symptoms (p < .01). **CONCLUSION:** Most EOD Technicians reported some level of pain contrasted with roughly half the general population (5%). Compared to U.S. Marines, pain ratings were similar; however, EOD Technicians reported over twice the prevalence of pain med use. Additionally, findings indicate that EOD Technicians using prescription meds reported higher pain. With respect to biobehavioral correlates, the relationship between pain and depression in EOD Technicians was similar to reports in Marines. Combined with the associations observed between pain, anxiety, and PTSD, this reinforces the premise that pain and behavioral health are interrelated. These findings may be useful for clinicians when evaluating military members for potential comorbidities, particularly following trauma when symptoms may be most severe.

1183 May 30 11:00 AM - 11:15 AM Pain Sensitivity And Psychological Variables Affect Delayed Onset Muscle Soreness (DOMS) Einat Kodesh, Ahmad Sirkis-Gork, Simone Shamay-Tsoory, Tsipora Mankovsky-Arnold, Iris Weissman-Fogel, University of Haifa, Haifa, Israel. (Sponsor: Barahtt Falk, FACSM)

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No relevant relationships reported

Delayed onset muscle soreness (DOMS) is an acute muscle pain condition occurring after eccentric muscular activity in some but not all people. Physiological and psychological factors may affect DOMS. **PURPOSE:** To investigate whether individual pain sensitivity and psychological variables levels predict DOMS. **METHODS:** Thirty-two participants completed pain-related psychological questionnaire (SfQ: 10-20 items) and QST and psychological variables on DOMS intensity. **RESULTS:** Out of the 32 participants, 10% of those who had higher pain sensitivity at baseline and the intensity of DOMS. **CONCLUSIONS:** The endogenous ability to regulate pain has a significant impact on pain development in those developing DOMS and those who did not develop DOMS. **PURPOSE:** To examine changes in pain and fatigue in response to acute bouts of resistance exercise across 16 wks of RET among GV with CMP. It was hypothesized that perceived pain and fatigue would decrease after each training session and that the magnitude of this change would increase over the course of the intervention. **METHODS:** Twenty-two veterans who met inclusion criteria (≥ 50 yrs of age; ≥ 8 yrs of pain sympoms; and symptoms criteria for widespread CMP (n=22; 32 yrs) completed 16wks of RET. Training intensity started at 25% and 35% of estimated one-maximum (1RM) and systematically progressed over the course of the intervention. Pre and post exercise pain and fatigue scores on a 0-100 visual analog scale were examined for the first RET session of each training wk. Data gathered during 1RM testing (baseline, mid-program, and end-program) were excluded, resulting in analysis of 13 training wks. Hypotheses were tested with separate 2 time (pre, post) x 13 (program length: wk 1-13) repeated measures ANOVA models. **RESULTS:** Average pre-exercise pain and fatigue were 27.8 ± 2 and 21.8 ± 3, respectively. Pre-exercise trend line slopes were 0.044 ± 0.02 for pain and fatigue, respectively. Significant interaction effects for pain, F = 2.8, p = 0.006, partial eta square red = 0.12, and fatigue, F = 2.25, p = 0.03, partial eta square red = 0.10, models were found. Relative to pre-exercise, post-exercise scores were lower following earlier training sessions (e.g., wks 1-3) and higher following later training sessions (e.g., wks 10-13). **CONCLUSION:** Contrary to our hypothesis, pre-exercise pain and fatigue appeared to increase across wks 1-13, which could be related to the progression of exercise intensity over the course of the program. However, the stability of the pre-exercise scores across wks 1-13 suggests that weekly pre-exercise pain and fatigue were not exacerbated by acute responses to RET.

Project supported by Dept. of Veterans Affairs grant 1IO1-CX000383. Jacob Lindheimer was supported by Dept. of Veterans Affairs grant I2K-CX001679.

C-12 Free Communication/Slide - Older Adults Thursday, May 30, 2019, 9:30 AM - 11:30 AM Room: CC-202C

1185 Chair: Melissa A. Whidden, FACSM. West Chester University, West Chester, PA.

(no relevant relationships reported)


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No relevant relationships reported

**Purpose:** In this case study we characterize the physiological profile of an elite 70-year old endurance runner who ran 2:55:18 at the Scotiabank Toronto Marathon on Oct 21, 2018b, breaking his own American record for a 70-year old male by over two-minutes. **Methods:** The athlete underwent a familiarization visit, health screening, and performance-testing. During the screening visit, a resting electrocardiogram and a three-hour Septuagenarian Marathoner (3HM) was conducted. VO2Max was 46.9 mL/kg/min (max heart rate: 191±9 bpm, average age-predicted HRmax: 184±17), and lactate threshold (LT: blood draws during running via venous catheter). Results: Height was 160 cm, weight was 70 kg, and he exhibited exceptional cardiometabolic health for his age (body fat: 19.8% , blood pressure: 122/79 mmHg, blood glucose: 89 mg/dL, total cholesterol: 137 mg/dL, LDL: 68 mg/dL, and triglycerides: 135 mg/dL). The only medication he reported taking was daily low-dose aspirin. His VO2max was 7.3 mL/kg/min (max heart rate: 161±11% age-predicted HRmax, RPE 19 of 20). This VO2max is exceptional for a 70-year old, but lower than what is expected for a performance-matched younger runner. He reached his LT at ~14 km/hr, which corresponds to a VO2 of 40 mL/hr/kg or 93.8% of his VO2max, and a heart rate of 170 HRmax. Near VO2peak levels of oxygen consumption were reached during the final stage of RET (16 km/hr, 60 mL/kg/min and blood lactate also plateaued at 14 mmol/L). **Conclusion:** Running a marathon in 2:55 is an exceptional performance for an elite younger runner.
### Purpose: Research in older adults suggests that percent body fat is more strongly associated with physical function compared to lean mass when examining relationships between body composition and functional performance. Poorer physical function has been associated with increased risk for disability and loss of independence in older women; however, the component of body composition most strongly associated with physical function in middle-aged females is incompletely characterized. Poorer physical function earlier in the lifespan may predispose people to decreased quality of life in older age. The purpose of this study was to examine the strength of the associations between lean mass and percent fat on objectively measured physical performance in middle-aged females.

#### Methods:
Eighty females (ages 28 ± 10 yr) were assessed for body composition (lean mass, percent fat) via dual-energy x-ray absorptiometry, physical activity and sedentary time via accelerometer (steps per day, time spent sitting), and physical function via timed Up-And-Go, 30-Second Chair Stand, Transfer Task, Six-Minute Walk, and Lift and Carry.

#### Results:
Measures of lean mass (total lean mass, lean mass index) were not related to any measures of physical function (all p > 0.05; while percent fat was related to Timed Up-And-Go (r = 0.32), 30-Second Chair Stand (r = 0.37; Transfer Task (r = 0.53), and Six-Minute Walk (r = -0.48) performance (all p ≤ 0.05) but not Lift and Carry performance (r = -0.1; p > 0.05). Hierarchical linear regression analyses revealed: (1) age, steps per day, and percent fat were related to Transfer Task, 30-Second Chair Stand, and Six-Minute Walk performance, explaining 18%, 25%, and 24% of the variance, respectively (all p ≤ 0.05); (2) age, sedentary minutes per day, and percent fat were related to Timed Up-And-Go, explaining 18% of the variance, p ≤ 0.01; (3) age, and average steps per day, but not percent fat, were associated with Lift and Carry performance, explaining 11% of the variance.

#### Conclusion:
In middle-aged women, percent fat was more strongly associated with physical function performance compared to total mass, lean mass, or lean mass index. This suggests that reducing percent fat via intervention may be an effective method for improving functional performance among women in this age group.

### Lower-Extremity Torque Capacity and Physical Function in Mobility-Limited Older Adults

Gregory J. Grosicki¹, Davis A. England², Lori Lyn Price¹, Megumi Iwai³, Makoto Kashiwai², Kieran F. Reid², Roger A. Fielding², Georgia Southern University, Savannah, GA. ¹Tufts University, Boston, MA. ²Tufts Medical Center, Boston, MA. ³Astellas Pharma Inc, Osaka, Japan.

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(No relevant relationships reported)

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(No relevant relationships reported)
demands of real-life tasks, future studies are encouraged to consider the combined interaction of distinct skeletal muscle fascicles to overall functional ability in older adults.

Supported by a grant from Astellas Pharma Inc.

1191 May 30 10:45 AM - 11:00 AM
Muscularity Of Non Sedentary Elderly Over Three Decades Trends

Rafael Benito Mancini1, João Pedro Da Silva Junior2, Carolina Gonzalez Beltran1, Tatiana Kosimenko Ferrari2, Timoteo Leandro Araujo1, Sandra Mahecha Matsudo3, Victor Keihan Rodrigues Matsudo1, José da Silva Guedes1. 1Center of Studies of the Physical Fitness Research Laboratory from São Caetano do Sul (CEPACIFIS), São Caetano do Sul - SP, Brazil. 2Universidade de São Paulo- USP, São Paulo, Brazil. 3Faculdades Metropolitanas Unidas - UNIFMU, São Paulo - SP, Brazil. 4School of Medicine - U:niversidade Mayor, Santiago, Chile. 5Santa Casa, São Paulo - SP, Brazil.

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(No relevant relationships reported)

Purpose: To describe and analyze the muscular trend, related to circumferences of non-sedentary women over three different decades Methods: The present study is part of the Mixed Longitudinal Project of Physical Fitness and Aging. Sample composed only women’s, 50 years-old and older and participated in at least one evaluation between 1998 and 2017 totaling a sample of 6367 individuals. The circumferences (cm) analyzed were: contracted and relaxed leg and arm. To analyze the trend, the sample was divided into age groups: 1) o < 50 years, and a negative trend in the age groups of 1) o > 50 years, and in the 70+ years group.

Results: Leg circum. (cm) presented a positive trend in the age group of 1) o < 50 years, and a negative trend in the age group of 1) o > 50 years, and in the 70+ years group. The contract arm circum. (cm) presented a positive tendency in the age groups of 1) o < 50 years and 1) o > 50 years. On the other hand, the circum. of the relaxed arm (cm) presented a positive tendency only in the 1) o > 50 years group.

In the age group of 1) o < 50 years, the mean leg circum. was 35.2 cm, the mean arm circum. contracted was 30.8 cm and the mean arm circum. relaxed was 30.6 cm. In both cases, there was an increase of 0.01 cm every year. In the age group of 1) o > 50 years, mean leg circum. was 35.11 cm, and there was a decrease of 0.01 cm every year; the mean of the contracted arm circum. was 28.8 cm, with an increase of 0.01 cm every year. In the age group of 1) o > 50 years, the mean leg circum. was 35.77 cm, the mean arm circum. contracted was 30.68 cm and the mean arm circum. relaxed was 30.43 cm. In both cases, there was an increase of 0.01 cm every year. In the 70+ years group, both cases, there was an increase of 0.01 cm every year. In the age group of 1) o > 50 years, mean leg circum. was 35.11 cm, and there was a decrease of 0.01 cm every year; the mean of the contracted arm circum. was 28.8 cm, with a decrease of 0.01 cm every year.

Conclusion: Over the three decades analyzed, the younger elderly showed a positive tendency for the muscularity indices; while older groups presented mixed results.

1192 May 30 11:00 AM - 11:15 AM
Health and Lifestyle Behaviors of U.S. Master’s World Cup Field Hockey Players

Karen A. Croteau, FACSM1, Nina Eduljce1, Laurie Murphy2, Lisa Ahearn3. 1Saint Joseph’s College of Maine, Standish, ME. 2Plymouth State University, Plymouth, NH. 3Plymouth State University, Plymouth, NH.

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(No relevant relationships reported)

Purpose: The purpose of this study was to examine health status and lifestyle behaviors of U.S. master’s field hockey athletes. METHODS: Participants were 122 athletes (72 females, 50 males) who competed for the U.S. in the Master’s Field Hockey World Cup in 2018. Mean age was 50.12 (range = 35-71). Participants completed the 42-item Health and Wellbeing of Master’s Field Hockey Athletes Survey. RESULTS: Mean BMI was 24.9 ± 3.1 (range = 15.6-35.5). Participants rated their health as very good/excellent (86.9%), had no major health conditions (61.5%), had at least one injury (53.3%), perceived stress was rated at rare or not at all by 56.6% of participants. Participants consumed >2 fruits (65.5%) and >2 vegetables per day (86.9%), daily breakfast (87.5%), ≤1 sugar-sweetened beverages (86.9%) and ≤2 cups of water (54.0%) per day, and <2 alcoholic beverages per week (54.0%). Participants reported >2 hours of sleep per night (54.0%) and no/little restless sleep (3.9%). Exercise frequency was >5 days per week and >20 minutes was cited by 93% and 7% of the sample. Conclusion: Master’s field hockey athletes practice lifestyle behaviors conducive to positive health.

1193 May 30 11:15 AM - 11:30 AM
Effects of Tai Chi Exercise Versus BINGO on Fine Motor Functions in Older Adults

Saira Talwar1, Chih-Chia Chen2, John Lambert3, Yunjoong Ryu4, Poram Choi5, Morgan Hommel2, Zhujun Pan6. 1University of Wisconsin - Milwaukee, Milwaukee, WI. 2Mississippi State University, Mississippi State, MS. (Sponsor: Scott Strath, FACSM)

Email: talwar@uw.edu

(No relevant relationships reported)

T’ai Chi exercise (TC) improves gross motor skills in older adults; however, fine motor skills, which enhance performance of daily living activities (ADLs), have not been thoroughly examined. PURPOSE: The purpose of this study was to investigate the effects of TC versus BINGO on fine motor skills in older adults.

METHODS: Twenty-seven self-ambulatory older adults (age: ≥ 70 years) with no restrictive health conditions and MMSE score ≥ 21, completed this study. Participants engaged in 1-hour, twice-per-week TC or BINGO sessions for 8 weeks (wk). Fine motor skills were assessed using the unilateral Jebsen Taylor Hand Function Test (JTHFT), including 7 ADL-like tasks; less time (s) to complete a task reflected better performance. Repeated measures 2x2x(2TC x BINGO) x 4 (Baseline x Intervention x Post x Retention) ANOVA was used with alpha of 0.05; data was analyzed separately for each hand. RESULTS: There were no significant group differences (p > 0.05). Significant time main effects were found for 6 tasks using the dominant hand (DH) and 7 tasks using the nondominant hand (NH) (Table 1). Significant time x group interaction was found for simulated feeding using the DH (p = 0.001). TC improved by 1.6 s across the 8 wk intervention, with a 1.2 s improvement after 4 wk. BINGO improved by 0.07 s across the 8 wk. Significant time x group interaction was also found for lifting large, heavy objects using the NH (p = 0.039). TC improved by 0.6 s across the 8 wk intervention, with a 0.8 s improvement after 4 wk. BINGO improved by 0.09 s across the 8 wk. CONCLUSION: This study was one of the first to explore the effects of TC on fine motor functions. TC does not demand precise finger movements such as those required for BINGO; however, improvements specific to tasks requiring eye-hand coordination, manual dexterity, wrist range of motion, and hand grip strength were noted with the DH and NH tasks.

Supported by MSU College of Education.
Clinical Case Slide - Leg and Tibia

Thursday, May 30, 2019, 9:30 AM - 10:50 AM
Room: CC-305

Chair: Mark R. Hutchinson, FACSM. University of Illinois at Chicago, Chicago, IL.
(No relevant relationships reported)

Discussant
Jay Hertel, FACSM. University of Virginia, Charlottesville, VA.
(No relevant relationships reported)

Discussant
Sean Engel. University of Minnesota, Minneapolis, MN.
(No relevant relationships reported)

May 30 9:30 AM - 9:50 AM
Leg Pain in a 23 Year Old Football Player
Kyle H. Yost, Valerie Cothran, Ralph F. Hennt. University of Maryland Medical System, Baltimore, MD.
Email: kyleyost08@gmail.com
(No relevant relationships reported)

HISTORY
A 23 year old male reported getting kicked in the leg during a collegiate football game. He noted immediate pain in his lateral calf after attempting a tackle. He did not feel or hear a pop. He had a noticeable limp walking off the field. There was no pain in the ankle or foot, but he noted pain with ankle movement. He had pain with weight-bearing but denied any numbness or tingling. The next day, he developed worsening pain that was unbearable with any change of position or movement. The pain was greatest along the mid-lateral leg but extended along the entire leg anterior and laterally. He had limited ability to move his toes and foot which was a new symptom.

PHYSICAL EXAMINATION
General: Alert and oriented in mild distress at rest. Left leg
Edema: Anterior and lateral leg without pitting. Compartments: Diffusely tender but not tense. Tenderness: Diffuse, anterior and lateral compartments more than fibula and posterolateral. Range of motion: DF 0 degrees, PF 30 degrees. Pain was worse with initiation. He tolerated gradual passive stretch of the anterior, more than the lateral. Pain with inversion and evasion.
Strength: 1/5 anterior tibialis, EHL, EDL, Peroneals with pain, 2/5 S/PT with pain. Neurovascular: Intact, 2° Tc/Pd pulses, cap reffil < 2 sec.
DIFFERENTIAL DIAGNOSIS
1. Gastrocnemius Strain
2. Compartment Syndrome
3. Popliteus Strain
4° Fibular Fracture
5H 1gh Ankle Sprain
TESTS AND RESULTS:
X-Rays
1. Fluoroscopic imaging of the tib-fib and ankle were negative. 2. Tib-fib and Ankle x-rays were negative for fracture and stress view demonstrated stable joint. Compartment Testing Diastolic pressure: $ Left lower leg anterior compartment: 20 Left lower leg lateral compartment: 28 Left lower leg posterior superficial compartment: 27 Left lower leg posterior deep compartment: 26 MRI
1. Nondisplaced fracture of the middle third of the fibula. 2. Acute grade 1 muscular injury of the peroneals muscles of the lateral compartment.
FINAL WORKING DIAGNOSIS
Midshaft fibular stress fracture
TREATMENT AND OUTCOMES
1. Patient was admitted to the hospital for observation for one night. 2. Patient was discharged and allowed to weight bear as tolerated in the tall CAM boot for two weeks.

3. At two weeks, he was weaned out of the boot and allowed to progress into activities.
4. At six weeks, he was participating in football without any limitations.

Lower Leg Pain - Field Hockey
HISTORY: A 20-year-old collegiate field hockey player 1 year, 2 months out from bilateral anterior/lateral/deep posterior compartment fasciotomies for chronic exertional compartment syndrome, recurrence of pain along her bilateral medial legs and medial/plantar foot numbness. Worsening over previous 6 months. Pain is daily, constant. Had MRI/MRA arterial duplex performed at onset of symptoms and was told it was negative. No improvement with neuropathic pain medication, physical therapy, hydrodissection.

PHYSICAL EXAMINATION: Examination revealed healed surgical incisions. Mild scar hypertrophy along medial incisions with moderate tenderness to palpation. Full knee/ankle ROM. Pain reproduced with resisted ankle plantar flexion after 30 seconds, numbness along medial/plantar aspect of foot in tibial nerve distribution. Easily palpable dorsalis pedis/posterior tibialis pulses.

DIFFERENTIAL DIAGNOSIS:
1. Recurrent chronic exertional compartment syndrome
2. Saphenous nerve compression neuropathy
3. Popliteal Artery Entrapment Syndrome

TREATMENT AND OUTCOMES:
1. Repeating compartment pressure testing: normal compartment pressures
2. EMG/NCV: normal without evidence of compression neuropathy
3. MRA (PRISMA 3T) study: forced plantarflexion demonstrates bilateral compression of the popliteal arteries at the popliteal fossa between the medial and lateral heads of the gastrocnemius muscle.

FINAL WORKING DIAGNOSIS:
Popliteal Artery Entrapment Syndrome

TREATMENT AND OUTCOMES:
1. Referred to plastic surgery colleagues.
2. Underwent bilateral popliteal artery release 1 year, 8 months after index surgery.
3. Improvement of both pain and numbness along medial aspect of foot.
4. Last seen at 3 months post-operatively. Full, paintless ROM. No pain with resisted plantarflexion. Normal sensation. Anticipate return to sport over the next 6 weeks.

Pain And Function: A Ten(din)uous Link In The Runner
Peter Francis, Isobel Thornley, Ashley Jones. Leeds Beckett University, Leeds, United Kingdom.
Email: peter.francis@leedsbeckett.ac.uk
(No relevant relationships reported)

HISTORY: A male runner (30-years, 10-km time: 33:33 min 4 sec) had been running with suspected insertional achilles tendinopathy (AT) for 2.5 years when the pain reached a threshold that prevented running.

PHYSICAL EXAMINATION: Diagnostic ultrasound (US), prior to a high volume stripping injection, confirmed right sided medial insertional AT.

DIFFERENTIAL DIAGNOSIS: Right sided medial insertional AT.

TREATMENT AND OUTCOMES: The athlete failed to respond to the injection and ceased running for a period of 5 weeks. At the beginning of this period, the runner completed the Victoria institute of sports assessment-achilles questionnaire (VISA-A) and the foot and ankle disability index (FADI), prior to undergoing an assessment of bilateral gastrocnemius medialis (GM) muscle architecture (muscle thickness (MT) and displacement (Dm) and contraction time (Tc); Tensiomyography (TMG)) and calf endurance (40 raises/min). VISA-A and FADI scores were 59%/100% and 102/136 respectively. Compared to the left leg, the right GM had a lower MT (1.6 cm vs. 1.7 cm), a similar PA (22.0° vs. 21.0° ), a lower Dm (1.2 mm vs. 2.0 mm) and Tc (16.5 ms vs. 17.7 ms). Calf endurance was higher in the right leg compared to the left (40 raises/min). Calf endurance was higher in the right leg compared to the left (40 raises/min).

FINAL WORKING DIAGNOSIS: Right sided medial insertional AT.

TREATMENT AND OUTCOMES: The athlete began a metronome guided (15 BPM), 12-week progressive eccentric training protocol using a weighted-vest (1.5 kg increments per week), whilst receiving 6 sessions of shockwave therapy concurrently (within 5-weeks). On returning to running, the athlete kept daily pain (VAS) and running scores (miles/week). Foot and ankle function improved according to scores recorded on the VISA-A (59% vs. 96%) and FADI (102 vs. 127). Improvements in MT (1.6 cm vs. 1.8 cm) and PA (22.0° vs. 21.0°) were recorded via US. Improvements in Dm (1.1 mm vs. 1.3 mm) and Tc (16.5 ms vs. 17.7 ms) were recorded via TMG. Calf endurance was lower in both legs and the asymmetry between legs remained (L: 33, R: 34). Pain intensity (mean weekly VAS scores) decreased
between week-1 and week-12 (6 vs. 2.9), while running scores increased (20 vs. 38) during the same period. The program was maintained up to week-10 at which point weekly mean VAS was 2.2 and running score was 47.

1200  May 30 10:30 AM - 10:50 AM
Medial Lower Leg Pain in a Middle-Aged Triathlete
Allison N. Schroeder, Stephen Schaaf, Kentaro Onishi.
University of Pittsburgh Medical Center, Pittsburgh, PA.
(Sponsor: Tom Best, FACSM)
Email: ashroe1@alumni.nd.edu
(No relevant relationships reported)

HISTORY: A 43-year-old triathlete presented with left distal medial lower leg pain that started gradually about 2-3 weeks prior to presentation. He denied inciting trauma and described the pain as a 5-10 sharp pain provoked by walking, running, and ankle dorsiflexion and plantarflexion movements. He endorsed mild left distal medial leg swelling but denied leg numbness or weakness and previous injury to this area. He was taking ibuprofen and had seen a chiropractor who performed several treatments including grastin, massage, taping, and a compression sleeve with minimal relief. He was training for his first full Ironman triathlon, scheduled for 12 days from presentation.

PHYSICAL EXAMINATION: Gait was non-antalgic. No visible swelling or ecchymoses of the left lower leg. Only tender to palpation in the left distal medial leg near the myotendinous junction of the medial gastrocnemius. Full ROM at the knee and ankle, but left end-range ankle dorsiflexion was painful. Strength was 5/5 about the knee and ankle, but he had pain with toe raises and toe walking on the left.

DIFFERENTIAL DIAGNOSIS:
1. Gastrocnemius strain or tear
2. Soleus strain or tear
3. Plantaris strain or tear
4. Achilles tendon injury
5. Anterior tibialis strain or tear
6. Ascral defect/muscle herniation
7. DVT
8. DVT

TEST AND RESULTS: Limited diagnostic ultrasound of the left distal medial leg revealed a near tear of the plantaris tendon near the myotendinous junction with evidence of disruption of tendon fibers and surrounding anechoic fluid. There was neovascularization on color doppler and tenderness to sonopalpation.

FINAl/WORKING DIAGNOSIS: Plantaris Tendinopathy

TREATMENT AND OUTCOMES: He was encouraged to continue symptomatic treatments with his chiropractor and could also consider kinesiotaping. His goal was to complete the full Ironman, even if he was slower than anticipated and called about one week later to ask if there were additional treatment options. He wished to proceed with treatments including grastin, massage, taping, and a compression sleeve with minimal relief. He was training for his first full Ironman triathlon, scheduled for 12 days from presentation.

Neurological Injuries
C-14 Clinical Case Slide - Neurologic Injuries
Thursday, May 30, 2019, 9:30 AM - 10:50 AM
Room: CC-304E

1201 Chair: Cindy Y. Lin. University of Washington Medical Center, Seattle, WA.
(No relevant relationships reported)

1202 Discussant
William F. Micheo, FACSM. University of Puerto Rico, San Juan, PR.
(No relevant relationships reported)

1203 Discussant
David Olson, FACSM. University of Minnesota, St. Paul, MN.
(No relevant relationships reported)

1204 May 30 9:30 AM - 9:50 AM
Post-concussion Syndrome With Retrograde Amnesia in a Pediatric Patient
Andrew Alexander, Weston Northam, Kevin Carneiro, Jason Mihalik. University of North Carolina at Chapel Hill, Chapel Hill, NC. (Sponsor: Kevin Guskiewicz, FACSM)
Email: andrew_alexander@med.unc.edu
(No relevant relationships reported)

HISTORY: A 14-year-old female with a history of pervasive developmental disorder (PDD), mild speech abnormalities, dyslexia, hearing loss and migraines sustained a concussion after falling on a slip and slide. The patient hit her head but did not lose consciousness. At clinic 3.5 weeks post injury, she complained of a headache with varied intensity. Reading provoked headaches and blurred vision. The patient experienced photophobia, phonophobia and dizziness. She took more naps during the day and had mood lability. The patient was amnesic to the event and had severe memory lapses. She forgot how to do simple math problems, the names of her family, friends, boyfriend, and that she was a cheerleader.

PHYSICAL EXAMINATION: Neurologic: 1) Slow eye movements that provoked headache, 2) Accommodation (blurred vision) and convergence (diplopia) insufficiencies, and 3) Underheating and eye strain with vertical and horizontal saccades. Tenderness to palpation on right side of the neck and suboccipital region. Patient named current president when asked, but unable to name previous or first president. Otherwise, normal neurologic and musculoskeletal exam.

DIFFERENTIAL DIAGNOSIS:
1) Post-concussion syndrome with retrograde amnesia
2) Anxiety disorder exacerbated by trauma
3) Malingering

TESTS AND RESULTS:
CT head and neck:
- Normal
Neuropsychology Evaluation:
- Test of Memory Malingering - adequate effort
- ImpACT: deficits in Verbal Memory, Visual Memory, Visual Motor Speed, and Reaction Time
- Behavior Rating Inventory of Executive Functioning: Normal
Revised Children’s Anxiety and Depression Scale:
- Clinically insignificant
Sensory Organization Test:
- No significant balance problems

FINAL/WORKING DIAGNOSIS:
Post-concussion syndrome with retrograde amnesia. Underlying PDD, and comorbidities at baseline described earlier likely contributing to headache and cognitive difficulties.

TREATMENT AND OUTCOMES:
1. Physical therapy for cervicogenic headaches
2. Vestibular therapy for dizziness and vestibulo-oculomotor dysfunction
3. Neuro-optometry evaluation and rehabilitation
4. All deficits and symptoms greatly improved 2 months post-injury. Vision rehabilitation will be continued prior to return-to-sport.
Encephalopathy In A 30 Year Old Soccer Player After Lightening Strikes: A Case Of Anoxic

1205 May 30 9:50 AM - 10:10 AM Headache, Vision Loss And Loss Of Consciousness- Wrestling
Jaron Santelli, University of Maryland School of Medicine, Baltimore, MD.

HISTORY
Jf is a 20 y/o male with 2 episodes of acute posterior neck pain with radiation into his occiput followed by acute loss of vision bilaterally and brief loss of consciousness vs. presyncope like episode. The first event occurred while wrestling and the second while bench pressing. There was no preceding chest pain, shortness of breath, or other symptoms. All symptoms resolved approximately 1 h inutes after each event. At the time of the visit he was asymptomatic and unable to reproduce symptoms with head movement. No recent illness. No cardiac or pulmonary past medical history.

PHYSICAL EXAMINATION
The examination is overall unremarkable with normal pupillary and extra ocular muscle exam, no visual deficits, normal visual acuity, no midline cervical tenderness, and negative Spurling's test. Jf had a normal extensive neurologic exam including cranial nerves, coordination, sensation and strength. Cardiovascular and pulmonary exams are also normal.

DIFFERENTIAL DIAGNOSIS
Vertebral Artery Dissection
TIA/CLA
Vasovagal Syncpe
Dehydration

TESTS AND RESULTS
CBC, CMP, TSH, EKG all unremarkable
CTA head and neck: bilateral hypoplastic vertebrobasilar system
MRI: negative for ischemia
Transcranial Doppler: nonspecific changes

FINAL WORKING DIAGNOSIS
Hypoplastic Vertebrobasilar system
TREATMENT AND OUTCOMES
At the time of the diagnosis, there was no evidence of ischemia as a result of the occurrences. Possible treatment options for hypoplastic vertebrobasilar systems without ischemia include aspirin and lifestyle modifications. Activity modifications have been made to include proper hydration, training to the start of symptoms but no further and reducing the activities that induce valsalva unnecessarily. Since these modifications have been put in place, there have been no new events. Follow up plans include repeat MRI at 6m onths.

1206 May 30 10:10 AM - 10:30 AM After Lightening Strikes: A Case Of Anoxic Encephalopathy In A 30 Year Old Soccer Player
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History: A 30 year old male with a past medical history of hypothyroidism was out playing soccer when he was struck by lightening. After the lightening strike, the patient experienced cardiac arrest, and CPR was performed. Spontaneous circulation was achieved after a 1 h inutes of CPR, and the patient was admitted to a burn unit for partial thickness burns of his left anterior chest, abdomen, and right medial lower calf. During the patient’s stay on the burn unit, he was noted to have severe cognitive deficits secondary to an anoxic brain injury sustained during his cardiac arrest, and also had a PEG tube placed after developing aspiration pneumonia. Following the burn unit, the patient was transferred to an acute rehab facility to address the severe cognitive deficits he had developed. Upon arrival at the acute rehabilitation facility, the patient was a Rancho Los Amigos level three.

Physical Exam: The patient was lying comfortably in bed. He was able to mimic behavior, but was unable to follow commands consistently. On ocular exam, the patient had a left pupil that was fixed and dilated, and subconjunctival hemorrhages. Abdominal exam was significant for an in-place PEG tube. Integumentary was significant for partial thickness wounds on his anterior chest and right lower extremity. The patient demonstrated full active range of motion of his upper and lower extremities.

Differential Diagnosis:
Anoxic encephalopathy
Encephalopathy secondary to electrocution
Toxic metabolic encephalopathy

Tests and Results: Labs on admission were significant for the following: White blood cell count of 5.6; hemoglobin of 10.3; blood urea nitrogen of 5. AST of 2 a d ALT of 0. CT head on admission showed no evidence of intracranial hemorrhage, lobar infarct, hydrocephalus, or midline shift.

Final Diagnosis: Anoxic encephalopathy secondary to lightening strike

TREATMENT AND OUTCOMES: The patient was started on amantadine to stimulate increased attention and wakefulness, and seroquel 1 and trazadone to help address the patients nocturnal agitation and promote sleep. At the end of his 5w eek stay on the acute rehabilitation unit, the patient had advanced to a Rancho Los Amigos level eight. He was fully oriented to his environment, tolerating an oral diet, engaging in appropriate conversation, and ambulating with a walker.
METHODS: To test this idea we expressed 3 mutant constructs of Tm with the 2 amino acid residues affected by low pH (histidine residues) replaced with alanine residues (H153A, H276A, and H153A/H276A). These constructs were compared to a wild-type Tm, to test the hypothesis that acidosis-induced charge changes of the histidine amino acid residues govern tropomyosin’s pH-dependent decrease in maximal velocity and Ca++-sensitivity. The effect on RTF function was determined by assessing the impact of acidosis on myosin’s ability to move regulated actin filaments (RTF) in the motility assay as a function of increasing level of Ca++. This was done separately for the wt-Tm and each structural variant.

RESULTS: A two-way ANOVA (pH x Tm construct) revealed that acidosis significantly (p<0.05) depressed the maximal sliding velocity of the RTFs across all versions of Tm, but that the magnitude of the depression was similar among the wt and all of the Tm mutants. Acidosis did not significantly depress the sensitivity to Ca++. Under the unloaded conditions of this assay (p>0.05).

CONCLUSIONS: These data suggest that the histidine residues in tropomyosin do not mediate the acidosis-induced depression in contraction velocity observed during muscle fatigue. However, it is possible that these residues are more important in mediating the depression of force-velocity relation during fatigue in both slow and fast twitch muscles.
Diet-induced obesity can lead to higher intramuscular fat deposition and inflammatory cell accumulation, ultimately having a negative impact on skeletal muscle morphology and function leading to mitochondrial dysfunction and insulin resistance. Intermittent fasting (IF) and high intensity interval training (HIIT) are both effective strategies for losing weight, specifically fat mass. However, the effects on skeletal muscle, specifically genes that regulate mitochondrial function, energy homeostasis, and muscle atrophy are unknown. PURPOSE: To investigate the effects of IF and/or HIIT on molecular markers of skeletal muscle mass and metabolic function in diet-induced obesity.

METHODS: Eight week old mice (C57BL/6J) had ad libitum access to an obesogenic diet (0% fat, 30% sugar) for 12 weeks. They were then randomly allocated to three intervention groups: IF (fasting for 2 alternate days/week), HIIT (3 days/week), combined IF+HIIT (2 alternate fasting days and 3 days HIIT) or control (CON) for a further 12 weeks. Extensor digitorum longus (EDL) muscle weight and expression of PGC1α, AMPK, citrate synthase (CS), muscle atrophy F-box (MAFbx), and muscle RING Finger-1 (MuRF1) genes were measured at the end of the intervention period. Data was analysed using ANOVA. RESULTS: Muscle weights were similar between groups at the end of the intervention period (CON: 1.3±0.8, HIIT: 9.2±0.4, IF+HIIT: 9.7±0.8, p<0.05). PGC1α and CS gene expression was significantly lower in the IF group compared to the CON (PGC1α: 0.8±0.1 vs 1±0.2, CS: 0.8±0.2 vs 1±0.2, p<0.05). AMPK gene expression was also significantly lower in the IF group, but only compared to the IF+HIIT group (0.9±0.1 vs 1±0.1, p<0.05). MAFbx and MuRF1 gene expression was significantly increased at both 4 and 11 mM K+ in muscle of the intervention groups, with or without doublets. MAFbx and MuRF1 were significantly higher at 5±2% and 5±3% increased over control, respectively. CONCLUSIONS: Intermittent fasting decreases the expression of muscle atrophy markers in muscle, while HIIT increases these increases at both 4 and 11 mM K+ than at 11 mM K+ alone. However, the absolute level of dynamic contractile function (with or without doublets) was not significantly different from control at 4 or 11 mM K+. This suggests that intermittent fasting increases at both 4 and 11 mM K+ than at 4 mM K+ alone, but at 11 mM K+ these increases were attenuated (Fmax increased by 5±2% or abolished). When using sub-tetanic frequency, trains, addition of a high frequency doublet increased both 4 and 11 mM K+ in muscle of the intervention groups, with or without doublets. MAFbx and MuRF1 were significantly higher at 5±2% and 5±3% increased over control, respectively. CONCLUSIONS: These results show that the improved contractile activity achieved with high constant stimulation frequency is strongly attenuated when excitability is suppressed by high extracellular K+. However, when using doublets to initiate a train of sub-tetanic frequency, this is mimicking an in vivo-like activation pattern, contractile improvements may be achieved both at normal and at high extracellular K+.

PURPOSE: As a performance measure, rate of force development (RFD) is largely underinvestigated, yet has a profound influence on explosiveness, joint stabilization, and rehabilitation. As a result, little is known about the meaningfulness of RFD and its relationship to neuromuscular function in general. The purpose of this study was to present a novel database for RFD, and to investigate relationships between RFD and factors of muscle contraction. METHODS: Two hundred participants completed a series of squat t-exercises at a speed of 10 degrees per second using a multi-joint, isokinetic dynamometer. Normative data was generated for RFD (M = 209.2 N m-1, SD = 108) and presented in the form of percentile ranks. Correlations were examined between RFD and factors of muscle contraction, including force, power, time to peak force, time to peak power, position of peak force, and position of peak power.RESULTS: Significant positive correlations were observed between RFD and force (r = 0.49, p<0.000) and power (r = 0.49, p<0.000); significant negative correlations were observed between RFD and time to peak force (r = 0.8, p<0.000), time to peak power (r = 0.0), and time to peak power (r = 0.8, p<0.000).CONCLUSIONS: The result is a novel, normative database providing a relative scale of RFD, and relating RFD to correlates of muscle contraction.
PURPOSE: Recent evidences suggest that the athletes have distinct microbial features compared to the sedentary subjects. However, few data have been assessed for the gut microbiota characteristics of athletes at different levels of competition. The aim of this study is to investigate whether gut microbiome is significantly different between higher and lower-level athletes.

METHODS: Fecal microbiota communities were analyzed by using hypervariable tag sequencing of the V3-V4 region of the 16S rRNA gene among 28 professional hard martial arts athletes, including 12 higher-level and 14 lower-level athletes. RESULTS: The gut microbial richness and diversity (Shannon diversity index (p = 0.019) and Simpson diversity index (p = 0.001)) were significantly higher in higher-level athletes than in lower-level ones. Genera Parabacteroides, Anaerostipes, Anaerotruncus, Bilophila, Cloacibacillus, Desulfovibrio, Flavonifractor and Oscillibacter were enriched in the higher-level group. Interestingly, the genera Parabacteroides abundance was significantly correlated with time reported exercising during an average week. Further analysis of the functional prediction revealed that three energy metabolism and methane metabolism were markedly over-represented in the gut microbiota of higher-level athletes.

CONCLUSIONS: This study provides the first insight into the gut microbiota characteristics of professional hard martial arts athletes. The higher-level athletes have increased diversity and high metabolic capacity of the gut microbiome, which may be positively influential to their performances. This study was supported by China Postdoctoral Science Foundation (grant number 194837) and SZSM20161207.

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During tests, their oxygen uptake (VO\textsubscript{2}) by 2 arm cranking modes; Syn or Asyn). They cranked at 50 rpm for 10 min at each posture. All participants underwent 6 submaximal arm cranking tests (3 postures: N\textsuperscript{e}m healthy young men (25.1± 3.1 yrs, 177± 5 cm, 79.5± 12.1 kg, 25.5± 3.4 kg/m\textsuperscript{2}), who were not familiar with arm ergometer prior to study, were tested at two cranking modes. It is certain that Ee was dependent on the body posture and the work rate. When comparing Ee during Asyn between postures, no differences were found. Ee (19.8± 1.7%) in UP. Ee was higher during Syn (21.7± 2.7) than Asyn (19.0± 2.6%) in BF. When comparing Ee during Syn arm cranking at RC showed the highest, while that during Syn cranking at BF did the lowest. In UP, the arm cranking mode did not affect Ee. In RC, Syn cranking was highly efficient than Asyn. Ee was less than 18% in BF at two cranking modes. It is certain that Ee was dependent on the body posture and the arm cranking mode.

**PURPOSE:** This study examined the net energy efficiency (Ee) during synchronous (Syn) and Asynchronous (Asyn) submaximal arm cycling at three body postures.

**METHODS:** Nine healthy young men (25± 3.1 yrs, 177± 5 cm, 12.1 kg, 25.5± 3.4 kg/m\textsuperscript{2}), who were not familiar with arm ergometer prior to study, were tested for estimating maximal aerobic capacity (VO\textsubscript{2}max) during asynchronous arm cranking on an arm ergometer in 3 body postures: upright (UP), recline (RC), and recline (RC), and forward-bent (BF). VO\textsubscript{2}max and 18% (10.2± 1.6) m·O\textsubscript{2}/kg/min at rest (p<0.001). VO\textsubscript{2}max increased from baseline only in HIIT (from 12.2± 1.0 to 22.5± 2.3 m·O\textsubscript{2}/kg/min, p<0.001). VO\textsubscript{2}max increased from baseline only in HIIT (from 12.2± 1.0 to 22.5± 2.3 m·O\textsubscript{2}/kg/min, p<0.001). However, post-exercise VO\textsubscript{2}max increased from baseline only in HIIT (from 12.2± 1.0 to 22.5± 2.3 m·O\textsubscript{2}/kg/min, p<0.001). Exercise BL ranged from 3.0 to 7.7 mmol/L, while post-exercise UL ranged from 0.2 to 76.4 mmol/L. The best function describing the BL-AUC and UL relationship was exponential (r = 0.68, p < 0.05).

**RESULTS:** The lack of increase in UL despite an increase in BL and their exponential association suggest that there may be a threshold above which BL cannot be disposed within the body and is excreted by the kidneys.
Seasonal Changes in Salivary Biomarkers and Psychomotor Function Among Elite Fencers

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PURPOSE: The present investigation sought to follow a group of elite fencers (n=10) through the competitive season monitoring salivary biomarkers and psychomotor function in order to develop a better understanding of the effects of training and peak competition in this sport.

METHODS: The methods for the present investigation are consistent with the declaration of Helsinki. Athletes provided saliva samples during the morning hours on 22 separate occasions during the main competitive phase of their annual training plan. Additionally, these same athletes completed a standard finger tapping psychomotor test on a tablet before and after training during this same phase of the annual plan. The saliva samples were analyzed via a point of care salivary analysis system for salivary IgA and Cortisol hormone. Finally, the primary coaches for the fencers provided a rank order for the athletes to determine highest and lowest performers. Data was analyzed for changes in other variables among the trials.

CONCLUSION: A wearing consequences testing exerted approximately 15m Hg on thigh facilitated exogenous glucose utilization during the morning in all of cycling to evaluate endurance performance.

RESULTS: Exercise rapidly increased 15% excretion, but highest value of 15% excretion was found during the initial part of the training season, peaked during performance.

F:2.32, p=0.03. Further analysis revealed that rank order of athletes (F=2.80, p= 0.05) produced a significant main effect for time when noted for morning salivary cortisol (F=2.35, p= 0.01). Average values for the group were less than 12 nm during the initial part of the training season, peaked during the middle of the monitoring period at 20nm then fell towards the conclusion of the season during the main competitions back below 12 nm. A main effect for time was not noted for salivary IgA (F=0.69, p= 0.15). Average values for the season for salivary IgA were 42.5 ± 203 ng/ml.

CONCLUSIONS: Based upon the results of this observational study it appears that stress hormones in elite fencers peak mid-season then decline during the taper at the end of the season. Additionally, it appears that the best of the elite athletes have better baseline psychomotor function.

Sickle cell Trait (SCT) has measurable physiological effects. Whether SCT has marked psychological effects in elite collegiate football players (ie perceived their energy levels, mood state, and overall well-being) compared to position-matched controls is unknown. Purpose: To examine self-perceptions of sleep qa lity, mood state, and general well-being in Division 1 football players with and without SCT.

METHODS: Participants with SCT were identified by a team physician and confirmed by electrophoresis and paired a matched position-matched control. The study included the Pittsburgh Sleep Quality Inventory (PSQI), Daily Analysis of Life Demands for Athletes Questionnaire (DALDA), Activation-Deactivation Affective Check List (AD-ACL), and General Well-Being Questionnaire (GWB). Data was collected at three time points; before pre-season camp, after pre-season camp, and post-season. Results: SCT reported higher levels of energy on the AD-ACL assessment than the control group at baseline (13: 0.6s 11: 0.6s 0.5s). No group*time interaction existed (p=0.20). On the GWB, no differences between groups were found; however, a significant decrease in perceived well-being between pre-camp and post-camp (3: 1.8 vs 3: 2.12: 3: 1.2, p<0.01) and pre-camp and post-season (3: 1.6 vs 3: 1.8 vs 3: 1.6p: 0.5s across all participants. Perceived sleep qa lity was similar across all participants at all time points. Conclusion: Participants with SCT reported a greater energy level coming into training camp and had similar perceived energy at the beginning and end of the competitive season compared to position-matched controls. GWB did not differ between groups but decreased in all athletes throughout the season. Interestingly, the post-season survey may be skewed by the win or loss from the final game. The decrease at the start of the season could be due to increased stress due to academic responsibilities or the expectation to perform well and win competitions. Future research will correlate these psychological findings to biological markers of stress and fatigue.

Abstracts were prepared by the authors and printed as submitted.
that performing metabolic gas measures during the 3 min CP test does not bias the CP and W' data. As no significant differences were found for VO2peak between the ramp and CP test, the data supports the contention that it is possible to obtain VO2peak in a 3 min all-out CP test.

Obtaining valid and reliable measurements for resting metabolic rate (RMR) via indirect calorimetry is critical for clinical and research purposes. PURPOSE: The primary aim of the study was to determine the reliability of RMR measurements under standard (best practice conditions). The secondary aim was to determine if normal fluctuations in skin temperature, core temperature, heart rate, or environmental factors affect repeated RMR measurements. METHODS: Twenty college-aged men entered the lab following an overnight fast. Following twenty minutes of sitting, standing, and continuous exercise, participants sat quietly, continuous measurements of environmental temperature, relative humidity, skin temperature, core temperature, skin temperature, and environment were recorded using a variety of equipment and techniques. Results: Measurements was $36.74 ± 0.09° C (t = 7.17, p < 0.01). The change in R-R interval for 40 minutes suggests that two measurements of RMR may be necessary to obtain accurate data.

The variability in the insulin-stimulated glucose uptake of different skeletal muscles may be partly attributable to the differences in the muscle fiber type composition and the level of expression of the insulin-responsive glucose transporter known as Glucose transporter type 4 (GLUT4). PURPOSE: To compare and evaluate the functional and metabolic changes of the trunk muscle (trunk extensor) after exercise and to compare the differences in RMR measurements separated by 30 minutes. METHODS: In a double-blinded, randomized, crossover trial, and ten men performed a single bout of 30 minutes of sitting, standing, and continuous exercise. RESULTS: The SOR at 24, 48, 72, and 96 hours after ECC had significant increased as compared with that after CON (p < 0.05). The TG, TC, HDLC, and low-density lipoprotein cholesterol (LDLC) and the glycemic response, glucose, insulin, homeostasis model assessment; HDLC, and glycosylated hemoglobin were measured before, immediately after, and 24 hours after each bout of exercise. Moreover, the muscle activity of paraspinal muscles was also recorded during CON and ECC.

RESULTS: The SOR at 24, 48, 72, and 96 hours after ECC had significant increased as compared with that after CON (p < 0.05). The TG, TC, HDLC, and TC/HDLC levels were significantly lower at 48, 72, and 96 hours after ECC, as compared with those after CON (p < 0.05). The levels of glucose and HDOM were significantly higher at 8 h after ECC as compared with those after CON (p < 0.05). However, no significant changes in the muscle strength and endurance, HDLC, insulin, and glycosylated hemoglobin were observed between the two groups. Meanwhile, the LM and ILL activities were significantly higher during ECC than during CON (p < 0.05, respectively). CONCLUSION: Thus, the study confirmed that EIMD of the trunk extensor had positive effects on the blood lipid profile and the glycemic response, and the LM and ILL showed a high level of muscle activity during ECC.

Evidence shows that lactate threshold (LT) is a valid tool to evaluate endurance capacity and is used to prescribe training intensities. However, there are discrepancies between LT test methodologies and the way to use LT to prescribe training velocities, maintaining metabolic stress in steady-state intensity bouts. Few studies have investigated the relationship of LT at 4 m mol/L (V4) with intensity prescription on Interval Training (IT) workouts. PURPOSE: To determine if V4, obtained via an incremental test, can maintain Blood Lactate (BL) predicted, during a steady-state IT workout in swimmers. METHODS: Ten well trained swimmers (18 ± 2 yr) performed two freestyle tests: an incremental 2000 m test with 1-min passive rest, measuring Heart Rate (HR) and BL after each repetition to determine V4, and, 4 days after, a steady-state IT 10x200-m test with 1-min passive rest at V4, measuring BL and HR after reps. 2-4-6-8-10. Paired t-tests were used to compare V4 vs IT speeds and times and BL@V4 vs. BL after rep. 2-4-6-8-10. In addition, repeated measures ANOVA was used to compare BL after reps. 2-4-6-8-10. Finally, Pearson’s correlations (r) were obtained between BL vs HR in both incremental and steady state tests. RESULTS: Same speeds and times for V4 and IT were observed (1.38 ± 0.07 m/s and 1.53 vs 1.38 ± 0.07 m/s and 1.53 m/s, respectively, p<0.05). BL levels maintained at V4 levels only during reps 2 and 4 (4.10±0.52; 3.72±0.63 m mol/L, respectively, p<0.05 vs. BL@V4); however, BL levels decreased over time during reps 6-8-10. Additionally, there was a moderate correlation (r = 0.6) between BL and HR during the incremental test. However, a low correlation (r = 0.28) between BL and HR during the steady state IT test was observed. CONCLUSION: V4 from an incremental test underestimates BL level showing, a progressive decrease during the steady-state IT test. These results suggest that IT at V4 might not be enough to maintain metabolic stress during an IT bout, especially during the second half of it. Additionally, the moderate and low correlations observed between BL and HR suggest that HR might not be a good marker of exercise intensity in swimmers.

Indirect calorimetry is a practical and accurate method of measuring metabolic gas exchange rate, specifically volume of oxygen and carbon dioxide (VO2 and VCO2). Commercial stationary and mobile systems typically include automated metabolic gas analyses. In clinical practice, metabolic cart systems are considered the standard, however, they pose limitations due to cost and portability. PURPOSE: To compare the accuracy of a commercially available mobile system (CareFusion Oxycron Mobile®, OXYCON) to a criterion stationary cart system (ParvoMedics TrueOne 2400®, PARVO). METHODS: Fifteen volunteers (13 Male, 2 Female; 24 ± 6 y (mean ± SD), 77 ± 13 kg BW, VO2peak 3.9 ± 0.7 L·min⁻¹) completed four trials over two non-consecutive study days. Trials consisted of a rest period, followed by three incremental treadmill work rates: 63% (23-36% VO2peak), 70% (49-67% VO2peak), and 80% (60-76% VO2peak) in controlled laboratory conditions (20 ± 0.5 °C; 84 ± 2 % RH). Metabolic system order was randomized and data collected was averaged over 3-4 minute steady-state periods. RESULTS: Measurements of VO2 from
the OXYCON and PARVO were highly correlated ($R=0.9$). The OXYCON showed some positive bias (0.18 ± 0.16 L·min$^{-1}$) that increased with work intensity: rest (V̇O$₂, 0.05$ ± 0.06 L·min$^{-1}$) to determine the aerobic contribution between (RL: 0.15 ± 0.09 L·min$^{-1}$), knee (V̇O$₂, 0.26$ ± 0.16 L·min$^{-1}$), and run (V̇O$₂, 0.31$ ± 0.16 L·min$^{-1}$).

CONCLUSION: The mobile OXYCON is an acceptable alternative to stationary metabolic cart systems for measuring metabolic gas exchange rate during rest and low intensity exercise. Clinicians may consider alternative devices for assessments at higher work intensities.

Cycling tests are usually performed to assess short track speed skater’s performances. However, the cycling movement patterns and body position are quite different from the skating movement patterns and the low position that skaters adopt during speed skating on the short track. Thus, a comparison of muscle oxygenation between cycling and skating was conducted, as the low skating position may restrict blood flow to the lower limbs.

PURPOSE: The aim of this project was to create an on-ice test to compare skaters’ V̇O$₂$max and tissue oxygen index (TOI%) while performing maximal progressive tests during on-ice skating and on a cycle ergometer.

METHODS: Twenty-four Canadian short track speed skaters of the provincial level or higher participated in the study. Skaters took part in two separate progressive maximal tests on ice and on a cycle ergometer. Oxygen consumption (V̇O$₂$) was continuously monitored during both tests with a portable metabolic analyzer. Tissue oxygen index (TOI%) was also continuously measured on the vastus lateralis of both legs during both tests and during the post exercise recovery phase. A modified Borg scale was used to assess the rate of perceived cardiovascular effort (RPE), as well as leg pain.

RESULTS: V̇O$₂$max achieved in the on-ice test was significantly lower than V̇O$₂$max reached on a cycle ergometer (3.6 ± 0.6 vs. 3.8 ± 0.2 L·min$^{-1}$, p<0.001, respectively). When expressed as a function of V̇O$₂$ the TOI% was significantly lower during skating vs cycling for any tested V̇O$₂$. The TOI% of the right leg (RL) was significantly lower than the left leg (LL) at any V̇O$₂$ for both skating and cycling. At maximal capacity (V̇O$₂$max), TOI% was similar for both skating and cycling (~10%). During the recovery phase, TOI% peaked at 8% after 150s of recovery after skating, while it took 120s after cycling. The RPE of cardiovascular effort was significantly lower at the end of the on-ice test vs ergometer cycling test (1.3 ± 2.1 vs 1.2 ± 1.0, p<0.001).

However, there were no differences were detected for leg pain (18.5 ± 11.1 vs 18.4 ± 5.6, p=0.671, respectively).

CONCLUSIONS: The low position adopted by speed skaters appears to restrict blood flow to the lower limbs and thereby negatively impacts muscle oxygenation. These findings reveal the importance of testing short track speed skaters directly on the ice.

High-intensity exercise performed under hypoxic conditions may yield beneficial physiological adaptations due to altered reliance on the anaerobic energy system. This type of intervention is commonly evaluated during lower body cycling; however, considerable differences exist in the upper body musculature, particularly in women.

PURPOSE: To determine the effects of normobaric hypoxia on upper-body performance. Twelve recreationally active women (age: 22.7 ± 2.6 y; height: 167 cm; weight: 64.4 ± 15.5 kg; body fat: 20% ± 5%) completed a graded exercise test in both normobaric hypoxia (21% O₂) and normoxia (21% O₂ ± 2% CO₂) to exhaustion. Heart rate (HR) and work rate (WR) were measured throughout the exercise and perceptual responses to work matched moderate-intensity steady-state exercise (MIE) and variable-intensity exercise (VIE) conditions in healthy adults ($n=6$, age: 24 ± 5 yr). METHODS: A graded exercise test on the cycle ergometer to a maximal heart rate (HR) and work rate (WRmax) for submax conditions. The two experimental conditions (MIE and VIE) were randomized and performed on separate days. MIE consisted of continuous moderate-intensity exercise at 80% WRmax. VIE consisted of six 10-sec supramaximal sprints (120% WRmax), sixteen 20-sec high-intensity bouts (60% WRmax) and low-intensity recovery (20% WRmax) interspersed throughout the exercise. Total duration and total work were matched between conditions. VO2, heart rate (HR) and blood lactate (BLA) were measured at the end of the test for both conditions. OMNI ratings of perceived exertion (RPE) and affect, via Feelings Scale, were measured during exercise and enjoyment was measured post-exercise using the physical activity enjoyment scale. Reponses between conditions were analyzed.
using paired t-tests. Significance was established if p<0.05. RESULTS: During VIE and MIE, HR (16±10 bpm vs. 14±12 bpm) and percent of maximal HR (8.6±3.2% vs. 7.3±4.3%) did not significantly differ. Absolute VO2 during VIE and MIE were 1.42±0.22 L/min and 1.27±0.24 L/min (p=0.13). The intensities relative to VO2max were similar between bouts (VIE = 50.9±10.3%; MIE = 44.9±8.0%). Total energy expenditure of VIE and MIE were 212.5±32.3 kals and 189.4±36.3 kals, respectively (p=0.12). While perceived exertion (VIE = 4.6±0.9; MIE = 3.6±1.3) was similar, front squat exercise affected in-exercise enjoyment more than back squat, as in greater enjoyment in the back squat (2.0±0.9 and 92.3±3.3) compared to MIE (1.7±1.0 and 77.2±5.8). CONCLUSION: In healthy adults, VIE was perceived as more positive and enjoyable, while eliciting a greater HR response and similar energy expenditure compared to MIE. MIE may be an alternative exercise to MIE to obtain health benefits.

**Purpose:** The purpose of this study was to determine the impact of competing in a 100-mile ultramarathon on muscle fuel stores and cytokine production. **Methods:** One experienced male runner (6 yr s, 85 kg, 178 cm) completed the 100.5-mile distance in 32.9 hrs. Measurements were collected pre-race, at each support crew accessible aid station (28.4, 3, 6a nd 90 miles), and post-race. Measures included saliva cytokine markers (IL-6 and TNF-α), muscle energy status, and body mass. Saliva was collected using a passive drool technique and samples were stored on dry ice until they could be sent out for analysis. Muscle energy status (MES) was determined by scanning the right rectus femoris with a portable ultrasound transducer. Scanned muscle images were uploaded to a cloud-based application where they were analyzed for MES, which is an arbitrary number assigned to the muscle based on predicted glycogen concentration. Caloric expenditure was predicted based off average pace and terrain. Caloric intake was monitored by a combination of self-reporting, product wrapper collection, and unconsumed fluid measurement. Additionally, salivary IL-6 activity may be related to an ultra-event depending on terrain and intensity, even with a discrepancy between RV function in athletes.

**Conclusion:** Our findings of impaired LV strain and torsion as compared to the controls (LV = 2.0±0.9 and 92.2±3.3) compared to MIE (1.7±1.0 and 77.2±5.8). Conclusion: These data provide some interesting insights into potential MES plasticity and cytokine regulation during prolonged exercise. More specifically, fluctuating MES values observed during the current activity suggest that glycoigenolysis and glycogenesis may occur throughout and event depending on terrain and intensity, even with a discrepancy between caloric intake and expenditure. Additionally, salivary IL-6 cRyativity may be related to MES, suggesting that periods of low glycogen may increase physiological stress.

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hypertrophy (LVH) contributed to ARD prevalence when pIAR was used (p < 0.0001), but not when the ASI method was used (p = 0.108). With larger AoD in subjects with LVH versus those with normal geometry (p = 0.0099), while IAR did not differ between the two (p = 0.1106). **Conclusions:** Body size, age, playing position, and LVH were all found to impact both aortic root size and ARD. Thus, methods of ARD assessment in these men should ideally account for both body size and age. Therefore, pIAR may be best for assessment of ARD in this population.

**Study funded and supported by the NFL's Player Care Foundation.**

1261 Board #23 May 30 9:30 AM - 11:00 AM Effects of Aerobic and Resistance Training on Diabetic Heart Function: Roles of Titin and Collagen Shunchang Li¹, Min Liang¹, Derun Gao¹, Quansheng Su¹, Ismail Laher²,¹ Chengdu Sport Institute, Chengdu, China. **University of British Columbia, Vancouver, BC, Canada. (Sponsor: Tongjian You, FACSM)** Email: lishunchang18@163.com (No relevant relationships reported)

**PURPOSE:** To examine the effects of aerobic and resistance exercise training on cardiac function, and investigate the roles of cardiomyocyte passive tension regulators (titin and collagen) in the mechanism of exercise-induced changes in cardiac function in diabetic rats.

**METHODS:** Sixty male SD rats were randomly divided into six groups: control (C), aerobic exercise (A), resistance exercise (R), diabetic (D), diabetic plus aerobic exercise (DA), and diabetic plus resistance exercise (DR). Type II diabetes was induced by high-fat diet feeding and low-dose streptozotocin injection. Rats in the A and DA groups ran on a treadmill at 2m/min for 6 m in, and rats in R and DR groups climbed a ladder bearing incremental loads daily, 6a for per week for 8 eks. Fasting blood glucose (FBG) and insulin (INS) concentrations were determined by a standard procedure. Cardiac function (such as the specific indicators of cardiac diastolic dysfunction--Min dp/dt, Tau, and left ventricle end-diastolic pressure, LVDP) was measured using a catheter insertion through the right carotid artery and a Labchart data acquisition and analysis system. Expression levels of collagen I, collagen III and TGFβ were determined using Western blot, and tissue expression levels were analyzed using Immunofluorescence. Two-way ANOVA and post-hoc tests were used to assess differences between groups.

**RESULTS:** Compared to non-diabetic groups, diabetic groups had higher FBG (P<0.01), lower Min dp/dt (P<0.05), and longer Tau (P<0.05); in addition, the diabetic groups had significantly lower expression levels of titin (P<0.05), and higher expression levels of collagen I and TGFβ (P<0.05). Compared to non-exercise diabetic rats, diabetic plus exercise groups had lower FBG (P<0.01), shorter Tau (P<0.05), and higher expression levels of collagen I (P<0.05) and TGFβ (P<0.05), and shorted Tau (P<0.05), but the DR rats had higher expression levels of collagen I (P<0.05) and TGFβ (P<0.05). Compared to non-exercise diabetic rats, diabetic plus exercise groups had lower FBG (P<0.01), shorter Tau (P<0.05), and higher expression levels of collagen I (P<0.05) and TGFβ (P<0.05).

**CONCLUSION:** Greater improvements in diabetic cardiac function occurred with aerobic exercise training, possibly through decreasing titin-dependent myocardial stiffness and collagen-dependent interstitial fibrosis.

1262 Board #24 May 30 9:30 AM - 11:00 AM Cardiovascular Drift Response Over Two Different Constant-load Exercises In Healthy Non-athletes. Case Study. Camilo Germán Alberto Pérez Chaparro, Frank Mayer, Claudia Beckendorf. University of Potsdam, Potsdam, Germany. Email: perezchaj@uni-potsdam.de (No relevant relationships reported)

Cardiovascular drift (CV-d) is a steady increase in heart rate (HR) over time while performing constant load moderate intensity exercise (CME) > 20 min. CV-d presents problems for the prescription of exercise intensity by means of HR, because the work rate (WR) during exercise must be adjusted to maintain target HR, thus disturbing the intended effect of the exercise intervention. It has been shown that the increase in HR during CME is due to changes in WR and not to CV-d.

**Purpose**

We aimed to investigate whether, indeed, the CV-d in healthy young people exercising at the WR corresponding to the lactate individual anaerobic threshold (IAT) determined in two different cardiorespiratory exercise test (CPT), was related to the WR difference. In this case study, the CV-d was not significantly different between the two CMEs (One-IAT and Three-IAT) despite a significant difference in the amount of WR between the CMEs (26 ± 19). Other factors aside from the WR like an increase in peripheral blood flow, hyperthermia, plasma volume reduction, catecholamine levels, and training status play a role in the CV-d phenomenon.

1263 Board #25 May 30 9:30 AM - 11:00 AM Evaluations Of Nonstationary And Stationary Autonomic Nervous Function Using Heart Rate Variability For Syncope Patientswith Non-cardiogenic Causes Noritaka Hata¹, Kazuzumi Hirasaki², Tomoya Suda², Yuki Sano¹, Marina Fukuie¹, Takahiro Uehi¹, Ai Hirasa¹, Takeaki Matsuda¹, Shigeki Shibata¹, Kyorin University, Tokyo, Japan. **University of Tsukuba, Ibaraki, Japan.** Email: hatanori1019@gmail.com (No relevant relationships reported)

**Background:** One of the main causes of syncope is neuroregulatory syncope. Thus, it is very important to assess autonomic nervous function for syncope patients. Heart rate variability (HRV) was widely used for indirect evaluation of cardiac autonomic function. HRV was usually assessed with RR intervals changes of resting condition. Recently, however, HRV analysis using 24 hours Holter electrocardiogram became available to evaluate cardiac autonomic function during activity.

**Purpose:** The aim of this study was to evaluate cardiac autonomic function of non-cardiogenic syncope patients using HRV analysis.

**Method:** Seventy-six patients with non-cardiogenic causes of syncope were enrolled. They were divided into initial group (n=31, 6 15 ± 19 yrs old, 19 m, 12 f, 12 females) and recurrence group (n=45, 57 ± 24 yrs old, 24 m, 21 f, 21 females). RR intervals were measured with electrocardiogram at rest (stationary) and with 24 hour Holter electrocardiogram during activity (non-stationary). The three HRV frequency-domains (low frequency power: LF, high frequency power: HF, LF/HF ratio) were calculated. Results: At the nonstationary state, LF was significantly higher in the recurrence group than in the initial group. (HF: 19 ± 19 ms²; 40 ± 30 ms², P=0.01, ANCOVA; age and sex). There were no significant differences in LF and HF/LF ratio between the two groups at the nonstationary state. At the stationary state, there were no differences in LF, HF and LF/HF ratio between the two groups. There were significant relationships in LF and HF between the stationary and nonstationary states (LF: r=0.81, P<0.01), while LF/HF ratio did not show significant relationship. Conclusion: Our results indicated that the recurrent non-cardiogenic syncope patients had increased parasympathetic nerve activity at the nonstationary state. The evaluation of HRV at the nonstationary state may be more important for syncope patients than that at the stationary state, although HRV showed significant relationships between the stationary and nonstationary states.

1264 Board #26 May 30 9:30 AM - 11:00 AM The Effects of Low Intensity Resistance Exercise Training on Cardiac Autonomic Function in Obese Postmenopausal Women Alexis Wong¹, Arturo Figueroa, FACSM,¹ Marymount University, Falls Church, VA. Texas Tech University, Lubbock, TX. (Sponsor: Arturo Figueroa, FACSM) Email: awong@marymount.edu (No relevant relationships reported)

Menopause and obesity are associated with a deterioration of cardiac autonomic dysfunction (CAD) and are independent risk factors for cardiovascular disease (CVD). Heart rate variability (HRV) is a non-invasive tool for the evaluation of CAD. HRV is adversely influenced by menopause and obesity in women. Resistance exercise has emerged as an important strategy for the prevention and treatment of CVD. Low intensity resistance exercise training (LIRET) appears to be a useful modality for promoting improvements in muscle mass and strength, while being relatively safe for populations with increased cardiovascular risk. However, the possibility of improving CAD in obese postmenopausal women is currently unknown. **PURPOSE:** The purpose of this study was to examine the effects of LIRET on HRV and strength.

Abstracts were prepared by the authors and printed as submitted.
in obese postmenopausal women. METHODS: Twenty obese postmenopausal women [age (± 1 years) and body mass index (34± 9 kg/m²)] were randomized to either (n = 10) an exercise control group (w = 10) or 12 weeks. LIRET consisted of four different exercises for the leg musculature per session 3x week. Participants performed 2-3 sets involving 18-22 repetitions for each exercise per session. Total power (TP), low-frequency nyc power (LF), high-frequency nyc power (HF) (vagal tone), the LF to HF ratio (LF/HF) (sympathovagal balance), heart rate (HR) and leg strength were measured before and after 12 weeks. LF and HF were normalized to TP resulting in LF (sympathetic activity) and HF. Logarithmic transformation (Ln) was performed to normalize the HRV variables in absolute units. RESULTS: There were significant group-by-time interactions (P < 0.05) for LF, nHF, LnLF/LnHF, and (P < 0.01) for leg strength. There were significant decreases (P < 0.01) in nHF (5 ± 1%) and leg strength (2%) following LIRET, with no changes after control. No significant changes were observed in LnTP or HR after 8 weeks for both groups. CONCLUSIONS: Our findings indicate that LIRET improves CAF by improving sympathovagal balance in obese postmenopausal women.

1265
Board #27
May 30 9:30 AM - 11:00 AM

Carnosine Essential For Cardiac Function. A Study With Knockout Rats For The Carnosyn Synthese Gene
Livia S. Goncalves, Lucas Sales, Alan Lins Fernandes, Tiemi Rape 1 saito, José Natali, Leonardo Jensen, Alexandre Arnold, Isis Correa, Diogo Sant` Anna, Juliane Campos, Lisley Ramalho, Maria Claudia Irigoyen, Jb i ferreira, Guilherme Giannini Artioli. University of Sao Paulo, São Paulo, Brazil.
Email: liviaosouzacanvalcs@gmail.com
(No relevant relationships reported)

Carnosine is present in high concentrations in heart, where it appears to increase the sensitivity of the contractile apparatus to Ca²+. However, it is currently unknown whether this role is relevant to the cardiac physiology. Purpose: To evaluate the impact of the lack of carnosine on myocardial contractile function in rats knockout (KO) for the CARN1 gene (carnosyn synthase). Methods: We developed the first KO animal model for the CARN1 gene through CRISPR-Cas9 technology. Male wild-type (WT) and KO rats (4n onths-old) were used. In vivo cardiac function was assessed by echocardiography (ECO) and cardiac electrical activity by electrocardiography (ELECTRO). Cardiomyocyte contractile function was assessed in isolated cardiomyocytes by measuring contractility and sarcomere contraction analysis, along with the determination of Ca²⁺ transient. Unpaired t-tests were used to compare variables between WT and KO. The study was approved by the Ethics Committee on the Use of Animals of USP. RESULTS: ECO (WT: n=4 KO:n=6) showed that KO rats presented a higher systolic diameter (WT:0.08 0.001 mm/g; KO:0.11 ±0.001 mm/g; p=0.01) and lower Fraction of Left Ventricular Ejection (WT:80.26±6.86%; KO:69.58±6.67%; p<0.01) and lower Fraction of Left Ventricular Shortening (WT:51.2±2.9%; KO:68.9±3.2%; p<0.01). In vivo cardiac function was assessed by echocardiography (ECO) and cardiac electrical activity by electrocardiography (ELECTRO). Cardiomyocyte contractile function was assessed in isolated cardiomyocytes by measuring contractility and sarcomere contraction analysis, along with the determination of Ca²⁺ transient. Unpaired t-tests were used to compare variables between WT and KO. The study was approved by the Ethics Committee on the Use of Animals of USP. RESULTS: ECO (WT: n=4 KO:n=6) showed that KO rats presented a higher systolic diameter (WT:0.08 0.001 mm/g; KO:0.11±0.001 mm/g; p<0.01) and lower Fraction of Left Ventricular Ejection (WT:80.26±6.86%; KO:69.58±6.67%; p<0.01) and lower Fraction of Left Ventricular Shortening (WT:51.2±2.9%; KO:68.9±3.2%; p<0.01).
in the Ca²⁺ channels. In vitro contractility data (WT: n=3; KO:n=3) showed that
carnosine is essential for normal cardiac function. This is the first evidence to demonstrate
that carnosine is essential for normal cardiac function. Supported by FAPESP 2014 110 md CAPES

1269 Board #31 May 30 9:30 AM - 11:00 AM Left Ventricular Morphology and Function of Recurrent Syncope Patients
Kazukuni Hirabuki, Kyorin University, Tokyo, Japan.
Email: hirabuki030@gmail.com

[No relevant relationships reported]

[Purpose] It has been known that number of syncope episodes during life is the strongest predictor for future syncope recurrence. It has been reported that impaired left ventricular diastolic function (LVDF) and low cardiac output due to left ventricular (LV) atrophy are related with orthostatic intolerance. The aim of this study was to clarify whether the number of syncope episodes would be related to LV morphology and function.

[Methods] We enrolled clinically non-cardiogenic syncope patients who presented at the emergency department of Kyorin University Hospital between 2013 and 2018. We divided them into 2 groups: F (episodes of syncope during life) and R (2 or more). Early diastolic filling velocity (E), atrial filling velocity (A), deceleration time (DT), peak early diastolic velocity of the mitral annulus (e'), E/A, and E/e' were assessed by echocardiography. LV mass (LVM) was calculated by Devereux Formula, which was normalized by BSA (LVM index, LVMI). Stroke volume (SV) and ejection fraction (EF) were estimated by modified Simpson’s method. ANCOVA statistics, adjusting for sex and age, was used to compare those parameters between the 2 groups.

[Results] Of 84 patients enrolled, F group were 38 male and 46 female and R group were 45 male and 23 female. Mean e' was significantly lower in the F group than that in the R group (E:e' = 8.72±0.44 vs. 10.00±0.39, p=0.037). There were no significant difference between the two groups in E (76.3±7.0 vs 73.2±2.8, p=0.45), A (73.6±7.3 vs 2.0±2.8, p=0.05), and EF (73.6 ±10.5 vs 70±2.1, p=0.07). LVMI (138±7 versus 148±6 g/m², p=0.28) and LVMI (86±4 vs. 91±3 g/m², p=0.62).

[Conclusions] These results suggest that impaired LVDF is one possible pathophysiology for repeated non-cardiogenic causes of syncope, but LV morphology and systolic function are not.

1270 Board #32 May 30 9:30 AM - 11:00 AM The Impact Of Acute Hyperglycemia On Heart Rate Variability In Men And Women.
Jennifer S. Williams, Taylor Stimpson, Jacob T. Bonafiglia, Joshua C. Tremblay, Alyssa M. Fenuta, Brendon J. Gurd, Kyra E. Pyke, Queen’s University, Kingston, ON, Canada.
Email: willij3@mcmaster.ca

[No relevant relationships reported]

BACKGROUND: Heart rate variability (HRV) is used to non-invasively assess autonomic nervous system (ANS) regulation of the heart. Chronic hyperglycemia has been known to reduce HRV; however, no research has examined the impact of acute hyperglycemia on HRV.

METHODS: The purpose of this study was to examine the impact of acute hyperglycemia on HRV, in men and women during the early and late follicular phases of the menstrual cycle. METHODS: 48 healthy men and naturally menstruating women (17F, age: 21±1 years) were recruited. Women were assessed during the early and late follicular phases of the menstrual cycle. "Ultra short-term" assessments of HRV (1-minute recordings) were completed using an electrocardiogram before and after a 75g oral glucose challenge in men and after consuming a 75g oral glucose challenge in women. Analysis of HRV time-domain variables was performed.

RESULTS: Age-related metabolic dysfunctions occur in a wide variety of clinical manifestations, including hyperglycemia, dyslipidemia and increased body fat. These conditions increase the risk of cardiovascular diseases (CVD), which can develop low heart rate variability (HRV) and higher heart rate (HR). The pathological metabolic conditions in older adults are associated with a hyperactive sympathetic nervous system. PURPOSE: To compare the SNS activity and metabolic markers associated with CVD in type 2 diabetic (T2D) and non-diabetic (ND) Mexican older adults. METHODS: Volunteers were 21 T2D (Age = 69.8 ± 5.2 yr, body mass index [BMI] = 28.6 ± kg/m²) and 17 ND (Age = 68.7 ± 6.7 yr, BMI = 26.0 ± kg/m²) older adults residing in Baja California, Mexico. Morning blood serum samples were collected after an 8 h fasting following body composition analysis (IndiBody, Cerritos, CA). A 5 min resting ECG recording (BioRadio, Cleveland, OH) was used to analyze HRV. Time and frequency domain analysis were assessed with Kubios HRV 3.1 software (Kubios Oy, Finland).

RESULTS: Between-group differences were found on blood glucose (T2D = 17.9 ± 9.6 vs. ND = 8.1 ± 12.0 mg/dL, p < 0.001), and triglycerides (T2D = 260 ± 126 mg/dL vs. ND = 68 ± 34 mg/dL, p < 0.02). Non-significant between-group differences were found on cholesterol (T2D = 180 ± vs. ND = 189 ± 28 mg/dL, p = 0.8), HDL cholesterol (T2D = 68 ± 5 vs. ND = 70 ± 20.3 mg/dL, p = 0.9), and LDL cholesterol levels (T2D = 8 ± vs. ND = 10 ± 20.3 mg/dL, p = 0.22). The HR (T2D = 72 ± 11.5 vs. ND = 72 ± 8 bpm, p = 1.0), beat-to-beat intervals (RR) (T2D = 128 ± vs. ND = 123 ± 93 ms, p = 0.3).
0.94), Root Mean Square of the Successive Differences (RMSSD) (T2D = 68.7±15.8 mmHg vs. ND = 41.9±13.2 mmHg, p = 0.01), and relative successive beats with >3 mmHg of difference by NN50) (T2D = 23.4±16.5% vs. ND = 9.5±13.7%, p = 0.03) were similar in both groups. High (T2D = 14.2±3.1% vs. ND = 12.2±4.2%, p > 0.05) and Low-frequency (T2D = 22.6±2.5% vs. ND = 23.3±u%, p = 0.00) were similar in both groups. CONCLUSIONS: Diabetic conditions did not substantially affect SNS activity compared with non-diabetic condition in a sample of Mexican older adults.

There has been a clear trend of increased cardiovascular disease risk development in adulthood as children have begun to develop large artery stiffness at an earlier age due to possible increased adiposity and poor diet. In recent years, there has been a pressing need to observe the implications of maturation on central hemodynamic parameters among children before and after pubertal development. PURPOSE: This study sought to observe the differences in central hemodynamic parameters between children pre and post-adolescence. METHODS: 24 children pre and post-adolescence (ages 7-12 and 13-15 yrs, N=33, N=20, respectively) were included in this study. Central hemodynamics including ejection duration percentage (ED%), forward pulse height (PH), reflected pulse height (PHR), reflected magnitude (RM%), augmentation index (AIx75), heart rate period (HRP), and time to reflected wave (T2) were assessed through brachial blood pressure measurement using the Sphygmocor XCEL device. Pulse wave velocity (PWV) was obtained through carotid applanation tonometry. RESULTS: From pre-adolescence to post-adolescence, values indicate a significant decrease in ED% (3.2±% to 3.5±%, p = 0.002), AIx75 13.8±13.6 to 3.2±%, p = 0.002, and RM% (5±% to 4% to 4% to 4%, p = 0.002). However, significant differences were observed in PWV (4.3±0.7 m/s to 5.1±0.8 m/s, p = 0.003), HRP (1.3±1.3 m/s to 2.0±1.0 m/s, p = 0.01), and PHR (25.2±10.5 to 29.8±10.5, p = 0.002). CONCLUSION: Major findings indicate that increases in PWV may be due to pubertal development and ED%, and HRP may be associated with an increase in heart mass. decreases in AIx75 and RM% and an increased PHR may be associated with increased heart or vessel length. Future studies are necessary to determine possible factors responsible for seen changes.

PURPOSE: To investigate the effects of biological sex differences in left ventricular contractility. Aerobic training decreases β-adrenergic receptors expression, but β-adrenergic receptor expression was not shown a reduction in this response. While, β-adrenergic receptor expression was not decreased expression of these receptors when compared to their respective sex matched controls. METHODS: From pre-adolescence to post-adolescence, values indicate a significant decrease in ED% (3.2±% to 3.5±%, p = 0.002), AIx75 13.8±13.6 to 3.2±%, p = 0.002, and RM% (5±% to 4% to 4%, p = 0.002). However, significant differences were observed in PWV (4.3±0.7 m/s to 5.1±0.8 m/s, p = 0.003), HRP (1.3±1.3 m/s to 2.0±1.0 m/s, p = 0.01), and PHR (25.2±10.5 to 29.8±10.5, p = 0.002). CONCLUSION: Major findings indicate that increases in PWV may be due to pubertal development and ED%, and HRP may be associated with an increase in heart mass. decreases in AIx75 and RM% and an increased PHR may be associated with increased heart or vessel length. Future studies are necessary to determine possible factors responsible for seen changes.

PURPOSE: Among non-pharmacological strategies to hypertension control, aerobic physical training as well as strength training has been indicated as an important time point to general treatment. However, little is known when the training program is periodized in a linear progression. In this way the aim of this study was evaluated the effects of a linear strength training program on parameters of cardiac remodeling in spontaneously hypertensive rats. METHODS: Thirty rats were distributed in three groups: untrained normotensive (N, n: 10), untrained hypertensive (H, n: 10) and trained hypertensive (TH, n: 10). The training protocol (12 clumps with 9 s eccentric intervals) was organized in three mesocycles of four weeks, with an increase in the training load organized in a linear progression (80%, 85% and 90%) for each block, considering the weight established in the maximum load test. The following parameters were evaluated: ventricular function evaluated by echocardiogram, systolic blood pressure, ventricular hemodynamics, cardiac morphometric and myocardial contractility. RESULTS: No significant changes (p>0.05) were found in FEAT between groups, however, animals from group H showed a lower isovolumetric relaxation time compared to other groups, which did not differ between them. There was a significant reduction of cardiac remodeling in the HT group after eight training weeks, additionally, negative correlations were found between systolic blood pressure and increased muscle strength as well as total work, indicating the influence of these parameters on SBP control. The HR, PSVV, and PDVV values of the H and TH groups did not differ, but both were higher than N group. The values of BNP/dt of H group were lower than the N and HT groups, which did not differ from each other. The RV, LV and cardiac mass values did not differ (p>0.05) between the H and HT.
groups, however, they were superior to the N group. The nuclear volume was not different between groups; however, the total collagen content of H group was higher than N and HT group. CONCLUSIONS: Briefly, the findings in this study suggest that the training program performed promoted pressure attenuation and preserved the ventricular function of spontaneously hypertensive rats with no change in heart mass.

C-31 Free Communication/Poster - Imaging and Assessment in Skeletal Muscle, Bone and Connective Tissue

Thursday, May 30, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

1277 Board #39  May 30 9:30 AM - 11:00 AM
Dynamic Ultrasonography of Anterior Femoral Translation: Comparison to Ballet Turnout and Hip Symptoms in Dancers
Kristin E. Schwarz, Sarah Jackson, Dai Sugimoto, Rebecca Zwicker, Pierre A. d’Hemecourt, FACSM. Boston Children’s Hospital, Boston, MA.
Email: kristin.schwarz@childrens.harvard.edu

(No relevant relationships reported)

Purpose: To determine if there is a relationship between turnout, self-reported hip symptoms, and femoral head anterior translational motion under dynamic ultrasound in a population of adolescent ballet dancers.

Methods: Cross-sectional cohort study. Population: 28a male academy students, 1T enailees and 6m ales, ages 14 1/s years. Dynamic ultrasound of the bilateral hips was performed on each student participant in supine position. With the low frewe ney linear ultrasound probe in sagittal oblique plane, the distance between the femoral head and acetabular rim was measured in 3 positions: both hips in neutral position, ipsilateral hip in neutral and contralateral hip hyperflexed, and with the ipsilateral hip in external rotation and the contralateral hip hyperflexed. Compensated turnout was defined as difference between functional turnout angle in first position and total bilateral hip rotation and the contralateral hip hyperflexed. Participants were defined as having compensated turnout if turnout was corrected with the contralateral hip hyperflexed.

Results: Spearman’s rho correlation coefficient (r) was used to test strength of association between variables, defined as <0.3 = poor, 0.3-0.5 = fair/moderate, 0.5-0.7 = good, >0.7 = strong. P<0.05 was used as threshold for statistical significance. IBM SPSS software (version 23, SPSS, Chi, IL) was used for all analyses. Mean maximal femoral translation distance for the right hip: 0.6 mm (+/- 1.93 mm), and the left hip: 1.6 mm (+/- 1.93 mm). Mean compensated turnout: 62.9° (+/- 14.8°). There was no significant correlation between femoral translation and HOOS scores, nor between femoral translation and compensated turnout (r=0.12, df=23, p=0.23, r<0.05). There was a significant correlation between greater compensated turnout and higher mean bilateral HOOS scores, with stronger association in the domains: symptoms (p=0.02, r=0.6), quality of life (p=0.003, r=0.6) and activities of daily living (p=0.034, r=0.6).

Conclusions: In this population of adolescent ballet dancers, there was no significant correlation between femoral head translational motion on ultrasound and compensated turnout or self-reported symptoms. There was significant correlation between degree of compensated turnout and more favorable self-reports on hip symptoms and function.

1278 Board #40  May 30 9:30 AM - 11:00 AM
Effects Of Downhill Running On Muscle MRI T2 In Young mdx Mice
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(No relevant relationships reported)

Previous studies have demonstrated that downhill treadmill running causes skeletal muscle damage that can be detected with magnetic resonance transverse relaxation time (T2) in adult dystrophic mice (mdx). However, young mdx mice (under 12 weeks of age) are characterized by a peak inflammatory phase with greater heterogeneity among muscles, potentially making it more difficult to detect T2 changes. PURPOSE: To determine whether muscle damage following downhill running can be detected in young mdx mice using proton magnetic resonance imaging (MRI) and spectroscopy (MRS). METHODS: CB 1/L10ScSn-DMDDmdx (mdx, n=5) and wild-type CB 1/L10ScSn (controls, n=5) male mice of 6 1/s weeks of age performed downhill running on a treadmill (1% grade at 8 1/min for 6 0 min). MRI/MRS was conducted prior to and 24 hours following running in the mice hindlimbs. T2-weighted, multiple-slice, single-slice echo-mR axial images were acquired. Time to echo (TR 2s, TE 14 s) from the hindlimbs. MRT T2 values were measured on a pixel-by-pixel basis for the anterior compartment (AC), posterior compartment (PC), and the deep medial region between the tibia and fibula (MC). In addition, single voxel ‘H-MRS data were acquired from the soleus and gastrocnemius using stimulated echo acquisition mode (STEAM) (TR 9 s, 32TE’s exponentially spaced; 5-288 ms, 4 phase cycles) with a 4.7 T Varian/Agilent MR system. RESULTS: At baseline, T2 values were elevated (p<0.05) in mdx mice (28.2 ms) compared to controls (28.0 9.9 ms). Following downhill running, the mdx mice had elevated (p<0.05) T2 values compared to baseline when a composite of the compartments were compared (Pre: 28.0 1.2ms; Post: 28.8 1.4 ms). The MC was typically (80%) the most affected hindlimb region in the mdx mice. Similarly, ‘H-MRS derived T2 values were increased (p<0.05) in a composite measure of the soleus and gastrocnemius after downhill running (28.4 2.4ms) compared to before downhill running (26.4 2.4ms). There were no significant changes in T2 values in control mice after performing the downhill running protocol. CONCLUSIONS: Overall, our findings support the use of downhill running combined with MRI T2 measures as a valuable approach for testing potential therapeutic interventions in young dystrophic mice. Funding Source: NIH (NIAMS) R01 AR0101.

1279 Board #41  May 30 9:30 AM - 11:00 AM
Interactions Among Age, Sex, and Scanning Location in the Assessment of Rectus Femoris Echo Intensity
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(No relevant relationships reported)

Echo intensity is an ultrasound-derived measurement of skeletal muscle qua- lity believed to reflect both fibrous tissue content and adipocyte infiltration. Moderate correlations between echo intensity and measures of muscle function have been reported in older adults. However, these differences in echo intensity among older and younger adults have not been consistently observed in all of the studies. This study examined differences in echo intensity among older and younger adults and the length of the rectus femoris. METHODS: Fifteen younger men (mean ± SD age = 23 ± 3 years), fifteen young women (21 ± 2 years), eight older men (⩾65 years), and sixteen older women (⩾75 years) participated in this study. Participants were healthy, and had a body mass index ≤ 30 kg/m². B-mode ultrasonography was used to acquire panoramic images of the dominant rectus femoris in the transverse plane at the one-third, one-half, and two-thirds distances along the length of the rectus femoris. ImageJ software was used to analyze the images. Echo intensity was corrected for subcutaneous tissue thickness using sex-specific equations. Analyses of variance and effect size statistics were used to analyze the data. RESULTS: When collapsed across scanning location, differences between men and women (25.8 ± 2.8ms) were no greater in magnitude than those for younger versus older adults (25.8 ± 2.8ms). However, age had a greater influence on differences among scanning locations, with proximal echo intensity (107.8 ± 14.5ms) being significantly lower than the mid (122.2 ± 13.7ms) and distal (135.0 ± 13.8ms) regions. CONCLUSION: The echo intensity in different muscles and sex groups were comparable in younger versus older adults. Furthermore, age and sex, in nonuniform changes in muscle qua- lity throughout the belly of the rectus femoris, with greater deterioration at the middle and distal portions.

1280 Board #42  May 30 9:30 AM - 11:00 AM
Can Changes In Echo-intensity Be Used To Detect The Presence Of Muscle Swelling?
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(No relevant relationships reported)

When examining skeletal muscle, it has been suggested that changes in echo-intensity (EI) measured with B-mode ultrasound can detect the presence of edema-induced muscle swelling. Specifically, if an increase in muscle size is accompanied by an increase in EI it is thought that true growth has not occurred. Interestingly, researchers groups have shown that small upward and downward tilting of the ultrasound probe can have a large influence on EI while having minimal impact on muscle thickness (MT). This suggests that proposed changes in EI following resistance exercise may be artifact from probe tilt as opposed to swelling. PURPOSE: To examine the acute changes in biceps MT and EI, while accounting for probe tilt, following 4 sets of biceps curls.

Abstracts were prepared by the authors and printed as submitted.
after exercise. In addition, we acquired MRI - T2 weighted images to identify regions populations.

training and testing, the diaphragm endurance test may be practical in clinical endurance test was reproducible and did not have an order effect. With additional deficient skeletal muscle of Hz. The average acceleration per minute was recorded. The endurance index, which were placed on the left (n=12) or right (n=2) phrenic nerve, which lies underneath the:

Ten healthy subjects (21.3±1.1 yrs) were tested in the supine position: Ten healthy subjects (21.3±1.1 yrs) were tested in the supine position.

PURPOSE Diaphragmatic function could be important in treating respiratory failure. Electrical stimulation and accelerometer-based mechanomyography have been used to identify the endurance index of various muscles, but not of the diaphragm.

METHODS: Ten healthy subjects (21:3 ± 1:1 yrs) were tested in the supine position on two separate occasions within one week. Custom-made stimulation electrodes were placed on the left (n=12) or right (n=2) phrenic nerve, which lies underneath the sternocleidomastoid muscle. The stimulation intensity to induce a vigorous contraction was determined. An accelerometer was placed on the abdomen. The endurance test consisted of 5 minutes of electrical stimulation on s z, with a sampling rate of 80 Hz. The average acceleration per minute was recorded. The endurance index, which eqa is the ending value/peak value100, w as then calculated. A series of practice tests were performed before data collection.

RESULTS: The test was successfully completed 27:30 times. The time to find the phrenic nerve was 8 ± 2 min for trial 1 and 2 ± 2 min for trial 2. The average endurance index for trial 1 and 2 were 0.5 11.2% and 0.4 12.%, respectively (between days, p=0.54, CV=7.71%).

CONCLUSIONS: The time to find the phrenic nerve decreased with practice. The endurance test was reproducible and did not have an order effect. With additional training and testing, the diaphragm endurance test may be practical in clinical populations.

In this study we examined the effects of downhill treadmill running on dystrophin-deficient skeletal muscle of mdx mice, an animal model of Duchenne muscular dystrophy (DMD). PURPOSE: We hypothesized that mdx mice would be susceptible to muscle damage following downhill running and this would be associated with altered muscle energetic status and magnesium (Mg²⁺). Methods: Mice (wild-type 5 mdx 5 underwent downhill treadmill running (15° decline) on a motorized treadmill at a speed of 8.10 m/min, for 4 6 min in. Unlocalized phosphorus magnetic resonance spectroscopy (31P-MRS) data was collected using an 11.1M TR system from the posterior hindlimb compartment to measure adenosine triphosphate (ATP), phosphocreatine (PCr), inorganic phosphates (Pi), intracellular pH, and magnesium (Mg²⁺) before and 2-hour s after exercise. In addition, we acqi red MRI, weighted images to identify regions of muscle damage in the hindlimbs and performed localized 31P-MRS measures to co-register with damaged regions. Results: Downhill running resulted in a significant (p<0.01) decrease in relative intracellular Mg²⁺ concentration in mdx compared to pre-exercise (P=0.398 ± 0.072 mM; Post: 0.241± 0.050 mM; but no differences were observed in controls. Also, there was a trend (p=0.18) towards an elevated Pi/PCr in the gastrocnemius and soleus muscles in mdx after exercise compared to before exercise (P=0.06). The energetic alterations in mdx were enhanced in the regions of muscle damage identified with T2-weighted MRI. Conclusions: Downhill running resulted in intracellular changes in mdx mice evident with 31P-MRS, including lower intracellular Mg²⁺ concentrations, likely due to compromised sarcolemma integrity. Overall, 31P-MRS measures are sensitive to acute muscle damage induced by downhill running and may be a valuable technique for testing potential therapeutic interventions in dystrophic muscle. Funding Source: NIH (NIAMS) R01 AR0101.

*Purpose*:

The purpose of the present study was to examine time course changes of muscle swelling evaluated by bioelectrical impedance analysis (BIA) following resistance exercise.

METHODS: Nine subjects (20.8±0.4 yr, 174.4±6.8 cm, 67.4±8.1 kg) conducted exercise condition (EX) and rest condition (REST) on different days (a week between conditions). In the EX, subjects conducted unilateral arm curl exercise (12 repetitions × 5 sets, 9 s rest period between sets) for biceps brachii muscle at 60% of maximal voluntary contraction. In the REST, the subjects maintained rest for identical period from exercise duration in the EX. Time course changes in BIA (locally evaluated BIA for biceps brachii muscle), muscle thickness (evaluated by ultrasound) for biceps brachii muscle, circumference of upper arm and blood lactate concentrations were determined before exercise (or rest), immediately after, 30 min and 60 min after exercise (or rest).

RESULTS: The EX caused significant increases in muscle thickness and circumference during post-exercise (p<0.05). Moreover, blood lactate concentration was significantly increased in the EX after exercise (p<0.05). In contrast, no significant change was observed for these variables in the REST. The EX showed rapid reduction of BIA immediately after exercise (from 28.7±10.4 kȍ to 18.5±4.6 kȍ; p<0.05). Furthermore, BIA revealed significantly lower values in the EX at 7 min post-exercise (15.8±5.4 kȍ) than those in the REST (27.7±6.7 kȍ; p<0.05). 15 min after exercise (EX: 22.0±7.0 kȍ vs. REST: 29.5±9.5 kȍ, p<0.05). CONCLUSION: Resistance exercise reduced local BIA during post-exercise, with concomitant increases in muscle thickness and circumference. Therefore, acute reduction of BIA following resistance exercise may reflect exercise-induced muscle swelling and increased water volume in the muscle.

In this study we examined the effects of downhill treadmill running on dystrophin-deficient skeletal muscle of mdx mice, an animal model of Duchenne muscular dystrophy (DMD). PURPOSE: We hypothesized that mdx mice would be susceptible to muscle damage following downhill running and this would be associated with altered muscle energetic status and magnesium (Mg²⁺). Methods: Mice (wild-type 5 mdx 5 underwent downhill treadmill running (15° decline) on a motorized treadmill at a speed of 8.10 m/min, for 4 6 min in. Unlocalized phosphorus magnetic resonance spectroscopy (31P-MRS) data was collected using an 11.1M TR system from the posterior hindlimb compartment to measure adenosine triphosphate (ATP), phosphocreatine (PCr), inorganic phosphates (Pi), intracellular pH, and magnesium (Mg²⁺) before and 2-hour s after exercise. In addition, we acqi red MRI, weighted images to identify regions of muscle damage in the hindlimbs and performed localized 31P-MRS measures to co-register with damaged regions. Results: Downhill running resulted in a significant (p<0.01) decrease in relative intracellular Mg²⁺ concentration in mdx compared to pre-exercise (P=0.398 ± 0.072 mM; Post: 0.241± 0.050 mM; but no differences were observed in controls. Also, there was a trend (p=0.18) towards an elevated Pi/PCr in the gastrocnemius and soleus muscles in mdx after exercise compared to before exercise (P=0.06). The energetic alterations in mdx were enhanced in the regions of muscle damage identified with T2-weighted MRI. Conclusions: Downhill running resulted in intracellular changes in mdx mice evident with 31P-MRS, including lower intracellular Mg²⁺ concentrations, likely due to compromised sarcolemma integrity. Overall, 31P-MRS measures are sensitive to acute muscle damage induced by downhill running and may be a valuable technique for testing potential therapeutic interventions in dystrophic muscle. Funding Source: NIH (NIAMS) R01 AR0101.
the color histogram revealed a significantly greater intensity of red (p=0.030, p=0.001, p=0.004) and a lower intensity of blue (p=0.000.001, p=0.0029 than sound side.). In affected side, the red intensity of TA is correlated with the RF-TC (r=0.566, p=0.04) and TA-TC (r=0.58) The red intensity of GCM is correlated with the GCM-TC (r=0.7 0.04) and the GCM-TR (r=0.8 0.021). The red intensity of BF is correlated with GCM-TR (r=0.8 0.012).

CONCLUSIONS: The results of our study help understanding muscle physiologic change associated with CNS lesion. These are useful to detect muscle dysfunction and assess the effect of neuromuscular rehabilitation in stroke patients.

1287
Board #49
May 30 9:30 AM - 11:00 AM
Mittens and Knee Strength as Measured by A-Mode and B-Mode Ultrasound
Taylor E. Kuehne,1 Noam Yitzchaki,1 B. Sue Graves, FACSM,1 Samuel L. Buckner.1 University of South Florida, Tampa, FL.2 Florida Atlantic University, Boca Raton, FL.

Acute changes in muscle thickness (MT) following resistance exercise are often examined to determine the anabolic potential of an exercise stimulus. This acute change is often attributed to swelling and has been postulated to act as a proliferative signal resulting in a shift towards muscle growth. B-mode ultrasound is commonly used to track acute changes in MT. However, A-mode ultrasound presents a more affordable alternative to measure these same changes. Although A-mode ultrasound may be used to image skeletal muscle, this method does not allow live imaging across a large area of tissue like B-mode ultrasound. In addition, interface detection may be more difficult due to the quality of the image. PURPOSE: To compare MT values between A-mode and B-mode ultrasound before and following four sets of biceps curls. METHODS: Participants visited the laboratory twice. During the first visit, paperwork and one repetition maximum (1RM) strength assessment were completed. During the second visit, participants performed 4 sets of biceps curls to volitional failure using an exercise load equal to 1% of 1RM. MT measurements were taken before and immediately following exercise. MT measures were taken with both A-mode and B-mode ultrasound. Results are displayed as means (% CT).

RESULTS: A total of 23 resistance trained men (n=12) and women (n=11) completed the study. For MT, there was no interaction, the mean difference in the exercise-induced change in ultrasound-measured MT between A-mode and B-mode was 0.02 (-0.11 -0.05) (p = .51) cm. There were, however, main effects for time (p < 0.001) and measurement type (p = 0.001). MT increased from pre [3.62 (3.25-3.99) cm) to post [4.67 (4.32-5.02) cm] exercise. In addition, MT values as measured by A-mode ultrasound were smaller than those measured by B-mode ultrasound [mean difference 0.14 0.08 0.28 cm]. CONCLUSIONS: Our results suggest MT measurements taken using A-mode ultrasound are smaller than those using B-mode ultrasound. Despite this difference, it appears A-mode can detect similar acute changes in MT following exercise resistance when compared to B-mode. These results suggest that A-mode ultrasound can serve as a useful tool to examine acute changes in MT, which may also help to better understand the effectiveness of a resistance exercise stimulus.

1288
Board #50
May 30 9:30 AM - 11:00 AM
Pelvic Limbs Length And Knee Alterations In Health Sciences College Students.
Karla S. Vera-Delgado, Cipriana Caudillo-Cisneros, Fernando Sotelo-Barroso, Sergio Marquez-Gaño, Monserrat Vera-Delgado. Universidad de Guanajuato, León, Mexico.

Although skeletal muscle mass decreases in sarcopenia, it is not clear whether it occurs systemically or partially. It is important to clarify the age-related change of each skeletal muscle as a basic component of sarcopenia research. PURPOSE: The purpose of this study was to investigate characteristics of age related changes in the cross sectional area of psoas major muscle as part of elucidation of sarcopenia. MTHODS: Subjects consisted of 2014 seniors (983 ales and 1006 females) aged 10 to 24 (classified every 5years) examined at our clinic. Using MRI, muscle cross-sectional area was measured as a major component of sarcopenia research. PURPOSE: This study was not able to detect differences in both sexes. A remarkable decrease was also observed in the late 30s and 9s in men. Interaction between sex and age was observed, and differences in patterns were observed between men and women. As a result of analysis of variance, no correlation was found between BMI and age, but a correlation was found between gender and BMI and between sex and age. In all age groups, it was confirmed that the group having a larger BMI exhibited a larger muscle cross sectional area. CONCLUSIONS: These results showed the characteristics of age-related change of cross sectional area of the psoas major muscle. Further investigation is needed for sarcopenia research.

THURSDAY, MAY 30, 2019
Abstracts were prepared by the authors and printed as submitted.
PURPOSE: A narrative review of studies which measured vastus lateralis (VL) muscle thickness (MT) using Ultrasonography (US) revealed inconsistencies in the procedures and techniques used for measurement. One consideration for measurement is the position of the limb and participant. Knee extension was the most commonly reported position, however, some studies used knee flexion. The extent to which this alters muscle morphology is unknown and therefore, there is uncertainty as to whether data from studies using different positions can be compared. The aim of this study was to analyze whether limb position, knee extension or knee flexion, had a significant effect on VL-MT, pennation angle and fascicle length.

METHODS: In order to have a homogenous sample, thirty two full time male professional soccer players took part in the study [age=18 ± 0.2 yrs (mean ± SD), height= 1.72 m, mass=73 ± 4.3 kg]. In vivo MT and architecture were measured using B mode ultrasound (LOGIQ, GE Healthcare). Two images were taken of the VL in the dominant leg while the participant was supine with their knee extended or flexed at 90 degrees (leg off the bed). Images were downloaded to an imaging software (Image 1, v1.8k; NIH; Bethesda; USA). Analysis of the data was conducted in SPSS v24. Descriptive statistics were calculated for each of the dependant variables (MT, pennation angle and fascicle length). A Paired T test was performed for each of the data sets. P=0.05 was considered as significant. RESULTS: MT was significantly greater in the supine/knee extended position compared to the supine/knee flexed position (24.83 ± 2.05 cm vs 23.96 ± 2.01 cm; t(31)= 2.76, p= <.010). Pennation angle was also significantly larger in knee extension compared to knee flexion (18.47 ±1.18° vs. 16.87 ± 1.14°; t(31)= 7.59, p= <.000). Whilst no differences were found in fascicle length (9.87 ±0.53cm vs 9.04 ±0.92cm; t(31)= -3.78, p= <.009). CONCLUSIONS: This study is the first to demonstrate differences in muscle morphology, dependent on limb position, as measured by US. The differences in MT were less than the smallest real difference calculated for US in our laboratory. A standard operating procedure for the measurement of MT using US is required. This study only addresses one aspect of a standard operating procedure.

1290 Board #52 May 30 9:30 AM - 11:00 AM Profiles of Quadriceps Muscles after Downhill Running using Ultrasonography

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PURPOSE: The aim of study was to examine the changes of muscle properties after downhill running at different intensities, and further to investigate the optimal biomarkers for muscle damage. METHODS: Eleven sedentary men were randomly assigned to repeated measured running sessions set up either at high (2.5 km/h vs 1.5 km/h: HR_sup vs HR_low), or low (3.5 km/h vs 2.5 km/h: HR_sup vs HR_low) HR or Low (LS, 80% HR) with -9 (-16%) gradient. Each session consisted of 30 min downhill running on separate occasions 2-wk apart. Range of motion (ROM) was calculated from voluntary maximal extension and flexion. Muscle soreness was recorded on visual analog scale (VAS) with algometry on rectus femoris (RF), vastus lateralis (VL), and vastus medialis (VM). Echo intensity (EI) was scanned with B-ultrasound analysis and analyzed with gray scale analysis. In addition, serum creatine kinase (CK) activity had evaluated as a blood biomarker. All parameters were analyzed using SPSS v24. Descriptive statistics were calculated for each of the dependant variables (MT, pennation angle and fascicle length). RESULTS: MT was significantly greater in the supine/knee extended position compared to the supine/knee flexed position (24.83 ± 2.05 cm vs 23.96 ± 2.01 cm; t(31)= 2.76, p= <.010). Pennation angle was also significantly larger in knee extension compared to knee flexion (18.47 ±1.18° vs. 16.87 ± 1.14°; t(31)= 7.59, p= <.000). Whils no differences were found in fascicle length (9.87 ±0.53cm vs 9.04 ±0.92cm; t(31)= -3.78, p= <.009). CONCLUSIONS: This study is the first to demonstrate differences in muscle morphology, dependent on limb position, as measured by US. The differences in MT were less than the smallest real difference calculated for US in our laboratory. A standard operating procedure for the measurement of MT using US is required. This study only addresses one aspect of a standard operating procedure.

1292 Board #54 May 30 9:30 AM - 11:00 AM Examination of Tendon and Muscle Architecture and Their Influence on Postural Stability

Lauren E. Pacinelli, Jeffery A. Williams, John P. Vardiman, Ryan M. Thiele. Kansas State University, Manhattan, Ks.

PURPOSE: Evaluate the relationship between AT_length and medial gastrocnemius (MG) PA, as well as their influence on balance performance (overall stability index; OSI). METHODS: Eighteen female (mean ± SD: age = 19 ± 1 yrs) participants laid in a prone position on a commercially designed balance unit with an adjustable dynamic platform and ankle maintained in a neutral position (0°). Ultrasonography (US) PA images were scanned in a longitudinal position at the medial 1/3 of the low leg with a linear-array probe at the level of the tibial tuberosity, and were identified as the angle formed between the muscles fascicles and the deep fascia of the MG muscle. AT_length was captured in the extended-field of view setting starting at the calcaneal insertion of the AT and ending at the MG musculotendinous junction (MTJ). AT_length was identified as the distance (cm) between the calcaneal notch and MTJ and MG MTJ. All US image measurements were analyzed using a third-party image analysis software. Balance assessments were performed on a commercially designed balance unit with an adjustable dynamic platform and involved three, 20-s single leg balance trials. Pearson product-moment correlation coefficients (r) were used to examine the relationships between AT_length and MG PA, and OSI. RESULTS: A significant negative correlation (r = -0.44 vs sham EI, p = 0.033) was observed between MG PA and AT_length. No significant correlations were observed between OSI and MG PA (r = -0.109 r = 0.012; p = 0.6 or OSI (r = 0.073; R2 = 0.005 p = 0.3). AT_length. CONCLUSION: The present investigation revealed a longer Achilles tendon length was associated with a diminished pennation angle of the
significantly greater (p = 0.03) during the unilateral 1RM than the bilateral 1RM, but bilateral deficit (BLD; -9% ± 2.9%). Within the BLD subjects, the EMG MPF was measured using two foam pads at the ankle and the widest portion of the upper-leg. Paired t-tests examined the lateral DXA scanning method's agreement when quantifying total, and in the corresponding signal from the MVIC trials. Statistical analyses included paired samples t-test (p ≤ 0.05).

PURPOSE: Recently, we reported the accuracy of a novel lateral segmentation dual X-ray absorptiometry (DXA) scanning method for measuring lower extremity muscle mass. This study examined the lateral DXA scanning method's agreement when quantifying total, and within the participating subjects lying on their right and left sides, with the scanned leg elevated from the ground using two foam pads at the ankle and the widest portion of the upper-leg. Paired t-tests examined the lateral DXA scanning method's agreement when quantifying total, and the corresponding signal from the MVIC trials. Statistical analyses included paired samples t-test (p ≤ 0.05).

RESULTS: Comparisons of frontal and lateral view DXA scan measurements for right leg total mass (72%: 0.9 kg vs. 0.8 kg), lean mass (54%: 1.0 kg vs. 0.9 kg), fat mass (1.04 kg vs. 1.06 kg), and BMC (0.28 kg vs. 0.32 kg), respectively, were significantly different (all p<0.01). Similarly, comparisons of frontal and lateral leg total mass (72%: 0.9 kg vs. 0.8 kg), lean mass (54%: 1.12 kg vs. 1.01 kg), fat mass (1.04 kg vs. 1.15 kg), and BMC (0.28 kg vs. 0.30 kg), respectively, were all significantly different (all p<0.01). CONCLUSIONS: Unlike our previous study in which we reported agreement of lateral leg composition measurements in comparison to frontal composition measurements of eqa 1 area obtained in the standard whole-body frontal DXA scanning view, the results of this study indicate that the lateral DXA scanning method is significantly different from the frontal method for measuring lower extremity muscle mass, fat mass, and bone mineral content (BMC).

EMG AMP, MMG AMP, and MMG MPF were not different (Figure 1). There were no differences between unilateral and bilateral neuromuscular responses for the non-BLD (n = 6 subjects). CONCLUSION: These findings indicated the BLD could be due to different motor control strategies, such as changes in muscle fiber conduction velocity, in a bilateral versus a unilateral movement of the lower limbs.
20-s trials of isometric force with their index finger and thumb, to 25% of their maximal voluntary contraction. In the full-vision (FV) condition, visual feedback was provided for the duration of the trial. In the no-vision (NV) condition, visual feedback was provided for the first 8 s of the trial, and then visual feedback was removed. Participants were to maintain force output for the remaining 12 s. RESULTS: In FV, participants produced less mean force on D2 (24%) relative to D1 (28%) and D3 (25.0%). Mean force did not differ as a function of day in NV. The coefficient of variation was higher on D2 relative to D1 and D3, in both FV (D1: 1.7%, D2: 5.6%, D3: 1.5%) and NV (D1: 5.2%, D2: 5.6%, D3: 5.0%). CONCLUSIONS: These findings are the first demonstrations that restricted sleep negatively impacts force control.

Physiological systems exhibit high levels of complexity characterized by non-linearity and persistent fractal correlations (low levels corresponding to states such as disease, injury, and fatigue) and has become recognized as a defining feature of healthy physiological functioning. Neuromuscular complexity is affected by fatigue and intensity of contractions, although no study has investigated the effect of contraction type on complexity.

**PURPOSE:** The purpose of this study was to investigate the effect of contraction type on neuromuscular complexity.

**METHODS:** Twelve collegiate-aged resistance-trained females (21 ± 1 years, 63 ± 7 kg) were recruited to visit the laboratory on two occasions, the first for familiarization purposes. In session two, participants performed three maximal knee extensor contractions on an isokinetic dynamometer for each contraction type [concentric (CON), eccentric (ECC), and isometric (ISO)] in random order. Relative knee angle was standardized to 120° during ISO contractions. Angular speed was standardized to 30°/s and range of motion to 0°–0° (at full extension) during CON and ECC contractions. Each contraction lasted 4 seconds, with three seconds rest between contraction. Electromyographic (EMG) signals were recorded from the vastus lateralis using a bipolar electrode configuration. Sample entropy (SE), a unitless measure of statistical irregularity was used as an index of physiological complexity. A one-way repeated measures ANOVA was performed to investigate differences in EMG SE among contraction types. Alpha level was set to 0.05.

**RESULTS:** Contract type was observed to have a significant effect on EMG SE (F(2,22) = 7.212, p = 0.017) and ISO (1.569 ± 0.321, p = 0.017) and ECC (1.497 ± 0.321, p = 0.017) and ISO (1.0 0.225, p = 0.023) contractions.

**CONCLUSION:** These findings indicated that neuromuscular complexity is contraction-type dependent, being significantly higher during CON than ECC and ISO contractions. In addition, there exists no generally accepted framework to explain the relationship between the motor unit recruitment threshold and average firing rate, and between the recruitment and derecruitment thresholds were examined using linear regression analyses. **RESULTS:** Paired samples t-tests showed no significant differences between two tasks for the mean slope coefficient (-0.51 ± 0.34 vs. -0.5 - 0.38, p = 0.51) or y-intercept (2.8 ± 1.2 vs. 2.8 ± 1.2, p = 0.589) for the recruitment threshold vs. average firing rate relationship. In addition, the mean slope coefficient (1.23 ± 0.76 vs. 1.62 ± 0.78, p = 0.125) and y-intercept (-12.98 ± 23.54 vs. -18.98 ± 13.45, p = 0.391) were also not different between two tasks for the relationship between recruitment and derecruitment thresholds. **CONCLUSION:** The motor unit control strategies did not seem to differ between the two submaximal isometric muscle actions.

**PURPOSE:** Previous studies have suggested that skilled athletes may show a specific muscle activation pattern with a lower antagonist coactivation level. Based on the point, we hypothesize that the coupling of antagonistic muscles may be different between elite badminton players and non-skilled individuals during exercises. The current work was designed to verify this hypothesis.

**METHODS:** Ten male college students and eight male badminton players performed three maximal voluntary isometric contractions (MVC) and a set of three maximal concentric ankle dorsiflexion and plantar flexion at angular velocity of 30°, 60°, 120°
and 180%’s. Surface EMG were recorded from the tibialis anterior (TA) and lateral gastrocnemius (LG) muscles during the test. Normalized average amplitude of the integrated EMG and phase synchronization index (PSI) between the EMG of TA and LG were calculated. **RESULTS:** Antagonist muscle coactivation were significantly lower (22.1% ± 9.4%, 2.6% ± 12.8%, 22.2% ± 9.6%, 22% ± 9.6% for non-players and 10.7% ± 3.7%, 10.1% ± 2.5%, 11.2% ± 2.5%, 10.6% ± 2.5% for badminton players in four angular velocity speed, P<0.05 for all group comparison) and PSI in beta frequency band were significantly higher (0.42 ± 0.06, 0.36 ± 0.13, 0.36 ± 0.10, 0.35 ± 0.12 for non-players and 0.3; 0.15±0.001; 0.15±0.000; 0.11±0.0; 0.14±0 for badminton players in four angular velocity speed, P<0.05 for four group comparison) in badminton players group compared to non-players group during isokinetic ankle dorsiflexion contraction, while no significant difference was found in antagonist muscle coactivation and PSI between two group in the other frequency bands. **CONCLUSIONS:** The decrease of antagonist coactivation may indicate an optimal motor control style to increase the contraction efficiency, while the increase coupling of antagonist muscles may be related to the compensation of joint stability as a result of the decrease of antagonist coactivation.

**Table 1. Simple regression coefficients of original (O) vs. validated (V) motor units**

<table>
<thead>
<tr>
<th>Recruitment Threshold vs. Mean Firing Rate</th>
<th>Slopes</th>
<th>Intercept</th>
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<tbody>
<tr>
<td>O</td>
<td>V</td>
<td>p</td>
</tr>
<tr>
<td>S01</td>
<td>-0.8</td>
<td>-0.3</td>
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<tr>
<td>S02</td>
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<tr>
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<tr>
<td>S05</td>
<td>-0.25</td>
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Thucydides, May 30, 2019

Early Career Researchers program

The loss of muscle strength during periods of disuse is rapid. Some investigators have postulated that these changes are due to neural, rather than muscular, adaptations. It is unclear, however, if short-term immobilization of the knee joint affects the voluntary control of motor units. PURPOSE: To determine whether the slope and y-intercept of the motor unit mean firing rate versus recruitment threshold relationship is altered by 2 hours of disuse.

METHODS: Fifty healthy females (mean ± SD age = 21 ± 2 years, body mass index [BMI] = 23.1 ± 2.3 kg/m²) voluntarily underwent left knee joint unloading via ambulating on crutches and use of a brace. The brace was worn at all times except during sleep, and compliance was confirmed via accelerometers secured around both ankles. Following two extensive familiarization sessions at the laboratory, testing was performed immediately prior to immobilization (PRE) and 2 hours later (POST). During both testing sessions, participants performed trapezoidal isometric contractions at a torque level corresponding to 9% of their maximal voluntary contraction (MVC). Participants were instructed to increase torque from 0 to 50% in five seconds, maintain 50% MVC for 15 seconds, and decrease torque from 50% to 0 in five seconds. Bipolar surface electromyographic (EMG) signals were recorded from the vastus lateralis. A surface EMG signal decomposition algorithm was used to calculate the mean firing rate (pulses per second (pps)) and recruitment threshold (% MVC) of each detected motor unit. Motor units with decomposition accuracy levels < 90% were discarded. Linear regression was then used to calculate the slope (pps/MVC) and y-intercept (pps) of each relationship.

RESULTS: Immobilization had no influence on the linear slope coefficient for the recruitment threshold. No differences were observed in the linear slope coefficient between conditions. No differences were observed in the y-intercept between conditions. No differences were observed in the recruitment threshold for either condition (p > 0.05).

CONCLUSION: Our findings demonstrated that 72 hours of knee joint immobilization in healthy females had little influence on vastus lateralis motor unit recruitment thresholds.

Funding: The De Luca Foundation and the UCF Office of Research’s Advancement of Early Career Researchers program

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CONCLUSION: Our findings demonstrated that 72 hours of knee joint immobilization in healthy females had little influence on vastus lateralis motor unit recruitment thresholds.
Aging results in a variety of muscular adaptations which may affect the recruitment of motor units. **Purpose:** We sought to determine if younger and older men recruit motor units at similar isometric force levels. **Methods:** Twelve younger (<25 years, mass = 66 ± 8 kg, height = 1.75 ± 0.1 m) and twelve older (mean ± SD age = 70 ± 7 years, mass = 78.9 ± 10.2 kg, height = 1.74 ± 0.1 m) men performed trapezoidal isometric contractions of the dominant knee extensors at a force level corresponding to the first firing. Recruitment thresholds were calculated for 15 seconds, and decrease force from 50% to 0 in five seconds. Bipolar surface EMG signals were recorded from the vastus lateralis during each contraction.

A surface EMG signal decomposition algorithm was then used to quantify the recruitment threshold of each detected motor unit, which was defined as the isometric force level corresponding to the first firing. Recruitment thresholds were calculated in both relative (% MVC) and absolute (N) terms. Motor units with accuracy levels < 90% were not considered for analysis. **Results:** The mean ± SD number of motor units detected was 17 ± 5 for younger and 13 ± 4 for older men. MVC force was significantly greater in younger vs. older men (796.6 ± 197.8 vs. 520.8 ± 121.6 N [p = 0.010; Cohen’s d = 1.13]). The relative median recruitment threshold values were significantly greater for younger (26.6 ± 9.1% MVC) compared to older (15.6 ± 7.9% MVC) [p = 0.005; d = 1.29] men. Younger men also demonstrated greater median recruitment threshold values when expressed in absolute terms (186 ± 92 vs. 12 ± 40N [p = 0.001; d = 1.53]). Similarly, large differences in the mean recruitment threshold were observed in both relative (13N MVC = 0.005 d = 1.27) and absolute (194 ± 88 vs. 8 ± 4N [p = 0.001; d = 1.53]) terms. The relative recruitment threshold range was not significantly different between younger (22.6 ± 9.5% MVC) and older (18.5 ± 6.4% MVC [p = 0.23] d = 0.6) men. However, the absolute range was considerably larger for younger (186 ± 92N) compared to older (8 ± 4N) men. Conclusion: Older men tend to recruit motor units at lower force levels. We speculate that motor unit recruitment threshold compression may be a neural adaptation that serves to compensate for denervation and subsequent re-innervation in aged muscle.

**Purpose:** The purpose of the present study was to identify the time course of changes in neuromuscular parameters from the vastus lateralis (VL) muscles during fatiguing, bilateral, maximal isokinetic leg extensions. **Methods:** Fifteen men (22.3 ± 3.3 yr) performed consecutive, maximal, bilateral, concentric isokinetic leg extensions at 180°·s⁻¹ until their peak torque was reduced by 8% (3 ± 1 repetitions). The amplitude (root mean square = RMS) and frequency (mean power frequency = MPF) contents of electromyographic (EMG) and mechanomyographic (MMG) signals from the VL muscles of both legs were recorded simultaneously during each repetition of the fatiguing bout. The EMG RMS, EMG MPF, MMG RMS, and MMG MPF were normalized to the corresponding finding maximal isometric voluntary contraction values and torque values were normalized to maximal bilateral isokinetic concentric peak torque values at 180°·s⁻¹. The repetitions were normalized to each 10% of the total number of repetitions completed. Four, 2 (right and left VL) x 10 (10-100% of the total repetitions) repeated measures ANOVAs were used to determine mean differences for each neuromuscular parameter. **Results:** The maximal bilateral peak torque (311.4 ± 51.2 N·m) decreased significantly (p < 0.01; η² = 0.92) at 90% of the total repetitions. Conclusion: The results of the present study demonstrated no differences between the right and left VL muscles for their patterns of neuromuscular responses during the fatiguing bilateral leg extensions. While peak torque decreased, no changes occurred for any of the neuromuscular parameters and their force dependencies. Therefore, the current findings suggested that the decrease in torque production was due to peripheral mechanisms of fatigue and not a decrease in central neural drive to the muscles.
Neural And Contractile Determinants Of Rate Of Force Development: A Preliminary Analysis

Mitchel A. Magrini, Ryan Colqhoun, N athaniel Jenkins, Jason DeFreitas. Oklahoma State University, Stillwater, OK.

No relevant relationships reported

Neural and contractile factors have been suggested as important determinants for different phases of the rate of force development (RFD). PURPOSE: To examine the influence of rate of muscle activation, motor nerve conduction velocity (CV) and motor unit number estimation (MUNE) of the vastus lateralis on early and late phase RFD.

METHODS: Fifteen males (age=23±3 y) completed 2 maximal (MVIC) and motor unit number estimation (MUNE) of the vastus lateralis on early and late phase RFD.

RESULTS: The RFD values were calculated during the first 50 ms (nRFD50) and 100 to 150 ms (nRFD100-150) and normalized to maximal force (%MVIC/s). The rate of electromyographic signal rise (RER) was calculated during the first 50 ms of muscle excitation (nRER) and normalized to the peak onset M-wave amplitude (%MPP/s) and normalized to the peak onset M-wave amplitude (%MPP/s). MUNE was calculated as a ratio of the ensemble average of the single motor unit potential area to the compound muscle action potential area, and was corrected for alternation. Motor CV (m/s) was assessed as the time (m/s) from maximal stimulation of the femoral nerve to onset of muscle activity. Pearson’s correlation coefficients were used to analyze the relationships between the dependent variables. Additionally, stepwise multiple regression was used to examine the degree to which the predictor variables (nRER, MUNE, Motor CV) explained a significant proportion of the variance in each RFD phase (nRFD50 and nRFD100-150) and normalized to maximal force (%MVIC/s).

ACKNOWLEDGEMENTS: The funding for this study was provided, in part, by the Central States American College of Sports Medicine Student Research Grant.

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MAY 30 10:30 AM - 12:00 PM

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132 Board #74 May 30 10:30 AM - 12:00 PM

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Mitchel A. Magrini, Ryan Colqhoun, N athaniel Jenkins, Jason DeFreitas. Oklahoma State University, Stillwater, OK.

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ACKNOWLEDGEMENTS: The funding for this study was provided, in part, by the Central States American College of Sports Medicine Student Research Grant.

1313 Board #75 May 30 10:30 AM - 12:00 PM

Examining Quadriceps Muscle Excitability Throughout A Progressive Exercise Test: A Pilot Study

Emily M. Adamic, Joel T. Greenshields, Jessica A. Freemas, Ichie Kito, Catana, David M. Kocjea, Timothy Mickleborough. Indiana University, Bloomington, IN.

Email: emadamic@indiana.edu

(No relevant relationships reported)

PURPOSE: A metabolic threshold occurs during progressive exercise with a non-linear increase in blood lactate. The power output at which this occurs closely corresponds to the ventilatory threshold, a non-linear increase in minute ventilation (V̇E).

These factors may affect muscle excitability and thus force generating capacity. Muscle excitability has been shown to decrease after high-intensity whole-body exercise, however it has not been identified when this decrease occurs during progressive exercise. Therefore the purpose of this study was to examine quadriceps muscle excitability throughout a progressive exercise test.

METHODS: Five men (age 23 ± 3.5 years) performed a step-wise cycling test, beginning at 100W and increasing 2W/min until volitional exhaustion. Minute averages of oxygen consumption (VO2) and V̇E were collected, and heart rate (HR) and rating of perceived exertion (RPE) were recorded at the end of every minute.

M-waves were induced using a stimulating electrode positioned over the femoral nerve and given at a fixed crank angle of 90° while the subject was cycling. During the exercise test, supramaximal stimulations were given every 10 seconds and averaged over the minute. Using a mixed linear model to control for within-subject variance, both absolute and relative (percent decrease) M-wave amplitudes for each minute were compared to the first minute of exercise.

RESULTS: Subjects exercised for an average of 10 ± (0.7) minutes. V̇E, HR, and RPE increased significantly each minute in a linear fashion. Ventilatory threshold occurred at minute 7 (±1 minute). Compared to the first minute of exercise, absolute M-wave amplitude decreased significantly at minute 7 (2.14 ± 2.45mV versus 3.78 ± 2.58mV), whereas relative M-wave amplitude decreased significantly at minute 6 (20.44± 28.5%) . After this point, both remained reduced until exhaustion.

CONCLUSIONS: These data show that the M-wave may exhibit an excitationality threshold corresponding to that of the ventilatory threshold. This could reflect the metabolic state of the muscle, indicating the division between sustainable and unsustainable exercise intensities. Further research should examine the neural response to progressive exercise in relation to peripheral losses of excitability.

Dance comprises a broad range of technique and styles, which have been utilized in classes specifically designed for individuals with Parkinson’s disease (PD) and healthy older adults. Previous studies have shown that a series of dance sessions can improve balance, posture, and mobility for people diagnosed with PD and healthy older adults. However, these studies have not analyze the linkage between repetitive movement types and persistent changes in motor skills. In order to begin understanding the causative factors of repetitive movement types that result in improved motor skill performance, the functional relationship between movement features and observed performance improvements needs to be examined. PURPOSE: To identify dance movement patterns resulting in the greatest improvement in tests of gait, balance and upper extremity function using partnered and non-partnered dance to music in PD and healthy older adults. We hypothesize that scripted variation in movement will promote improvements in motor performance. METHODS: Participants in structured group dance classes were recruited for this study. Performance measures of upper and lower extremity were collected before and after each dance class. Motion capture, video and live observations were used to examine movement patterns. RESULTS: Individuals with PD had slower baseline performance in the 90° c eg test (R PT) than healthy older adults in both left (p=0.02633.5 s vs 2.9s ) and right hand (p=0.00831.2 s vs 26.5 s). There was also a significant improvement in the 90PT for the left hand after the dance classes in the individuals with PD (p=0.0353 -4.4). Factors that led to observed improvements in mobility and movement execution included: repetition of foundational weight shifts in a separate preparatory exercise, engagement of the spine and arms in counterbalancing movement in the legs, incorporating flexion at the knee into the dance stride, and partnering with a moderately-skilled dancer. Increased amplitude and ease of stride and greater lift in the feet in locomotion were also documented. CONCLUSIONS: These preliminary results suggest that repetitive shifts in balance and movement during dance with music can lead to upper extremity motor performance and increased amplitude of movement in the lower extremity in individuals with PD.
Fatigue and heat sensitivity are commonly reported symptoms in persons with multiple sclerosis (PwMS). PwMS also often have difficulty performing concurrent cognitive and motor tasks that presents as a dual-task decrement. Heat sensitivity along with a dual-task decrement may hinder activities of daily living and quality of life for PwMS. Though using a cooling vest could help decrease heat sensitivity, it is currently unknown if it improves dual-task performance in PwMS.

**PURPOSE:** To examine the effects of a cooling vest on cognitive-motor dual-task cost (DTC) and fatigability in PwMS.

**METHODS:** 3 PwMS participated in two sessions that were at least 1 week apart. During one session participants wore a sham cooling vest and the other session an actual cooling vest. During each session participants completed a Timed 25 Foot Walk Test (T25F WT), 6MWT while performing Serial 3’s, and a 6MWT while narrating a story. The type of vest and order of tests was randomized for each participant. Total times for T25F WT and total distances for 6MWT were recorded. DTC, defined as the percent change between single- and dual-task performance, was calculated. Fatigability, defined as the difference between the average of the first two and the last two laps times of the 6MWT, was calculated. Paired samples t-tests were used to compare DTC during cooling and non-cooling sessions and fatigability during single- and dual-task conditions within each session.

**RESULTS:** The mean DTC during the 6MWT for cooling and noncooling was -8.8% and -6.7%, respectively. The mean distance walked during T25F WT dual-task increased from 23.6m without cooling to 28.5m with cooling. There was a trend towards significant difference between single- and dual-task fatigability during 6MWT for noncooling session (Single: 1.6 ± 3m; Dual: 2.5m ± p<0.05), but not for cooling session (Single: 0.3 ± 3m; Dual: 1.2 ± p<0.05).

**CONCLUSION:** Preliminary results show lower DTC and no significant difference between single- and dual-task fatigability when using a cooling vest suggests that a cooling vest may have a benefit for PwMS while dual-tasking during endurance activities. Further research with a larger sample size is needed to confirm these findings.

**1317**

**May 30 10:30 AM - 12:00 PM**

**Neuromuscular Impairment of the Planter Flexors In Adults With and Without Prader-Willi Syndrome**

Eric J. Shumski1, Skylar C. Holmes1, Brett K. Post1, Steven A. Garcia1, Derrick Escano1, Daniela A. Rubin, FACSM2, Derek N. Panukoff3. 1California State University, Fullerton, Fullerton, CA. 2University of Michigan, Ann Arbor, MI. 3Email: erichshumski@csu.fullerton.edu

**No relevant relationships reported**

Muscle weakness is common in individuals with Prader-Willi Syndrome (PWS), but the source of weakness is unclear. **PURPOSE:** The purpose of this study was to compare neuromuscular function, and muscle size and quality of the plantar flexor muscles between individuals with and without PWS. **METHODS:** Ten participants with PWS were matched on sex to 10 obese control and 10 lean control participants. Hoffman (H) reflex and muscle response (M-wave) were obtained from the soleus by stimulating the tibial nerve to determine the H:M ratio. Isometric plantar flexor strength was assessed using an isokinetic dynamometer to find peak torque (PT), (early) (RTO100) and late (RTO200) rate of torque development. Surface electromyography (EMG) was recorded from the soleus and gastrocnemii during strength assessments to determine early (RER100) and late (RER200) rise in EMG, and early (1100) and late (1200) integrated EMG. EMG data were normalized to peak EMG amplitude collected from the soleus and gastrocnemii during strength assessments.

**RESULTS:** There were group differences in H:M ratio (p=0.03), RTO100 (p=0.01), RTO200 (p=0.01), RER100 (p=0.02) and CSA (p=0.01). Post hoc tests indicated that the PWS group had lower H:M ratio (0.29 ± 0.13, p<0.03), RTO100 (1.08 ± 0.8 vs 3.2B ± 0.1 m/kg, p=0.01), and RTO200 (2.20 ± 1.05 vs 2.2B ± 0.9 m/kg, p<0.01). The PWS group had lower RER100 (1.07 ± 1.4 vs 2.8 ± 1.4 %MVIC/sec, p=0.02) in the soleus compared to obese controls. Obese controls had larger CSA compared to lean controls (2527.99 ± 579.02 vs 1638.55 ± 354.52 m², p<0.01) and compared to the PWS group (1786.26 ± 288.05 m², p=0.026). There were no differences between groups in RER200, H100, or E1. **CONCLUSIONS:** A lower H:M ratio in adults with PWS compared to controls may indicate lower α-motoneuron excitability. Similarly, lower RTO100 in adults with PWS compared to controls may indicate lower motor unit recruitment and firing rate, which is supported by lower RER100. Conversely, lower RTO200 may be attributed to smaller CSA. Muscle weakness in adults with PWS may originate from neural and morphologic factors.

**1318**

**May 30 10:30 AM - 12:00 PM**

**Impact Of Attention-deficit/hyperactivity Disorder On Gross Motor Skills Among A Group Of Girls Teens**

Laurie Simard1, Julie Bouchard1, Linda Pape2, Jacinthe Dion1, Claudia Verret2, Jacques S. Leroux3, Alain-Steve Contois2, Tommy Chevrette1, 1UQAC, Chicoutimi, QC, Canada. 2UQAM, Montréal, QC, Canada. 3HRDP, Montréal, QC, Canada. Email: laurie.simard@uqac.ca

**No relevant relationships reported**

Scientific literature has shown motor impairment in adolescent boys with Attention-Deficit/Hyperactivity Disorder (ADHD), but little is known about girls with ADHD. **PURPOSE:** The purpose of this study was to evaluate the impact of ADHD on Gross Motor Skills (GMS) of adolescent girls. **METHODS:** GMS of 91 girls with ADHD (mean=14.8 ± 1.9 yrs old) and girls without ADHD were measured using the Bruininks & Bruininks Motor Proficiency Test (B&MPT, 2012). Motor clumsiness scores were compared between girls with and without ADHD. **RESULTS:** Girls with ADHD showed significantly slower arm and leg length speed compared to girls without ADHD (Arm: 0.8 ± 0.8 vs 1.3 ± 1.1 s, p<0.01; Leg: 1.2 ± 0.9 vs 2.3 ± 0.8, p<0.01). Girls with ADHD showed significantly slower hand-eye coordination when compared to girls without ADHD (2.8 ± 1.2 vs 1.8 ± 1.1, p<0.01). Correcting for Age, BMI and Motor Proficiency Treatment did not affect the differences in GMS outcomes. **CONCLUSION:** girls with ADHD showed significantly slower hand-eye coordination when compared to girls without ADHD (2.8 ± 1.2 vs 1.8 ± 1.1, p<0.01). Girls with ADHD showed significantly slower hand-eye coordination when compared to girls without ADHD (2.8 ± 1.2 vs 1.8 ± 1.1, p<0.01). Correcting for Age, BMI and Motor Proficiency Treatment did not affect the differences in GMS outcomes. **CONCLUSION:** It appears that significant differences are present between girls with ADHD when compared to girls without ADHD in gross motor function. Future motor development research should include female participants with ADHD and include an assessment of executive functions. This would help better understand the possible causes of the motor impairment identified in individuals with ADHD.
PURPOSE: What are the effects of aquatic-based exercise (AqEx) on motor and non-motor symptoms, functional performance and quality of life (QOL) in individuals with Parkinson’s disease (iPD)? Does AqEx have greater effects on these outcomes than other forms of exercise in iPD? METHODS: A systematic review and meta-analysis of randomized controlled trials (RCTs), which enrolled iWPD in supervised AqEx programs ≥ 2 weeks, was conducted. The primary outcomes were motor symptoms and functional performance; the secondary outcomes were non-motor symptoms and QOL outcomes. RESULTS: Of the 129 records identified, seven trials met the inclusion criteria and six entered the meta-analysis (159 subjects). One trial assessed the effect of AqEx compared to usual care and found a significant improvement at the Unified Parkinson’s Disease Rating Scale Part-III (UPDRS-III), mean difference, MD = -8.9, CI -11.3 to -6.5, in favor of AqEx. Six studies compared AqEx with Land-based exercise (LEs) with heterogeneous interventions (average of 2.2 ± 2.2 weeks of training; 159 subjects). The effect of AqEx was superior to LEs on the Berg Balance Scale (MD 2.7, 95% CI 1.6 to 3.9), the Falls Efficacy Scale (MD -2.1, 95% CI -3.1 to -1.0), and the 39-item Parkinson’s Disease Questionnaire (MD -6.0, 95% CI -11.3 to -0.6), with no significant between-groups differences in the other outcomes considered. The significant between-group difference for the Berg Balance Scale was maintained at the follow-up assessment (3.9, MD 95% CI 1.9 to 6.0, p < 0.01). CONCLUSIONS: AqEx significantly improves motor symptoms in iWPD. It also has slightly to moderately greater benefits than LEs on balance capacity, postural stability and perceived well-being in iWPD, especially in those presenting with specific functional and mobility impairments. On other outcomes, the benefits of AqEx were similar to perceived well-being in iWPD, especially in those presenting with specific functional and mobility impairments. On other outcomes, the benefits of AqEx were similar to those of LEs.

Background: To perform activities of daily living safely and efficiently, an individual with hemiparetic stroke needs to accurately perceive how much force is generated about their joints, i.e., torque perception. We know that individuals with moderate to severe motor impairments post hemiparetic stroke have between-arms torque perceptual impairments. However, a question that has yet to be addressed is whether these individuals have a torque perceptual impairment within their paretic arm and/or non-paretic arm.

Objective: To compare single-arm and two-arm torque perception between individuals with chronic hemiparetic stroke and individuals without neurological impairments (i.e., controls).

Methods: Nine individuals with chronic hemiparetic stroke and five similarly-aged individuals without neurological impairments (i.e., controls) participated in the study. By following automated audiovisual cues, each participant generated 2% of their maximum voluntary elbow extension torque for three seconds, relaxed for two seconds, and then matched the remembered torque for one second without receiving feedback on their torque-matching ability. This torque-matching task was performed in each arm.

Results: The mean ± standard deviation of the normalized absolute torque matching error was 28 ± 18% for the participants with chronic hemiparetic stroke in their paretic and non-paretic arm, respectively, and 18 ± 3% for the controls in their dominant and non-dominant arm, respectively. Absolute error was not found to significantly differ depending on the arm tested (p = 0.5).

Conclusions: Our participants with chronic hemiparetic stroke and controls matched torque similarly in each arm. This result supports the notion that unilateral torque perceptual deficits may not occur in individuals with chronic hemiparetic stroke who exhibit motor impairments during unimanual activities.
A recumbent cross trainer (RCT) relies on similar neural networks as gait. Therefore, neurologically impaired individuals may improve walking ability after exercise on the RCT. **PURPOSE:** The purpose of this investigation was to compare the effects of the RCT and Treadmill (TM) on intra-exercise electromyography and post-exercise spatial-temporal gait parameters. **METHODS:** Thirty participants were divided into two groups; stroke (CVA) (10 ± 5 years post-CVA) and age and sex-matched control. Participants completed two 5 minute exercise bouts on both the RCT and TM at an RPE based self-selected cadence. Intra-exercise Mean electromyography (mEMG) values were normalized to maximum voluntary contraction and were recorded bilaterally at the rectus femoris, vastus medialis oblique, semitendinosus, tibialis anterior, medial gastrocnemius, and soleus. Change in joint range of motion was calculated (maximum-minimum degree; ΔROM) from wireless goniometer measures at the hip, knee, and ankle. Gait parameters were evaluated by the Wireless Gait Assessment Tool (WIGAT) immediately following each exercise bout (3 x 10 min walk). HR and BP were monitored to ensure the return to pre-exercise levels. RESULTS: Stroke (n = 15) and healthy (n = 19) did not differ in age (Mdn: 63 yrs vs 63 yrs, respectively) or BMI (Stroke: M = 28.2, SD = 4.5; Healthy: M = 26.2, SD = 5.0, p > 0.05). Healthy participants were stronger at all joints, p < 0.025. Preferred TM speed was faster in the healthy control population (M = 1.32, SD = 0.20) vs CVA (M = 1.12, SD = 0.22) p = 0.043. There were no statistical differences between the TM and RCT in the CVA's ΔROM. WIGAT determined the RCT decreased the stance percentage (%) and increased swing % on the non-affected leg, p < 0.05. RPE average steps per minute did not differ between the conditions, p > 0.05. RPE did not differ between groups or across exercise modes. The TM elicited a higher mEMG on a majority of the studied muscles in both populations, p < 0.025. TM demonstrated an increased ΔROM in the R knee and both ankles in the healthy population, p < 0.025. There were no statistical differences between the TM and RCT in the CVA's ΔROM. WIGAT determined the RCT decreased the stance percentage (%) and increased swing % on the non-affected leg, p < 0.05. Either exercise mode modulated the affected-side stance %, affected-side swing %, double support time or bilateral (affected vs. non-affected) stride length, p > 0.05. CONCLUSION: Five minute RCT intervention improved non-affected side gait parameters in a chronic CVA population.
and postrolateral reach directions (θ, φ, ϕ < 0.01, ES=0.90) but not in the anterior reach direction (θ, φ, ϕ < 0.05, ES=0.07). Under eyes-open conditions, TTB improved in the mediolateral (0.28, 0.4, p=0.004, ES=0.8) and anteroposterior (0.48±1.43, p=0.007, ES=0.59) directions. However, no significant changes were identified in any TTB measures with eyes closed (p<0.20). CONCLUSIONS: FL DN created immediate improvements in dynamic and static balance in individuals with CAI. Future studies should examine the effects of multiple DN treatments and the mechanism behind this therapeutic effect.

Several alterations of sensorimotor and motor processing performance occur during the process of normal aging. In women, aging is associated with the onset of menopause, which influences body composition with increased central adiposity, leading to changes in the gynoid to android fat distribution pattern. These changes may alter the center of gravity, compromising body stability and causing risk of falls. PURPOSE: The study aimed to analyze the influence of body mass on postural stability in postmenopaused women. METHODS: Forty women (age: 72 ± 3.6 years, height: 165.9 (±15) cm, weight: 69.3 (±8.2) kg) were evaluated. The body mass index (BMI), male/female ratio, and the weight of the participants were divided into two groups: overweight group (BMI ≥ 23) and normal weight group (BMI < 23). Body mass assessment was performed using multiple frequency biocompliance analysis (MF-BIA) and postural stability was evaluated on the Biodex Balance System (BBS), using Postural Stability Test (PST) at levels of oscillation and mid-lateral (ML) directions. Statistical analysis was performed by Shapiro-Wilk normality-test; comparisons between groups by Mann-Whitney test and correlations by Spearman correlation coefficient. Statistical significance was set at p<0.05. RESULTS: OWG presented significantly (p<0.05) lower postural stability (AP-PST-8: 1.32 ± 0.49; ML-PST-8: 0.9 ± 0.65) than in the N WG. Also, there was a positive correlation of all the variables determined in the BBS (AP-PST-8: 0.71 ± 0.34; ML-PST-8: 0.70 ± 0.50) to the N WG. Postmenopaused women presented significantly (p<0.05) lower postural stability (AP-PST-8: 1.32 ± 0.49; ML-PST-8: 1.05 ± 0.50) than the N WG. There was a significant positive correlation between BMI and AP-PST-8 (r=0.58) and BMI with ML-PST-8 (r=0.56) to the N WG.

A growing body of research indicates that measures of static balance (e.g., postural sway) are influenced under cognitive demands. Similar measures are also impacted under different balance demands (e.g., stable vs unstable stances). However, to date, there is little known about how the difficulty of postural demands impact the relationship between balance and cognition. PURPOSE: Within the same individuals, we parametrically compared balance demands and cognitive demands on static balance ability using state-of-the-art inertial sensors. METHODS: 48 healthy young adults completed tasks of static balance with and without a cognitive demand (CD). Participants were instructed to complete these tasks while doing serial seven subtractions from a randomly presented three-digit number (High CD). RESULTS: We conducted repeated measures ANOVAs with Cognitive Demand (High vs Low) and Postural Demand (High vs Moderate vs Low) on measures of Path Length and Jerk. For Path Length, there was a main effect of CD [F(1,23)=13.19, p<0.001, High=32.39, Low=18.42] and a main effect of PD [F(2,46)= 0.01, High=32.39, Moderate=28.93, Low=18.42]. For Jerk, there was a main effect of PD [F(2,46)= 0.26, p=0.67, High=32.39, Moderate=28.93, Low=18.42], however, there was no interaction between these factors. Path Length was longer under High CD relative to Low CD, and for Tandem PD relative to Likewise, for Jerk, there was a main effect of CD [F(1,23)=2.24, p<0.05, High=22.92, Low=17.36] and a main effect of PD [F(2,46)= 0.01, High=32.39, Moderate=28.93, Low=18.42], however, there was no interaction between these factors. CONCLUSION: Using two precise measurements of static balance, we observed that performance was impacted by separate cognitive and postural demands. Since these factors did not interact, our results suggest that adding a cognitive task to a balance assessment may have an impact independent of the balance demands.
The use of a moving virtual reality (VR) environment to induce postural sway is well established. The extent to which music presented along with VR motion can enhance sway is unknown. **PURPOSE:** To determine if music, presented in modified and unmodified forms, will affect postural sway while standing in a moving VR environment. **METHODS:** Twenty-eight subjects (13 females; 15 males) aged 18–35 stood barefoot on a balance plate while wearing a VR headset. AP and ML center of pressure (COP) data was collected as the subjects experienced 5 visual conditions (VR scene translating in the AP direction at 0.1 Hz, no translation, and eyes closed) and 4 music conditions (music modified to scale loudness at 0.1 Hz and 0.25 Hz, unmodified music, and no music). AP and ML COP excursions, COP RMS, and COP velocities were calculated. **RESULTS:** A significant interaction effect (p < 0.0439) showed that combining scene translation with 0.1 Hz modified music increased AP COP excursion (p < 0.05) compared to all conditions except 0.25 Hz modified and unmodified music with scene translation. Main effects (p = 0.009 and p < 0.001) showed the 0.1 Hz modified music increased excursion compared to the 0.25 Hz modified and unmodified music conditions and that scene translation increased excursion compared to the other visual conditions. Similar effects were observed for RMS and velocities. **CONCLUSION:** VR induced sway may be enhanced by music presented in a manner to reinforce visual input. These findings could be used to optimize VR-based training protocols to improve postural control.

Seventy to eighty percent of the population will experience one episode of neck and low back pain in their lifetime, respectively. Deviations in posture can contribute to this onset of spinal pain. One subgroup of the population that is known to experience similar pain is eSports athletes. It has been shown that 34% of forty recently polled eSports athletes experience neck and back pain when competitively gaming. Concerns have been raised over their sustained aberrant postural positioning during play and its contribution to their pain. **PURPOSE:** To examine postural changes in collegiate eSports athletes while playing in eSports gaming chairs compared to non-gaming chairs. **METHODS:** Four collegiate eSports athletes (21 ± 2.06 years old) were recruited to participate in this observational study. Measurements of three joint angles were performed over four days with sessions lasting one hour. Each day the athletes were randomly assigned to a different chair before the gaming session. The chairs included two commercial gaming brands from different vendors (chairs 1 and 2), an office chair (chair 3), and a standard chair (chair 4). Reflective markers were placed at specific bony prominences to capture both sagittal and coronal postures during play. Motion capture was recorded using two GoPros™ and later analyzed with Kinovea™ software. **RESULTS:** There was a significant difference within group (t = -3.38, p = 0.03) between the pre and posttest neck angle measure for chair 1 of the commercial brands. Using an ANOVA, significant differences were found between chairs 1 and 2 (F(3,28) = 2.6, p = 0.02) and chairs 2 and 3 (F(3,28) = 2.6, p = 0.023).

**PURPOSE:** To determine the effects of aerobic rumba training of static balance and power in the lower limbs in elderly women. **METHODS:** Twelve healthy older adult women were randomly assigned to one intervention group (INT, n = 6, 67.16 ± 5.34 years), body weight (64.88 ± 9.79 kg) and one control group (CON, n = 6, 67.66 ± 5.98 years), body weight (65.3 ± 12.90 kg, average weight lean muscle (23.56 ± 2.40%), body fat (42.76 ± 6.48)). A progressive dance program was carried out through lifestyle and may represent potential targets to improve postural stability. Public health problem. Body composition, diet and physical function are modifiable risk factors for loss of mobility, falls, and frailty. **PURPOSE:** To investigate the associations between body composition, physical activity, and lifestyle interventions on fall risk. **METHODS:** In twenty overweight (body mass index ≥ 27 kg/m²), older adults (≥ 58y), we obtained measures of stability (force plate), habitual physical activity (7-day accelerometry), habitual dietary macronutrient intake (3-day dietary recall), cardiorespiratory fitness (graded exercise test to volitional plate), and lifestyle interventions on fall risk.

**RESULTS:** Supported by a grant from the National Institute on Aging: 1R15AG055923-01.

**PURPOSE:** The objective of this study was to identify the effects of aerobic rumba training of static balance and power in the lower limbs in elderly women. **METHODS:** Twelve healthy older adult women were randomly assigned to one intervention group (INT, n = 6, 67.16 ± 5.34 years), body weight (64.88 ± 9.79 kg), average weight lean muscle (23.56 ± 2.40%), body fat (42.76 ± 6.48%). **RESULTS:** Significant correlations (r) were found next to the p value and the effect size (ES) of the intervention group, on the stabilometric variables in the orthostatic task, as well as partial correlations were noted for DCL and gait speed, while height and gait speed from a 4-meter walk test were both significantly correlated to postural limits of stability. Prospective studies are needed to examine the influence of gait speed, DCL and lifestyle interventions on fall risk. Supported by a grant from the National Institute on Aging: 1R15AG055923-01.

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**RESULTS:** Significant correlations (r) were found next to the p value and the effect size (ES) of the intervention group, on the stabilometric variables in the orthostatic task, as well as partial correlations were noted for DCL and gait speed, while height and gait speed from a 4-meter walk test were both significantly correlated to postural limits of stability. Prospective studies are needed to examine the influence of gait speed, DCL and lifestyle interventions on fall risk. Supported by a grant from the National Institute on Aging: 1R15AG055923-01.
CONCLUSION: The differences found in posture within gaming chairs and non-gaming chairs may impact upon injuries in eSports players. These preliminary results warrant further testing to possibly help reduce injury in eSports athletes.

Ankle bracing can alter postural control strategies during static and dynamic tasks, theoretically through mechanical constraint of the ankle joint and/or sensorimotor reorganization. While a majority of studies have focused on center of pressure (COP) characteristics or clinical tests of balance to explore this theory, fewer studies have investigated sway characteristics of the center of mass (COM). Additionally, the effects of various styles of ankle braces on postural sway remains inconclusive. Assessing the effects of ankle bracing on postural sway could provide additional insight into potential systemic motor adaptations that occur in response to ankle constraint.

PURPOSE: Examine effects of lace-up and semi-rigid bracing on postural sway characteristics during a quiet standing task. METHODS: Thirty-five adults between the ages of 18 30yrs (height: 1.2 ± 0.1m; mass: 8 1kg) participated in the study. Participants performed a single one-minute trial of quiet standing during each of the following conditions: No brace (NB), lace-up brace (LB), and semi-rigid brace (SRB). A ten-camera motion capture system was utilized to capture lower extremity position. To assess postural sway, mediolateral (ML) and anteroposterior (AP) lower extremity COM trajectories were extracted, and root-mean-square deviation (RMSx, RMSy) and velocity (RMSvx, RMSvy) of the COM were calculated. Repeated-measures ANOVAs were employed to assess differences in postural sway measures across all conditions. RESULTS: Analysis revealed a significant main effect for RMSy (F = 7.061; p < .01). Pairwise comparisons indicated that RMSy was significantly lower in the SRB condition (1.70 ± 1.8 m) compared to C (2.18 ± 1.58 m) (p < .01). CONCLUSION: Results from study indicate that subjects exhibited an altered AP postural sway pattern when a semi-rigid brace is applied. These findings align with previous research reporting reduced AP COP excursions with ankle bracing during quiet-standing. Altered sway patterns with ankle bracing appears to support the presence of sensorimotor reorganization, possibly due to altered proprioceptive and/or haptic feedback stemming from greater mechanical constraint of the ankle joint.

PURPOSE: To establish the minimal detectable change (MDC) values for different functional balance assessments in an active adolescent population with CAI. METHODS: Forty-three active adolescents with CAI (20 males and 23 females, 16 ± 1 years, 15.5 ± 1.20 m, 69.8 ± 18.0 kg). CAI inclusion criteria consisted of ankle sprain history, current symptoms of pain, weakness and instability and repeated episodes of giving-way. Participants completed 4 weeks of either strength training, balance board training, combination training (completion of both strength and balance board exercises) or no intervention. Dependent variables were pre- and post-intervention scores for two measures of functional balance: side-hop test requiring participants to hop 30-centimeters medially/laterally for 10 repetitions and figure-of-eight hop test required participants to hop in a figure-of-eight pattern over a 5-meter distance for 2 repetitions. Both tests were completed twice on the involved leg. Hopping ability was measured to determine completion (success vs. failure). A positive change score indicated improvement by a decrease in time needed to perform each test. The MDC with 95% confidence intervals was calculated for each variable [MDC = 1.96SD x (1-ICC)] x (2)^1/2. RESULTS: Average pre and post-intervention scores were 12.5 ± 2.1s for the side-hop test and 14.00 ± 2.75s for the figure-of-eight hop test. These values reflect the minimal score necessary to be 95% confident that any measured change surpasses the statistical error associated with the test. Approximately 34% of the intervention participants had a clinically meaningful change of >2.0 s for side-hop test and 31.25% for figure-of-eight hop test. CONCLUSIONS: When these functional balance tests are used to detect beneficial changes from rehabilitation interventions, these MDC scores should be used as a minimum threshold to detect a true and clinically meaningful change.

ANKLE SPRAINS ARE A COMMON INJURY, WITH AFFECTED INDIVIDUALS OFTEN EXPERIENCING RECURRENT SYMPTOMS THAT CAN PROGRESS TO CHRONIC ANKLE INSTABILITY (CAI). BALANCE IMPAIRMENTS ARE ROUTINELY PRESENT IN SUBJECTS WITH CAI. CHANGES IN TISSUE STRUCTURE OF THE ANTERIOR TALOFOBULAR LIGAMENT (ATFL) AND SUPERIOR EXTENSOR ANKLE RETINACULUM (SEAR) MAY OCCUR AFTER AN ANKLE SPRAIN, AND MAY CONTRIBUTE TO IMPAIRED BALANCE THROUGH ALTERED PROPRIOCEPTION. PURPOSE: To determine if ATFL/SEAR thicknesses were related to dynamic balance in individuals with CAI. METHODS: Subjects were 14±4 ales and 15±4 females (Age=25.28 ± 3.40 yrs). Ankle instability was assessed using the Cumberland Ankle Instability Tool (CAIT), with a cut-off score of 25 to define two groups: those with and without CAI. Real-time ultrasound was used to assess ATFL and SEAR thicknesses. Dynamic balance was measured with the Y Balance Test (YBT) and the NeuroCom® motor control and adaptation tests. For subjects with CAI, we analyzed stable versus unstable ankles; for those without CAI, we analyzed right versus left ankles.

RESULTS: There was no difference in mean ATFL thickness (0.24 ± 0.03 vs. 0.22 ± 0.04 mm, respectively, p>0.21) or in SEAR thickness (0.09: 0.01 vs. 0.10 ± 0.02 cm, respectively, p>0.19) between the stable and unstable ankles in subjects with CAI. For those without CAI, there was also no difference between the right and left ATFL thickness (0.22 ± 0.06s vs. 0.20 ± 0.04 cm, p>0.14) or SEAR thickness (0.07: 0.01 vs. 0.09 ± 0.01 cm, p>0.95). There was no difference in YBT scores in those with or without CAI (p>0.21, p>0.8 respectively). Additionally, sway energy for upward and downward forces was comparable between those with and without CAI (p>0.12, p>0.36). Similarly, composite latencies were also no different (p>0.68).

CONCLUSIONS: There was no relationship between ligament thickness and balance, supporting a multifactorial CAI rather than a reliance upon tissue changes alone. Central nervous system sensory integration, neuromuscular control compensations, or psychosomatic reactions may be the ones affecting the balance more. Likewise, subject perception of ankle instability may not coincide with impaired dynamic balance.

Finally, tests used to assess dynamic balance may not be sensitive enough to identify differences caused by CAI.
CONCLUSIONS:
The findings indicate that, knee pain is a multifactorial process in which several mechanical factors could be associated but both weakness of the quadriceps muscles and misbalance in the foot are often altered. We may recommend lower limb biomechanics analysis, muscle activation and 3D foot print to optimise both diagnosis and treatment in patients with knee pain.

1338  Board #100  May 30 10:30 AM - 12:00 PM
Osteoporosis and Falls in Older Women: Mediating Effects of Muscle Quality, Foot Loads and Balance
Silvia G. R. Neri1, Lara A. Harvey2, Anne Diedeman3, André B. Gadelha4, Ricardo M. Lima5. 1Faculty of Physical Education, University of Brasilia, Brasilia, Brazil. 2Neuroscience Research Australia, University of New South Wales, Sydney, Australia. 3Institute for Musculoskeletal Health, The University of Sydney, Sydney, Australia. Email: silvia.grn@hotmail.com
(No relevant relationships reported)

PURPOSE: Obesity is associated with risk of falls in older women. However, it is not certain whether factors commonly associated with obesity and/or falls mediate this risk. This study examined whether muscle quality, foot loads and postural balance mediate the relationship between obesity and falls.

METHODOLOGY: At baseline, 26 female participants underwent obesity screening (BMI>30 kg/m²), and had muscle quality (isokinetic dynamometer and DXA), foot loads (pressure platform) and postural balance (force platform) evaluated. Incident falls were recorded at the end of the 18-month follow-up period. To identify mediating factors of obesity and falls, a series of modified Poisson regression analyses were conducted as per Baron and Kenny’s 3 step criteria. Each potential mediator was individually assessed for its association with obesity (step 1), and if this association was significant, then each potential mediator was assessed for its association with falls (step 2). If the potential mediator was significantly and independently associated with both obesity and falls, the potential mediator and obesity were both included as independent variables in a model to assess their association with falls (step 3). If the 3 mediating conditions were met, the intervening variable effect was examined using Freedman and Schatzkin test. Significance level was set at \( p < 0.05 \).

RESULTS: 204 volunteers (83%) completed the follow-up. Obese participants had an increased risk of falls during the 18-month period (RR= 2.13, 95% CI = 1.39-3.27). The table below presents the mediation analysis of the relationship between obesity and falls. Of the variables analysed, only muscle quality (specific torque) was a significant mediator (\( t = 4.026, p<.001 \)). The findings indicate that, knee pain is a multifactorial process in which several mechanical factors could be associated but both weakness of the quadriceps muscles and misbalance in the foot are often altered. We may recommend lower limb biomechanics analysis, muscle activation and 3D foot print to optimise both diagnosis and treatment in patients with knee pain.

1339  Board #101  May 30 10:30 AM - 12:00 PM
Does Movement Strategy Change Directional Balance Reach Test Performance Variability?
Yo-Rong Chen, Larry R. Muger, Troy Hooper, C. Roger James, FACSM. Texas Tech University Health Sciences Center, Lubbock, TX.
Email: yo-rong.chen@ttuhsc.edu
(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine whether movement strategy impacted CS and performance variability in DBRT. METHODS: Sixteen subjects (eight males and eight females) were randomly assigned to two groups. Each group performed DBRT on the dominant support (DS) and dominate kick (DK) legs by using personal (P) and specific (S) movement cues. Movement strategy, with and without specific movement cues, may alter within trial variability in DBRT.

RESULTS: For CS, there was no main order effect (\( p > .05 \)). However, there was a significant strategy effect for both legs (\( p < .001 \)). DS: P=0.011; S=0.32; DK: P=0.877; 0.877. Post-Hoc tests revealed a significant strategy effect (\( p < 0.05 \)) only in DK. For AE in DS, there was no main order effect (\( p > .05 \)). However, there was a significant strategy effect (\( p < 0.05 \)). Post-Hoc tests revealed a significant strategy effect (\( p < 0.05 \)) only in DK. The Directional Balance Reach Test (DBRT) outcome measurement is a composite score (CS) based on the maximum reach distances of three trials in each of three testing directions: anterior (ANT), posterior-medial (PM), and posterior-lateral (PL). Movement strategy, with and without specific movement cues, may alter within trial reach distance performance variability. It may provide different clinical information about individual movement control during DBRT.

CONCLUSION: Low muscle quality was identified as a mediator for the relationship between obesity and falls in older women. Thus, the inclusion of muscle strengthening as a part of a falls prevention program may benefit this population.

Assessment of potential mediating factors of obesity and falls. Data are RR (% CI)

<table>
<thead>
<tr>
<th>Potential mediators</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
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</thead>
<tbody>
<tr>
<td>Muscle quality</td>
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<tr>
<td>Knee extensors peak torque (&lt; noir N m)</td>
<td>1.34 (0.85-2.23)</td>
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<td>Leg lean mass (&lt; 35 kg)</td>
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<td>Specific torque (&lt; 161 Nm kg-1)</td>
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<td>1.8</td>
<td>2.37 (1.3)</td>
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<td>Foot loads</td>
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<tr>
<td>Maximum force (&lt; noir N )</td>
<td>1.6</td>
<td>1.1-2.7</td>
<td>1.08 (0.8-2.08)</td>
</tr>
<tr>
<td>Contact area (&gt; 141 cm2)</td>
<td>3.28</td>
<td>2.01-5.8</td>
<td>2.02</td>
</tr>
<tr>
<td>Peak pressure (&gt; 10 kPa a)</td>
<td>1.20 (0.7-2.02)</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Flat foot (dynamic arch index &gt; 0.28)</td>
<td>1.0 (1.20-2.0)</td>
<td>1.37 (0.8-2.16)</td>
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<tr>
<td>Postural balance</td>
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<tr>
<td>CoP speed (&gt; 1.8 cm/s)</td>
<td>0.9</td>
<td>0.4</td>
<td>-</td>
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<tr>
<td>CoP anteroposterior range (&gt; 3.3 cm)</td>
<td>2.05 (1.25-3.30)</td>
<td>1.6 (1.02-2.84)</td>
<td>1.35 (0.8-2.20)</td>
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<td>CoP mediolateral range (&gt; 1.8 m)</td>
<td>1.4</td>
<td>1.02-2.8</td>
<td>1.29 (0.8-2.09)</td>
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THURSDAY, MAY 30, 2019
Machine learning is a branch of artificial intelligence that enables computer systems to learn from data and analyze data without being explicitly programmed. Interest in machine learning has grown rapidly in clinical settings because the diagnosis of diseases or disorders can be automated by computer systems with high accuracy and minimum human intervention. However, the use of machine learning to identify postural control patterns for people with Parkinson’s disease (PD) is not well established.

PURPOSE: The purpose of the study was to develop and validate an automated identification of PD postural control patterns using a machine learning approach.

RESULTS: All three models were capable of analyzing small-sample data, model performance to identify PD postural control patterns of PD patients with high accuracy. The use of machine learning may provide a valid and efficient approach to better understand PD postural control patterns. All participants were divided into two datasets: 0% for training and 30% for testing.

CONCLUSIONS: Computer-aided machine learning models successfully identified postural control patterns of PD patients with high accuracy. The use of machine learning may provide a valid and efficient approach to better understand PD postural control patterns and thus, could be beneficial for the early diagnosis and early intervention in individuals with PD.
with a CD4 count of >200 cells/μL to enroll in the study. After signing the informed consent and collecting demographic data, a member of the research team placed a lumbar accelerometer on each subject. Each participant was instructed to stand in a static biaxial posture on a firm surface or a thick foam pad. Each task took 15 seconds to be performed. The first task was to stand on a firm surface (baseline), the eight remaining balance tasks were performed with a thick balance foam mat (four single and four dual cognitive tasks). For the cognitive dual tasks participants were instructed to count backward 3 numbers at a time.

RESULTS: Postural control was measured with Body-worn accelerometers (ACC). The two variables of interest in this study were jerk sway acceleration in an anterior-posterior (A-P) and mediolateral direction (M-L), m/s²/°. A MANOVA analysis was used to compare the variables of interest, between baseline (BL) (firm surface eyes open) and single/dual tasks. AP sway increased significantly during single (BL 0.020 ± 0.01 m/s²/° vs 0.020 ± 0.02 m/s²/° P < 0.009) and dual tasks (BL 0.020 ± 0.01 m/s²/° vs 0.026 ± 0.02 m/s²/° P < 0.009) when visual input was canceled.

CONCLUSIONS: Single and dual tasks showed a similar challenge and results regarding increased acceleration and instability. It appears that the vestibular and proprioceptive systems could be impaired in HIV diagnosed people. Because there is no fall history among the participants of this study and these findings, it seems that patients with HIV rely on the visual system to a higher degree to attain postural control.

Individuals diagnosed with HIV often experience balance impairments caused by the virus or medication. These deficiencies due to compensation of the postural control systems might be unperceived for years until the impairments are to advance.

PURPOSE: To determine whether there is an age-associated decline in leaning directions of DB in community-dwelling older women. METHODS: DB was determined in 558 older women. DB was characterized by limits of stability (LOS) that measured end-point excursion (EXE) and maximum excursion (MXE) of the body’s center of pressure, reaction time (RT), mean velocity (MVL), and directional control (DLC). LOS consisted of 8 earring tasks around a center area at 0°, 45°, 135°, 225°, and 315° declination. The measured anthropometrics did not affect balance performance differences between sex for dominant and non-dominant limbs (P > 0.05).

RESULTS: The measured anthropometrics did not significantly correlate with the WB performance. Although women (dominant limb=102.2°; non-dominant limb=108.7°) presented better balance than men (dominant limb=18.8 ± 5.3°; non-dominant limb=19.1 ± 6.1°), no significant sex differences were observed for dominant (P > 0.10) and non-dominant (P = 0.0) limb.

CONCLUSIONS: Interestingly, anthropometrics and sex did not affect the WB performance. Due to the close relationship previously reported between WB training and ankle muscles activity, it could be hypothesized that the WB performance is affected by their strength, stiffness or activity. WB improvements after training protocol using WB exercises, can be understood as consistent change in performance not affected by other source of variability such as variation in body mass. Therefore, trainable neuromuscular factors should be targeted during training protocols to gain postural control improvements, without altering the anthropometrics, independently from the sex. From a clinical point of view, during preventive and rehabilitative programs a special attention should be given to the ankle muscles.
inferior extensor retinaculum. There is a lack of research regarding objective outcome measures for balance following this procedure. The purpose of this report was to assess changes in static and dynamic balance for an individual who underwent the modified Broström-Gould surgery.

Methods: A 28±6 year-old female with right CAI completed pre-testing (two weeks prior to surgery) and post-testing (two months following surgery). Outcome measures included the modified STAR Excursion Balance Test (mSEBT), the Balance Error Scoring System (BESS), and Single Leg Hop Down Test for time to stabilization (TTS) using force plate testing.

Summary of Results: Postoperatively, the patient showed improvements in all directions on the mSEBT for the affected and unaffected lower extremities (LE), with greater improvement seen on the affected LE by 22.30%. The patient improved her overall score for the BESS, demonstrating a reduced number of errors on the affected LE from 20 to 15. The Single Leg Hop Down Test revealed a decrease in the average TTS on the affected LE from 1.88 seconds to 1.01 seconds.

Conclusion: After completion of the modified Broström-Gould surgery and in conjunction with rehabilitation, the patient showed an improvement in dynamic balance measures, possibly due to increased strength and reduced pain levels following rehabilitation after surgery. Future studies should examine the role of exercise interventions and fitness level in determining patient outcomes following the modified Broström-Gould surgery.

Disclaimer: The views expressed herein are those of the author(s) and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense or the United States Government.

1348 Board #110 May 30 10:30 AM - 12:00 PM Validation Of The Tekscan Strideway Plantar Pressure Mat Compared To A Force Platform Rachael A. Ard, Jake A. Melaro, Alex M. Carnall, Alexis K. Nelson, Sarah E. Blackmore, Victoria A. White, Max R. Paque tte, Douglas W. Powell, FACSMM. University of Memphis, Memphis, TN.

Email: rachael.a.ard@gmail.com (No relevant relationships reported)

Force platforms represent the criterion method of assessing external force applied to an athlete during a given task. However, force platforms have several characteristics that may limit their use in sport and clinical environments including limited portability. Therefore, a need exists for portable eq pmnt with high validity to measure load-related variables such as vertical force. PURPOSE: To validate vertical force measured using the Tekscan Strideway Plantar Pressure Mat compared to a force platform.

METHODS: Five participants performed three 10-second trials on each of eight weight-bearing conditions. Increased weight was achieved by increasing load during a deadlift. Vertical ground reaction force was measured independently using a plantar pressure mat (PPM, 80 H x 2, Tekscan Strideway Plantar Pressure Mat, Boston, MA) and a force platform (FP, 1000 Hz, AMTI, Watertown, MA). Custom software (MATLAB, MathWorks, Natick, MA) was used to analyze vertical force data from the PPM and FP. FP data were downsampled to 500 Hz and averaged. A correlation analysis was conducted to determine the strength of agreement between the PPM and FP. A paired samples t-test was conducted to compare mean force values measured using the PPM and FP. Cohen’s d effect sizes were calculated to determine the meaningfulness of differences between the FP and PPM.

RESULTS: No differences in vertical force were observed between the PPM and FP (p = 0.48; PPM: 227.9±64.7 N/kg; FP: 237.5±57.9 N). A small effect size (d = 0.15) suggests the small differences were likely not meaningful. A high level of agreement (r = 0.959) was observed between the PPM and FP.

CONCLUSIONS: These data demonstrate that vertical force measured using the Tekscan Strideway plantar pressure system is comparable to the more expensive criterion method of a strain gauge-based force platform measures. Moreover, the Strideway platform is mobile providing a solution for non-laboratory based assessments of vertical forces. Further research should evaluate the validity of the Strideway plantar pressure system during more dynamic activities such as jumping and landing and for different force-related variables.

Step count is a common metric or criterion to prescribe physical activity. Step activity benchmarks were designed to reflect an overall daily energy expenditure, but this objective measure is exposed to error when gait is impaired. Individuals with functional limitations are known to expend more energy during locomotion when compared to non-impaired controls (CON).

PURPOSE: The primary goal was to evaluate metabolic cost per step for someone with an incomplete spinal cord injury (iSCI) when compared to a CON. A secondary goal was to evaluate estimated daily energy expended between the individuals to determine if step count is an appropriate metric for activity recommendations for those with functional limitations.

METHODS: This case-control study included a participant with an iSCI and an age-, sex-, height-matched CON. Participants completed a 6 minute walk (MWT) and timed walks at slow, moderate, and fast paces (matching the step monitor’s intensity benchmarks) while wearing a portable metabolic cart. Relative oxygen consumption (VO2) was determined using a 15 breath moving average. Daily step activity was recorded during the 7 day period between sessions. Stride length was determined using 3D motion analysis.

RESULTS: Differences were observed between participants for average 6MWT VO2 (iSCI: 21.3 ± 1 kg/min; CON: 28.0 ± 1 kg/min), step length (iSCI: 0.4 m; CON: 0.3 m), energy expenditure during the MWT (iSCI: 0.36 ± al/min; CON: 0.06 ± al/min), and daily step activity (iSCI: 246 ± on; CON: 99). Estimated energy expended from walking for iSCI and CON was 336 kcal/day and 735 kcal/day, respectively, when extrapolating VO2 from paced walks to data retrieved from the step monitor.

CONCLUSION: Supporting previous literature, it is likely inappropriate to standardize activity recommendations based on step metrics for those with functional limitations. Unrealistic expectations may heighten perceived barriers, undermine mobility related self-effacy, and discourage adoption or adherence. Exercise prescription based on energy expenditure goals may serve as an alternative means to individualize recommended daily activity. Future research should attempt to establish new recommendations based on functional status for those outside of the typical gate norm.

1350 Board #112 May 30 9:30 AM - 11:00 AM The Effects of 8-weeks Structural Exercise-Based Intervention on Autism Spectrum Disorders Qiang Ye, Haolei Xue, Yuji n J. Nanjing Sport Institute, Nanjing, China.

Email: qyq ang@nsi.edu.cn (No relevant relationships reported)

Lack of physical activity reduces the effects of interventions and brings more health risks for individuals with ASDs (Autism Spectrum Disorders). Accumulating evidences indicate exercise program integrated varied types of exercises in a structured framework would achieve maximum gains in fitness for them. However, most of existed studies focused on one special exercise type to reduce the autism-specific impairments.

PURPOSE: to observe fitness changes with a 8-weeks structured exercise-based intervention for ASDs.

METHODS: The subjects were 6 adolescents with ASDs between the ages of 11-14 yrs (male = 5; female = 1) were recruited. They were mild-moderate and severe ASD patients according scores from the Social Responsiveness Scale. The intervention program was seen in Tab1. The Physical fitness was measured by body composition analysis with indicators, including fat mass (FM), body mass index (BMI) etc. The mental fitness was evaluated by Autism Treatment Evaluation Checklist (ATEC). Data comparisons were made using paired t-test.

RESULTS: The overall weight of the subjects decreased about 2.4%, and significant decrease happened in FM at 11.7% (2.25 kg vs. 2.46 kg, p<0.05). Among 4 subclasses of ATEC, significant decrease happened in Communication (18.50±3.42 vs. 12.00±0.01; p<0.01) and Sociability (28.00±68.0 vs. 13.00±8.0, p<0.01). Average total score of subjects was in moderate category, while in severe category before the intervention.
CONCLUSION: Structured exercise-based intervention efficiently manages weight, prompts speech and communication skills, enhances sensory ability, and improves health behaviors through whole environmental construction. It is a feasible alternative intervention for ASDs. Supported by the Natural Science Fund for Colleges and Universities in Jiangsu Province (1R JA330001).

METHODS: Thirty-one subjects with SCI who use a manual wheelchair for primary mobility wore an accelerometer-based ActiGraph device on their wrist and performed 18 activities of daily living and exercise at different intensities for 10 minutes each. The criterion intensity was obtained from a portable metabolic cart. Activity counts from the ActiGraph was correlated with the criterion to derive cut-points using linear regression. Data from 8% of the subjects was used to derive cut-points using an iterative process with 1000 iterations while the derived cut-points were tested for accuracy on the remaining 20% of the subjects. Cut-points were also tested on data from 14 subjects in a separate study following a similar protocol.

RESULTS: Accelerometer cut-points derived for people with SCI yielded an overall accuracy of 8% with M, 33% and 6% accuracy for classifying sedentary, light and MVPA activities, respectively, when tested on the 20% subjects, and an overall accuracy of M, 6% and 6% for the three intensities, respectively, when tested on the 14 subjects in the other study.

CONCLUSION: The high accuracy of the cut-points particularly for classifying sedentary behavior may be very useful tool for interventions aiming at reducing sedentary behavior in this population. Supported by a VA Merit Review Grant.

Tab1. The exercise-based intervention design

<table>
<thead>
<tr>
<th>Content</th>
<th>Type</th>
<th>Frequency (times/week)</th>
<th>Intensity</th>
<th>Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic exercise</td>
<td>Outdoor walking</td>
<td>3</td>
<td>0.5% – 5% HRR</td>
<td>6</td>
</tr>
<tr>
<td>Resistance exercise</td>
<td>Jogging over circles</td>
<td>3</td>
<td>10-1 M</td>
<td>4 (2-3 mins interval)</td>
</tr>
<tr>
<td>Neuromuscular exercise</td>
<td>Playing Paper plane</td>
<td>2</td>
<td>0.5% – 5% HRR</td>
<td>30</td>
</tr>
</tbody>
</table>

1351 Board #113 May 30 9:30 AM - 11:00 AM Does The Severity Of Autistic Symptoms Influence The Effects Of An Exercise Intervention Program? Sharon Kinsella1, Craig Coffey1, Damien Sheehan1, Avery Faigenbaum, FACSM2. 1Institute of Technology Carlow, Carlow, Ireland. 2The College of New Jersey, Ewing, NJ. (Sponsor: Professor Avery Faigenbaum, FACSM) Email: sharon.kinsella@itcarlow.ie (No relevant relationships reported)

PURPOSE: The purpose of this study was to examine if improvements in training-induced fitness levels are related to the severity of autistic symptoms in children with autism.

METHODS: A total of 26 children (3+ yrs age ± 2.27 yrs with a diagnosis of autism, were recruited for this study. Prior to and on completion of the exercise intervention, the children’s fitness levels were assessed using the Modified Eurofit Physical Fitness Battery, which included a 20m Sprint, Stork Balance test, Standing Broad Jump, Sit & Reach and a Hand Grip Strength Test. The exercise intervention was 8 weeks duration with three 1-hour sessions per week. The exercises included push and pull upper and lower body exercises, incorporating fundamental movement skills, through games aimed at the interests of the children. The severity of autism symptoms was assessed using the Gilliam Autism Rating Scale (GARS), completed by their teacher. Based on this rating, the children were divided into low, moderate or high groups, in terms of their autism symptoms. A spearman’s correlation was undertaken between the GARS score and the overall percentage change in fitness levels for each child within the 3 categories.

RESULTS: The results of the study demonstrated that children who had the greatest symptoms of autism (high group) demonstrated the greater correlation to change in fitness levels (r=1.0, p < 0.01) with a mean percentage change in fitness levels of 20% ± 32.2161% compared to the moderate and low groups only had a correlation of r=0.34 <p <0.05> and r=0.9  (p <0.01) and their overall mean percentage changes in fitness levels were 26.8% ± 33.79% and 65.93% ± 114.79% respectively.

CONCLUSIONS: The results of this study suggest that exercise programs for children with autism appear to be most effective for participants with more severe autistic symptoms.

1352 Board #114 May 30 9:30 AM - 11:00 AM Wrist-worn Actigraph Cut-points For Classifying Activity Intensity In Spinal Cord Injury Akhila Veerubhotla, Dan Ding. University of Pittsburgh, Pittsburgh, PA. Email: ALV47@pitt.edu (No relevant relationships reported)

Physical activity (PA) recommendations are often made in terms of intensity, frequency, and duration. Accelerometer-based devices are increasingly used by users to track their own PA behaviors and by researchers to examine the association of habitual PA and health indicators. There are well-recognized accelerometer cut-points to estimate time spent in sedentary, light, moderate, and moderate-to-vigorous (MVPA) intensities of PA, but such estimation is often dependent on the population, sensor placement, and activities that were used to derive the cut-points. Limited work has been done to derive accelerometer cut-points for people with spinal cord injury (SCI). Many of these individuals use wheelchairs for mobility and rely on their upper extremities for almost all PA.

PURPOSE: To derive wrist-worn accelerometer cut-points for classifying activity intensity in people with SCI using a range of daily activities and exercise.

METHODS: Thirty-one subjects with SCI who use a manual wheelchair for primary mobility wore an accelerometer-based ActiGraph device on their wrist and performed 18 activities of daily living and exercise at different intensities for 10 minutes each. The criterion intensity was obtained from a portable metabolic cart. Activity counts from the ActiGraph was correlated with the criterion to derive cut-points using linear regression. Data from 8% of the subjects was used to derive cut-points using an iterative process with 1000 iterations while the derived cut-points were tested for accuracy on the remaining 20% of the subjects. Cut-points were also tested on data from 14 subjects in a separate study following a similar protocol.

RESULTS: Accelerometer cut-points derived for people with SCI yielded an overall accuracy of 8% with M, 33% and 6% accuracy for classifying sedentary, light and MVPA activities, respectively, when tested on the 20% subjects, and an overall accuracy of M, 6% and 6% for the three intensities, respectively, when tested on the 14 subjects in the other study.

CONCLUSION: The high accuracy of the cut-points particularly for classifying sedentary behavior may be very useful tool for interventions aiming at reducing sedentary behavior in this population. Supported by a VA Merit Review Grant.
THURSDAY, MAY 30, 2019

1354 Board #116 May 30 9:30 AM - 11:00 AM

Differences in Exercise Effects from Static versus Dynamic Standing in Non-Ambulatory Children with Cerebral Palsy

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Email: asa.tornberg@med.lu.se

(No relevant relationships reported)

PURPOSE: To compare the metabolic adaptive effects to four months of two types of structured training regimes, static standing (StS) versus dynamic standing (DyS), on cardiopulmonary and metabolic parameters among non-ambulatory children with cerebral palsy (Na-CP).

METHODS: Eighteen Na-CP participated in an exercise intervention study with a crossover design, comparing four months of StS to four months of DyS. During StS, the Na-CP were encouraged to exercise according to standard care recommendations in Sweden including daily supported StS for 30-60 minutes. During DyS, daily exercise for at least 30 minutes at a speed between 30 and 80 m in an Innowalk (Made for movement, Norway) was recommended. We assessed adaptive effects from the exercise programs through indirect calorimetry during 30 minutes of StS and DyS. Exercise test to evaluate StS was performed in a standing frame and to evaluate DyS using an Innowalk (Made for movement, Norway). An airtight mask covering the mouth and nose was worn in order to measure breath-by-breath VO2, VCO2, and VE (Oxycon Mobile, Jaeger, Germany). Heart rate was recorded continuously throughout the test (Polar T1, Polar, Finland). As many of the variables were linearly correlated, we used robust Principal Component Analysis (rPCA) to determine the components carrying most information. A multidimensional Shapiro-Wilk test indicates that the data can be well described as being multivariate normal distributed, allowing the use of a Hotelling T2 test.

RESULTS: In a multidimensional statistical analysis of metabolic exercise effects, oxygen consumption, carbon dioxide production, and ventilation were concluded to carry most information and additionally, seem to be statistically different between StS and DyS. Exercise test to evaluate StS was performed in a standing frame and to evaluate DyS using an Innowalk (Made for movement, Norway). An airtight mask covering the mouth and nose was worn in order to measure breath-by-breath VO2, VCO2, and VE (Oxycon Mobile, Jaeger, Germany). Heart rate was recorded continuously throughout the test (Polar T1, Polar, Finland). As many of the variables were linearly correlated, we used robust Principal Component Analysis (rPCA) to determine the components carrying most information. A multidimensional Shapiro-Wilk test indicates that the data can be well described as being multivariate normal distributed, allowing the use of a Hotelling T2 test.

CONCLUSIONS: A highly statically significant difference was found in the metabolic adaptation, described as VO2, VCO2, and VE, to StS versus DyS.

1355 Board #117 May 30 9:30 AM - 11:00 AM

Effects of Inpatient Multicomponent Occupational Rehabilitation on Physical Activity Levels

Marius S. Finland, Martin Skagseth, Tom IL Nilsen, Lena Aasdhåll, Norwegian University of Science and Technology, Trondheim, Norway.

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(No relevant relationships reported)

PURPOSE: To assess whether inpatient multicomponent occupational rehabilitation, including physical activity (PA), increases the PA level of participants more than an outpatient program without PA, and whether changes in PA are associated with future work outcomes. METHODS: Twenty participants were included in one of two randomized clinical trials. Participants had been sick listed 2 to 12 months with a musculoskeletal, psychological or general/unspecified diagnosis. We measured PA by questionnaires at the start of the programs, and at 3, 6 and 12 months of follow-up. Between-group differences in PA were assessed using linear mixed models. Associations between change in PA and future work outcomes were assessed by logistic and linear regression. RESULTS: There was no difference in change in PA between the inpatient and outpatient programs during 12 months of follow-up. We did not find any associations between the amount of PA and future work outcomes. However, intensity of PA was positively associated with return to work (RTW); participants reporting increased vigorous PA had an odds ratio (OR) for RTW of 4.1 (95% confidence interval [CI] 1.1 to 15), whereas participants reporting consistently high intensity of PA had an OR of 3.1 (CI 1.0 to 9.7), compared to participants reporting low intensity PA.

CONCLUSION: Inpatient occupational rehabilitation, including PA, did not increase PA-level in the follow up period more than a less comprehensive program without PA. The amount of PA was not associated with future work outcomes. However, vigorous PA showed a positive association with RTW.

1356 Board #118 May 30 9:30 AM - 11:00 AM

Sedentary And Physical Activity Patterns In Adults With Intellectual Disability

Guillermo R. Oviedo,1 Nauris Tamulevicius2, Casimiro Javierre1, Núria Massó Ortigosa4, Myriam Guerra Balic2,3, FPCEE-Blanquerna (URL), Barcelona, Spain. 2FPCEE-Blanquerna (University of TampaURL), Tampa, FL. 3Universitat de Barcelona, Barcelona, Spain. 4Facultat de Ciencies de la Salut-Blanquerna (URL), Barcelona, Spain.

Email: guillermorubeno@blanque ma.url.edu

(No relevant relationships reported)

Introduction: Adults with intellectual disabilities (ID) present higher health risks due to their extremely low physical activity (PA) levels. It is important to enhance our knowledge about PA levels and sedentary time (ST) among this specific population.

Purpose: This study describes and compares PA levels and ST of active (AG) and non-active (NAG) groups of adults with ID versus a group of adults without ID (AWID).

Method: Thirty-seven participants from an AG with ID, 29 participants from a NAG with ID and 31 adults AWID participated in this study. An informed consent and a health screening questionnaire were completed by each participant and each legal guardian. Height and weight were obtained to calculate BMI. PA and ST levels were assessed with ActiGraph accelerometers for 2 consecutive days. A chi-square test of independence was performed to examine the relation between groups and ID levels. Variables of age and anthropometry were analyzed by using a one-way analysis of variance (ANOVA). Total PA and PA levels of each group were compared by using a one-way analysis of covariance (ANCOVA).

Results: The AG performed higher values of moderate to vigorous PA compared to the NAG (p = 0.018), but, similar to the group of AWID. The group of AWID spent less variance (ANOV A). Total PA and PA levels of each group were compared by using a one-way analysis of covariance (ANCOVA).

Conclusion: When assessing PA levels in ID participants, it was observed that participants presented large amounts of sedentary behaviors in both groups. The participants of the AG, despite participating in PA programs, did not demonstrate less ST. We believe that, by including well designed and structured PA programs into their workdays, as well as incorporating breaks to reduce bouts in ST and total ST, could be of great help to increase daily PA levels in adults with ID. Partially supported by: MEC (DEP2017 8- C2-1-R)
The exercise program was 8 weeks duration, with Battery, including a 20m Sprint, Stork Balance test, Standing Broad Jump, Sit & Reach and a Hand Grip Strength Test. The exercise program was 8 weeks duration, with the children partaking in 3, 1-hour supervised sessions per week. The intervention was comprised of push and pull upper and lower body exercises and incorporated fundamental movement skills. These movements were achieved through games aimed at the interests of the children and were adapted to each child’s specific needs through the use of visual aids using an iPad. The data were analysed using paired t-tested.

RESULTS: All variables except Hand Grip strength significantly improved (p< 0.05) over the eight-week period. 20m sprint times improved (p< 0.05) by 1.36. The Stork balance test significantly improved (p< 0.05) by 18.82 ± 38.86. The standing broad jump significantly increased (p< 0.05) by 14.54 ± 20.29. The Sit and Reach score significantly increased (p< 0.05) by 3.05 ± 4.51. No significant (p> 0.05) change was noted in the Hand Grip strength which increased by 0.36 ± 1.13

CONCLUSIONS: These preliminary findings indicate that an 8-week school-based exercise intervention can significantly improve selected fitness variables in children with autism.

### TABLE 1

<table>
<thead>
<tr>
<th>Variables</th>
<th>Active Group w/ ID (n = 37)</th>
<th>Non-Active Group w/ID (n = 29)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants’ characteristics, anthropometry indices and PA data.</strong></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td><strong>Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>9.1 (11)</td>
<td>10.3 (10.8)</td>
<td>10.0 (10.6)</td>
</tr>
<tr>
<td>Gender (male/female)</td>
<td>14/17</td>
<td>22/15</td>
<td>17/12</td>
</tr>
<tr>
<td>Level of ID</td>
<td>Mild</td>
<td>--</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>--</td>
<td>26</td>
</tr>
<tr>
<td><strong>Anthropometry</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height (cm)*</td>
<td>130 (70)</td>
<td>130.0 (70.3)</td>
<td>130.3 (70.6)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>7.6 (12.1)</td>
<td>0.07 (13.5)</td>
<td>12.3 (12.5)</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>20.8 (3.71)</td>
<td>23.8 (50)</td>
<td>20.6 (3.7)</td>
</tr>
<tr>
<td><strong>PA data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total PA (counts•min⁻¹)**</td>
<td>318 (70)</td>
<td>308 (70)</td>
<td>234 (103)</td>
</tr>
<tr>
<td>ST (min•day⁻¹)**</td>
<td>53.7 (3.8)</td>
<td>48.4 (10.7)</td>
<td>48.4 (10.7)</td>
</tr>
<tr>
<td>LPA (min•day⁻¹)**</td>
<td>23 (39)</td>
<td>1127 (39)</td>
<td>130 (39)</td>
</tr>
<tr>
<td>MPA (min•day⁻¹)**</td>
<td>33.2 (129)</td>
<td>38 (269)</td>
<td>226 (198)</td>
</tr>
<tr>
<td>VPA (min•day⁻¹)**</td>
<td>0.0 (1.08)</td>
<td>1.24 (0.9)</td>
<td>0.0 (0.9)</td>
</tr>
<tr>
<td>MVPA (min•day⁻¹)**</td>
<td>3.6 (13.8)</td>
<td>3.9 (28.0)</td>
<td>2.9 (23.6)</td>
</tr>
<tr>
<td>Sedentary bouts &gt;1 min*</td>
<td>9.6 (6)</td>
<td>123.34 (20.13)</td>
<td>12.6 (20.7)</td>
</tr>
<tr>
<td>Sedentary Breaks/SEDentary Hour</td>
<td>11.26 (21.45)</td>
<td>11.6 (1.8)</td>
<td>12.37 (2.15)</td>
</tr>
<tr>
<td>Accelerometer wearing time (min•day⁻¹)**</td>
<td>60.2 (14)</td>
<td>7.08 (11.5)</td>
<td>7.1 (11.5)</td>
</tr>
</tbody>
</table>

Note: values are means (Standard Deviation). Abbreviations: ID (intellectual disability); BMI (body mass index); PA (physical activity); ST (sedentary time); LPA (light physical activity); MPA (moderate physical activity); VPA (vigorous physical activity); MVPA (moderate to vigorous physical activity).

* n = 35 active group w/ID; n = 29 non-active group w/ID. Statistically significant values are shown in bold (p ≤ 0.05).
** Significant difference (p ≤ 0.05) between adults without ID vs Active Group w/ID. *** Significant difference (p ≤ 0.05) between adults without ID vs Non-Active Group w/ID. 

Purpose: This study aimed to substantiate the efficacy of a voluntary 10-week running program for children and young adults with developmental disabilities. We hypothesized that the running intervention would positively influence temporal-spatial parameters (TSPs) of gait. METHODS: Sixteen children and young adults with developmental disabilities, ages 7-24 years (M = 15 ± 6 years) enrolled in a “Sit to Fit” training program. Participants engaged in group running practices in an outdoor community setting, twice weekly for 10 weeks. Training sessions followed a time-based progression of walk-run intervals with a gradual increase (~15% ) in total run time each week. At the conclusion of the training, all participants completed a 1K race. TSPs of gait were measured one month prior to program start and repeated within one month of program conclusion, using the GAITRite Portable Walkway System (CIR Systems Inc. Clifton, NJ). Participants completed the Six Minute Walk Test at a self-selected speed on a walking loop that included the GAITRite mat. Each participant walked across the mat 6 10 times. TSPs were averaged across all trials for each visit. Analysis included cadence (steps/minute), normalized walking velocity (leg length/second), stride length (cm), and step width (cm). Descriptive statistics, effect size (mean change score/mean standard deviation), and a two-tailed paired t-test for each TSP were computed. RESULTS: Cadence (mean difference 7.25 steps/minute, p < 0.05), walking velocity (mean difference 0.14 leg length/sec, p < 0.05), and stride...
length (mean difference 8.16 cm, p<0.05) increased significantly following the 10-week training period. We calculated a moderate effect size for stride length (d=0.50), small to moderate effect sizes for cadence (d=0.35), and walking velocity (d=0.26), and negligible effect size for step width (d=0.06). CONCLUSION: A community-based running program contributed to improved gait mechanics in a cohort of children with mobility impairments. Others have shown that walking ability gains are associated with improved bipolar gross motor skills like running. The results of this study indicate that the reverse may also be true: running was associated with gains in walking ability in children and young adults with developmental disabilities.

1360 Board #122 May 30 9:30 AM - 11:00 AM Flourishing and Physical Activity in Adolescents With and Without Autism Spectrum Disorder
Stephanie M. McCoy, Kristen Morgan. University of Southern Mississippi, Hattiesburg, MS.

(Autism spectrum disorder (ASD) is characterized by behaviors that can negatively affect daily life. However, little is known about the effects of physical activity (PA) participation on measures of flourishing (i.e., resilience in functioning) as well as excessive arguing and behavioral conduct problems in those with ASD vs. typically developing (TD) youth. PURPOSE: To compare measures of flourishing, excessive arguing, and behavioral conduct problems in youth with ASD compared to TD peers and determine if physical activity participation mediates these differences. METHODS: Analysis included 223 youth aged 10 to 17yrs (mean 13.8 ± 2.3 yrs) from the 2016 National Survey of Children’s Health. Youth were grouped into those with ASD (n=16) and TD (n=2217)Outcome variables included measures of flourishing (finishing tasks, staying calm, showing interest in new things), excessive arguing, and behavioral conduct problems. Logistic regression models, adjusted for gender, SES, ASD severity, and medication assessed the odds of each outcome comparing ASD to TD. Further analyses examined whether participation in PA (≥4 d/wk) mediated the relationships between ASD and outcome variables. RESULTS: Within youth with ASD, only 31% engaged in regular PA (≥4 d/wk) vs. 3% of TD youth. In adjusted models, those with ASD were less likely to finish tasks (OR=0.42; p<0.001), and 65% less likely to stay calm when faced with a challenge (OR=0.35 p=0.009 compared to TD youth). Additionally, those with ASD were more likely to argue excessively (OR=2.9 p<0.001), and times more likely to experience behavioral conduct problems (OR=3 p<0.001) compared to TD youth. After adjustment for PA, relationships were slightly attenuated for flourishing (OR=0.46, p=0.001; OR=0.38, p=0.014), excessive arguing (OR=2.80; p=0.001), and behavioral conduct problems (OR=80; p=0.001). ASD was not associated with showing interest in learning new things. CONCLUSIONS: Those with ASD were significantly less likely to flourish, and more likely to experience behavioral conduct problems and argue excessively compared to TD youth. However, PA attenuated these relationships. These findings suggest that regular PA may increase positive flourishing behaviors and decrease negative behaviors.

1361 Board #123 May 30 9:30 AM - 11:00 AM Age-related Changes In para-athletics And Racing Wheelchair Performance
Julien Schipman, Pasqua le Gallo, Andy Marc, Juliana Antero, Jean-francois Toussaint, Adrien Sedeau, Adrien Marc. INSEP, France, France.

(Autism spectrum disorders (ASD) are a neurodevelopmental condition that affects the way people understand the world and interact with others. The effects of ASD on physical activity participation are not well understood, with mixed results regarding how ASD impacts physical activity levels. This study aimed to examine age-related changes in participation in para-athletics and racing wheelchair disciplines among youth with and without ASD.

METHODS: Participants were divided into two groups: youth with ASD (n=656) and youth without ASD (n=22,217). A mixed-methods approach was used, combining surveys and interviews. Approximately 50% of the participants were aged 10-13 years. The survey included questions about participation in para-athletics and racing wheelchair disciplines, and the interviews were conducted with a subset of participants to gather more in-depth qualitative information.

RESULTS: Participation in para-athletics and racing wheelchair disciplines was significantly lower among youth with ASD compared to those without ASD, regardless of age. The percentage of youth with ASD participating in these disciplines was significantly lower than their TD counterparts, with the largest differences observed in younger age groups (10-13 years). Youth with ASD reported lower confidence in their ability to compete and were more likely to feel excluded from team events. Moreover, youth with ASD had fewer opportunities to participate due to barriers such as access to resources, accommodations, and social stigma.

CONCLUSIONS: These findings highlight the importance of inclusive physical activity programs for youth with ASD, especially in para-athletics and racing wheelchair disciplines. Early intervention strategies are crucial to ensure these youth have access to appropriate resources and support to promote their physical activity participation. Further research is needed to understand the specific needs of youth with ASD in these disciplines and to develop effective support and accommodation plans. This study underscores the need for continued advocacy and policy changes to make physical activity more inclusive for youth with ASD.
was perceived to be beneficial for promoting positive physical and psychological changes in people with MS. Future interventions could be improved regarding times and locations.

### C-36 Free Communication/Poster - Physical Activity Assessment and Measurement Methods

**Thursday, May 30, 2019, 7:30 AM - 12:30 PM**

**Room: CC-Hall WA2**

**1364 Board #126**

**May 30 9:30 AM - 11:00 AM**

**Accelerometer-Based Activity Classification Algorithm for Toddlers: Machine Learning Approach**

Soyang Kwon¹, Pinky Sindu², Katherine Nickelő¹, Patricia Zavos³, Albert Sugianto², Mark V. Albert¹.¹Ann & Robert H. Lurie Children’s Hospital of Chicago, Chicago, IL. ²Loyola University Chicago, Chicago, IL.

Email: skwon@luriechildrens.org

(No relevant relationships reported)

**PURPOSE:** To develop activity classifiers based on accelerometer data to recognize toddler’s eight distinct activities: walking/running, climbing up/down, standing, crawling, sitting, lying down, being carried, and riding a stroller/wagon.

**METHODS:** Twenty-four toddlers aged 13 to 35 months (8% girls) performed various prescribed activities during free play in a commercial indoor playground, while wearing ActiGraph wGT3X-BT accelerometers on the hip and wrist. Their activities were video recorded. The video data were annotated and synchronized with accelerometer data. Five machine learning classifiers, including random forest, support vector machine, decision tree, K-nearest neighbors, and logistic regression, were trained and tested. Classifier performance was evaluated using subject-wise cross-validation.

**RESULTS:** Activity classifiers were developed based on 1,011 two-second window accelerometer signal clips from the 24 participants. Of the five classifiers tested, the random forest classifier presented the highest overall accuracy (69% for hip and 55% for wrist). Over all, hip data showed higher accuracy than wrist data. Based on the hip random forest classifier, 91% of “walking/running” activities and 84% of “sitting” activities were correctly identified. However, 35% of “being carried” activities and 30% of “standing still” activities were misclassified as “walking/running.” Only 8% of “stroller/wagon ride” activities were misclassified as “walking/running.”

**CONCLUSIONS:** This pilot study demonstrates that the machine learning approach can be used to detect toddler’s “walking/running” activities at a high level of sensitivity. However, the algorithm developed in this pilot study often misclassified “standing still” or “being carried” as “walking/running.” “Stroller/wagon ride” was less frequently misclassified as “walking/running.” Overall, hip data demonstrated higher accuracy than wrist data in detecting key activities for toddlers. Future research should follow to refine the algorithms and test external validity.

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**1365 Board #127**

**May 30 9:30 AM - 11:00 AM**

**Thresholds of Sedentary Behavior in Children Based on Various Measures**

Ying Gao, Eero A. Haapala, Anssi Vanhala, Martti Melin, Arja Sääslähti, Merja Rantakokko, Arto Laukkonen, Arto J. Pesola, Timo Rantalainen, Taïja Finn.

University of Jyväskylä, Jyväskylä, Finland.

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(No relevant relationships reported)

**PURPOSE:** To investigate the classification accuracy of estimates of energy expenditure (REE), accelerometry (ACC), muscle EMG, and heart rate (HR) for sedentary and non-sedentary activities in children. The agreement of directly measured value of metabolic equivalent of task (MET) with commonly used adult MET value was assessed.

**METHODS:** VO₂, HR, triaxial ACC and thigh muscle EMG were simultaneously recorded from 38, all 12-year-old children, who performed 3 pre-determined sedentary and non-sedentary tasks in a random order. Mean values of the concurrent 2 minutes epochs from the measures for each activity were analyzed. Resting EE (REE) was determined during 30 minutes rest in supine position. Adult-estimated MET (METa, VO₂peak/VO2rest × 100), HR (at 3 h: kg/min) and REE-based measured MET (METb, VO₂peak/VO2rest × 100) were calculated. Mean amplitude deviation (MAD) was computed for ACC and EMG was normalized to mean muscle activity during self-paced walking. The classification accuracy of METa, METb, HR, ACC and EMG for SB was investigated by receiver operating characteristic (ROC) curves, the area under the ROC curve (AUC) with (95% confidence interval (CI) and optimal cut-points with sensitivity (Se) and specificity (Sp) for METa, METb, HR, ACC, and EMG were compared.

**RESULTS:** METa was 2% lower than METb in any activity (p<0.001). Measured REE in children was: 0.8 kg/min. Figure 1 shows the ROC curves with AUC and its CI for METa, METb, HR, MAD and EMG. The optimal cut-points for SB was 1.3 for METa (Se=80% Sp=81%), 1.9 for METb (Se=80% Sp=82%), 104 beats/min for HR (Se=80% Sp=82%), 0.003g for MAD (Se=80% Sp=82%) and 13% for EMG (Se=80% Sp=82%).

**CONCLUSIONS:** The SB threshold based on adult METs (<1.5 METs) did not appear to be appropriate for children. All of the used indicators had reasonable classification accuracy with appropriate sensitivity and specificity for sedentary and non-sedentary activities in children.
Validity Of Objectively-measured And Self-reported Sedentary Behavior Across Three Trimesters Of Pregnancy

Bethany Barone Gibbs1, Melissa A. Jones1, Joshua L. Paley1, Kara M. Whitaker2, Christopher P. Connolly3, Janet M. Catov1.

1University of Pittsburgh, Pittsburgh, PA. 2University of Iowa, Iowa City. 3Washington State University, Pullman, WA.

Email: bbarone@pitt.edu

(No relevant relationships reported)

PURPOSE: Sedentary behavior (SED), low intensity behavior in a seated, reclining, or lying posture, is a potential risk factor for poor pregnancy outcomes. We evaluated the validity of commonly used methods to assess SED across three trimesters of pregnancy.

METHODS: This cohort study of pregnant women measured objective and self-reported SED during each trimester including: 7 days (valid if ≥4 days with ≥10 hr) of thigh-worn activPAL micro3 (criterion) and waist-worn Actigraph GT3X and self-report from the Global Physical Activity Questionnaire (GPAQ; modified SED; stion in hr/day and relative Likert scale) and the Pregnancy Physical Activity Questionnaire (PPAQ) modified to assess sedentary behavior (SED%). SED was compared to GT3X, GPAQ, and PPAQ using paired t-tests and Pearson’s r. Correlations were rated as: <0.5 poor; 0.5-0.69 moderate, ≥0.70.9 good, and ≥0.9 excellent.

RESULTS: Fifty-eight women (mean age 32 ± 5 yr; pre-pregnancy BMI 25 ± 6 kg/m²; % white) provided three trimesters of valid activPAL data. Compared to activPAL, GT3X SED was similar in the 1st and 2nd trimester, slightly lower in the 3rd (p=0.03), and moderately correlated (Table). Self-reported SED was systematically lower by GPAQ and higher by PPAQ (all p<0.001); correlations with activPAL were poor-to-moderate (GPAQ) or poor (PPAQ). SED% was slightly higher by GT3X vs. activPAL in the 1st trimester (p=0.04), but otherwise similar, with moderate correlations throughout pregnancy. GPAQ (Likert) underestimated %SED (p=0.01) from activPAL in the 1st and 2nd trimesters, but not the 3rd, and had poor-to-moderate correlations. CONCLUSIONS: Compared to activPAL, waist-worn GT3X resulted in only moderate correlations with SED and SED% across pregnancy, though differences in mean estimates were small. Self-report scores differed from activPAL but were poorly correlated to SED hr/day during pregnancy. GPAQ SED% was the best self-report method.

Table. Sedentary behavior (SED) in hr/day, percent time in SED (%SED), and correlations (r) between activPAL and GT3X, the Global Physical Activity Questionnaire (GPAQ), and the Pregnancy Physical Activity Questionnaire (PPAQ)

<table>
<thead>
<tr>
<th></th>
<th>1st Trimester</th>
<th>2nd Trimester</th>
<th>3rd Trimester</th>
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<tr>
<td></td>
<td>(≤14 weeks)</td>
<td>(20-22 weeks)</td>
<td>(33-24 weeks)</td>
</tr>
<tr>
<td>mean (SD)</td>
<td>mean (SD)</td>
<td>mean (SD)</td>
<td>mean (SD)</td>
</tr>
<tr>
<td>SED (hr/day)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>activPAL</td>
<td>8.66 (15.5)</td>
<td>9.50 (12.3)</td>
<td>9.48 (11.2)</td>
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<tr>
<td>GT3X</td>
<td>9.50 (1.3)</td>
<td>9.05 (0.39)</td>
<td>9.06 (1.29)</td>
</tr>
<tr>
<td>GPAQ</td>
<td>9.50 (0.30**)</td>
<td>8.97 (0.33**)</td>
<td>8.97 (0.41**)</td>
</tr>
<tr>
<td>PPAQ</td>
<td>12.25 (0.55**)</td>
<td>13.28 (0.83)</td>
<td>11.47 (0.57)</td>
</tr>
<tr>
<td>r</td>
<td></td>
<td></td>
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<tr>
<td>SED (%)</td>
<td>0.62***</td>
<td>0.58***</td>
<td>0.58***</td>
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<td>ST</td>
<td>0.50***</td>
<td>0.50***</td>
<td>0.50***</td>
</tr>
<tr>
<td>FL</td>
<td>0.63***</td>
<td>0.68***</td>
<td>0.64***</td>
</tr>
<tr>
<td>GPAQ</td>
<td>0.35**</td>
<td>0.33**</td>
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<tr>
<td>PPAQ</td>
<td>0.64***</td>
<td>0.66***</td>
<td>0.64***</td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01 ***p<0.001

Figure 1. Combined activPAL and GT3X data from pregnancy study. a) GT3X and activPAL 24hr activity. Step counts across six days are a reliable indicator of physical activity in 4th grade students, but the lower reliability of floors climbed suggests these data should be interpreted with caution.

Unidimensionality and Internal Consistency Reliability of Step Counts and Floors Climbed in 4th-5th Grade Students

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(No relevant relationships reported)

PURPOSE: To determine if weekday and weekend days step counts and floors climbed are unidimensional and internally consistent indicators of physical activity 4th- and 5th-grade students.

METHODS: Students in 4th and 5th grade (n = 8, a age [mean ± SD]: 10.1 ± 0.6 yr) at two Title I schools participated in a 12-week after-school program focused on nutrition, cooking skills, and physical activity. At the beginning (T1) and end (T2) of the program the students wore commercial activity trackers for six days, including two weekend days. Unidimensionality and internal consistency reliability (Cronbach’s coefficient α) of the six daily step counts (ST) and floors climbed (FL) values were analyzed at T1 and T2. Days with ST < 12,000 were excluded. Complete ST data was available for 41 students at both T1 and T2. Principal axis factoring (initial, unrotated solution) was used to confirm unidimensionality.

RESULTS: Both ST and FL at T1 and T2 were unidimensional based on visual inspection of the scree plots (Figure 1) and interpretability of the factors. Variance explained by the first factor was 32.9% (T1) and 42.0% (T2) for ST and 30.2% (T1) and 31.5% (T2) for FL, respectively. Coefficient α was 0.71 (T1) and 0.68 (T2) for ST and 0.67 (T1) and 0.68 (T2) for FL. CONCLUSIONS: In this sample of 4th-5th grade students step counts and floors climbed are unidimensional indicators of physical activity. Step counts across six days are a reliable indicator of physical activity in 4th and 5th grade students, but the lower reliability of floors climbed suggests these data should be interpreted with caution.

Approximately half of American households own a dog, and dog ownership is associated with higher levels of physical activity (PA). These increased PA levels are assumed to be dog-related, but there is limited scientific evidence to support this assumption. Although dog walking is classified as moderate intensity PA (3 METS) in the PA compendium, few studies have used objective PA measures to track intensity during dog walking bouts. PURPOSE: To 1) determine the percentage of daily accelerometer-estimated moderate-to-vigorous PA (MVPA) minutes that are accumulated during self-reported dog walking bouts, and 2) quantify the percentage of dog walking minutes that qualify as MVPA. METHODS: Thirty-three healthy dog owners (30 female; BMI 22±5; age 25±1.5) wore an ActiGraph GT3X+ accelerometer on their right hip for 24 hr. Participants were asked to keep their normal routine, log leisure-time activity with and without their dog, and ActiGraph on/off periods. T-tests were used to compare differences in MVPA for dog age (<7 vs. ≥7 years) and size (med/large vs. small). RESULTS: (Thirty-three participants averaged 56.62 ±31.1 min/day in MVPA. An average 42.12 ±25.25% of this time was spent dog walking. Of time spent dog walking, 65.19 ±26% was MVPA. There was no significant difference in % of MVPA min/day attributable to dog walking or % of dog walking in MVPA based on dog age or size (p=0.4). Combined ActiGraph and self-report data provides context for participants’ PA, and further insight for investigation (Figure 1). CONCLUSION: The sample demonstrated large variability, with some participants accumulating almost all MVPA from dog walking, and others accumulating little or none. Two-thirds of dog walking minutes were MVPA, but also varied by individual. Variations were not explained by dog size or age. Given the prevalence of dog ownership in America, further investigation into how dog ownership affects PA is warranted.
Recognition of activities performed during military training may benefit the identification and quantification of factors that may predispose to the high prevalence of injury. There is evidence to suggest that the use of machine learning classifiers along with features from accelerometry data can achieve accurate activity recognition; however, there is no evidence to this application within military activities. **PURPOSE:** To develop and determine the accuracy of decision tree (DT), support vector machine (SVM), k-nearest neighbour (KNN) and ensemble bagged tree (EBT) models to classify military training type activities. **METHODS:** A total of 46 male participants (mean ± SD: age: 25.8 ± 3.0 years, height: 1.79 ± 0.06 m, body mass: 79.9 ± 8.5 kg) completed three sessions that consisted of performing military activities (walking, running, marching, weighted marching, halt to attention, countermovement jump and sedentary) with a low cost accelerometer (Axivity AX3, UK) mounted on the distal third of the medial tibia. Accelerometer data were segmented into two-second windows with a 1% overlap to introduce activity variance. Raw data along with filtered (butterworth, chebyshev and elliptic) were processed through a variety of features and classifiers (DT, SVM, KNN, EBT). Models were trained (80%) and hold-out validated (20%) using the classification learner within MATLAB (MathWorks Ltd, UK). Accuracy was determined by the percentage of true values during validation. **RESULTS:** 0.201 to 1.000 for two episodes of activities were recognized (1.30 m inutes). Hold-out validation accuracy for the EBT model and raw data (no improvement through filtering) was 0.96 (95% confidence interval (CI), 0.96-0.96). Other models demonstrated good validation accuracies [DT - 0.90 (95% CI, 0.88-0.91), SVM - 0.94 (95% CI, 0.93-0.95) and KNN - 0.91 (95% CI, 0.90-0.92)]. Validation accuracy was moderate to excellent (>80%) for walking and excellent (>90%) for all other activities. **CONCLUSIONS:** All machine learning models (especially EBT) provided excellent classification accuracy with the use of a tibial mounted accelerometer. These low-cost sensors and models thus offer potential for characterising military activity and examining relationships of activity parameters with injury. Supported by EPSRC and Loughborough University Studentship 1185.
Previous algorithms have been developed to approximately replicate ActiLife software’s activity counts when used with raw acceleration data from physical activity accelerometers.

**PURPOSE:** To compare a new algorithm based upon two cascaded infinite impulse response filters (ALG1) to an existing algorithm (ALG2; Brond, Andersen, & Arvidsson [2017]) for generating activity counts from raw acceleration data.

**METHODS:** Sixteen adults (19.8 ± 6.8 kg) completed a series of simulated free-living activities (e.g., walking, climbing stairs, eating, sitting down, brushing teeth, etc.) while wearing an accelerometer on their right wrist initialized at a sampling frequency of 32 Hz. These activity data are publicly available ([https://archive.ics.uci.edu/ml/machine-learning-databases/00382](https://archive.ics.uci.edu/ml/machine-learning-databases/00382)) within the UCI Machine Learning Repository.

**RESULTS:** Mean error (% error from ActiLife cps) was used to compare mean cps values from ALG1 and ALG2 with those from ActiLife (criterion). Correlations and mean absolute errors for ALG1 and ActiLife were also quantified. Correlation magnitudes were compared between algorithms using Meng’s z-test.

**RESULTS:** Mean error (% error from ActiLife [M ± 95% ps] for ALG1 (1.7%; 95% CI: 0.8 ± 2.3%) and ALG2 (-1.0%; 95% CI: -2.2 ± 0.2%) was small and indicates both algorithms provided equivalent valence estimates to those obtained from ActiLife. Correlations for ALG1 (r = 0.92) and ALG2 (r = 0.97) with ActiLife (p < 0.001) were high; however, the ALG1 correlation was of a significantly greater magnitude than the ALG2 correlation (p = 0.025). Moreover, mean absolute error was smaller for ALG1 (1.0% ps) than for ALG2 (9.2% ps).

**CONCLUSION:** Mean vector magnitude cps values from ALG1 and ALG2 were comparable to those generated by ActiLife. Estimates from ALG1 appear to be more strongly correlated with ActiLife cps and have smaller absolute errors than ALG2.

Additional research is needed to evaluate the performance of each algorithm for generating estimated ActiLife activity counts with acceleration data collected at other body locations (e.g., waist, chest, ankle, etc.).

**CONCLUSIONS:** Previous algorithms have been developed to approximately replicate ActiLife software’s activity counts when used with raw acceleration data from physical activity accelerometers. The new algorithm (ALG1) appears to be more strongly correlated with ActiLife cps and have smaller absolute errors than ALG2. ALG1 (4.9 cps) than for ALG2 (6.4 cps).

**AP** was fair for both ST (k = 0.22) and PA (k = 0.22).

**GPAQ** question for ST showed fair correlation with AP (r = 0.37, mean bias: -2.7 h/day, 95% LoA: -11.1, 2.6 h/day). The GPAQ showed fair correlation with PA on a usual day (r = 0.39) with mean bias of -5.7 h/day when compared with ALG2.

When ST was categorized into tertiles, agreement was significant but poor between the RAPA and YPAS. Data are presented as mean ± standard deviation. Statistical significance was set at p < 0.05.

**RESULTS:** Mean age (10 years) and Body Mass Index (14.8 kg/m²) indicated an older, mostly overweight and obese sample. Mean time since diagnosis was 2.6 ± 1.3 yrs. The sample was socioculturally diverse, with 31% non-Hispanic black, 33% non-Hispanic white, 29% Latina, and 8% other race/ethnicity. Forty-two percent reported having earned a college degree, and 11% reported not having graduated high school. According to the RAPA results, 44% of the participants were sedentary, 44% were insufficiently active, and 52% were active (27 out of 52). The five RAPA categories were significantly correlated with the YPAS Summary Index (r = 0.34, p < 0.001) and the YPAS Energy Expenditure Index (r = 0.23, p < 0.016). Although there were significant correlations between measures, the strength of the associations was not large.

**CONCLUSIONS:** There was convergent validity between the RAPA and YPAS questionnaires, but with relatively weak strength of association. Further research should be conducted to validate each measure with an instrumented criterion, such as accelerometry, among cancer survivors.

**METHODS:** Fifty-nine endometrial cancer survivors were approached during their gynecologic oncology follow-up appointments. The 3 survivors who agreed to participate were administered the nine-item RAPA, which requires approximately 3 minutes to complete, and 35 item YPAS, which requires approximately 1 hour to complete. The RAPA is scored by selecting the one that best describes the individual. The YPAS is scored by providing the estimated time spent engaged in one of five groups.

**RESULTS:** The Rapid Assessment of Physical Activity (RAPA), a simple physical activity survey containing nine question items with accompanying images, may be a valid method for assessing undeserved populations. The purpose of this study was to evaluate the convergent validity of the RAPA and Yale Physical Activity Survey (YPAS) for socioculturally diverse endometrial cancer survivors.

**CONCLUSIONS:** The RAPA and YPAS were significantly correlated with each other, indicating that both instruments provide valid estimates of physical activity. The YPAS provided energy expenditure (EE) and summary indices. Kendall Rank Correlation Coefficients (r) were analyzed to evaluate the convergent validity between the RAPA and YPAS. Data are presented as mean ± standard deviation.
Further research is needed to optimize SD during non-ambulatory upper body activities and slow walking.

A signal pattern-specific algorithm provides reasonable step estimates to 0.019g.s across clusters. Bias and accuracy were acceptable for most ambulatory activities.

Table 1. RMS for the VAPH ranged from 0.011 to 0.036 (gs) across clusters. Bias and accuracy were acceptable for most ambulatory activities and slow walking.

Purpose: To test a multi-phased, signal pattern-specific step detection (SD) algorithm for a wrist-worn triaxial accelerometer.

Methods: Adults [N=30; age: 37(11); female: 65%; BMI: 25.4(3.8)] wore accelerometers while engaged in 5-minute activity bouts (see Table 1), and hand-tallied steps were simultaneously recorded as the ground truth. Phase 1—Raw accelerometer data were processed by: 1) low-pass filtering, 2) calculating the bandpass filtered vertical accelerations (VA) in gravity seconds (gs), and 3) calculating the integrated area under the curve for the VA time series. For all activities, the VA peak heights (VAPH) that minimized SD error relative to the ground truth were determined by brute force. Phase 2—A signal features for each activity (triaxial vector magnitude, signal variability, and device angle) were passed to a k-means clustering algorithm, which grouped all activities into 3 clusters. Phase 3—A Random Forest (RF) algorithm was used to estimate VAPH for each cluster using activity signal features as inputs, and the cross-validated root-mean-squared error (RMSE) for the RF-determined VAPH were calculated. Phase 4—RF-determined VAPH were applied to the original VA time series for SD. Bias (mean difference and accuracy (median absolute percentage error) were calculated to evaluate SD performance. Sign tests were used to check for significant bias (p<0.05).

Results: SD performance is shown in Table 1. RMS for the VAPH ranged from 0.011 to 0.036 (gs) across clusters. Bias and accuracy were acceptable for most ambulatory activities and seated non-ambulatory activities, but not for non-ambulatory upper body activities and slow walking.

Conclusions: A signal pattern-specific algorithm provides reasonable step estimates for a wrist-worn accelerometer across ambulatory and non-ambulatory activities. Further research is needed to optimize SD during non-ambulatory upper body activities and slow walking.

Funding: NIH-NIA- R1A1G0824

Results:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Observed Steps (steps/minute)</th>
<th>Estimated Steps (steps/minute)</th>
<th>Vertical Acceleration Peak Heights (gs)</th>
<th>Bias (steps/minute)</th>
<th>MdAPE (%)</th>
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</thead>
<tbody>
<tr>
<td>Seated</td>
<td></td>
<td></td>
<td></td>
<td>(-)</td>
<td></td>
</tr>
<tr>
<td>Rest</td>
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<td>[0.05; 0.07]</td>
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<td>[0.08; 0.09]</td>
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<td>0(20)</td>
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<tr>
<td>Self-paced corridor walking</td>
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<td>104(34)</td>
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</tr>
<tr>
<td>0.5 mph</td>
<td>31(19)</td>
<td>16(28)</td>
<td>[0.012; 0.017]</td>
<td>-37</td>
<td>6</td>
</tr>
<tr>
<td>1.0 mph</td>
<td>17(15)</td>
<td>9(27)</td>
<td>[0.022; 0.023]</td>
<td>-12</td>
<td>38</td>
</tr>
<tr>
<td>1.5 mph</td>
<td>13(13)</td>
<td>8(39)</td>
<td>[0.029; 0.029]</td>
<td>-8</td>
<td>34</td>
</tr>
<tr>
<td>2.0 mph</td>
<td>9(9)</td>
<td>110(31)</td>
<td>[0.034; 0.032]</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>2.5 mph</td>
<td>10(7)</td>
<td>110(37)</td>
<td>[0.034; 0.033]</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>3.0 mph</td>
<td>11(7)</td>
<td>122(27)</td>
<td>[0.033; 0.032]</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>3.5 mph</td>
<td>123(17)</td>
<td>116(18)</td>
<td>[0.029; 0.031]</td>
<td>-7</td>
<td>5</td>
</tr>
<tr>
<td>4.0 mph</td>
<td>132(17)</td>
<td>118(18)</td>
<td>[0.024; 0.026]</td>
<td>-14</td>
<td>5</td>
</tr>
<tr>
<td>4.5 mph</td>
<td>14(6)</td>
<td>120(10)</td>
<td>[0.028; 0.026]</td>
<td>-13*</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 1. Bias (mean difference) and accuracy (MdAPE) for the hand-counted (observed) algorithm-determined (estimated) steps/minute. Abbreviations: gravity seconds (gs), median absolute percentage error (MdAPE), min (minute).

* Mean (Standard Deviation)

Vertical Acceleration peak height thresholds are the average best observed versus algorithm-derived values for step detection (observed; estimated).

Negative values indicate underestimation of steps/minute relative to the observed steps/minute while positive values show overestimation. Asterisks indicate significant bias (p<0.05), as determined by a two-sided sign test.

Note: By definition, MdAPE values are not available for conditions wherein the observed step counts are zero.

Purpose:

Using Heart Rate to Predict Energy Expenditure: A Validity Generalization Study

Zezhao Chen, Xiaofei Wang, Hai Yan, Xiong Qin, Jingyuan Zhu, Weimo Zha, FACSM, 'University of Illinois at Urbana Champaign, Champaign, IL. 2Tsinghua University, Beijing, China.

Email: zchen106@illinois.edu

No relevant relationships reported

Physical activity (PA) plays a critical role in preventing chronic diseases. Heart rate has been frequently used to predict PA energy expenditure (PAEE). While a number of prediction equations has been frequently used to predict PAEE using heart rate. The validity generalization model (Pearlman, Schmidt, & Hunter, 1980) was utilized for the analysis. Four components including sample size, observed validity coefficients, test reliability coefficients, and criterion reliability coefficients were summarized and examined from each study. When test and criterion reliability coefficients were not reported, the information was derived from the literature. The percentages of variance accounted for “by artifacts” were computed. RESULT: 8% of validity studies were screened and 23 studies (McSD: Sample size = 8; 13), validity coefficients = .70±.13. Test reliability coefficients = .83±.05, & Criterion reliability coefficients = .95±.02 were analyzed to determine the degree of validity generalization using heart rate to predict PAEE. The percentage of variance accounted...
for “by the artifacts” was only at 65%. Thus, the needed “75% decision rule” was no met. The estimated “90% credibility value” for the true validities was at .55, and the estimated average true validity was at .6 Conclusion: The validity to use heart rate predicting PAEE did not appear to be generalizable and these heart rate prediction equations should be used with caution, especially when it is used for another population.

**1379 Board #141 May 30 9:30 AM - 11:00 AM**

**Aerobic Exercise Training and Blood Lipids-Lipoproteins Among Healthy Adults: A Methodological Umbrella Review**

Lucas P. Santos1, Angélica T. De Nardi1, Lucínea O. Pfeifer1, Néton L. Oliveira2, Yin Wu1, Daniel Uppercire1, Linda S. Pescatello, FACSM1. Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil. 1Hospital de Clínicas de Porto Alegre, Porto Alegre, Brazil. 2University of Connecticut, Storrs, CT. (Sponsor: Linda Pescatello, FACSM)

**No relevant relationships reported**

**PURPOSE:** Meta-analyses (MA) that have examined whether aerobic exercise training (AET) affects blood lipids-lipoproteins have yielded conflicting findings. Since methodological characteristics and completeness of reporting may influence interpretation and generalizability of MA results, we sought to assess the qa lity of these parameters in published MA that examined the blood lipids-lipoproteins response to AET. **METHODS:** We used search terms related to AET and blood lipids-lipoproteins in six databases to find MA published in English, Portuguese, or Spanish. The MA included trials that: (1) enrolled adults with no established disease; (2) measured lipids-lipoproteins before and after intervention; (3) reported the number of intervention, I group (n=50) used to develop the equation and a validation group (n=10) used to find MA published in English, Portuguese, or Spanish. The MA included trials that: (1) enrolled adults with no established disease; (2) measured lipids-lipoproteins before and after intervention; (3) reported the number of intervention, I group (n=50) used to develop the equation and a validation group (n=10) used to validate the same. **RESULTS:** Of 275 electronically identified records, 41 were included in the review. Seven MA qualified for our umbrella review, which may partially explain the disparate findings of the effects of AET on blood lipids-lipoproteins. Future MA following current methodological standards that explore which may partially explain the disparate findings of the effects of AET on blood lipids-lipoproteins. Future MA following current methodological standards that explore which may partially explain the disparate findings of the effects of AET on blood lipids-lipoproteins.

**CONCLUSION:** The validity to use heart rate predicting PAEE did not appear to be generalizable and these heart rate prediction equations should be used with caution, especially when it is used for another population.

**Preliminary evidence suggests that a cadence of 10 steps/min is associated with the walk to run transition (W2R). However, this cadence threshold does not take into consideration leg length. Alternatively, the Froude number is used to compare the similarities of locomotion across individuals by incorporating leg length, and provides a theoretical prediction of the W2R at a value of 0.5. Additionally, the W2R has been shown to occur at an estimated speed of 2.09 m/s. If supported, a W2R cadence value could be used to identify running in free-living accelerometer-based data sets.**

**PURPOSE:** To examine whether 140 steps/min is a more accurate predictor of the W2R than a Froude number of 0.5. A Froude number of 0.9 predicted the W2R with a sensitivity of 35.7%, a specificity of 96.4%, and an overall accuracy of 66.0%. A speed of 2.09 m/s predicted the W2R with a sensitivity of 14.3%, a specificity of 96.4%, and an overall accuracy of 59.6%. **CONCLUSION:** A cadence of 10 steps/min was a more accurate predictor of the W2R than the traditionally supported Froude or speed values. Given the high sensitivity, specificity and overall accuracy values, 140 steps/min may be used to identify running behaviors in free-living accelerometer-based data sets.

**1380 Board #142 May 30 9:30 AM - 11:00 AM**

**Regression Equation To Predict Body Fat In Elderly Women Using Body Circumference Measures**

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**No relevant relationships reported**

**Purpose:** The purpose of this study was to develop and validate an equation to estimate body composition in elderly women above 60 years of age using body circumference measurements. **Methods:** The sample consisted of 60 women individuals with an average age of 83.4 years, 10.6 kg/m2 and 0.3 m from the Vitoria metropolitan area. The group was split into two subgroups: a regression group (n=50) used to develop the equation and a validation group (n=10) used for cross reference. A multiple linear regression was used to develop the equation. Both equations were compared using the Student’s t test for paired samples. **RESULTS:** Of the 20 women included in the regression group, 14 (70%) were chosen to develop the equation and 6 (30%) were chosen to validate the equation. The high sensitivity, specificity and overall accuracy values, 140 steps/min may be used to identify running behaviors in free-living accelerometer-based data sets.

**Activity trackers (AT) continue to be one of the top fitness trends as the wearable market continues to diversify. As new features of AT’s emerge, the need for evidence-based research is needed for reporting the reliability and validity of existing devices.**

**Purpose:** The purpose of this study was to assess the validity and reliability of the single frequency bioimpedance analysis (SF-BIA) device, InBody Band2 and Omron 306 in Adults. **METHODS:** A Pearson’s product-moment correlation was run to assess the relationship between measurements of %BF in adults using the IB2 and O306c. Overall the estimated average true validity was at .69. The validity to use heart rate predicting PAEE did not appear to be generalizable and these heart rate prediction equations should be used with caution, especially when it is used for another population.

**Conclusions:** Findings indicate that the estimates of %BF obtained from the IB2 did not exceed estimates from O306c. Overall the measurements were eq as valent. IB2 showed excellent reliability.
Accelerometers, such as the ActiGraph (AG), are commonly used for measuring sedentary behavior, but the ActiPal (AP) has been validated as the gold standard. The use of various AG processing methods, including filters and non-wear time algorithms, influences sedentary time estimates. The optimal combination of AG filter and non-wear algorithm may depend on the population being studied. PURPOSE: To perform a secondary data analysis to identify which AG filter and non-wear algorithm produce estimates of sedentary time that have the strongest agreement with AP-measured sedentary time in a sample of 341 der adults with chronic obstructive pulmonary disease (COPD). METHODS: Participants wore AG and AP monitors concurrently for 7 consecutive days. Each participant’s AG data was processed using six different methods, using all possible combinations of two filters (normal and low frequency extension) and non-wear algorithms with three different minimum lengths (6 m in units, 9 m in units, and 120 m minutes). The Bland-Altman method was used to assess concordance in sedentary behavior time (minutes per day) between AP and each of the six AG estimates. RESULTS: Correlation concordance coefficients between AP-measured sedentary time and AG-measured sedentary time range from 0.388 to 0.511 (see table). The AG low frequency extension filter with the 60-minute non-wear algorithm resulted in the highest concordance correlation, along with a low mean difference between sedentary minutes per day measured by the two devices. CONCLUSIONS: Although correlation concordance showed moderate agreement, the AG measures of sedentary time are reasonably accurate with the appropriate filter and non-wear algorithm are used. This analysis provides evidence supporting the combination of the AG low frequency extension filter with the 60-minute non-wear algorithm as the optimal method of processing AG data to measure sedentary time in older adults with COPD.

<table>
<thead>
<tr>
<th>Processing Method (Filter &amp; Non-Wear Algorithm Length)</th>
<th>Concordance (Correlation Coefficient)</th>
<th>Difference in 10 (Mean Difference)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal &amp; 6 m in.</td>
<td>0.99 ± 0.19</td>
<td>-12.9 ± 11.7</td>
</tr>
<tr>
<td>Normal &amp; 9 m in.</td>
<td>0.38 ± 0.16</td>
<td>-20.8 ± 11.9</td>
</tr>
<tr>
<td>Normal &amp; 120 min.</td>
<td>0.90 ± 0.13</td>
<td>-5.6 ± 11.7</td>
</tr>
<tr>
<td>Low Frequency Extension &amp; 6 m in.</td>
<td>0.5 (0.132)</td>
<td>106 (908)</td>
</tr>
<tr>
<td>Low Frequency Extension &amp; 9 m in.</td>
<td>0.0 (0.138)</td>
<td>-2.2 (112.2)</td>
</tr>
<tr>
<td>Low Frequency Extension &amp; 120 min.</td>
<td>0.50 (0.129)</td>
<td>-12.9 (1058)</td>
</tr>
</tbody>
</table>

1384 Board #146 May 30 9:30 AM - 11:00 AM Accuracy of Activity Trackers during Treadmill Walking Versus Outdoor Walking

Merrill D. Funk,1 Ivan A. Figueroa,2 Jose L. Gamez,2 Murat Karabulut, FACSM SM,3 Southern Utah University, Cedar City, UT. 1University of Texas Rio Grande Valley, Brownsville, TX. Email: merrillfunk@hotmail.com

(No relevant relationships reported)

Establishing the accuracy of devices that measure daily activity is important in controlled lab settings and in real-life settings. PURPOSE: To assess the accuracy of a pedometer and optical activity trackers at measuring steps while walking on a treadmill and walking outside. METHODS: Twenty-three college students (Mean±SD: 22.1±3.9 yr, 11 males) walked 80 s at 3mph on a treadmill while wearing 7 different activity trackers (Pedometer (PED), Blaze (BLA), Charge HR (CHHR), Alta (ALT), Flex (FLEX), Zip (ZIP), One (ONE)). During a second visit, participants were the devices while walking 80 m eters at 3mph outside. Steps were counted by a trained researcher using a hand tally counter. Mean Absolute Percent Error (MAPE) values were calculated for each device relative to the tally counter and were correlated between each of the devices and the tally counter using Pearson correlations. Significance was set at p<0.05. Mean bias scores were calculated between the step counts for each device and the tally counter. RESULTS: MAPE values were significantly correlated between the treadmill and outdoor protocol for the PED (r=0.68±0.001). The remaining devices were not correlated between protocols (p>0.05). The treadmill protocol produced underestimations in step counts for 5 devices (mean bias:SD: PED = -1.4 ± 4.5 steps; BLA = -3.8 ± 0.8 steps; CHHR = -3.9 ± 5.9 steps; FLEX = -3.9 ± 8.7 steps; and slight overestimations for 2 devices (mean bias:SD: ZIP = 2.1 ± 3.5 steps; ONE = 0.3 ± 2.2 steps). The outdoor protocol produced step count overestimations for all devices. MAPE values were approximately twice as large for 1 of the devices in the outdoor protocol as compared to the treadmill protocol except for the PED (MAPE:SD: PED = 40 ± 2 r treadmill vs. 3.5 ± 2 out door). Besides the PED, the ONE was the most accurate during the treadmill protocol (MAPE:SD: PED = 0.3 ± 0.3) and the ZIP was the most accurate during the outdoor protocol (MAPE:SD: PED = 1.4 ± 0.3). CONCLUSION: The step counting devices in this study performed better in the controlled laboratory setting compared to the outdoor setting with a device worn on the waist producing the best results in each trial. These findings indicate that step counts in real-life settings from commercial activity devices may produce significant error.

1385 Board #147 May 30 9:30 AM - 11:00 AM The Accuracy Of A Smartphone To Measure Laboratory And Free-living Physical Activity

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(No relevant relationships reported)

Accelerometers worn on the wrist or hip can be used to measure physical activity (PA) levels in free-living populations. Most modern smartphones also contain an inertial accelerometer but the capacity of this technology to accurately measure parameters of PA needs to be further established. PURPOSE: The primary objective of this study was to assess the validity of a popular smartphone to count steps and estimate energy expenditure (EE) during laboratory-based PA. A second objective was to compare free-living daily step counts measurements from the smartphone with a waist-worn accelerometer commonly used in research studies. METHODS: Healthy adults (n=20, 23±7 yr) took part in a single laboratory trial and a free-living trial (n=16, 23±13 yr). Participants wore the smartphone and accelerometer in a waist-mounted pouch continuously during both trials. Laboratory trials comprised 30 mins in bouts of treadmill walking and jogging. Step counts were manually counted (MC) and EE was measured using indirect calorimetry (IC). The estimates of PA parameters from the smartphone and accelerometer were compared to each other and to the gold standard measures (MC and IC) using the concordance correlation coefficient (CCC) with the thresholds: almost perfect ≥0.9, substantial >0.8 - 0.9, moderate 0.65 - 0.8, poor <0.6. Levels of agreement are expressed as mean bias with 95% limits of agreement (LOA). RESULTS: Compared to MC (80±18 steps), the smartphone (59±9 steps; CCC 0.9, mean bias -3 steps, LOA = -15 to 24 steps) and accelerometer (133±33 steps; CCC 0.6, mean bias -2 steps, LOA = -12 to 26 steps) provided accurate measurements of step count. Compared to IC (8.3 kcal·min⁻¹), the smartphone (6±1 kcal·min⁻¹) underestimated EE with poor agreement between methods (CCC = 0.6, mean bias -3.6 kcal·min⁻¹, LOA = -8 to 1.5 kcal·min⁻¹). During free-living, the smartphone (9±5 steps·day⁻¹) substantially underestimated step count compared to the accelerometer (9±5 steps·day⁻¹, mean bias -15% steps·day⁻¹, LOA = -16 to 5 steps·day⁻¹). CONCLUSION: The smartphone provided accurate measurements of step count during a controlled laboratory walking trial but substantially underestimated PA in comparison to an accelerometer during a period of free-living. Supported by a grant from the Digital Health and Care Institute.

1386 Board #148 May 30 9:30 AM - 11:00 AM Temporal Relationships Between The Act24 And A Temporal-Based Method For Estimating Energy Expenditure Over A 24 Hour Period

Nicholas R. Lamoureux1, Paul R. Hething2, Charles E. Matthews3, Gregory J. Welk, FACSM.4 Iowa State University, Ames, IA. 1University of Tennessee, Knoxville, Knoxville, TN. 2National Cancer Institute, Bethesda, MD. (Sponsor: Greg Welk, FACSM) Email: nrl1@iastate.edu

(No relevant relationships reported)

The ability to quantify physical activity (PA) behavior and energy expenditure (EE) remains an important metric in public health and fitness research. While monitor-based methods remain popular, they cannot provide the context needed to understand relationships between PA, sedentary behavior, and sleep. The Act24 is a promising online, self-guided recall survey that enables activities to be summarized and processed by day, activity time or period. PURPOSE: To compare EE estimates from the Act24 with estimates from the established Sensewear armband (SWA) across all days as well as at the minute-by-minute level.

METHODS: 9 adults (56% male, mean±SD age 20±6, 10.2 years) wore a SWA for 24 hours and completed the Act24 the following morning. The compendium of physical activities was used to quantify self-reported activity levels based on Act24 responses. To compare overall relationships, estimates of total daily EE from the
The Comparison of Using the Preferred or Non-Preferred Wrist When Measuring Physical Activity

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(No relevant relationships reported)

People who participate in regular physical activity (PA) have a decreased risk of chronic diseases and premature death. A dramatic decrease of PA occurs from adolescence to young adulthood. With serious implications on health, PA is a critical behavior to measure. However, inconsistencies exist on how to measure PA. When using accelerometers, differences between the preferred (arm most commonly used to perform daily tasks of living, P) or non-preferred (NP) wrist may result in underreporting of PA.

The purpose of this study was to compare accelerometer counts from the P and NP wrists to determine if there were significant differences within the preferred and non-preferred hands. All participants were healthy participants from focus groups of 30 college students (15 females and 15 males) completed 7 lab tasks including shooting a basketball (BB), relaxing on a couch (Relax), hitting a racquet-ball (RB), going up and down stairs (WUS), walking on an inclined surface (WUI), walking while using a smart phone (WSP), and using a laptop (COM). An accelerometer was placed on each wrist of the participants. The first 5 minutes was used as a warm up period, and the last 10 minutes was used to compare P and NP wrist measurements.

RESULTS: The daily estimates were highly correlated (r = 0.80, p < 0.0001) and similar in magnitude for total daily EE (SWE: 269 ± 6; 265 ± 7 kcal) with a group level MAPE of 13.6%. The associations of temporally matched estimates revealed individual correlations ranging from r = 0.80 to r = 0.9 [mean of r = 0.8 +/- 0.15]. The individual MAPE values for the temporally matched data ranged from 0.02% to 6% (mean MAPE = 1% +/- 1.6%).

CONCLUSION: Previous-day recalls such as ACT24n may be useful alternatives to self-stimulators or wearable devices for assessment of daily activities over 24 h periods. The robust export options also enable data to be temporally matched with other data sources to provide contextual information to be merged with monitor data. The results reveal good overall agreement between the two methods at both the group and individual level and provides a promising way to investigate PA context; however, additional research is needed to understand the factors influencing error between report-based and monitor-based methods.

Table 1: Device-specific cadence thresholds by intensity

<table>
<thead>
<tr>
<th>Device</th>
<th>Absolutely-defined Intensity</th>
<th>Cadence (steps/min)</th>
<th>Specificity (%)</th>
<th>Sensitivity (%)</th>
<th>AUC</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>ActiGraph (Wrist)</td>
<td>MOD</td>
<td>6</td>
<td>6</td>
<td>0.9</td>
<td>0.6</td>
<td>0.9-1.0</td>
</tr>
<tr>
<td></td>
<td>VIG</td>
<td>7</td>
<td>10</td>
<td>0.9</td>
<td>0.9</td>
<td>1.0-1.0</td>
</tr>
<tr>
<td>Fitbit Zip (Wrist)</td>
<td>MOD</td>
<td>9</td>
<td>7</td>
<td>0.9</td>
<td>0.8</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>VIG</td>
<td>136</td>
<td>9</td>
<td>100</td>
<td>0.8</td>
<td>1.0</td>
</tr>
<tr>
<td>ActiGraph (Wrist)</td>
<td>MOD</td>
<td>39</td>
<td>7</td>
<td>0.8</td>
<td>0.8</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>VIG</td>
<td>8</td>
<td>8</td>
<td>100</td>
<td>0.8</td>
<td>1.0</td>
</tr>
<tr>
<td>Vivaactive® 3 (Wrist)</td>
<td>MOD</td>
<td>9</td>
<td>9</td>
<td>0.9</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>VIG</td>
<td>133</td>
<td>9</td>
<td>100</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>StepWatch (Ankle)</td>
<td>MOD</td>
<td>104</td>
<td>9</td>
<td>9</td>
<td>0.9</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>VIG</td>
<td>125</td>
<td>9</td>
<td>5</td>
<td>0.8</td>
<td>0.0-1.0</td>
</tr>
<tr>
<td>ActiPAM (Thigh)</td>
<td>MOD</td>
<td>101</td>
<td>8</td>
<td>0.2</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>VIG</td>
<td>138</td>
<td>9</td>
<td>5</td>
<td>0.0</td>
<td>0.2-1.0</td>
</tr>
</tbody>
</table>

AUC = Area Under the Curve
CI = Confidence interval

In studies where steps are directly observed, walking cadences of 100 steps/min and 130 steps/min have emerged as thresholds for absolutely-defined moderate (MOD); 3 metabolic equivalents [METs]) and vigorous (VIG; 6 METs) intensities, respectively. However, there is limited information regarding device-specific cadence thresholds provided for guidance.

PURPOSE: To estimate device-specific cadence thresholds for MOD and VIG in 6-75+ yr old adults.

METHODS: Thirty-seven healthy older adults (33% women; age=68.5±4.6 years; BMI=26±3.8 kg/m2) walked on a treadmill for 5-min bouts. The first bout was conducted at 0.5 mph. Speed increased in 0.5 mph increments until participants reached 85% of their age-predicted maximum heart rate, started to run, or reported a Borg Rating of Perceived Exertion > 13. Cadence (steps/min) was measured across all speeds with multiple devices: ActiGraph GTW (hip and wrist), activPAL (thigh), StepWatch (ankle), Fitbit Zip (wrist), and Garmin vivactive® 3 (wrist). Oxygen uptake was measured with indirect calorimetry and converted to METs. Receiver Operator Characteristic (ROC) analysis was used to determine optimal cadence thresholds associated with MOD and VIG intensity using Youden’s index.

RESULTS: Device-specific cadence thresholds for MOD and VIG intensity are presented in Table 1. The optimal device-specific cadence thresholds were associated with very good to excellent classification accuracy for both intensities (AUC > 0.8). Except for the wrist-worn ActiGraph, which had relatively lower specificity for identifying thresholds, optimal cadence thresholds for all devices ranged from 104 steps/min for MOD and 125-140 steps/min for VIG intensity.

CONCLUSION: Device-specific cadence thresholds appear to be acceptable indicators of MOD and VIG walking intensities.

FUNDING: NIH-NIA-R 1 AG0224

Table 1: Device-specific cadence thresholds by intensity
Purpose: Activity trackers are becoming increasingly popular worldwide. As a result, the market has expanded with different brands that produce a variety of activity trackers varying in function and ability. Consumers who purchase these devices rely on the functions that are advertised, especially when cost, exercise, and lifestyle choices are considered. The purpose of this study was to assess the accuracy of the energy expenditure function of three popular activity trackers (1, 2, and 3).

Methods: A sample was drawn from students attending Indiana Wesleyan University. Of those eligible, a total of 35 participants completed the study. Each participant wore the three devices and walked on a treadmill for 10 minutes at 3.0 mph with no incline. To assess accuracy, a t-test was used to compare the total energy expenditure obtained from each device to the indirect calorimetry measurement obtained, which is considered the gold standard of energy expenditure. Correlations were calculated to analyze the relationships between the activity trackers.

Results: All three activity trackers overestimated energy expenditure (p < .05) when compared to the indirect calorimetry measurement. Activity tracker 1, 2, and 3 overestimated by 3722.4 ± 4.4 kcal, respectively. Activity tracker 1 (r = 0.6), 2 (r = 0.8), and 3 (r = 0.8) had a moderate correlation to the indirect calorimetry measurement.

Conclusions: Based on the findings of this study, consumers who purchase one of these devices will read an overestimated energy expenditure. Purchasing activity trackers can be expensive so doing research on which one is the most accurate is essential for consumers.

C-37 Free Communication/Poster - Carbohydrate Metabolism

Glycogen is stored in combination with 3.5g of water in muscle tissue, and carbohydrate (CHO) loading is accompanied by an increase in body water content, especially intracellular water. Therefore, body water status may be useful as an indicator of muscle glycogen level. However, body water status under conditions of glycogen depletion has not been investigated.

Purpose: To determine the effect of muscle glycogen depletion on body water distribution using segmental bioimpedance spectroscopy (S-BIS).

Methods: Twelve healthy men performed cycling exercise aimed at muscle glycogen depletion, and 24h was later consumed a high-(CHO) and low-(LOW) CHO-loading intervention. Muscle glycogen content was measured at baseline, immediately after, and 24h after exercise using 13C magnetic resonance spectroscopy. Intra- and extracellular water content (ICW and ECW) in the leg were assessed using S-BIS; measurement was performed at baseline and 24h after exercise to avoid the effect of exercise-induced acute changes in blood flow and metabolite concentration, but not glycogen, on body electrical properties.

Results: Muscle glycogen content decreased after exercise in both groups (HIGH: Δ ± SD = 18 ± 10% vs 15 ± 10, LOW: 7.1% ± 10.1; 2.1± 0.05% ± 2.1). Significant differences (p<0.05) were observed in the LOW group (HIGH: 2.1± 0.05%) between trials. ECW and ICW in the leg were unchanged from baseline in both groups (ICW: HIGH: Δ ± SD = 13 ± 10, LOW: 3.1 ± 12.4%; ECW: HIGH: Δ ± SD = 0.8 ± 1.4; LOW: 4.2 ± 0.8%).

Conclusion: Muscle glycogen was obviously decreased in thigh muscles, but ICW and ECW in the leg were unchanged. We conclude that muscle glycogen depletion per se does not alter body water status assessed with S-BIS.

Purpose: The effects of low-volume-high-intensity interval exercise (HIIE) and moderate-intensity continuous exercise (MCE) on postprandial glucose, insulin, and triglyceride (TG) concentration following a mixed meal (MM).

Methods: Recreationally active men (n = 7; age = 22.2± 2.1; years; body mass = 9.7± 10 kg; BMI = 28.1± 3.8; body fat% = 22.6± 7.8; WC = 93.5± 15 cm; completed a 1) rest bout, 2) MICE bout, and 3) HIIE bout in a random order. Resting consisted of sitting quietly for 20 minutes. MICE required 20 minutes of continuous cycling at 60% maximal work rate (WRmax). HIIE consisted of performing 20 (15-second) cycling sprints (@ 130% WRmax) followed by 6 seconds of passive cycling. Thirty minutes following the completion of each trial, participants consumed a MM in the form of a milkshake providing 6± 0.5 kcal/kg BM (body mass) with a macronutrient composition of 8% carbohydrate (CHO), 15% protein, and 35% fat. Blood samples were acquried prior to each trial and at 0.51, 2, and 4 hours post-MM. Blood samples were analyzed for glucose, insulin, and TG concentration. Postprandial responses were quantified using the incremental area under the curve (AUC) using the trapezoidal method. Significant differences (p<0.05) between trials were determined using a one-way, repeated measures ANOVA and Bonferroni post-hoc test.

Results: The average work performed over 20 minutes was similar between MICE (120.8± 30.8 W) and HIIE (113.3± 15 W) (p = .8, E S = .1). Glucose AUC was reduced following HIIE (38.7± 16.3 mg·dl⁻¹·h⁻¹) when compared to MICE (68.2± 33.1 mg·dl⁻¹·h⁻¹) (p = .018, ES = .5). HIIE was not different from rest (42.6± 6.4 mg·dl⁻¹·h⁻¹) (p = .13, ES = .3). Insulin AUC was unchanged between trials, however HIIE did elicit the lowest AUC (5.8± 14.1 IU·ml⁻¹·h⁻¹) compared to rest (5.6± 14.1 IU·ml⁻¹·h⁻¹) (p = .15, E S = .6). There was a significant difference in TG concentration.

Conclusion: Low-volume HIIE may reduce the postprandial glucose and insulin concentration. While there was no statistical significance with insulin AUC, there was a moderate effect size with HIIE. The lack of change in TG AUC was anticipated as previous studies have reported that exercise completed immediately prior to a mixed meal does not influence postprandial TG concentration.

Purpose: Prediabetes can be characterized as impaired fasting glucose (IFG) with or without impaired glucose tolerance (IGT, 2-hr blood glucose). IFG is depicted by impaired liver insulin sensitivity, while IFG+IGT is related to reduced liver and muscle insulin sensitivity. Lactate is a byproduct of non-oxidative glycolysis that may mediate altered glucose regulation. However, whether people with IFG and/or IFG+IGT have elevated lactate concentrations compared to normal glucose tolerant (NGT) controls is unclear. We hypothesized that individuals with IFG and IFG+IGT would have higher lactate levels than NGT controls in relation to glucose metabolism. Methods: Forty-one obese adults (Age: 49.2± 20.9 yrs; BMI: 31.2± 6.4 kg/m²; 38.36.7% female) were screened for NGT, IFG, or IFG+IGT (O GTT, ADA criteria) following an overnight fast. Plasma lactate, glucose, and insulin were measured during a 120min OGTT. The oral minimal model was used as an estimate for insulin sensitivity. Aerobic fitness (VO₂peak), fasting substrate oxidation (respiratory exchange ratio, RER), indirect calorimetry) and body composition (bioelectrical impedance) were also tested. Results: There were no differences in VO₂peak, body fat or fasting RER across groups. Individuals with IGT+IFG had lower insulin sensitivity compared with IFG and NGT (P<0.01). However, both IFG and IFG+IGT had increased lactate tAUC compared to NGT (P<0.01 and P<0.01, respectively). Increased lactate tAUC correlated with fasting glucose (r=0.33, P<0.03) and reduced VO₂peak (r=0.34, P=0.03). Fasting lactate also related to fasting RER (r=0.31, P<0.04). Conclusion: Despite no differences between prediabetes phenotypes, adults with IFG and IFG+IGT have elevated lactate concentrations compared to NGT controls. Lactate tAUC directly associates with fasting glucose and fitness, but not insulin sensitivity. These data suggest that fitness may mediate lactate metabolism via the liver. Future work is warranted to determine the mechanism by which lactate influences type 2 diabetes risk.
Glycemic Control
Acute Resistance Exercise Fails to Alter Post-Exercise Glycemic Control
William A. Braun, FACSM, Zach Rollar, Dan Hauck, Shippensburg University, Shippensburg, PA.
Email: wbrau@ship.edu
(No relevant relationships reported)

Acute exercise has commonly been found to transiently enhance glycemic control during recovery from the exercise. This effect has more commonly been observed following aerobic exercise. PURPOSE: This study combined results from two recent smaller investigations to gauge the effects of resistance exercise on post-exercise blood glucose (BG) response to an oral glucose tolerance test (OGTT). METHODS: Data from seventeen resistance-trained volunteers were used. All subjects completed a resting control trial consisting of a 7 min OGTT following consumption of a 2.5 g glucose solution dosed at 1 g/kg body mass. On a separate day, subjects completed either 30 repetitions of squat only exercise (at 10-RM); 30 repetitions each of squat, bench press and bicep curl (at 10-RM); or 30 repetitions each of bicep curl and knee extension (at 10-RM). BG was assessed via fingertip sampling prior to exercise, post-exercise and during the OGTT (every 15 min). Blood lactate was collected at rest and upon completion of exercise. RESULTS: Resistance exercise resulted in significantly increased blood lactate vs. resting state (8.58±0.87 vs. 1.39±0.22 mmol/L). OGTT response following acute resistance exercise was not significantly different (p=0.05) from the resting OGTT condition. BG area under the curve was 2% smaller (p=0.05) following resistance exercise compared to resting control (1133.6 ± 320 vs. 115 1.3 ±38.3 kbits per minute). CONCLUSIONS: Based on the results of this investigation, acute resistance exercise was not found to elicit enhanced glycemic control. The volume of working muscle, the overall energy deficit induced by exercise and the magnitude of the body’s glycogen depletion may be important factors to consider when examining post-exercise blood glucose response to an OGTT challenge.

Shif t work, which involves working during normal sleeping periods, results in asynchrony between central and peripheral molecular circadian clocks and is associated with increased risk for metabolic disease. Catecholamines released during physical activity act as entrainers of the circadian clock, and disruption of physical activity patterns may contribute to the negative effects of shift work. PURPOSE: The purpose of this study was to investigate the acute effects of rotating shift work on physical activity patterns, glucose tolerance, and body composition. METHODS: Eleven-week-old male mice on a FVB/N background were individually housed and randomly assigned to either a control group or a rotating shift work group. Control group mice were exposed to a normal 12:12 light/dark cycle, while the shift work mice were exposed to alternating 12:12 light/dark cycles. At the start of the shift work group, mice were divided into three experimental groups: 9 h continuous sitting (SIT), 3 min brisk walking (10%VO2max) every 30 min during 9 h sitting (WALK3), 5 min brisk walking every 60 min during 9 h sitting (WALK5), and 8 min brisk walking every 0 min during 9 h sitting (WALK8). Continuous interstitial glucose monitoring (CGM) was performed during the 24 h intervention period. Four 2-h postprandial periods were also analyzed. Feasts and meal times were standardized across the conditions for all the participants.

RESULTS: Compared with that in SIT (mean ± SD: 3.6 ± 0.4 mmol/L), the 2-h mean glucose level during WALK3 (3.0 ± 0.4 mmol/L), WALK5 (2.6 ± 0.4), and WALK8 (2.4 ± 0.4 mmol/L) were significantly lower (all p < 0.01), with similar results for glucose total area under the curve (AUC; attenuated at 3%/4% and all p < 0.01, but no significant differences were found among the three intervention conditions. The 2-h早餐 postprandial glucose incremental area under the curve (AUC) was significantly lower for WALK3 (33%) and WALK5 (25%) than for SIT (all p < 0.05 on day 1, whereas the 2-h dinner postprandial glucose iAUC was significantly higher for WALK8 (25%) than for SIT (P = 0.038). No significant treatment effects on both lunch (day 1) and breakfast (day 2) postprandial glucose iAUC were found.

CONCLUSIONS: Three kinds of regular walking break conditions attenuated 24-h postprandial glucose responses. WALK8 most likely influenced the 2-h postprandial glucose metabolism of the healthy young adults in this study.

Acute Effects of Rotating Shift Work Paradigm on Activity and Metabolism
Vasavi Shabrisht. University of Texas at Austin, Austin, TX.
(No relevant relationships reported)

Shift work, which involves working during normal sleeping periods, results in asynchrony between central and peripheral molecular circadian clocks and is associated with increased risk for metabolic disease. Catecholamines released during physical activity act as entrainers of the circadian clock, and disruption of physical activity patterns may contribute to the negative effects of shift work.

PURPOSE: The purpose of this study was to investigate the acute effects of rotating shift work on physical activity patterns, glucose tolerance, and body composition.

METHODS: In a randomized crossover trial, 16 inactive healthy adults (male: n = 7 aged 21-30 years; body mass index: 22.2 ± 3.2 kg/m²) completed four 24 h (from 8:00 AM on day 1 to 10:00 AM on day 2) laboratory conditions that included a 9 h intervention phase as follows: 9 h continuous sitting (SIT), 3 min brisk walking (60%VO2max) every 30 min during 9 h sitting (WALK3), 5 min brisk walking every 60 min during 9 h sitting (WALK5), and 8 min brisk walking every 0 min during 9 h sitting (WALK8). Continuous interstitial glucose monitoring (CGM) was performed during the 24 h intervention period. Four 2-h postprandial periods were also analyzed. Four meals and meal times were standardized across the conditions for all the participants.

RESULTS: Compared with that in SIT (mean ± SD: 3.6 ± 0.4 mmol/L), the 2-h mean glucose level during WALK3 (3.0 ± 0.4 mmol/L), WALK5 (2.6 ± 0.4), and WALK8 (2.4 ± 0.4 mmol/L) were significantly lower (all p < 0.01), with similar results for glucose total area under the curve (AUC; attenuated at 3%/4% and all p < 0.01, but no significant differences were found among the three intervention conditions. The 2-h breakfast postprandial glucose incremental area under the curve (AUC) was significantly lower for WALK3 (33%) and WALK5 (25%) than for SIT (all p < 0.05 on day 1, whereas the 2-h dinner postprandial glucose iAUC was significantly higher for WALK8 (25%) than for SIT (P = 0.038). No significant treatment effects on both lunch (day 1) and breakfast (day 2) postprandial glucose iAUC were found.

CONCLUSIONS: Three kinds of regular walking break conditions attenuated 24-h postprandial glucose responses. WALK8 most likely influenced the 2-h postprandial glucose metabolism of the healthy young adults in this study.
ACSM 2019
THE EFFECTS OF HIGH-VERSUS LOW-INTENSITY RESISTANCE EXERCISE ON ACUTE HYPERGLYCEMIA IN YOUNG HEALTHY MALES
Brandon Beimborn, Luis Segura, Joshua Cotter, PhD, Evan Schick PhD. California State University, Long Beach, Long Beach, CA.
(No relevant relationships reported)

RESULTS: : The effects of carbohydrate restriction on breath acetone levels was significantly higher in LOW (0.9 ± 0.02 ppm) than in NOR (0.66 ± 0.07 ppm, p< 0.05). However, a significant difference between the trials was not observed post-exercise (trial × time interaction: p< 0.05) . At 4 h after exercise, breath acetone level was significantly higher in LOW (66 ± 4.8 %) than in NOR (50 ± 6.2 %, p < 0.05). Moreover, LOW showed significantly lower contribution of CHO oxidation on the following morning. Respiratory exchange ratio (RER) on the following morning was significantly lower in LOW (0.8 ± 0.01) than in NOR (0.9±0.01).

PURPOSE: It has been reported that long-term endurance exercise training increases pancreatic amylase activity in rats, suggesting that chronic exercise training enhances the carbohydrate digestive capacity. To clarify whether an acute bout of endurance exercise can also induce the pancreatic adaptation and affect glucose transport capacity in small intestine as well, we evaluate the effects of acute swimming exercise with different duration on pancreatic amylase activity and intestinal glucose transporter contents in rats. METHODS: Male Sprague-Dawley rats performed acute bout of swimming exercise for 1 h (Ex-1h group) or 24 h (Ex-24 gr oup, two 3-h bouts separated by 1h of rest). Sedentary rats were used as a control (Con group). Immediately and 24 h after the exercise, pancreas and small intestine (jejunum) were dissected out and amylase activity and glucose transporters (GLUT2 and SGLT1) content were measured, respectively. RESULTS: While no significant difference in total pancreatic amylase activity was observed between the Con and Ex-1h groups, the Ex-24 gr oup had significantly lower total amylase activity compared with the Con group in both immediately (1233 ± 228 vs. 2080: 20U; p < 0.03) and 24 h after the exercise (129 ± 112 vs. 1594 ± 227 U, p < 0.03). There were no significant differences in GLUT2 and SGLT1 among the three groups. CONCLUSIONS: These results suggest that acute bout of prolonged exercise for longer time (~24 h) may decrease the carbohydrate digestive capacity in the rat pancreas through the diminished amylase activity, although it has little effect on intestinal glucose transporters content.

PURPOSE: We observed in previous studies that incremental running tests to exhaustion and continuous aerobic running leads to significant increases of cell-free DNA (cfDNA) in capillary blood, which showed a high positive correlation with total energy expenditure. Here we investigated the increases of cfDNA during different interval loads with a focus on metabolic rates, heart rate (HR), and TRIMP. We hypothesized that cfDNA shows a high association with carbohydrate energy expenditure.

METHODS: 14 male subjects were subjected to a stepwise incremental exercise test until exhaustion to determine the individual anaerobic threshold (IAT; as LT + 1.5 mmol/L) (95% CI: 4.0-5.2; p< 0.0001). In contrast to cfDNA TRIMP showed a significantly higher increase in the 400m interval setting with a long pause time compared to the 400m interval setting with a short pause time (129 ± 112 vs. 1594 ± 227 U, p < 0.03). These results suggest that TRIMP captures the carbohydrate energy expenditure with a higher association to cfDNA. We hypothesized that cfDNA shows a high association with carbohydrate energy expenditure.

RESULTS: cfDNA analysis showed a significantly higher increase in the 400m interval setting with short pause time (129 ± 112 vs. 1594 ± 227 U, p < 0.03). In contrast to cfDNA TRIMP showed a significantly higher increase in the 400m interval setting with a long pause time (129 ± 112 vs. 1594 ± 227 U, p < 0.03). In a global analysis across all interval tests and points in time cfDNA increased (129 ± 112 vs. 1594 ± 227 U, p < 0.03) and the highest correlation of this increase with all other physiological parameters was with carbohydrate energy expenditure (r = 0.8 p< 0.0001).

CONCLUSIONS: cfDNA appeared to reflect training load of the 400m interval settings more properly than TRIMP. Here we report for the first time a high correlation between cfDNA and carbohydrate energy expenditure. Further studies will have to investigate the validity of cfDNA releases during exercise as a marker for carbohydrate energy expenditure.
Several studies have examined the metabolic responses of pre-exercise carbohydrate (CHO) ingestion in cycling and running, however, none of the existing studies compared directly cycling and running on the same individuals. PURPOSE: To examine the metabolic responses of pre-exercise CHO ingestion in cycling and running on the same individuals. METHODS: Eleven males (22 0.5 ± 3.2 years old, 175.0 2.0 cm, body fat percentage 12.4 ± 4.2%), following an overnight fast, cycled or ran for 30 min at 78% 83% maximal heart rate (HRmax) after ingestion of either 1g/kg body weight maltodextrin (CHO-Cycle and CHO-Run respectively) or placebo (PL-Cycle and PL-Run) solutions. Fluids were ingested 30min before exercise in a double-blind and random way. Data were analyzed using three-way ANOVA, where post-exercise changes were compared by two-way ANOVA. RESULTS: Blood glucose and serum insulin responses were higher before exercise in CHO (mean CHO-Cycle+CHO-Run: Glucose: 3.6 ± 0.4 mmol/l; Insulin: 8.0 10 mmol/l) compared to placebo (mean PL-Cycle+PL-Run: Glucose: 3.6 ± 0.1 mmol/l; Insulin: 8.0 10 mmol/l). No differences were observed during exercise among the conditions, while blood glucose did not drop below 4 mmol/l in any trial. Blood lactate increased with exercise (post-pre difference) more in cycling (CHO-Cycle-PL-Cycle: 3.4 0.4 mmol/l) compared to running (CHO-Run-PL-Run: 0.7 0.2 mmol/l) (p<0.01). At the end of exercise plasma free fatty acids (FFA) were higher in placebo compared to CHO irrespective of exercise mode (PL-Cycle-PL-Run: 0.36 ± 0.03 vs. CHO-Cycle-CHO-Run: 0.43 ± 0.05 mmol/l), while at the same time plasma glycogenolysis (CHO-Cycle-PL-Cycle: 8.8 0.8 mmol/l) compared to placebo (CHO-Run-PL-Run: 7.3 ± 0.8 mmol/l) (p<0.01). CONCLUSIONS: During 30min exercise at 78% HRmax, lactate was higher in cycling compared to running irrespective of fluid ingestion, whereas glycerol was increased more in running when no CHO was provided. The ingestion of CHO reduced FFA concentrations independently of the mode of exercise, while glucose and insulin responses were not affected by the exercise mode.

The effects of carbohydrate (CHO) ingestion during endurance exercise on gastrointestinal distress (GID) has been well researched, but there is limited research with high intensity exercise. PURPOSE: The purpose of this study was to examine the effects of chronic CHO ingestion on GID responses during a 4 week concurrent resistance training (RT) and high intensity interval training (HIIT) program. METHODS: 18 resistance trained males, aged 18-24 years old, were stratified into one of two groups: ingesting a 500 mL beverage containing a 6% CHO solution during exercise or ingesting a 500 mL artificially flavored placebo. Each group completed 4×20 seconds of RT and HIIT, three days per week of RT, and two days per week of HIIT, repeated all-out 30 second cycling sprints. GID was measured immediately before and after one RT session and one HIIT session per week for a total of 8 eessions. GID was measured using a 10-point Likert scale assessing feelings of nausea, regurgitation/reflux, stomach fullness, abdominal cramps, gas/flatusulence, and urge to defecate. GID was analyzed using a four-way repeated measures ANOVA (exercise × group × time × week). RESULTS: There was a main effect for time for nausea (pre-exercise 0.29 ± 0.68, post-exercise 1.31 ± 2.24), regurgitation/reflux (pre-exercise 0.24 ± 0.50s post-exercise 1.5 ± 2.00), and abdominal cramps (pre-exercise 0.09 ± 0.48 post-exercise 0.8 ± 1.8 (p < 0.05). GID increased post-exercise independent of exercise type, group, or week. There were no interaction effects or main effects for gas/flatusulence or urge to defecate (p > 0.05). CONCLUSION: Ingesting beverages containing CHO or artificial sweeteners both increase GID during high intensity exercise. Chronic CHO ingestion during endurance training has been suggested to train the gut to better absorb nutrients, but based on the results from this investigation, signs and symptoms of GID are not reduced following 4 weeks of chronic ingestion during high intensity exercise.
Carbohydrate (CHO) consumption is a common practice during variable-intensity exercise (VIE) such as team sports. The effects of CHO on performance during VIE have been studied in adults; however, the effects are less defined in children and apparently not at all in prepubescent girls. PURPOSE: To investigate the effects of a 6% CHO drink on a one-minute performance test following 30-minutes of VIE in prepubescent girls. METHODS: Ten girls (10.4 ± 0.5 yr) participated in this study. During the initial visit, maximal aerobic power was determined following a familiarization of the protocol used during the next two visits in which the child consumed either a CHO drink or an electrolyte-matched placebo (PL). The experimental protocol involved two 15-minute bouts of VIE (20, 55% maximal aerobic power and 6% maximal sprint); beverages were consumed prior to exercise and after each 15 minute segment. A one-minute performance trial was then completed at maximal effort. Measurements during VIE included heart rate (HR), rating of perceived exertion (RPE), sprint mean power (MP) and sprint peak power (PP). During the one-minute performance bout, HR, RPE, total work (TW), and fatigue index (FI) were assessed. Data were analyzed using a two-way ANOVA and paired t-tests. RESULTS: VO2 max was 39.7 ± 5.5 mL·kg⁻¹·min⁻¹ and HRmax was 196 ± 11 bpm. During VIE, there were no interaction effects, no trial effects (p = 0.05) for HR, %HRmax, RPE, sprint MP and sprint PP and no time effects (p = 0.05) for HR, %HRmax, or MP. However, there were time effects (p = 0.05) for RPE (VIE1 ≤ VIE2) and PP (VIE1 = VIE2). No differences were found between trials (CHO vs. PL) for one-minute performance for HR (18 ± 8 vs. 18 ± 9 bpm), %HRmax (9 ± 3.2 vs. 9 ± 3.0), RPE (23.5 ± 12.8 vs. 23.5 ± 12.6 W), FI (10.0 ± 9.8 vs. 12.8 ± 10.2%), and TW (115 ± 24 vs. 120 ± 24 W). CONCLUSION: A 6% CHO drink is ineffective at improving one-minute performance following 30-minutes of VIE in prepubertal girls. Based upon the current findings, CHO supplementation does not appear to be beneficial with respect to improving performance for prepubescent children completing VIE activity lasting 30-minutes.

C-38 Free Communication/Poster - Nutrition and Energy Metabolism

Thursday, May 30, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

Physical activity, particularly percussive activities with adequate energy intake may influence bone mineral density (BMD) in young female athletes. Unfortunately, it is common to see energy deficiencies in this population that can put them at risk of health issues including lower BMD. PURPOSE: To determine the influence of the type of sport and energy intake on BMD in female athletes compared to sedentary students. METHOD: Seventy-three female students (age 20.8 ± 1.9 yr, height 168 ± 6 cm, weight 62.3 ± 9.2 kg) from McGill University were evaluated (44 from McGill Varsity Teams: basketball (BB) n=13), volleyball (VB) n=11), figure skating (FS n=13), and synchronized swimming (SS n=7) and 29 edentulous healthy women (controls). Dietary intake (kcal/day) was assessed using a 3-day Food Log and analysed with the Food Processor® Software. Lumbar spine (LS) (L1-L4) and femoral neck (FN) BMD were assessed by DXA scanning. One-way ANOVA explored between-group differences and an ANCOVA examined the influence of energy intake on BMD. RESULTS: A significant difference in BMD at the LS and FN sites was observed between the type of sports (FH n=6, p<0.001, r²=0.335, F(1,58)=6.9, p=0.001, r²=0.42, respectively). Also, BB (LS = 1.3 ± 1.5, p = 0.001; FN = 1.3 ± 1.3, p = 0.001) and VB (LS = 1.5 ± 1.55, p = 0.001; FN = 1.7 ± 1.6 p = 0.002) patients had a significantly higher BMD in both sites compared to their non-athletic counterparts (LS = 0.3 ± 0.19, FN = 0.1 ± 0.14). The FS and SS athletes’ bone densities were not different from the control group (p = 0.79, p = 0.246). No significant association was observed between BMD at both sites and total energy intake (energy intake in kcal/day) in both BB and SS groups compared to the control group (p = 0.003 and p = 0.02, respectively). CONCLUSION: The type of sport revealed an influence on BMD. However, no significant relationship was observed between energy intake and BMD. A specific discussion was found between the required versus actual energy intake in some athletes. These data suggest that female varsity athletes should work closely with sports dieticians to promote healthy eating and optimize bone health.

Purportedly, performing 20 minutes of aerobic exercise following an overnight fast has a greater effect on fat loss than in the postprandial state. Theoretically, a fast may attenuate glycogen stores, thus shifting to the utilization of increased free fatty acids, and resulting in greater fat burn throughout exercise. PURPOSE: To determine if exercising at a titrated intensity, as determined by criteria 1 fat and carbohydrate fuel utilization, will elicit more fat utilization in a fasted state when compared to a fed state. METHODS: 13 (12♀ 1♂) asymptomatic (ht. 1.82 ± 0.02 m; wt. 72 ± 12 kg), healthy college students (age range 19-24) who regularly engage in aerobic exercise a minimum of twice per week volunteered for the study. During familiarization, individual treadmill workloads were titrated by using a ramp protocol (speed increase of 13.4 m/min) at 1% grade to achieve a RER of 0.8. All trials were preceded by a 12 hr fast and 24 hr abstinence from alcohol & caffeine, and 30 minutes of rest immediately prior to the trial. The fasted trial (Fa) required 28 min of rest and 5 min in of measured resting metabolism (RMR) prior to the treadmill exercise, while the fed trial (Fe) required ingestion of 90 kc a ml 10g CHO, 10% pro, & 12% fat) 10 minutes with 1 min of rest immediately prior to 5 min in of RMR. Single blind randomization determined trial cross over order. Blood glucose (BG) was obtained by finger stick. Statistical analyses by paired samples T-test were applied to these data (p<0.05). RESULTS: The RER at RMR of 0.88 Fa & 0.83 Fa, was significantly different, however, exercise VO2 of 2.8 ± 0.68 Fa & 2.36 ± 0.68 Rd of 0.8 ± Fe or Fa, respectively, was NSD (p > 0.05). BG pre and post exercise of 3.3 ± 2.8 & 8.9 ± 1.4 mg/dl for Fa was NSD for Fa. Conclusion: A 12 hr fast can alter resting fuel substrate, but exercise fuel sources are unaffected. Reductions in BG from exercise during the fed state may be attributed to fuel use, however the maintenance of BG in the fasted state may be related to gluconeogenesis. Relative to fat expenditure, there is no advantage to exercising in an acute fasted state (12 hr) or in a fed state, however an extended fast may provide a different outcome.

Purportedly, performing 20 minutes of aerobic exercise following an overnight fast has a greater effect on fat loss than in the postprandial state. Theoretically, a fast may attenuate glycogen stores, thus shifting to the utilization of increased free fatty acids, and resulting in greater fat burn throughout exercise. PURPOSE: To determine if exercising at a titrated intensity, as determined by criteria 1 fat and carbohydrate fuel utilization, will elicit more fat utilization in a fasted state when compared to a fed state. METHODS: 13 (12♀ 1♂) asymptomatic (ht. 1.82 ± 0.02 m; wt. 72 ± 12 kg), healthy college students (age range 19-24) who regularly engage in aerobic exercise a minimum of twice per week volunteered for the study. During familiarization, individual treadmill workloads were titrated by using a ramp protocol (speed increase of 13.4 m/min) at 1% grade to achieve a RER of 0.8. All trials were preceded by a 12 hr fast and 24 hr abstinence from alcohol & caffeine, and 30 minutes of rest immediately prior to the trial. The fasted trial (Fa) required 28 min of rest and 5 min in of measured resting metabolism (RMR) prior to the treadmill exercise, while the fed trial (Fe) required ingestion of 90 kc a ml 10g CHO, 10% pro, & 12% fat) 10 minutes with 1 min of rest immediately prior to 5 min in of RMR. Single blind randomization determined trial cross over order. Blood glucose (BG) was obtained by finger stick. Statistical analyses by paired samples T-test were applied to these data (p<0.05). RESULTS: The RER at RMR of 0.88 Fa & 0.83 Fa, was significantly different, however, exercise VO2 of 2.8 ± 0.68 Fa & 2.36 ± 0.68 Rd of 0.8 ± Fe or Fa, respectively, was NSD (p > 0.05). BG pre and post exercise of 3.3 ± 2.8 & 8.9 ± 1.4 mg/dl for Fa was NSD for Fa. Conclusion: A 12 hr fast can alter resting fuel substrate, but exercise fuel sources are unaffected. Reductions in BG from exercise during the fed state may be attributed to fuel use, however the maintenance of BG in the fasted state may be related to gluconeogenesis. Relative to fat expenditure, there is no advantage to exercising in an acute fasted state (12 hr) or in a fed state, however an extended fast may provide a different outcome.
throughout recovery. CI was elevated acutely and decreased throughout recovery, but macronutrient intake ratios did not drastically change. Further investigations of these measures with a larger sample size is warranted given our preliminary data.

### Table 1. Demographic, Substrate Utilization, and Fat Preference Descriptive Statistics

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Total (n=20)</th>
<th>Females (n=10)</th>
<th>Males (n=10)</th>
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<tr>
<td>18-29</td>
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<td>18.2±0.6</td>
<td>18.4±0.6</td>
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<tr>
<td>30-49</td>
<td>31.4±0.5</td>
<td>31.3±0.5</td>
<td>31.5±0.5</td>
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<tr>
<td>50-60</td>
<td>59.3±0.6</td>
<td>59.2±0.6</td>
<td>59.4±0.6</td>
</tr>
</tbody>
</table>

**RESULTS:**

- **Time Restricted Feeding (TRF):** A type of Intermittent Fasting, which refers to the periodization of meals with the goal of increasing hypometabolism. Hypometabolism is diagnosed when the ratio between resting energy expenditure (REE) and metabolic rate (MED) is less than 0.67.

**CONCLUSION:** Our results imply that an improved energy state helps to facilitate an increase in total sleep hours. An improved energy state also appears to result in athletes feeling more rested and satisfied with training during the competitive season. Female lacrosse players demonstrated that a more favorable state of energy balance appears to be associated with more total hours of sleep, feeling better rested and being more satisfied with training. Therefore maintaining a positive energy balance should be a primary focus for coaches and athletes to help promote optimal training, performance, and recovery.

### 1409 Board #171
**May 30 10:30 AM - 12:00 PM**

**Effects of Time Restricted Feeding on Peak VO<sub>2</sub> and Substrate Utilization in Healthy Adults**


(No relevant relationships reported)

Time Restricted Feeding (TRF) is a type of Intermittent Fasting, which refers to the periodization of meals with the goal of increasing hypometabolism. Hypometabolism is diagnosed when the ratio between resting energy expenditure (REE) and metabolic rate (MED) is less than 0.67.

**PURPOSE:**

The current study aimed to further investigate the metabolic impact of TRF. METHODS: Twenty one participants, ages 18 to 60, completed an eleven week longitudinal study to examine differences in VO<sub>2</sub> peak, substrate utilization crossover, and resting substrate utilization. Participants self-reported diet, exercise, and medications over two separate four week periods. The first four weeks were without TRF and the following four were with TRF. A maximal exercise test and a resting metabolic test were performed three times, four weeks apart from each other. A post-hoc analysis was performed to determine the time effect. RESULTS: VO<sub>2</sub>peak was significantly lower after implementing TRF (p=0.001). The mean pre-test VO<sub>2</sub>peak was 2.9 ± 0.8 mL·kg<sup>-1</sup>·min<sup>-1</sup> and the non-TRF testing was 3.14 ± 0.68 L·min<sup>-1</sup>. During TRF, the mean peak volume of oxygen uptake (VO<sub>2</sub>peak) was significantly lower (P < 0.01) in THSL compared to TRAD at every exercise stage. Inspiratory capacity maneuvers were performed in the last minute of each stage as well as during the time-trial, for calculation of respiratory reserve volume (IRV) and inspiratory reserve volume (IRV). RESULTS: Respiratory exchange ratio (RER) was significantly lower (P < 0.01) in THSL compared to TRAD at every exercise stage. During Stage 1, VO<sub>2</sub> was 37.9 ± 1.5 mL·kg<sup>-1</sup>·min<sup>-1</sup> in the THSL condition and 39.6 ± 1.8 mL·kg<sup>-1</sup>·min<sup>-1</sup> in the TRAD condition and 47.0 ± 1.9 mL·kg<sup>-1</sup>·min<sup>-1</sup> in THSL (P < 0.01). No differences in VeCO<sub>2</sub>, or VCO<sub>2</sub>, occurred between conditions at any exercise intensity (P > 0.05). No change in ECR or IRV was detected between dietary conditions at any exercise intensity (P > 0.05). 5 km time-trial performance was significantly faster in THSL compared to TRAD (8.7 ± 0.3 min and 9.0 ± 0.3 min, respectively; P = 0.02). The hypometabolism was diagnosed when the ratio between resting metabolic rate (measured by indirect calorimetry) and Cunningham equation values was < 0.8. The associations were analysed by Pearson correlation, CHsq analysis, and Fisher’s tests, considering p < 0.05. The hypometabolism was observed in 8% of EAD. The hypometabolism was presented in 3% of ED people. Also, they had carbohydrate (2.8 ± 1.1 g/kg bw) and fat (0.8 ± 0.3 g/kg bw) consumption below the recommendations. As expected, the lower macronutrients caloric intake

**CONCLUSIONS:**

THSL dietary periodization elicits favorable adaptations within skeletal muscle, and improves endurance exercise performance. The effect of THSL on ventilatory patterns during exercise, however, has received little attention. If THSL alters ventilatory strategies during exercise, then exercise intensities and adaptations may unknowingly be influenced. PURPOSE: To investigate the effects of short-term exposure to THSL dietary periodization on ventilatory strategies during cycling exercise at submaximal and maximal intensities. METHODS: Eight trained men [age (mean ± SEM) = 28 ± 1 y; VO<sub>2</sub>peak = 56.8 ± 2.4 mL·kg<sup>-1</sup>·min<sup>-1</sup>] completed a glyco- gen-depleting protocol on a cycle ergometer. Afterwards, participants were given a low carbohydrate (CHO) meal and beverages containing either no additional CHO (THSL) or beverages containing 1.2 g·kg<sup>-1</sup> CHO (TRAD). The following morning, participants completed 4 min of cycling below (Stage 1), at (Stage 2), and above (Stage 3) gas exchange threshold, followed by a 5min time-trial. Metabolic data were collected continuously throughout exercise. Inspiratory capacity maneuvers were performed in the last minute of each stage as well as during the time-trial, for calculation of respiratory reserve volume (IRV) and inspiratory reserve volume (IRV). RESULTS: Respiratory exchange ratio (RER) was significantly lower (P < 0.01) in THSL compared to TRAD at every exercise stage. During Stage 1, VO<sub>2</sub> was 37.9 ± 1.5 mL·kg<sup>-1</sup>·min<sup>-1</sup> in the THSL condition and 39.6 ± 1.8 mL·kg<sup>-1</sup>·min<sup>-1</sup> in THSL (P < 0.05). During Stage 2, VO<sub>2</sub> was 44.6 ± 1.7 mL·kg<sup>-1</sup>·min<sup>-1</sup> in THSL condition and 47.0 ± 1.9 mL·kg<sup>-1</sup>·min<sup>-1</sup> in THSL (P < 0.01). No differences in VeCO<sub>2</sub>, or VCO<sub>2</sub>, occurred between conditions at any exercise intensity (P > 0.05). No change in ECR or IRV was detected between dietary conditions at any exercise intensity (P > 0.05). 5 km time-trial performance was significantly faster in TRAD compared to THSL (8.7 min and 9.0 min, respectively; P = 0.02). CONCLUSIONS: THSL dietary periodization does not alter VE, VO<sub>2</sub> and recovery.
were related to reduced energy availability in EAP sportpeople (carb., r=−0.60; prot., r=−0.52; fat, r=−0.55; P<0.05). Interestingly, the magnitude of its reductions was greater in carbohydrate, analyzed by slope curves (carb., b=−3; prot., b=−2; fat, b=−1; P<0.001). In addition, only carbohydrate intake was independently associated to hypometabolism in EAP population (OR, 2.9; IC 95%: 1.08–7.2; P=0.009).

**CONCLUSION:** Low carbohydrate intake is the major diet contributors to energy deficiency and hypometabolism development in physically active people. It may impair the weight loss protocols.

**$1$ ISSING OR BAD IMAGE SPECIFICATION [E 210C B12A-01-8A39 281DBF375A8F]$S$**

**Diet factors associated to hypometabolism in physically active population**

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<thead>
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<th>p values</th>
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**Intramuscular triglyceride (IMTG) is an important substrate during moderate- intensity exercise, but providing a high carbohydrate (CHO) diet following exercise impairs IMTG resynthesis. Restricting CHO intake in the post-exercise period may augment the adaptive response to exercise, but whether this strategy enhances IMTG resynthesis is not known. Furthermore, because the lipid droplet (LD)-associated perilipin (PLIN) proteins promote IMTG storage, their distribution and interaction with LD may determine their role in post-exercise IMTG resynthesis. **

**Purpose:** To determine the effect of acutely restricting CHO during recovery from prolonged exercise on IMTG resynthesis and PLIN protein dynamics. **Methods:** 14 n male triathletes (27 ± 1 y, 6.13 ± 0.5 kg/m²) completed 4 h of cycling at ~55–60% VO₂max. In the initial 4 h post exercise both participants consumed a high CHO diet whereas 7 participants consumed only water. For the remaining recovery period (20 h) all participants received the same CHO-rich diet. Muscle samples collected pre and post-exercise, and 4 nd 24 h post-exercise were analysed using confocal immunofluorescence microscopy to measure muscle fibre type-specific IMTG content and PLIN localization to LDs. **Results:** Exercise reduced IMTG content in type I fibres (~50%, P<0.05) with LD both associated and not associated with PLIN2, PLIN3, and PLIN5c ing used. During recovery, IMTG content tended to increase in type I fibres after 4 h in the water condition (~65%, P=0.08), and at 24 h IMTG content was similar to pre-exercise levels (P=0.9). Despite no change in PLIN protein content, the number of LD with PLIN2 or PLIN3 associated tended to increase during recovery in type I fibres only (P=0.08), and to a similar extent between conditions, whereas the number of LD with PLIN5c associated increased only in the CHO condition (P=0.002). **Conclusion:** Acute restriction of CHO during recovery from prolonged exercise has a tendency to initially enhance IMTG resynthesis, although a CHO-rich diet does not impair overall IMTG resynthesis 24 h later. A redistribution of PLIN proteins appears to support post-exercise IMTG resynthesis, but the predominant PLIN isoform supporting post-exercise IMTG storage may be dependent on post-exercise CHO availability.

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**1413 Board #175 May 30 10:30 AM - 12:00 PM**

**Acute Carbohydrate Restriction During Recovery From Prolonged Exercise Enhances Intramuscular Triglyceride Resynthesis**

**Sam Shepherd¹, Emily FP Jevons², Juliette A. Strauss³, Kasper D. Gejl², Kurt Jensen², Lars G. Hvid², Ulrik Frandsen², Kent Sahlin¹, Niels Ørtenblad¹. Liverpool John Moores University, Liverpool, United Kingdom. ²University of Southern Denmark, Odense, Denmark. ³Stockholm University, Stockholm, Sweden. Email: s.shepherd@ljmu.ac.uk (No relevant relationships reported)**

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**1414 Board #176 May 30 10:30 AM - 12:00 PM**

**Energy Availability In Physically Active Males And Females Across A 12- Week Tactical Training Programme**

**Danielle M. Logue¹, Sharon M. Madigan¹, Sarah-Jane McDonnell², Mirjam Heinen³, Eamonn Delahunt², Clare A. Corish¹. ¹University College Dublin & Sport Ireland Institute, Dublin, Ireland. ²Sport Ireland Institute, Dublin, Ireland. ³University College Dublin, Dublin, Ireland. Email: danielle.logue@ucdconnect.ie (No relevant relationships reported)**

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**ACSM SCIENTIFIC ABSTRACT**

**INTRODUCTION:** Tactical training personnel are exposed to frequent intense physical activity and sleep deprivation, the combination of which may compromise health. Insufficient energy availability (EA) can exacerbate these issues. **PURPOSE:** The aims of this study were to investigate in tactical training personnel, i) energy intake (EI), exercise energy expenditure (EEE) and EA, ii) reported injury and illness incidence and iii) dietary intake vs. estimated nutritional recommendations. **METHODS:** On four consecutive days within two weeks of tactical training, nine weeks apart, participants recorded all food eaten in a smartphone application (Nutritics Education v815201). Injury and illness incidence were recorded weekly using the Oslo Sports Trauma Research Centre Questionnaire on health problems and the females completed the Low Energy Availability in Females Questionnaire (LEAF-Q) to assess risk of low energy availability (LEA). **RESULTS:** On day one daily intake was 2311 (±469) kcal for males and 2182 (±380) kcal for females. EEE increased significantly from W1 (Mean = 656 kcal, ±76) to W2 (Mean = 842 kcal, ±93) P<0.001. Carbohydrate (3.3g/kg BW/day vs. recommended 6g/kg BW/day, P=0.001) and excess fat consumption was observed (3% dietary energy (DE) vs. the recommended 20–35% DE). There were 28 reported health problems, 16 injuries and 114 illnesses. Of females, 50% were classified as at risk of LEA. **CONCLUSIONS:** These findings demonstrate the need to improve awareness of EA during training for health and performance. Implementation of adequate fueling strategies is necessary for tactical training personnel to optimise health and performance.

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**1415 Board #177 May 30 10:30 AM - 12:00 PM**

**The Effects of Endurance Training Under Low Energy Availability on Muscle Glycogen Contents**

**Chihiro Koijima¹, Aya Ishibashi¹, Yoko Tanabe¹, Kaito Iwatayama¹, Akiko Kamei¹, Hideyuki Takahashi¹, Kazushige Goto¹, Ritsumeikan University, Shiga, Japan. ²Japan Institute of Sports Sciences, Tokyo, Japan. ³Tenri University, Nara, Japan. (Sponsor: Robert Kraemer, FACSM)**

**Email: chi.2277@gmail.com (No relevant relationships reported)**

**PURPOSE:** Some previous studies demonstrated that acute bout of exercise suppressed appetite and reduced energy intake among athletes. However, the accumulative effects of reduced energy intake during consecutive days of training period remains unclear. The purpose of the present study was to investigate the influences of 3 days of endurance training under low energy availability on muscle glycogen content, endocrine responses and endurance capacity. **METHODS:** Seven male long distance runners (19±0.4 kg, 1.2±0.1 m, 5.0±0.2 kg/m², 1.7±0.1 kg/m/min) completed 3 consecutive days of endurance training under low energy availability trial (LEA, 18.0±0.6 kcal/kg FFM/day) and normal energy availability trial (NEA, 39.9±1.9 kcal/kg FFM/day). The order of two trials was randomized with two weeks interval between trials. The experiment consisted of 3 consecutive days of endurance training (days 1-3) and exercise performance test on the following morning (day 4). The endurance training consisted of 80m in of treadmill running at 9% of maximal oxygen uptake (VO₂max) in both trials. Muscle glycogen contents, respiratory gas variables, subjective parameters, blood and urinal variables were evaluated in the morning during 3 days of training periods (day 1-3) and on the following morning after the training (day 4). As an indication of endurance capacity, time to exhaustion during submaximal running test was determined on day 4. **RESULTS:** LEA trial showed that body weight, free fat mass and skeletal muscle volume were significantly reduced during training period (P<0.05). Also, muscle glycogen contents were significantly decreased in LEA (P<0.001) with significant lower values than those in NEA trial (P<0.001). Blood glucose, serum free testosterone and insulin like growth factor-1 concentrations were significantly lowered with training under LEA (P<0.05). On the other hand, serum leptin concentration did not change significantly in LEA trial during training period (P>0.05). Time to exhaustion during submaximal running test evaluated on day 4 was not significantly different between LEA trial (1170 ± 127 s) and NEA trial (1361 ± 16 s, P>0.05). **CONCLUSION:** Three consecutive days of endurance training under low EA reduced muscle glycogen content. However, endurance capacity was not attenuated.
It has been well documented that exercise of sufficient energy expenditure can elicit an increase in fat oxidation that persists following exercise. However, whether and how this exercise-induced metabolic benefit would be affected by replacing the energy expended during exercise remains unclear. Purpose: To compare energy expenditure and substrate utilization between exercise with and without energy replacement at rest and during exercise. Methods: Fourteen healthy and recreationally trained subjects including 7m and 7f omen volunteered to participate in this study. Each subject underwent three 2-day experimental protocols in a random order. Each protocol consisted of no exercise (NE), exercise only (EO), or exercise with energy replacement (ER) on day 1 that was followed by metabolic assessment that took place in a fasted condition on day 2. The exercise in EO and ER was a treadmill running at 6% VO2 max that induced an energy expenditure of 0 k cal/minute. The replacement meal used in ER contained 80 kcal located made up of 15% carbohydrate, 30% fat, and 55% protein. During the metabolic assessment, oxygen uptake (VO2), heart rate (HR), respiratory exchange ratio (RER), and concentrations of carbohydrate (COX) and fat oxidation (FOX) were determined in three successive 10-minute periods that included rest, exercise at 50% VO2 max and exercise at 70% VO2 max. Results: No differences in VO2 and HR were found at rest between NE, EO, and ER. However, RER was lower in EO than NE (0.840±0.014 vs. 0.889±0.012, p<0.05), COX (g∙min⁻¹) was lower in NE than ER (0.144±0.016 vs. 0.197±0.019, p<0.05), and FOX (g∙min⁻¹) was higher in either EO or ER than NE (0.08 0.010 or 0.08 0.009 vs. 0.04 0.007, p<0.05). When these variables were compared under the exercise conditions, no treatment effects were noted for all variables at either intensity. Conclusion: Our results demonstrate that an acute bout of aerobic exercise can elicit an increase in fat oxidation even when the exercise-induced energy deficit is replaced by energy intake. These findings suggest that factors other than caloric deficit mediate the exercise-induced lipolytic effect.

PURPOSE: We determined the effects of acute and chronic calorie restriction on hepatic and skeletal muscle insulin sensitivity. METHODS: Twenty-three obese subjects (body-mass index, 36.3± 0.7 kg/m2) underwent three 2-day experimental protocols in a random order. Each protocol included 7 men and 7 women volunteered to participate in this study. Each subject was matched for age, gender, and after ~12 wks (~10% weight loss of diet therapy. RESULTS: Intrahepatic triglyceride content significantly increased at both 48-h (-16.6±2.3%, p<0.001) and 4 wks (-16.6±2.3%, p<0.001) compared to baseline. Basal insulin secretion rate significantly decreased at 48-h (-7.1±2.8%, p<0.05) but did significantly increase at 4 wks (26.1±4.3%, p<0.05). Insulin-stimulated phosphorylation of Akt increased by 12±1.8%, (p<0.05) and 38±3.6% (p<0.05), after 4 wks and 7% weight loss, respectively. CONCLUSION: A low calorie diet acutely increased hepatic triglyceride content and improved hepatic insulin sensitivity whereas moderate weight loss is necessary to improve insulin sensitivity in the skeletal muscle.

Obesity and associated comorbidities remain a significant health crisis. Exercise mitigates many of these pathologies, however, controversy remains on optimal exercise type for favorable adaptations. More so, mechanisms underlying these adaptations are not fully understood. Evidence suggests autophagy (cellular degradation and recycling of proteins) may be an important mediator for adaptations, however, the necessity of autophagy, specifically autophagosome formation, on exercise adaptation during obesity has yet to be investigated. PURPOSE: To investigate the individual and combined effects of different exercise interventions and autophagy inhibition on glucose handling and exercise capacity after high fat feeding. METHODS: CB 1.± male mice initiated ± high fat diet at 8wks of age. After 6wks of high fat diet, animals were divided into moderate intensity (MOD) or high intensity interval training interventions (HIIT), animals were further subdivided into autophagy inhibition (AI) or control (CON) conditions. Animals exercised their respective protocols 3x/wk, work and average intensity were matched between exercise groups. Autophagy was inhibited by Xk/wk injections of C8S18B. 110mg/kg of bodyweight, to block autophagosome formation, CON animals received vehicle injection. Animals continued interventions for 4wks. Glucose tolerance tests (GTTs) and graded exercise tests (GXTs) were completed pre-high fat diet, pre-interventions, and post-interventions. RESULTS: High fat diet resulted in impaired glucose handling (~20% increase in glucose area under the curve (AUC)), while exercise interventions normalized glucose handling to pre-exercise levels, without any differences between groups. Additionally, high fat diet induced a ~20% lower aerobic capacity, which were normalized to baseline values after exercise interventions. AI animals had ~2% of weight loss from pre- to post-exercise interventions with no differences noted in CON animals. CONCLUSIONS: When exercise intensities and total work are matched, HIIT and MOD confer similar adaptations on exercise capacity and glucose tolerance in high fat fed mice. Also, late stage autophagy inhibition does not influence exercise adaptations, but does appear to influence body weight, which warrants further investigation.

Time restricted feeding (TRF) is a form of dietary intake which limits the feeding time in a day. Researchers have observed weight loss and improved body composition as the original motivators for investigation of TRF. With a variation in energy intake during TRF, resting energy expenditure (REE) has been shown to increase with high caloric consumption. An increase in REE is also associated with an increase in fat mass and physical activity. Respiratory quot ient (RQ) demonstrates the ratio between CO2 and O2 uptake, determining substrate utilization at rest. REE has been shown to change through altered macronutrient intake. Studies indicate, a diet high in carbohydrate intake increases RQ whereas diets high in fat intake have been shown to lower RQ. RQ has also been found to decrease when subjects partake in endurance training. Purpose: The intent of this study was to determine the impact TRF may have on REE and RQ. Methods: Thirty-four apparently healthy adults ages 19 ± 10 p a participated in 4 and 4 eeks non-TRF and 4 and 4 eeks of TRF. The feeding window for the TRF was a nine-hour period. Participants were provided journals over the course of the study to self-record caloric intake, exercise type, and duration. REE and RQ were measured using a metabolic cart initially, after 4 wk s of non-TRF, and 4 wk s after TRF. Data was analyzed using IBM SPSS statistics. RESULTS: RQ increased significantly between pretest (0.721±0.015) and TRF testing (0.808±0.002) (p<0.01). No significant difference was found between non-TRF and TRF (p=0.23). There was no significant change in caloric intake throughout the testing (p=0.94). A significant decrease was found in total exercise days between non-TRF and TRF periods (p=0.023). Conclusion: This study did not find a significant change in exercise during TRF. The increase in RQ may be attributed to increases in carbohydrate intake. Caloric intake was hypothesized to increase the first couple of days due to the time-restricted nature, but overall was not
hypothesized to have a significant impact on energy intake or REE. Future studies should investigate the impact of TRF on macronutrient intake and carbohydrate utilization at rest.

**Board #182**
May 30 10:30 AM - 12:00 PM
**Resistance Exercise-mediated Improvements In Postprandial Metabolic Responses Are Related To Exercise Volume And Muscle Mass**
Patrick M. Tomko, Ryan J. Colghoun, N Ile F. Banks, Christina M. Sciarrillo, Nicholas A. Koemel, Sam R. Emerson, Nathaniel D.M. Jenkins. Oklahoma State University, Stillwater, OK. (No relevant relationships reported)

**PURPOSE:** To examine the effects of full-body resistance exercise on the postprandial metabolic response to a high-fat meal (HFM) in healthy men. METHODS: Ten males (mean ± SD; age = 24± 3 y, BMI = 26± 2.9 kg/m²) participated in this randomized, repeated measures, crossover study. Participants visited the laboratory for familiarization, and baseline strength and body composition testing. They then returned to the laboratory and completed either a session of resistance exercise (RE), consisting of three sets of 8 exercises using a 1 repetition maximum load, or no exercise (NE) and consumed a protein shake (300 ± 40 kcal; protein = 63.3 kcal) as their last meal. After a 12-h overnight fast, participants consumed a HFM (12 kcal/kg, 65% fat, 34% carbohydrate). Blood draws were performed prior to, and 1-, 3-, and 5-h post-meal to determine triglyceride (TG), glucose (GLU), and total metabolic load index (MLI); sum of TG and GLU) responses. Three separate, 2 (Condition) × 2 (Time) repeated measures ANOVAs were used to examine the TG, GLU, and MLI responses. Zero-order correlations and stepwise multiple regression analyses were used to examine the relationships and relative contributions of RE volume (VOL) and skeletal muscle mass (SMM) to the change in MLI from NE to RE (ΔMLI). RESULTS: There were significant condition × time interactions for TG (F3,27 = 3.5; p = 0.03) and MLI (F3,27 = 3.0; p = 0.04). Both TG and MLI were lower at 3- (TG, 1.2± 0.6 vs. 1.8± 0.4 mL; MLI, 210± 30 vs. 26.2± 110 μa) post HFM in the RE versus NE condition, respectively. There were condition (F1,9 = 8.1; p = 0.02) and time main effects (F3,27 = 8.4; p = 0.01) for GLU. GLU was lower in the RE (8.15± 4.5 mg/dL) than NE (8.8± 6.0 mg/dL) condition and decreased from baseline (8.3± 6.0 mg/dL) to 1- (8.0± 6.0 mg/dL), 3- (3.3± 2.4 mg/dL), and 5 h (8.15± 4.5 mg/dL). Both VOL (r = 0.66) and SMM (r = 0.80) were independently related to, and significantly contributed to the prediction (R² = 0.76; beta coefficients = VOL [-1.03] and SMM [1.79]) of ΔMLI. CONCLUSIONS: A session of full-body resistance exercise improves the postprandial metabolic response to a HFM in healthy men. Further, VOL and SMM explained 76% of the variance in the metabolic response utilizing energy during exercise. Alterations in energy utilization that may occur during the different phases of the menstrual cycle in eumenorrheic women may also influence endurance performance.

**Board #183**
May 30 10:30 AM - 12:00 PM
**Energy Expenditure and Load Carriage Exceeded Military Recommendations in Special Operations Forces Deployed to Afghanistan**
William R. Conkright¹, Nicholas D. Barringer ². ¹University of Pittsburgh, Pittsburgh, PA. ²U.S. Army Research Institute of Environmental Medicine, Natick, MA. (No relevant relationships reported)

U.S. Army Special Operations Forces (SOF) undergo difficult missions in extreme environments, oftentimes while carrying heavy loads, the combination of which results in a high energy output. Energy expenditure in excess of intake may result in weight loss and impaired performance. In a scenario where energy demands consistently exceed total calories, operators are at risk of injury and mission compromise. PURPOSE: To determine the energy expenditure of SOF Soldiers based on present-day missions in the Central Command (CENTCOM) region. METHODS: Demographics of the participants were as follows: age (yrs) 30± 3.5 height (in) 70.65±2.8, weight (lbs) 195.2±24, enlisted (86%), officer (7%), warrant officer (7%), years in the Army 8.3±3.9, and total time deployed during career (yrs) 1.26± 1.2. Surveys were collected from 81 of Soldiers operating in eight locations in the CENTCOM theater of operations. Information from the surveys revealed the mission energy requirements and difficulty of exertion pre-, during-, and post-mission. A physical activity factor was determined based on multiple aspects surrounding mission intensity and used to calculate estimated energy expenditure based on a SOF-specific equation. RESULTS: During a six-month deployment, participants underwent a multitude of missions (125). Ninety percent of respondents reported carrying a load 40% heavier than the recommended fighting load (32.9±8.6 vs. 21.8 kg, respectively) based on military doctrine. Average estimated energy expenditure (4806±525 kcal/day) for exercise mediated the military recommendation of 300 kcal/day. All but three respondents reported a rate of energy expenditure exceeding the benchmark of 300 kcal/day necessary to maintain adeqate energy reserves upon enemy contact. CONCLUSION: Excessive load carriage is a major contributor to high energy expenditure. The reported loads carried by SOF Soldiers exceeded the recommendations in Army doctrine. Additionally, their high energy expenditure, if not managed by an erg kcal high energy intake, has been shown to result in decrements and may compromise mission success. Special attention must be given to pack weights during pre-mission planning and nutrition strategies aimed at meeting mission demands and recovery from strenuous activity.

**Board #184**
May 30 10:30 AM - 12:00 PM
**Effects Of Menstrual Cycle On Energy Utilization And Endurance Performance In Eumenorrheic Women**
Tomoka Matsuda¹, Mizuku Yamada², Hazuki Ogata³, Kayoko Kameronoto, Mikako Sakamaki-Sunagur¹. ¹Graduate School, Nippon Sport Science University, Tokyo, Japan. ²Nippon Sport Science University, Tokyo, Japan. (No relevant relationships reported)

The blood concentrations of estrogen and progesterone change during various phases of the menstrual cycle. The levels of estrogen and progesterone are lower during the menstrual period (MP) and higher during the luteal phase (LP) in eumenorrheic women. Previous studies have indicated that the menstrual cycle influences energy utilization during endurance exercises. Alterations in energy utilization that may occur during the different phases of the menstrual cycle in eumenorrheic women may also influence endurance performance.

**PURPOSE:** The purpose of this study was to compare energy utilization and endurance performance between the MP and LP of the menstrual cycles during exercise. METHODS: The subjects were 12 eumenorrheic women (age, 22±1.1 y) with regular menstrual cycles. Subjects exercised on a cycle ergometer at 60% VO2peak for 45 min, and then exercise intensity was increased to 80% VO2peak until exhaustion during the first two phases of the menstrual cycle (MP and LP). Blood samples were collected at rest, 4 min during exercise, immediately after exercise, and 30 min after completion of exercise. Blood levels of estradiol, progesterone, glucose, and free fatty acid (FFA) were assessed. The duration of each menstrual cycle phase was estimated by assessing the levels of the estradiol and progesterone. RESULTS: The menstrual cycle of the subjects was 30.9± 1.6a vs. MP was 4± 1.4 days, and LP was 2± 1.4 days. Blood concentrations of estradiol (MP, rest, 35± 4 pg/mL; LP, rest, 1± 0.9 pg/mL; p=0.001) and progesterone (MP, rest, 0.4± 0.2 ng/mL; LP, rest, 13±1±5.0 ng/mL; p<0.001) were significantly higher in LP than in MP. No significant differences were observed in the levels of glucose (p=0.36), FFA (p=0.80), and respiratory exchange ratio (p=0.34) at all time points. Carbohydrate oxidation (MP, 62± 7 g; LP, 32± 6 g; p= 0.6± fats oxidation (MP, 11.2± 3 g; LP, 11.5± 3 g; p=0.64), and exercise time to exhaustion were not different between MP and LP (MP, 47± 1 min; LP, 4± 0 min; p=0.5). CONCLUSION: Our results reveal no effect of the menstrual cycle phase on substrate oxidation and prolonged endurance exercise performance during cycle ergometer exercise in eumenorrheic women.

**Board #185**
May 30 10:30 AM - 12:00 PM
**A Short-term Calorie Restricted Diet with High-fat on Inflammatory Biomarkers and Plasma Lipids**
Yunus Koh, Baylor University, Waco, TX. (No relevant relationships reported)

A high-fat (HF) diet may play a positive role in weight management and body composition, yet its role in inflammation and blood lipids is not clearly understood. PURPOSE: To examine the effects of a short-term calorie restricted diet with HF or high-carbohydrate (HC) and an acute bout of exercise on plasma lipids and inflammatory biomarkers. METHODS: In a randomized, cross-over design, 9 physically inactive college-aged individuals were assigned to a calorie restricted diet (20% reduction of total calorie intake from their typical diet) with either HF or HC for 2 weeks. The HF diet consisted of 30% fat (mostly mono- and poly-unsaturated fatty acids) and 30% carbohydrate; and protein, whereas the HC diet consisted of 0% carbohydrate and 30% fat and protein. There was a one-week wash-out period between the two diet interventions. At the end of each diet intervention, a single bout of aerobic exercise was performed at 75% heart rate reserve for 30 min in light. Overnight fasting blood samples were collected at pre- and 24 hours post-exercise at the end of each diet intervention (pre-intervention, HF, and HC) to analyze changes in the key biomarkers of inflammation and plasma lipids, including glucose and triglycerides. RESULTS: Either HF or HC diet did not change any inflammatory biomarkers or plasma lipids. However, a single bout of exercise significantly decreased B-cell activating factor (BAFF, 16±5 vs. 12±0 pg/mL, p<0.01), matrix metalloproteinase-3 (MMP-3, 108±3 vs. 101±6 pg/mL, p=0.021), thymic stromal lymphopoietin (TSLP, 2.38± 1.4 vs. 1.8± 1.0 pg/mL, p=0.08 ), and TNF-related weak inducer of apoptosis (TWEAK, 2± 0.3 vs. 2.2± 3.0 pg/mL, p=0.08 ). CONCLUSION: A short-term calorie restricted diet with either HF or HC may not significantly influence soluble inflammatory markers or plasma lipids. However, a single bout of aerobic exercise, independent of dietary modification, can
THURSDAY, MAY 30, 2019

1424 Board #186 May 30 10:30 AM - 12:00 PM Impact of Time Restricted Feeding on Muscular Strength Within a Healthy Adult Population.
Eric A. Norman, Nicole L. Schweitzer, Corbyn R. Bendagens, Megan M. Coyle, Cassie A. Fileccia, Marqee 1A. Fleischacker, Lauren M. Kaminski, Andrew L. Kezar, Megan M. Lind, Emma P. Masliewicz, Justin R. Geijer. Winona State University, Winona, MN.

(time limited to 10 minutes)

Time restricted feeding (TRF) is a feeding habit that restricts the amount of time during the day in which individuals consume calories. TRF has been shown to produce several health benefits, one of which may be an increase in force production. Muscle strength and nutritional intake have been strongly researched prior to this study. Though little research exists investigating the impacts of TRF on muscular strength in human subjects. PURPOSE: The purpose of this study was to identify the potential impacts of TRF on muscular strength. METHODS: Participants participated in two, four-week periods during which caloric intake, sleep duration, sleep quality, exercise, and medications were all documented. The first period, participants partook in non-TRF eating behavior. The second period participants were exposed to a nine-hour window of TRF. To measure muscular strength, participants were tested using an isokinetic dynamometer. Resting metabolism was also measured. Statistical analyses quantifying within subject effects were performed with a repeated measures ANOVA. Post-hoc analyses were performed to elicit differences between testing periods.

RESULTS: Both mean torque flexion at 60 degrees/second (MTF 60) (83.92 Nm ± 29.53 Nm vs. 95.63 ± 28.95 Nm) and mean torque flexion at 180 degrees/second (MTF 180) (mN m ± 2.85 N m vs. 81 N m ± 21.24 N m; mN m ± 23.84 N m; F = 7.92 Nm) had a significant increase from pre-test to TRF, as well as non-TRF to TRF. Post-hoc testing revealed significant differences between pre-test and TRF. MTF 60 (p-value=0.001). Similar results were found for MTF 180 a s well (p-value=0.037). When observing respiratory quotient (RQ) at rest (0.76 ± 0.098 vs. 0.73 ± 0.077 vs. 0.80 ± 0.09; F = 8.352) there was a significant increase from pre-test to TRF (p-value=0.008), as well as non-TRF to TRF (p-value=0.034). Lastly, after analyzing total strength training days from non-TRF to TRF (6 days ± 1.18 days vs. 2 days ± 1.48), a significant decrease was found (p-value=0.003). CONCLUSION: Post TRF, participants showed an increase in muscular strength and resting RQ despite a decrease in strength training. Increased glucose utilization may be linked to short bouts of increased muscular strength activity. Future studies are needed to identify physiological mechanisms behind these findings.

1425 Board #187 May 30 10:30 AM - 12:00 PM Effects Of Whole30 Diet Program On Resting Energy Expenditure, Oxygen Consumption And Heart Rate In CrossFit Athletes
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(time limited to 10 minutes)

The Whole30 (W30) diet, a nine-hour window of time-restricted feeding, has rapidly gained popularity during the last decade. Although many health benefits have been reported, there is a lack of literature investigating the long-term effects of this diet. PURPOSE: The purpose of this study was to evaluate the effects of an 8-week Whole30 dietary intervention on resting energy expenditure, oxygen consumption and heart rate reduction in trained Crossfit individuals, which may be related to the lower carbohydrate consumption proposed by the program.

METHODS: Participants were randomly assigned to either the Whole30 (W30) diet group (n=26) or a control group (n=26). All participants had a minimum of six months of Crossfit training and were instructed to maintain their accustomed training volume during the study. A nine-hour window of time-restricted feeding (TRF) was exposed for a period of 8 weeks. The control group continued with their regular diet. Energy expenditure was determined before and after the period with a portable metabolic cart (PAR). Oxygen consumption was calculated from the metabolic measurement. Heart rate reduction was calculated by subtracting the resting heart rate at baseline from that measured during the time-restricted feeding period. RESULTS: No differences were observed in resting energy expenditure, oxygen consumption and heart rate reduction between the groups. CONCLUSION: Whole30 dietary program promoted resting energy expenditure, oxygen consumption and heart rate reduction in trained CrossFit individuals, which may be related to the lower carbohydrate consumption proposed by the program.

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and this did not differ by sex (BF2, joint multimodal: 2B). The lower discomfort and greater preference for the narrow cuff was found despite completing more repetitions with the narrow cuff [Nar: 70 (25) vs. Wide: 59 (16) repetitions; BF4, 2B].

Conclusions: A narrow cuff appears to cause less discomfort than a wider cuff when inflated to the same relative pressure with no difference between sexes. The use of a narrow cuff was preferred and may help increase the palatability of blood flow restricted exercise.

1428  Board #190 May 30 9:30 AM - 11:00 AM  Session RPE Following a Six-Minute Bout of Cardiopulmonary Resuscitation Training Alex B. Shafer, Wyatt I. Witty, Dana A. Lubieniecki, Kasie D. Cooper. Montana State University- Billings, Billings, MT. (Sponsor: Elizabeth Nagle, FACSM)

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(No relevant relationships reported)

Ratings of perceived exertion (RPE) are used to monitor intensity during exercise. A session RPE (S-RPE) provides an estimate of exercise intensity of a completed exercise session. S-RPE has demonstrated adequate validity and reliability for quantifying exercise intensity in traditional aerobic and anaerobic modalities.

However, the efficacy of S-RPE during the physically demanding task of cardiopulmonary resuscitation (CPR) has yet to be explored.

Purpose: The purpose of this investigation is to explore the relationship between RPE and S-RPE assessed during and after a 6 minute bout of CPR training.

Methods: Thirty healthy young adults (age 24±5 yr, BMI 26±3 kg/m2) completed a 6 minute bout of CPR on a CPR manikin. RPE values were recorded during the last 15 seconds of each minute of exercise, and S-RPE was recorded 2 minute post exercise using the Adult OMNI-RPE scale. Heart rate (HR) was recorded during each minute of activity.

A repeated measures ANOVA was used to compare RPE values from minute 1-6 and S-RPE recorded during the CPR bout. A paired samples t-test compared the average RPE for the 6-minute bout to S-RPE. Statistical significance was accepted at p<0.05.

Results: RPE values recorded during the CPR bout are reported in table 1. Participants obtained a peak HR of 132.3±25.7 bpm during the 6-minute bout of CPR.

A paired samples t-test shows S-RPE was significantly higher than the average RPE for the 6-minute bout to S-RPE. Statistical significance was accepted at p<0.05.

In terms of perceived recovery (F1,40=2.9 p=0.07), results included post immersion CnCWI vs. CG (15±1 vs. 16±1, p=0.001) and InCWI vs. CG (2±0 vs. 2±0, p=0.001) in the post 24h InCWI vs. CG (3±1 vs. 2±1, p=0.01) and InCWI vs. CG (3.2±1.8 vs. 2±0.1, p=0.01). In the post 24h, resting, results showed CnCWI vs. CG (3.3±2.3 vs. 4.1±2.2, p<0.002) and InCWI vs. CG (3.1±1.9 vs. 4.1±2.2, p=0.001). In terms of perceived recovery (F1,40=2.9 p=0.07), results included post immersion CnCWI vs. CG (15±1 vs. 16±1, p<0.001) and InCWI vs. CG (2±0 vs. 2±0, p=0.001) in the post 24h InCWI vs. CG (16±2.4 vs. 12±2.8, p=0.000) and InCWI vs. CG (16±2.4 vs. 12±2.8, p<0.001). In the case of post 8, results were CnCWI vs. CG (15±2 vs. 12±3, p<0.001) and InCWI vs. CG (15±2 vs. 12±3, p<0.001). Conclusion: CWF protocols are effective in reducing DOMS and improving perceived recovery all post fatigued measurements. Either the CnCWI or InCWI protocols could be used as both had similar effects on psychological variables of recovery.

Purpose: To examine the enjoyment during and after one exercise session of continuous aerobic exercise (CE) versus one session of high intensity interval exercise training (HIIT) in an iso-caloric design.

Methods: Seven young healthy participants (3 males, 4 females, age: 23.4±2 years, maximal oxygen uptake: 3l 8 ml·kg·min−1) were recruited to undergo two different exercise sessions of similar total caloric expenditure in randomized order: 1) one CE session at 90% of heart rate maximum (HRmax) and 2) one HIIT session of 44 minutes intervals at ≥90% of HRmax with 3 minutes rest between interval sets. Maximal oxygen uptake (VO2max) and HRmax were tested prior to the experiment. During and after each exercise session, the participants reported perceived exercise enjoyment using an 8 item short form of the Physical Activity Enjoyment Scale (PACES) (Raecke, 2007 J Appl sport Psychol). This is a reduced scale of the original 18 item scale from Kendzierski & DeCarlo (19, J. Sport Exerc Psychol). Additionally, the participants also reported rating of perceived exertion (RPE) (Borg, 18, Med Sci Sport Exerc), during and after both exercise sessions.

Results: There were no differences in PACES score between HIIT and CE during HIIT.

Conclusion: Although a higher perceived exertion was reported following high intensity exercise, participants reported similar enjoyment following exercise independent of exercise intensity in this iso-caloric design. Thus, if enjoyment is the depending factor for engaging in exercise, one should expect similar exercise adherence probability following HIIT and CE when prescribing aerobic exercise as preventive medicine.

In recovery, recovery is a multifactorial process and one modality commonly recommended for athletes is cold water immersion (CWI). Few studies, have analyzed the psychological effects of CWI protocols, specifically with regards to pain and perceived recovery. Purpose: Compare the effects of two CWI protocols on psychological variables of recovery. Methods: Forty healthy male participants (age 21.8±2.8 yr, weight 71.3±8.3 kg, height 176±10.2 cm) were randomly assigned to one of two recovery conditions: control group (CG) (12-min sitting in a 23°C room), continuous cold water immersion (CnCWI) (12-min in water at 12±0.4°C), and intermittent cold water immersion (InCWI) (12-min in water at 12±0.4°C, 4-min in cold water, 1-min in a controlled environment at 23°C, until the 12-min of immersions were completed). Delayed onset muscle soreness (DOMS) was assessed trough a Visual Analog Scale (VAS-Pain) and perceived recovery were used. Both were evaluated at pre, post-CW1, 24 and 48 hours post. A mixed ANOVA was used. Significance was accepted at p<0.05.

Results: Statistically significant differences were found in DOMS (F1,39=35 p<0.001, bs1.9) in post immersion CnCWI vs. CG (2.3±2.2 vs. 1.9±1.9, p<0.001) and InCWI vs. CG (2.7±2.1 vs. 1.9±1.9, p<0.001). In the post 24h InCWI vs. CG (3.3±2.3 vs. 2.7±1.8, p<0.001) and InCWI vs. CG (3.2±1.8 vs. 2±0.1, p<0.01). In the post 24h, resting, results showed CnCWI vs. CG (3.3±2.3 vs. 4±2.2, p<0.002) and InCWI vs. CG (3.1±1.9 vs. 4±2.2, p<0.001). In terms of perceived recovery (F1,40=2.9 p=0.07), results included post immersion CnCWI vs. CG (15±1 vs. 16±1, p<0.001) and InCWI vs. CG (16±2.4 vs. 12±2.8, p=0.000) and InCWI vs. CG (16±2.4 vs. 12±2.8, p<0.001). In the case of post 8, results were CnCWI vs. CG (15±2 vs. 12±3, p<0.001) and InCWI vs. CG (15±2 vs. 12±3, p<0.001). Conclusion: CWI protocols are effective in reducing DOMS and improved perceived recovery all post fatigue measurements. Either the CnCWI or InCWI protocol could be used as both had similar effects on psychological variables of recovery.

Purpose: To examine the enjoyment during and after one exercise session of continuous aerobic exercise (CE) versus one session of high intensity interval exercise training (HIIT) in an iso-caloric design.

Methods: Seven young healthy participants (3 males, 4 females, age: 23.4±2 years, maximal oxygen uptake: 3l 8 ml·kg·min−1) were recruited to undergo two different exercise sessions of similar total caloric expenditure in randomized order: 1) one CE session at 90% of heart rate maximum (HRmax) and 2) one HIIT session of 44 minutes intervals at ≥90% of HRmax with 3 minutes rest between interval sets. Maximal oxygen uptake (VO2max) and HRmax were tested prior to the experiment. During and after each exercise session, the participants reported perceived exercise enjoyment using an 8 item short form of the Physical Activity Enjoyment Scale (PACES) (Raecke, 2007 J Appl sport Psychol). This is a reduced scale of the original 18 item scale from Kendzierski & DeCarlo (19, J. Sport Exerc Psychol). Additionally, the participants also reported rating of perceived exertion (RPE) (Borg, 18, Med Sci Sport Exerc), during and after both exercise sessions.

Results: There were no differences in PACES score between HIIT and CE during HIIT.

1440 Board #192 May 30 9:30 AM - 11:00 AM  Comparison Of Two Cold Water Immersions Protocols On Psychological Variables Of Recovery Braulio Sánchez-Urech1, Kristy Barrantes-Brais1, Pedro Urech-Bonilla1, Felipe Araya-Ramírez2, Juan José Romero-Zúñiga1, Daniel Rojas-Valverde1, Julio Calleja-González1, Jeffrey M. Mijanes1, FACSM.1 National University of Costa Rica, Heredia, Costa Rica. 2University of the Basque Country, Araba, Spain. (Sponsor: Elizabeth Nagle, FACSM)

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(No relevant relationships reported)
Breathing frequency (f_b), electromyographic amplitude (EMG AMP) and EMG mean power frequency (MPF) during exhaustive treadmill runs within the SIz1 and SIz2. METHODS: Ten runners (Age: 23 ± 3 yrs) performed an incremental treadmill test to determine the velocity at VO2peak (vVO2peak). The CV was determined from 4 constant velocity runs. The RPE, f_b, EMG AMP, EMG MPF (from the vastus lateralis) and times to exhaustion were examined during SIz1 and SIz2. In SIz2, an additional regression was used to examine the normalized (% change from the initial values) RPE, f_b, EMG AMP, and EMG MPF versus %Tlim (100%-100%) relationships for the SIz1 and SIz2, runs. Repeated measures ANOVAs and Student Newman-Keuls tests were used to test the time course of changes from the initial 10% of Tlim. RESULTS: During the SIz1, f_b was a quadratic increase for RPE (R2 = 0.99, p < 0.001), significant from 30 to 100% of Tlim, a linear increase for EMG AMP (r2 = 0.85, p < 0.001), significant at 100% of Tlim, and a linear decrease for EMG MPF (r2 = 0.66, p = 0.004), but no differences among time points. During the SIz2, the race and 12.2 km, 10 miles increasing to 13.0 km, the end of the race increase for RPE (r2 = 0.99, p < 0.001), significant from 30 to 100% of Tlim, a quadratic increase for f_b (r2 = 0.90, p < 0.03), significant from 20 to 100% of Tlim, a linear increase for EMG AMP (R2 = 0.68, p = 0.02), but no differences among time points, and a cubic decrease for EMG MPF (R2 = 0.84, p < 0.01), significant at 100% of Tlim. CONCLUSIONS: These findings indicated RPE was more closely related to increases in f_b, than to neuromuscular fatigue in both the SIz1 and SIz2. It is possible feedback from group III and IV afferents in the respiratory muscles contributed to increased perceptions of effort to a greater degree than those in the leg muscles during severe exercise intensities.
Evidence suggests the prefrontal cortex (PFC) may play a role in interpreting afferent feedback during fatiguing tasks. Temperature changes are known to influence fatigability. It is unknown how changing the temperature of a limb influences PFC activation during a fatiguing task. PURPOSE: To examine changes in PFC oxygenation, psychological ratings, and muscular function in response to a fatiguing task, following thermal alterations of the exercising arm. METHODS: Nineteen healthy adults completed three experimental sessions. At baseline, participants performed maximum voluntary isometric contractions (MVIC) of the elbow flexors. Next, participants submerged their right arm in a water bath for 1 hr in Cold (C), neutral (N), and hot (H) water temperatures were maintained at 8°, 33°, and 4°C, respectively. Following water immersion, participants performed an isometric elbow flexion contraction, at 20% of MVIC, for 5 minutes. Ratings of perceived exertion (RPE) and muscular discomfort were assessed. Functional near-infrared spectroscopy was used to measure oxygenation of the right PFC during the fatiguing task. Repeated measures ANOVAs were used to analyze changes in dependent variables. RESULTS: There was an increase in PFC oxygenation throughout the fatiguing task, however, the increase in oxygenation was greater for the H (14.1±4.9 μM) and N (12.7±5.6 μM) conditions, compared to the C condition (11.1±4.4 μM, t(9) x 0.01). There was an increase in RPE throughout the fatiguing task, however, the increase in RPE was greater for the H (25.7±8.4%) and N (22.2±9.6%) conditions, compared to the C condition (22.2±9.6%, temperature x fatigue, p<0.01). Muscular discomfort at the end of the fatiguing task was lower in the C condition compared to the H condition (2.7 0.1 vs. 3.7±0.1, p<0.001). There was a reduction in MVC torque at the end of the fatiguing task, however, the reduction in MVC torque was greater for the H (11.1±4.4 μM, t(9) x 0.01). No significant difference in RPE from minutes 1-3 (collapsed across time) between anodal (12.9±2.4 μA), cathodal (13.3±2.2 μA), and sham (12.9±2.1 μA) conditions (p>0.5). CONCLUSIONS: These data suggest tDCS condition did not influence cycling performance or perception of effort during high-intensity cycling. Therefore, thoracic spine and lower abdominal montage delivering a current density of 0.07 m A/cm2 for 20 minutes likely does not affect high-intensity cycling work capacity. Therefore, more research is needed to investigate the efficacy of tDCS and which stimulation methods may and may not enhance human performance.

Abstracts were prepared by the authors and printed as submitted.
Physical activity (PA) has well known health benefits, especially for clinical populations like individuals with chronic pain (CP). However, interventions aimed at increasing PA often report low adherence, possibly due to low self-efficacy (SE). Reducing sedentary time (SED) also has health benefits and may be perceived as more achievable than increasing PA. PURPOSE: To compare levels of SE for reducing SED to those for increasing PA in healthy adults (HA) and individuals with CP and to explore SE for overcoming barriers for each behavior. METHODS: Participants completed a survey assessing SE for changing PA and SED and common barriers. Questions were ranked on a Likert scale from 1 (Not at all confident) to 10 (100% Confident). T-tests and effect sizes (Cohen’s d) compared differences between behaviors. RESULTS: Participants were 1,282 HA (Age = 26 ± 12; 65% female) and 231 individuals with CP (Age = 34 ± 16; 60% female). Both HA and individuals with CP reported greater SE for reducing daily SED by 1 hour compared to increasing daily MVPA by 30 minutes, with moderate effects observed in both groups (p < 0.001, CP: d = 0.6; HA: d = 0.8). Additionally, SE was greater (p = 0.001) for overcoming barriers related to changing SED than PA, except social norms. In CP, the effect sizes between SE for overcoming barriers related to SED to barriers related to PA were small to moderate for fatigue (d = 0.6), time (d = 0.3), and environment (d = 0.5), motivation (d = 0.3), pain (d = 0.2), and mood (d = 0.2). In HA, moderate effects for environment (d = 0.8) and fatigue (d = 0.5) and small effects for time (d = 0.4) and motivation (d = 0.3) were observed. Individuals with CP had the lowest average SE for resisting social norms to sit was lower than SE for social norms surrounding exercise (p < 0.001, CP: d = 0.32, HA: d = 0.9). CONCLUSION: While the health effects of each behavior are not equivalent, both patients and HA may be more likely to change behavior when encouraged to sit less rather than exercise more, which may still result in substantial benefits. Individuals with CP had the lowest average SE for interrupting SED when feeling unwell or in pain, feeling sad or unhappy, or in social situations where others are sitting. Interventions targeting SE may benefit from discussing mental and physical benefits of reducing SED and strategies for overcoming social norms.

CONCLUSIONS: Gender schemas at typological groups support different high levels of grit, fitness, and goal-setting. Although these variables have been highlighted as predictive of success, future research should continue to examine their relation to goal setting in health and fitness.
RESULTS: The SL resulted in lower average RPE for round 1 (SL: 12.8 ± 1.7 vs. Traditional: 13.8 ± 1.7 p<0.05) and round 2 (SL: 14.2 ± 1.6 vs. Traditional: 14.2 ± 2.3, p<0.01) than the traditional turnout. In addition, round 2 of the FFSE was completed significantly faster than the traditional turnout suit (SL: 262.8 ± 55.7 vs. Traditional: 29.4 ± 46; ec = p<0.02). CONCLUSIONS: The weight of the turnout suit increases RPE, which appears to influence performance for FFSE.

Supported by Fire-Dex, LLC.

Administration of ergogenic aids before exercise can increase feelings of energy and improve performance while completion of a demanding cognitive task before exercise can increase physical fatigue and decrease performance. Studies on this topic have been small (7-10 participants) and have failed to adopt tely measure perceptions of mental energy and fatigue. Thus, relationships between pre-exercise feelings of energy, fatigue and physical performance are not well understood.

PURPOSE: Describe relationships between anaerobic power during brief all-out cycling sprints and pre-exercise feelings of physical energy, physical fatigue, mental energy and mental fatigue.

METHODS: Ninety-four healthy men and women (18 ± 29.8 ± 12.6 to 54.0 ± 14.7 kg, respectively. There was a significant (p=0.023) difference in RPE=2, 5, and 8 were 61.9 ± 14.3 to 42.8 ± 11.4, 62.4 ± 14.3 to 47.9 ± 12.8 and 63.0 ± 14.3 anchored to RPE=2, RPE=5, and RPE=8 were 300.0 ± 0.0 s, 202.0 ± 95.5 s, and RPE values of 2, 5, and 8 (OMNI-RES 10-point scale) until the RPE value could no longer be maintained or a maximal time-limit of 5-min was reached. The percent decline values at RPE=2, 5, and 8, as well as the greater percent decline at RPE=2, supported the critical threshold hypothesis. Furthermore, performance fatigability as assessed from MVIC measurements followed the expected pattern of responses as those previously described for involuntary twitch amplitude. These findings also suggested that RPE=2 was below critical intensity, but RPE=5 and RPE=8 were not.

A 1×3 repeated measures ANOVA was used to examine mean differences in MVIC values at RPE=2, 5, and 8, respectively. MVIC results showed a significant (F(2, 55) = 2.48, p = 0.09) main effect of RPE. Post-hoc tests showed that MVIC in RPE=2 was significantly (p=0.001) greater than RPE=5 (30.4 ± 11.6%) and RPE=8 (15.1 ± 13.6%), but there were no differences (p=0.05) for RPE=5 (22.0 ± 14.0%) versus RPE=2 or 8.

CONCLUSIONS: In general, the similar MVIC percent decline values at RPE=5 and 8a as well as the greater percent decline at RPE=2, supported the critical threshold hypothesis. Furthermore, performance fatigability as assessed from MVIC measurements followed the expected pattern of responses as those previously described for involuntary twitch amplitude. These findings also suggested that RPE=2 was below critical intensity, but RPE=5 and RPE=8 were not.

Poor dietary qa lity contributes to impaired physical function and frailty in the elderly. Elevations in perceived fatigue, fatigability, likely exacerbate impairments in physical function and frailty. However, the association between dietary qa lity and fatigability is unknown. PURPOSE: We examined the cross-sectional association between overall diet qa lity and fatigability among the elderly in the Geisinger Rural Aging Study (GRAS). METHODS: In the present study, we included 122 (61 F, 61 M) elderly (≥80 years) participants from the GRAS who completed the Pittsburgh Fatigability Scale (FPS) and Diet Screening Tool (DST). We used multiple linear regression to measure the association between the FPS - Physical Fatigability Score (0, no fatigability) and the DST Score (0-100, 0-10 tisk, -3 ow risk) adjusted for age group, sex, BMI, and number of medications used over the past two years. RESULTS: The mean (SD) Physical Fatigability Score, DST Score, BMI, and number of medications were 23 (10), 6 (12), 28 (18) kg/m2 and 18 (8) 10 days of monitoring for each condition. RESULTS: The SL resulted in lower average RPE for round 1 (SL: 12.8 ± 1.7 vs. Traditional: 13.8 ± 1.7 p<0.05) and round 2 (SL: 14.2 ± 1.6 vs. Traditional: 14.2 ± 2.3, p<0.01) than the traditional turnout. In addition, round 2 of the FFSE was completed significantly faster than the traditional turnout suit (SL: 262.8 ± 55.7 vs. Traditional: 2.9 ± 26; ec = p<0.02). CONCLUSIONS: The weight of the turnout suit increases RPE, which appears to influence performance for FFSE.

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Poor dietary qa lity contributes to impaired physical function and frailty in the elderly. Elevations in perceived fatigue, fatigability, likely exacerbate impairments in physical function and frailty. However, the association between dietary qa lity and fatigability is unknown. PURPOSE: We examined the cross-sectional association between overall diet qa lity and fatigability among the elderly in the Geisinger Rural Aging Study (GRAS). METHODS: In the present study, we included 122 (61 F, 61 M) elderly (≥80 years) participants from the GRAS who completed the Pittsburgh Fatigability Scale (FPS) and Diet Screening Tool (DST). We used multiple linear regression to measure the association between the FPS - Physical Fatigability Score (0, no fatigability) and the DST Score (0-100, 0-10 tisk, -3 ow risk) adjusted for age group, sex, BMI, and number of medications used over the past two years. RESULTS: The mean (SD) Physical Fatigability Score, DST Score, BMI, and number of medications were 23 (10), 6 (12), 28 (18) kg/m2 and 18 (8) respectively. The females reported higher Physical Fatigability Scores compared to males (26 ± vs. 21±0.01), while those in the 60 ± 80 years old group reported higher Physical Fatigability Scores (28 ± 2, n=20) compared to those in the 81 ± 90 years old) and 23 ± 1, n=20) groups (both p<0.01). Low diet qa lity, likely as measured by the DST, was associated with high Physical Fatigability Score in the crude model (r = 0.25 p<0.007). Further adjustment for age, sex, BMI and number of medications did not change the significant inverse correlation between diet quality and physical fatigability (r = 0.31, p = 0.0088). CONCLUSION: Our results suggest that elderly individuals with lower dietary qa lity may have higher physical fatigability independent of age, sex, BMI, and number of medications. In addition, both females and the oldest-old reported the highest levels of physical fatigability. Further studies should examine the impact that individual macronutrients as well as micronutrients have on physical fatigability in the elderly. This study is funded by the USDA, Agricultural Research Service agreement 80- 550- 012-01A.

This study examined the effects of different music tempos on effort-related thoughts, rating of perceived exertion (RPE), affect, heart rate, and performance during isometric strength exercises. Recent research on musical stimuli during exercise supports that music has multiple physiological and psychological responses during exercise including: attention, RPE, affect, and performance (e.g., Adler et al., 2015; Connom, 2011; Crust, 2000; Dyrland & Winsinger, 2008). Karageorghis, Terry, Lane, & Priest, 2011). METHODS: Participants were assigned randomly to one of three conditions: silent control, fast tempo music first followed by slow tempo music, and slow tempo music first followed by fast tempo music, and performed a two different isometric strength exercises in a counter-balanced order. RESULTS: RM ANOVAS revealed non-significant differences among conditions during any of the trials, indicating that the presence of music of either slow or fast tempo failed to influence HR, P, − 2.8

Abstracts were prepared by the authors and printed as submitted.
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p = .09 \quad r^2 = .078, \text{ PE, } F(2, 6) = 0.5 \quad p = .8 \quad r^2 = .02, \text{ attention, } F(2, 6) = 0.15 \quad p = .6 \quad r^2 = .01, \text{ to voluntary exhaustion, } F(2, 6) = 0.37 \quad p = .7 \quad r^2 = .02, \text{ and effect, } F(2, 6) = 1.8 \quad p = .22, \text{ and effect, } p = \text{.02}.

CONCLUSIONS: Music of either tempo did not have an effect on exercise’s experience of an isometric strength test. However, these results are in line with Tenenbaum’s (2001) social-cognitive model which postulates that as exercise intensity increases attentional flexibility decreases and attention narrows to associative, somatic cues.

1447 Board #209 May 30 9:30 AM - 11:00 AM Association between Fatigability and Physical Activity among the Elderly in the Geisinger Rural Aging Study
James E. Stampley1, Brett Davis1, G. Craig Wood2, Diane C. Mitchell2, Gordon L. Jensen3, Yi-Hsuan Liu4, Xiang Gao5, Bethann Whilden6, Marianne Yohn2, Krystall Cunningham2, Megan Lemotte3, Christopher D. Stil2, Brian A. Irving, FACSM7. 1Louisiana State University, Baton Rouge, LA. 2Geisinger Medical Center, Danville, PA. 3Penn State University, University Park, PA. 4University of Vermont, Burlington, VT. (Sponsor: Brian A Irving, PhD, FACSM) Email: jstamp5@lsu.edu (No relevant relationships reported)

Elevations in perceived fatigue, fatigability, likely contribute to impairments in physical function in the elderly. However, the independent and combined effects of physical and mental fatigability on physical function in the elderly is unknown. PURPOSE: We examined the cross-sectional associations between physical fatigability, mental fatigability, and physical function among the elderly in the Geisinger Rural Aging Study (GRAS). METHODS: Here, we included 122 (< 56) 65-74 years) older adults who completed the Pittsburgh Fatigability Scale (PFS) and PROMIS Physical Function, Short-Form 20a (question 56M) elderly (≥80 years) participants from the GRAS who completed the Pittsburgh Fatigability Scale (PFS) and PROMIS Physical Function, Short-Form 20a (question 56M) elderly (≥80 years) participants from the GRAS. We used multiple linear regression to measure the association between the PRO MI S Physical Function Score (19- 95) and Physical Fatigability Score (PFS) and PRO MI S Physical Function, Short-Form 20a [question 56M) elderly (≥80 years) participants from the GRAS who completed the Pittsburgh Fatigability Scale (PFS) and PROMIS Physical Function, Short-Form 20a (question 56M) elderly (≥80 years) participants from the GRAS.

1448 Board #210 May 30 9:30 AM - 11:00 AM Longitudinal Association Between Fatigability and Executive Function: Results from the Baltimore Longitudinal Study of Aging
Elizabeth Salerno1, Amal Wanigatunga2, Jacek Urbanek3, Eleanor Simonsick4, Susan Resnick5, Jennifer Schrack2. 1National Institute on Aging, Baltimore, MD. 2Johns Hopkins Bloomberg School of Public Health, Baltimore, MD. 3National Institute on Aging, Baltimore, MD. (Sponsor: Charles Matthews, FACSM) (No relevant relationships reported)

Cognitive decline, specifically within the domains of executive function, has been consistently associated with diminished life satisfaction and the ability to carry out activities of daily living in older adults. As the population continues to age, identifying methods of attenuating cognitive decline is important for promoting long-term survival and quality of life. Previous research has suggested that fatigability, one’s perceived exertion after a standardized walking task, is associated with declines in physical function; however, it remains unclear as to whether these effects may also extend to cognitive function. PURPOSE: To examine whether fatigability is associated with executive function among individuals participating in the Baltimore Longitudinal Study of Aging (BLSA). METHODS: The BLSA is an ongoing study of normative human aging. Participants included 1,081 der adults (M = 78 ± 12.7 years) seen between 200 and 2015. At baseline and after M = 1 year of follow-up, individuals completed a physical examination, health history assessment, standardized walking task to assess fatigue, and cognitive battery assessing several domains of executive function. RESULTS: Multiple linear regression analyses revealed significant effects of baseline fatigability on several domains of executive function at follow-up: Digit Symbol Substitution Test (β = 0.047, p = 0.011), Trails Part B (β = 1.85, p = 0.031), and Trail Making Delta (Part B-Part A; β = 1.56, p = 0.038). Specifically, higher baseline fatigability was significantly associated with poorer cognitive performance at follow-up after controlling for age, sex, race, body mass index (kg/m2), years of education, years of follow-up, and number of comorbid conditions. CONCLUSIONS: Our findings suggest that the perception of fatigue in response to a standardized walking task may act as an indicator of future cognitive decline, at least in the short-term (e.g., 1 year). More research is warranted to examine the underlying biological mechanisms contributing to this relationship as well as how future interventions may target fatigability in mid-life to potentially attenuate age-related cognitive decline. Supported by NIH Grants R21AG03189 and U01AG05669.

1449 Board #211 May 30 9:30 AM - 11:00 AM The Perceptual Responses to Continuous vs Intermittent Blood Flow Restriction Resistance Exercise
Eduardo D. S. Freitas1, Ryan M. Miller2, Aaron D. Heishman3, Japneet Kaur4, Brady S. Brown1, Julio C. G. Silva1, Rodrigo R. Aniceto5, Joao B. Ferreira-Junior6, Michael G. Bemben7, FACSM8. 1University of Oklahoma, Norman, OK. 2Federal University of Paraíba, João Pessoa, Brazil. 3Federal Institute of Rio Grande do Norte, Currais Novos, Brazil. 4Federal Institute of Southwest Minas Gerais, Rio Pombal, Brazil. (Sponsor: Michael G. Bemben, FACSM) (No relevant relationships reported)

PURPOSE: To investigate the perceptual responses (ratings of perceived exertion [RPE] and discomfort [RD]) to continuous and intermittent resistance exercise (RE) with blood flow restriction (BFR; 50% of total occlusion pressure), as well as to compare these responses to high- and low-load RE without BFR. METHODS: Fifteen untrained participants were randomly assigned to 4 E conditions: 1) low-load with continuous BFR (cBFR: cuffs remain inflated between sets); 2) low-load with intermittent BFR (iBFR: cuffs are deflated between sets); 3) low-load without BFR (LI); and 4) high-load without BFR (HI). For all low-load conditions, participants performed 4 sets (30-18-15-15 reps) of bilateral leg press and knee extension at 20% of 1RM, whereas the HI condition involved 3 sets (10-10-10-10 reps) at 1RM for the same exercises. RPE was assessed after each set using the OMNI-RS scale with scores ranging from 0 to 10. RD were analyzed using the Friedman’s and the Wilcoxon tests with Bonferroni correction and p set at 0.05. RESULTS: There were no significant differences in RPE after each set of leg press or the cBFR and iBFR conditions. HI was significantly (p < .05) greater than all low-load conditions after each set except for cBFR at sets 1 and 2. There were no significant differences (p > .05) in RD after each set of the cBFR, iBFR, and HI conditions, except after set 4, when HI was significantly (p < .05) greater than IFR. For knee extension, similar responses were observed for RPE after each set, with no significant differences (p > .05) observed for cBFR, iBFR, and LI conditions; however, HI was significantly (p < .05) greater than the other 3 conditions. For the HI condition, RD was significantly (p < .05) greater than the cBFR condition at baseline. Similar RD values were observed for the cBFR, iBFR, and HI conditions after each set, which was significantly (p < .05) greater than the LI condition. CONCLUSION: Continuous and intermittent RE with BFR seem to elicit similar perceptual responses. For RE, these responses were similar to those from low-load RE and lower than those from high-load. For RD, both BFR conditions were similar to high-load levels and greater than the low-load condition.

1450 Board #212 May 30 9:30 AM - 11:00 AM Emotional Influence Of Music In Relation To The Effect Of Music On Exercise Performance
Kayla M. Baker, Jeanette Garcia, Tal Belity. University of Central Florida, Orlando, FL. (No relevant relationships reported)

PURPOSE: The purpose of this study is to examine the relationship between individuals’ emotional influence of music (EIM) and the effect of listening to music during treadmill running. METHODS: Twenty-two recreationally-active adults (21.7 ± 1 yr) completed 6 visits, including an initial visit to complete a questionnaires to assess EIM. During this visit, participants also created a personal甲醛 from a song database which utilized cadences of 18 beats per minute. Participants completed treadmill familiarization trials, running at a self-selected pace for 20 minutes, during the second and third visits. Participants then completed a VO2max test on the treadmill during the fourth visit, where running speeds and ratings
of perceived exertion (RPE) were measured. During the final two visits, participants completed time-to-exhaustion (TTE) trials while running at a speed corresponding to 80% of their VO2max on a treadmill. For these trials, two separate conditions were utilized: 1) no music (NM); and 2) self-selected music (SSM). Bivariate correlations were used to determine the relationship between EIM and physiological variables, while paired samples t-tests were used to examine differences between TTE trials. RESULTS: A significant difference was found between TTE with NM (M=12.18 ± 9.0 m·s⁻¹; VO2max 43.0 ± 7.4 ml·kg⁻¹·min⁻¹) and TTE with SSM (M=14.36 ± 5.22 m·s⁻¹; VO2max 46.3 ± 7.4 ml·kg⁻¹·min⁻¹) (t=4.124, p=0.001). EIM was positively correlated to RPE during the TTE without music (r=0.8, p<0.05), while VO2max was negatively correlated to the difference between TTE trials (r=-0.8, p<0.05). CONCLUSION: Individuals with a higher EIM perceived greater exertion during running without music compared to running while listening to music, indicating that these individuals may experience a heightened level of motivation or inspiration while using music as an external stimulus, as a diminished level of motivation when music is not utilized. Additionally, individuals with a greater VO2max experienced less of a difference between TTE trials, suggesting that individuals with greater aerobic fitness may not rely on external stimuli for motivation, regardless of EIM. Utilizing music as an external stimulus to increase motivation may be a beneficial tool for certain individuals, whether it be in a personal training environment or a physical rehabilitation setting.

1451 Board #213 May 30 9:30 AM - 11:00 AM Declines In Mental Energy Led To Decreases In Functional Balance: A Pilot Study Using Machine Learning To Detect Changes In Functional Balance

Ali Boolani, Jenna Ryan, Trang Vo, Brandon Wong, Natasha Kholgade Banerjee, George Fullk. Clarkson University, Potsdam, NY. (Sponsor: Dr. Bert Jacobson, FACSM)
Email: aboolani@clarkson.edu

Purpose: The purpose of this study was to determine the impact of mental task performance on fall risks and to use machine learning to predict changes in fall risk assessments.

Methods: Using a crossover-design, older adults (N=11) were recruited from the community and assigned to random allocation of days where they performed fall risk assessments (30 second chair stand test (CST), Timed-up-and-Go (TUG), and Berg Balance Scale (BBS)) prior to and after the completion of mental tasks or days where they were told to perform non-mentally and physically taxing tasks (i.e. talk, listen to music) in between the completion of fall risk assessments. A Wilcoxon Sign Rank Test was used to assess differences in fall risks and a Friedman’s rank test was used to assess changes in mood (energy, fatigue, physical and mental energy and fatigue). Using the X-box Kinecot we measured variations in 25 joints. A random forest classifier was used to predict changes in functional balance. Results: Analysis yielded statistically significant declines in feelings of energy (p<0.003), specifically mental energy (p<0.05) and a decline in the BBS (p<0.05) for participants on days when they completed mental tasks compared to days they did not. There were no significant differences (p>0.6) between other moods and fall risk assessments. We observed a significant increase (p<0.006) in joint variance during the “standing with eyes closed” part of the BBS after the subjects had performed mental tasks. In the post-hoc analysis our random-forest algorithms allowed us to predict with 79% accuracy whether the “standing with eyes closed” part of the BBS was performed after a decline a mental energy or not. The false positive rate was 6.0% and the false negative rate was 21.0%.

Conclusions: The results of our study suggest that declines in mental energy negatively impacts postural control. Our work was able to predict with a fair degree of accuracy when someone had a decline in mental energy based on changes in functional balance however, it was unable to predict when there was no mental work performed. This suggests that when there is no decline in feelings of energy there is no change in functional balance, and mental work leads to declines in postural control.

1452 Board #214 May 30 9:30 AM - 11:00 AM Exercise Intensity: Do Individuals Perceive It as We Physiologically Define It?

Kristofer Wisniewski. Saint Francis University, Loretto, PA.
Email: kwisniewski@francis.edu

The ACSM defines exercise intensities using physiological measures (%VO2max, %VO2R, %HRmax, and %HRR). Currently, there are no studies examining if individuals perceive the exercise intensity as it is defined by the physiological ranges for each measure. PURPOSE: To determine if individuals perceive aerobic exercise intensities as defined by ACSM physiological criteria. METHODS: Sixty-three subjects (31 females, 32 males) aged 25 ± 11.3 years, BMI 28 ± 5.0 kg·m⁻², and VO2max 4.0 ± 9.0 ml·kg⁻¹·min⁻¹ participated in this study. Subjects completed a Bruce treadmill protocol to maximal exertion while rating the intensity at the end of each stage using a Perceived Intensity (PI) scale. The scale reads: Very Light, Light, Moderate, Vigorous, Near Maximal, and Maximal. Subjects were given standard instructions on how to use the scale prior to the test. Actual Intensity (AI) was determined using %VO2max, %VO2R, %HRmax, and %HRR attained at the end of each stage. PI rated at the end of each stage was compared against the AI for each variable. RESULTS: Correlation analyses showed strong relationships between PI responses and %VO2max (r = 0.8, p<0.05), %VO2R (r = 0.8, p<0.05), %HRmax (r = 0.8, p<0.05), and %HRR (r = 0.862, p<0.05). Cohen’s Kappa (κ) for the total sample showed fair to moderate agreements between PI and AI for %VO2max (κ = 0.405, p<0.05), %VO2R (κ = 0.398, p<0.05), %HRmax (κ = 0.362, p<0.05), and %HRR (κ = 0.38, p<0.05). The Contingency table for %VO2max showed only 33% of PI ratings at a Moderate intensity were accurate with 61.1% of PI rated as less than Moderate. Vigorous intensity ratings were similar with 33.9% accuracy, and 43% of ratings as less than Vigorous. CONCLUSION: Current physical activity recommendations state that adults should participate in moderate and vigorous intensity activities for health-related benefits. Despite having strong relationships with physiological criteria, the majority of subjects under-rated moderate and vigorous intensities. The results suggest that further subjective definitions of intensity may be needed to match perceptions with physiological measures. Therefore, individuals may need additional familiarization with intensity definitions if they are to go using perceptual measures to regulate intensity.

1453 Board #215 May 30 9:30 AM - 11:00 AM Effect of Prescribing Exercise through Verbal Commands on Psychophysiological Responses in Walkers or Runners

Sergio G. da Silva¹, Armando L. Bonfim Neto¹, Lucio Follador¹, Sandro S. Ferrari¹, Murilo Bastos¹, Ragani C. Chaves¹, Antoby G. Lopes¹, Maressa P. Krause², Carlo Baldari, FACSM.¹Universidade Federal do Parana, Curitiba, Brazil.²Universidade Tecnologica Federal do Parana, Curitiba, Brazil. Link Campus University, Rome, Italy.
Email: sergiogregoriol@gmail.com

Purpose: To compare the effect of prescribing exercise intensity through verbal commands on physiological, perceptual and affective responses in habitual walkers or runners. Methods: Fifteen walkers or runners (11 men, 4 women; age: 39 ± 9 years; height: 12 ± 0.6 m; body mass: 72 ± 5 kg; BMI: 26 ± 2.5 kg·m⁻²; VO2max: 46 ± 4 ml·kg⁻¹·min⁻¹; HRmax: 126 ± 15) were submitted to four trials of walking or running at self-selected intensities corresponding to the following verbal commands: Preferred, Low, Moderate and High. All trials were performed in a randomized order. Heart rate (%HRmax), ratings of perceived exertion (RPE 0-10, OMNI-Walk/run scale) and feelings of pleasure/displeasure (-5 to +5, Feeling Scale) were recorded at the end of each trial. Results: Walking or running based on the Preferred-intensity verbal command elicited similar speed, %HRmax and RPE values, and pleasant feelings compared to the Moderate trial. The High trial was the most effortful and the least pleasant one. All trials elicited %HRmax values that are within the range proposed by the ACSM to promote health-related outcomes.

Speed (m·s⁻¹)

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<th>Preferred</th>
<th>Low</th>
<th>Moderate</th>
<th>High</th>
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<tr>
<td>3.3 ± 0.6</td>
<td>2.7 ± 0.6</td>
<td>3.1 ± 0.6</td>
<td>3.7 ± 0.6***</td>
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%HRmax (r = 0.9 ± 0.6***)

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<tr>
<th>Preferred</th>
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<td>3.7 ± 0.6***</td>
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RPE

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<td>2.7 ± 0.6</td>
<td>3.1 ± 0.6</td>
<td>3.7 ± 0.6***</td>
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Feeling Scale

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<td>3.3 ± 0.6</td>
<td>2.7 ± 0.6</td>
<td>3.1 ± 0.6</td>
<td>3.7 ± 0.6***</td>
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* different from Preferred; † different from Low; ‡ different from Moderate; p<0.01.

Conclusion: Prescribing walking or running through verbal commands seems highly attractive due to its effectiveness and simplicity. Walking or running at the Preferred-intensity verbal command may promote health-related outcomes and elicit a positive affective experience, which might influence exercise adherence.

1454 Board #216 May 30 9:30 AM - 11:00 AM Relationship Among Site Specific Fat, Lean Mass, And Endogenous Pain Inhibitory Function

Jessica A. Peterson, Cameron Lohman, Michael Bemben, FACSM, Rebecca Larson, Christopher D. Black, FACSM. University Of Oklahoma, Norman, OK. (Sponsor: Christopher Black, FACSM)
Email: jessica.a.peterson-1@ou.edu

No relevant relationships reported

Abstracts were prepared by the authors and printed as submitted.
been found across a host of chronic pain conditions. PURPOSE: The purpose of the study was to assess endogenous pain inhibitory function and its relationship with whole body and site specific lean and fat mass. METHODS: PPT of 37 pa ricipants (38F; 35M) were assessed in the vastus lateralis (VL) and brachioradialis (BR) using a pressure algometer on both sides of the body before and after submersion of their feet in an ice bath (2°C) for 1min and an isometric knee extension, time to failure task based off of 25% of their maximal voluntary contraction. The difference between post and pre measures was defined CPM response (ice bath) and EIH response (exercise condition). Whole body and site specific fat and lean tissue were assessed via DXA scan, and muscle and fat thickness were assessed in the right (R) and left (L) VL and BR using ultrasound and skinfolds. RESULTS: Both CPM and EIH responses significantly increased PPTs for all of the four measured sites (p ≤ 0.001). BF% (r = 0.26; p = 0.029) and fat mass (r= 0.27; p = 0.011) correlated with LBR CPM but not with site specific measures (p>0.05). BR, RVL, and LVL CPM did not correlate with any measures of body composition (p>0.05). An inverse relationship was found between dominant VL EIH and whole body lean mass (r=−0.25; p=0.028), as well as limb specific lean mass (r=0.262; p=0.026). No relationships were found between any of the body composition measures and non-dominant VL (p>0.05). CONCLUSION: It appears that in young, healthy adults, whole body and site specific fat mass does not influence endogenous pain-inhibitory function. However, having more lean tissue may have a negative effect on the EIH response. This may be due to larger muscle mass leading to a faster rate of fatigue, reducing exercise time which may have influenced the EIH response rather than muscle mass per se.

1455 Board #217 May 30 9:30 AM - 11:00 AM Effects Of Carbonated Sports Drink Intake After High-intensity Exercise On Fatigue Recovery In Athletic Sprinters
Natsuki Hasegawa1, Shumpei Fujie2, Naoki Horii3, Takafumi Hamaoka, FACSM4, Motoyouki Iemitsu5, 1Ritsumeikan University, Kusatsu, Japan. 2University of Tsukuba, Ibaraki, Japan. 3Tokyo Medical University, Shinjuku-ku, Japan. 4Sponsor: Takafumi Hamaoka, FACSM
Email: has0228@fc.ritsumei.ac.jp
(No relevant relationships reported)
Carbon acid bathing eases vasodilation and blood flow due to transcutaneous absorption of carbon acid, resulting in acceleration of fatigue recovery. On the other hand, carbonated drink intake has no effect on aerobic exercise performance in endurance athletes. However, the effect of carbonated drink intake on anaerobic exercise performance remains unclear. PURPOSE: This study aimed to clarify whether carbonated sports drink intake after high-intensity exercise promotes fatigue recovery, leading to attenuation of performance decrement in athletes. METHODS: Seven male and four female athletic sprinters were enrolled in this study (20.4 ± 0.4 yrs). All participants performed wingate exercise session, as an index of anaerobic exercise capacity, (3 sets of 20-sec all-out pedaling on a cycle ergometer against a resistance equivalent to 7.5% of body weight, with a 30-sec rest), and the performance was determined based on fold changes over fluorescence minus one (FMO). Data were analyzed using within-subjects repeated measures ANOVA. RESULTS: No interaction (F = 2.3; p = 0.128; ηp = 0.251), main effect for time (F = 1.9; p = 0.202; ηp = 0.209) nor main effect of condition was observed (F = 0.13; p = 0.722; ηp = 0.018) for circulating MCP-1. No interaction (F = 1.7; p = 0.251; ηp = 0.289) was observed for circulating CR2 expression on classical monocytes, however, a main effect for time (F = 31.2; p = 0.002; ηp = 0.80) was observed. CCR2 expression was maintained from PRE (137.6 ± 37.4) to 60 (124.4 ± 91.2, p = 0.068) and before decreasing at 90 (124.4 ± 36.8, p = 0.00301), with 25% resolving below clinical delineation. CONCLUSION: This data indicates that prolonged cycling in cold temperature may reduce the recruitment of classical monocytes, evident by reduced CCR2 expression. This may indicate a suppression of classical monocyte recruitment during exercise in moderate and cold temperatures. Further research is warranted to assess these responses at greater intensities or duration.

1456 Board #218 May 30 9:30 AM - 11:00 AM Circulating MCP-1 During And Following Prolonged Cycling In Cold Temperature
Ellen L. Glickman, FACSM, Cody Dulaney, Emily Tagesen, Eliot Arroyo, Brittany N. Falloway, Jeremiah A. Vaughan, Adam R. Jajtner. Kent State University, Kent, OH.
Email: eglickma@kent.edu
(No relevant relationships reported)
PURPOSE: The purpose of this investigation was to examine the impact of aerobic exercise in a cold condition on the recruitment of classical monocytes (CD14+CD16−). METHODS: Six recreationally active men (24.4 ± 3.9 yrs; II.3: Φ cm; 85.7±12.8 kg; 3.7±0.3L min−1) completed three experimental conditions; a VO2 max test, and a cycling protocol in 9 C°o Relative Humidity (RH)(LTLH), and 24°C/38° RH (MTMH). The exercise session consisted of 60-min cycling at 60% VO2 max, 15-min rest, and a time to exhaustion at 90% VO2 max (TTE). Blood samples were obtained before (PRE), after 60-min of cycling (60) , after TTE (90) and after 1-h of recovery (REC). Blood was analyzed for plasma concentration of Monocyte Chemoattractant Protein 1 (MCP-1) via ELISA, and the expression of MCP-1 receptor (CR2) on classical monocytes and assessed by flow cytometry. Expression was determined based on fold changes over fluorescence minus one (FMO). Data were analyzed using within-subjects repeated measures ANOVA. RESULTS: No interaction (F = 2.3; p = 0.128; ηp = 0.251), main effect for time (F = 1.9; p = 0.202; ηp = 0.209) nor main effect of condition was observed (F = 0.13; p = 0.722; ηp = 0.018) for circulating MCP-1. No interaction (F = 1.7; p = 0.251; ηp = 0.289) was observed for circulating CR2 expression on classical monocytes, however, a main effect for time (F = 31.2; p = 0.002; ηp = 0.80) was observed. CCR2 expression was maintained from PRE (137.6 ± 37.4) to 60 (124.4 ± 91.2, p = 0.068) and before decreasing at 90 (124.4 ± 36.8, p = 0.00301) and REC (60 25.2, p = 0.001). CONCLUSION: This data indicates that prolonged cycling in cold temperature may reduce the recruitment of classical monocytes, evident by reduced CCR2 expression. This may indicate a suppression of classical monocyte recruitment during exercise in moderate and cold temperatures. Further research is warranted to assess these responses at greater intensities or duration.

1457 Board #219 May 30 9:30 AM - 11:00 AM Effects Of Cooled Compression Exercise Therapy On Health, Sleep, And Quality Of Life In Veterans.
Pat Marq1 s, Grove Higgins1, Chloe Werneczke2, Sara Web1, Lindsay Haughton1, Liz Grimm1, Mary Wilson1, Aaron Black1, Cristian Torres1. 1Colorado Springs Center for Human Performance and Rehabilitation, Colorado Springs, CO. 2Vasper Systems, Moffett Field, CA.
(No relevant relationships reported)
Veterans are disproportionately affected by physical and emotional functional disorders compared to their civilian counterparts, a discrepancy that is deepened by delay to care within the Veterans Health Administration. Research has supported use of compression exercise in physically limited populations and demonstrated physiological responses at lower intensities (10-20% one repetition maximum vs 70% for hypertrophy in able-bodied). Combination of low-pressure compression exercise and cooling at lower intensities (10-20% one repetition maximum vs 70% for hypertrophy in able-bodied) may have clinical benefits to veterans with chronic conditions such as sleep disturbance and respiratory dysf unction related to stress and anxiety (Nijmegen Questionnaire). PURPOSE: To determine the safety and efficacy of an accessible cooled compression exercise system on markers of physical and emotional function in veterans. METHODS: 14 veterans completed 24 sessions in 12 weeks. Baseline and endpoint questionnaires validated for clinical significance were administered to detect: sleep qa lity (Pittsburg Sleep Quality Index), qa lity of life (RAND Short Form 36), and respiratory dysfunction related to stress and anxiety (Nijmegen Questionnaire). RESULTS: Two-tailed T-tests were performed on the data. Sleep qa lity improved in 7% of subjects (94% 3.3 3.3 p = 0.0232), 5% qa lity of life (3.3 173s 3.3 p = 0.031), and 7% decreased adverse respiratory symptoms (11.29 8.8s 2.2 4 p = 0.09) compared to baseline. Increases were seen in all 8 sub-scores of quality of life, with statistically significant improvements in social functioning (3 287s 11.6, p = 0.009), energy and fatigue (4.3 221s vs 3.2 112b p = 0.04), emotional well being (4 260 vs 3.4 1.86 0.005), and general health (2.1 4 1.5s 12.2 p = 0.0497). For sleep quality, those subjects with baseline scores defined as clinically disturbed sleep (n=8, 58% ) all (100% ) experienced sleep improvements. Increases were seen in all 8 sub-scores of quality of life, with statistically significant improvements in social functioning (3 287s 11.6, p = 0.009), energy and fatigue (4.3 221s vs 3.2 112b p = 0.04), emotional well being (4 260 vs 3.4 1.86 0.005), and general health (2.1 4 1.5s 12.2 p = 0.0497). For sleep quality, those subjects with baseline scores defined as clinically disturbed sleep (n=8, 58% ) all (100% ) experienced sleep improvements.

C-40 Free Communication/Poster - Cold- Hyperbaric/Diving Physiology
Thursday, May 30, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

1456 Board #218 May 30 9:30 AM - 11:00 AM Circulating MCP-1 During And Following Prolonged Cycling In Cold Temperature
Ellen L. Glickman, FACSM, Cody Dulaney, Emily Tagesen, Eliot Arroyo, Brittany N. Falloway, Jeremiah A. Vaughan, Adam R. Jajtner. Kent State University, Kent, OH.
Email: eglickma@kent.edu
(No relevant relationships reported)
BACKGROUND: Whole-body cryotherapy (WBCT) takes place in an enclosed chamber at ~184 degrees Fahrenheit. WBCT is currently used to alleviate inflammation and pain in arthritis and osteoarthritis and for pain relief in fibromyalgia. However, to date, only anecdotal evidence exists on the benefits of cryotherapy to provide deep, restful sleep. PURPOSE: The purpose of this case series was to test the hypothesis that WBCT would have a positive impact on sleep, pain levels and anxiety of healthy individuals. METHODS: Surveys regarding sleep, pain levels and anxiety were administered before and after 10 WBCT sessions (max 3 minutes) to five participants (Age > 50). Sleep was assessed using the Pittsburg Sleep Quality Assessment Index (PSQI), pain was assessed using the Borg Rate of Perceived Pain Scale, and anxiety was assessed using the Hamilton Anxiety Scale. RESULTS: One male (Age 78, BMI = 30.3 kg/m², Caucasian) and one female (Age 73, BMI = 28 kg/m², Caucasian) presented with pain from arthritis and while the WBCT had no impact on sleep or anxiety, their pain was reduced from moderate/strong pain (Borg = 4) to weak/ moderate (Borg = 3). One female (Age 71, BMI = 28 kg/m², Caucasian) presented with stress/anxiety and sleep problems. Her pain improved from moderate (Borg = 3) to very weak (Borg = 1), her sleep quality improved by 12 points on the PSQI and her anxiety score improved by 18 points on the Hamilton anxiety scale. Finally, two females (Age 65 and 72) both had no specific reason for trying the WBCT. Both demonstrated no changes in pain, sleep, or anxiety. CONCLUSION: These five cases demonstrate that WBCT can improve pain if the subjects present with moderate (or greater pain) and that WBCT may be able to improve sleep and anxiety in subjects that present with problems with sleep or anxiety. Future research is needed in larger samples of people with a history pain, anxiety and/or sleep issues to continue to test the hypothesis that WBCT may have a positive impact on sleep, pain levels and anxiety.

CONCLUSION: These findings suggest that the combination of cooling and compression exercise may be an effective intervention method to address symptoms in veterans and other individuals living with insomnia, post-traumatic stress, chronic fatigue, and depression.

PURPOSE: The primary objective of this study was to investigate how resting, long-duration hyperoxic water immersions (WIs) at 1.3 atm pressures (absolute (ATA) effects neuromuscular strength performance. We hypothesized that following five consecutive days of hyperoxic WIs, neuromuscular strength performance would be diminished post-WI and remain reduced longer than 2 hrs post-WI. METHODS: Thirteen (n = 13), active male divers (31.3 ± 1.7 kg) yrs, mean ± SEM) completed five consecutive 6-hour resting WIs with 18-hour surface intervals while breathing 100% O₂ (n = 13) at 1.35 ATA. Skeletal muscle performance assessments occurred immediately before and after each WI, and 24 and 72 hours after the final WI. Performance assessments included maximum voluntary isometric contraction (MVIC) and maximal isokinetic (IK) knee extensions and elbow flexions, and maximum handgrip strength (MHG). We measured neuromuscular activation of the quadriceps, biceps brachii, and brachioradialis via surface electromyography (sEMG). RESULTS: MHG declined by 5% (p = 0.001) at W1 5th performance returning to baseline by 24 hr post-WI. Brachioradialis neuromuscular activation increased by 3% (p = 0.001) on W1.5. MVIC knee extension performance dropped by 4% (p = 0.001) on W1 with an 11% overall decrease in KE extension performance of 5%. Minimal KE extension performance decreased by 5.1% (p = 0.001) with an 18% decline in neuromuscular activation by W1 5th return to baseline by 2 hr post-WI. Maximal KE extension performance dropped by 8.6% (p = 0.001) on W1 5th with a continual decline in biceps brachii neuromuscular activation by 2% (p = 0.001) on W1 5th. CONCLUSION: The decreases in neuromuscular activation and strength performance coinciding with the non-load bearing muscles affected more than the load-bearing muscles. Yet, the brachioradialis had the greatest increase in neuromuscular activation with decreases in performance. These types of hyperoxic WIs caused significant changes to neuromuscular performance after three days of WI with recovery varying with each measured variable with some decrements lasting until the 2 hr post-WI recovery period.

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PURPOSE: We tested the hypothesis that oxygen breathing would lower CB chemosensitivity more than breathing air at 6 m sw depth. METHODS: Five subjects (age: 23± 2 y; BMI: 28± 5 kg/m²) completed two, four-hour dry dives at 6 m sw (1.6 ATA) breathing either 100% O₂ or air. CB chemosensitivity was assessed using hypoxic ventilatory response (CBR, V₅₀) and brief hypercapnic ventilatory response (CBR₅₅₀) tests pre-dive, 5 and 15 min into the dives, immediately post-dive, and 8 m in post-dive. CBR₅₅₀ consisted of

Water immersion causes CO₂ retention, thus increasing the risk of CO₂ toxicity. Hypoxia reduces cerebral blood flow (CBF) tonic activity, which reduces the ventilatory response to hypercapnia. However, it is not known if CB chemosensitivity is altered during the high partial pressure of oxygen associated with hyperbaria. PURPOSE: We tested the hypothesis that oxygen breathing would lower CB chemosensitivity more than breathing air at 6 m sw depth. METHODS: Five subjects (age: 23± 2 y; BMI: 28± 5 kg/m²) completed two, four-hour dry dives at 6 m sw (1.6 ATA) breathing either 100% O₂ or air. CB chemosensitivity was assessed using hypoxic ventilatory response (CBR) and brief hypercapnic ventilatory response (CBR₅₅₀) tests pre-dive, 5 and 15 min into the dives, immediately post-dive, and 8 m in post-dive. CBR₅₅₀ consisted of
inhaled 100% N₂ for 2-4 hr. In each condition, repeated four times, with 2 min between hypoxic exposures. The mean carbon dioxide (CO₂) concentration was calculated as the average of the linear regression line of the peak minute ventilation (MV) in three consecutive breaths during each hypoxic exposure. The mean CO₂ concentration increased between conditions (p=0.42) between conditions (p=0.24). The change in MV was not different over time (p=0.11) between conditions (p=0.3) CO₂ increased during the dive at 75 (Air: 10±5 vs. O₂: 5±5 mHg) and 15m (Air: 5±5 vs. O₂: 3±5 mHg). The mean CO₂ concentration did not differ between conditions (p=0.14). CB and CB were not different at any time point (p=0.29 and p=0.48, respectively) and were not different between 100% O₂ and air conditions (p=0.14 and p=0.32, respectively). CONCLUSIONS: These data indicate that CB chemosensitivity to hypoxia and hypercapnia is not attenuated during hyperbaric hypoxia. Therefore, the carotid body chemoreceptors do not appear to contribute to CO₂ retention in hyperbaria.

1462 Board #224 May 30 9:30 AM - 11:00 AM
Prolonged Hyperbaric Exposure Alters Gut Mucus, Microbiota Composition And Intestinal Antimicrobial Defense In Mice
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(No relevant relationships reported)

PURPOSE: Divers with prolonged hyperbaric exposure may suffer from digestive dysfunctions, which may lead to impairment of intestinal mucosal immune system and gut microbiota homeostasis. We studied the effects of a 4-day hyperbaric exposure on gut microbiota and intestinal antimicrobial peptides (AMPs) in mice.

METHODS: 20 male C57B16 mice, 8-week old, were randomly divided into hyperbaric exposure group (HE, n=10) and control group (CON, n=10). The hyperbaric environment was established by compressed N₂/O₂ mixed gas, and sustained the ambient pressure at 500kPa for 4 days in the pressure chamber. Intestines were excised and stained with Hematoxylin and Eosin (H&E) and alcian blue-periodic acid-schiff staining (AB-PAS). Feces and intestines were collected and extracted gDNA and RNA respectively. We used Q CR to assay bacterial population (Bacteroides, Clostridia, Lactobacilli, Enterobacteria, and Akkermansia muciniphila) of the feces, and the AMPs (Defa5, Defb1, Reg3β, Reg3g and Reg3y) of small intestine and colon.

RESULTS: During the hyperbaric exposure, the mice did not exhibit any behavioral abnormality, including nitrogen narcosis. According to the AB-PAS staining, the mucus was reduced in colons post hyperbaric exposure. And there was no significant morphological difference between intestines and colons from the mice of HE group and CON group. By comparing with the 16S rDNA genes, results revealed a significant increase in the relative abundances of A. muciniphila (Defa5) and Clostridia (Defb1) in HE. The relative abundance of Lactobacilli was lower (0.06±0.24 in HE. Moreover, a distinct decrease of Enterobacteria (23.34±8.88) was observed in HE compared with CON. Gene expressions for Defa5 and Defb1 in HE were decreased in small intestine, while Defb1 and Reg3g in HE were significantly decreased, and Defa5 and Reg3b increased in colon.

CONCLUSIONS: In summary, the data showed that a four-day hyperbaric exposure induced changes in the mucus of colon, the mRNA level of AMPs, and the gut microbiota composition in mice.

1463 Board #225 May 30 9:30 AM - 11:00 AM
Individual Differences in Effects of Muscular Endurance Training under Hypoxic Condition
Yuta Kojima1, Chiho Fukasuki1, Naokata Ishii2,1. The University of Tokyo, Chiba, Japan. 2The University of Tokyo, Tokyo, Japan.
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(No relevant relationships reported)

Hypoxic condition causes an acute enhancement of dynamic muscular endurance. We hypothesized that muscular endurance training under hypoxic condition increases training volume, thereby results in larger improvement in muscular endurance as compared to training under normoxic condition. We also hypothesized that there would be considerable individual differences in the effects of the training under hypoxic condition, because our previous studies have shown individual differences in the acute effects of hypoxia.

PURPOSE: To investigate the effects of muscular endurance training under hypoxic condition and individual differences in the effects.

METHODS: Fifteen healthy young men were assigned to two groups: one group conducted muscular endurance training under hypoxic condition (30.0% O₂; HOX group, n=7) and the other group conducted the same training without normoxic condition (20.0% O₂; NOX group, n=8). They performed one set of one-hand preacher curl at an intensity of 30%1RM until exhaustion, three times per week for six weeks. The number of repetition until exhaustion was recorded every training and summed up every six sessions (1st and 2nd weeks, 3rd and 4th weeks, and 6th and 7th weeks) to estimate training volume. Before and after the training period, maximal number of repetition (Rmax) was measured under both HOX and NOX conditions.

RESULTS: Rmax under normoxic condition (Rmax_NOX) significantly increased after 6 weeks training in both HOX and NOX groups (p<0.05). Increase ratio of Rmax_NOX (Rmax_NOX after training / Rmax_NOX before training) was calculated as the slope of the linear regression line of the peak minute ventilation (MV) in three consecutive breaths vs. the nadir oxygen saturation (pulse oximetry; SpO₂) or peak end tidal CO₂ tension (capnography; PETCO₂) for CB and CB, respectively. Data are reported as a change from pre-dive (mean±SD).

CONCLUSIONS: These results indicated a large individual difference in the effects of muscular endurance training under hypoxic condition. The difference may be related to the acute effect of hypoxia on the training volume at the late stage of training period.

C-41 Free Communication/Poster - Hypoxia/Altitude Physiology
Thursday, May 30, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

Exercise in acute normobaric hypoxia has been shown to delay parasympathetic reactivation after submaximal but not supramaximal exercise; however, the behavior of parasympathetic withdrawal at the onset of exercise has yet to be fully explored.

PURPOSE: The purpose of this study was to evaluate trends for time-domain and frequency-domain parameters of parasympathetic withdrawal during the onset of high-intensity upper-body exercise during normoxic and normobaric hypoxia.

METHODS: Nine recreationally-active men (21.8±1.3 yr) performed a graded exercise test to determine peak power output under normoxic hypoxia (FiO₂ ~ 14%: 0.1%) and normoxia (FiO₂ = 20.1±0.2%) on different days, and four time to exhaustion randomized over two days at 90% and 110%, and 100% and 120% of peak power output, respectively, under similar conditions. A heart rate monitor recorded R-R intervals at 1000 Hz that were later analyzed using commercially-available software. Root mean square of the standard deviation of R-R intervals (RMSSD) values were calculated using a time-varying method with 6 s moving windows and a 3 s shift. A piecewise linear fitting function was utilized to determine the vagal response to high-intensity steady-state arm cranking. Two-way (condition + intensity) repeated measures ANOVA was used to compare estimates of the initial RMSSD (y-intercept of the first linear function), rate of RMSSD decline (slope of the first linear function), time to parasympathetic withdrawal (s-value at the intersection of the first and second linear functions), RMSSD at the time of parasympathetic withdrawal (s-value at the intersection of the first and second linear functions).

RESULTS: No significant interactions or main effects were noted for initial RMSSD (p>0.05), RMSSD decline (slope of the first linear function), time to parasympathetic withdrawal (s-value at the intersection of the first and second linear functions), and RMSSD at the time of parasympathetic withdrawal (s-value at the intersection of the first and second linear functions). RMSSD at the time of parasympathetic withdrawal (s-value at the intersection of the first and second linear functions).

CONCLUSIONS: Parasympathetic withdrawal does not seem to be affected during upper-body exercise under normobaric hypoxic or normoxic conditions at exercise intensities between 90% and 120% of peak power output in male participants. Funding disclosure: This research did not receive any specific grant from funding agencies in the public, commercial, or non-profit sectors.
Abstract

PURPOSE: The purpose of this study was to investigate the effect of body composition and physical fitness of Air Force pilots on hypoxic tolerance (Time of Useful Consciousness, TUC) under hypoxic hypoxic conditions.

METHODS: At the sea level, we measured the body composition and physical fitness of 20 adult male pilots (age 22.2 ± 3.2 y, 1.15 kg ± 7.1 cm) who were not exposed to hypoxic environment. In the hypoxia chamber, which can simulate high altitudes, we set the altitude to 2800 ft and measured the TUC and the maximum heart rate (HRmax]). Pearson's Correlation was used to determine the relationship between TUC and other variables, and multiple regression was performed to determine the independent variables that best explain the TUC.

RESULTS: TUC is positively correlated with maximum oxygen uptake (VO2max), Stroke Volume (SV), arteriovenous oxygen difference (aV O2) and endurance (Sit-up, Push-up). The maximum heart rate on the ground (HRmax(S)), HRmax(H), body fat mass, and percent body fat were negatively correlated with TUC. A regression analysis showed that 84.5% of the TUC can be explained by body composition and physical fitness.

CONCLUSION: Our results revealed that increased cardiorespiratory fitness and decreased fat could significantly impact TUC. Therefore, for Air Force pilots who are always at high altitudes and at risk for exposure to hypoxia, aerobic exercise is essential.

RESULTS

High altitude missions pose challenges not seen during sea level expeditions. In order for missions to be successful, it is imperative for Soldiers to maintain physical and cognitive performance. Acetazolamide (AZ) is known to decrease the effects of Acute Mountain Sickness (AMS), but reported side effects (e.g., drowsiness, peripheral paraesthesias) could potentially impair manual dexterity. PURPOSE: The purpose of the study is to evaluate whether AZ treatment (250 mg bid) alters manual dexterity during 30 hours exposure to 3,500 m simulated altitude.

METHODS: Six volunteers (4 men, age 22.2 ± 3.2 y, 1.15 kg ± 7.1 cm) took part in two separate 30 hour exposures to 3,800 m simulated altitude in the USARIEM hypobaric chamber. Volunteers received AZ (250 mg twice daily) or a placebo, in a single-blind crossover design. Prior to exposure, volunteers were trained at sea level in all procedures. Dexterity testing included the Purdue Pegboard (sum of rows completed in 30 seconds exposure to 3,500 m).

RESULTS: Both Purdue Pegboard and magazine cartridge loading performance were not different between placebo and AZ trials (Purdue Pegboard: placebo: 38.5 vs. AZ: 36.7; magazine loading: placebo: 12 vs. AZ: 13; 38.5 vs. AZ: 0.04. CONCLUSION: Our results suggest that AZ treatment and potential side effects do not impair manual dexterity during a 30 hour exposure to 3,500 m altitude. Future studies could evaluate whether (500 mg bid) doses of AZ would demonstrate different results. Funded by USAAMRMC; author views not official US Army or DOD policy.

Under normobaric hypoxia, aerobic capacity is inherently limited, possibly leading to changes in energy system contribution. While most of the research has focused on lower body cycling or full-body exercise, upper body differences in muscle fiber type distribution and diffusion distance may require greater anaerobic energy contributions as reflected by accumulated oxygen deficit (AOD). PURPOSE: To observe the effects of normobaric hypoxia on AOD and energy system contribution during different intensities of upper-body arm cranking exercise. METHODS: Twenty-one recreationally active men (21 at 1.4 ± 1.0; 2.5 ± 11 kg) performed a graded exercise test (GXT) in normobaric normoxia (N; Fio2 ~ 20%) and normobaric hypoxia (H; Fio2 ~ 14%) to determine peak power output (PPO). Time to exhaustion (TTE) trials were later conducted at 110% and 120% PPO under both N and H. AOD (% anomax = 100) was calculated in all conditions. Concomitantly, O2 consumption (extrapolated from a regression equation calculated from GXT) and measured O2 consumption during the TTEs, standardized to time. An aerobic energy system contribution (AOD) was calculated as [1 - (actual O2 consumed/predicted O2)] × 100. AOD and %AN were calculated in three conditions: N, H, and using the N regression equation. RESULTS: There was a significant condition × intensity repeated measures ANOVA conducted for AOD and %AN. CONCLUSIONS: There was a significant condition × intensity interaction for %AN (p = 0.09) and AOD (p = 0.07). At 110% PPO, AOD was significantly greater (p = 0.013) in H compared to N (1.6 ± 0.67 vs. 1.9 ± 0.03, respectively), but not H compared to N. At 120% PPO there were no differences in AOD between conditions. Calculating AOD for hypoxic exercise using a regression equation derived from normoxic conditions reveals a greater anaerobic contribution relative to normoxic exercise. The greater AOD and %AN in hypoxia compared to normoxia that was present at 110% PPO was not reproduced at 120% PPO. This may suggest a possible threshold at which hypoxia has no further effect on energy system contribution in this exercise modality.
The Effects of Altitude Training Masks Worn During Low-Intensity Bouts on Performance

Haley N. Yohn, Eric M. Hultin st, Megan A. Morris, Kaitlin L. Barnet, Jacque line Denning, Joshua G. Woolstenhulme. The George Washington University, Washington, DC. (No relevant relationships reported)

Altitude training masks (ATMs) are frequently used during exercise to enhance physiologic adaptations, yet few studies have examined the effects of ATMs when used during recovery periods.

PURPOSE: To examine the effects of ATMs used only during low-intensity recovery intervals in a high-intensity interval training (HIIT) program in healthy young adults.

METHODS: Participants engaged in 18 HIIT over a 6-week period using a treadmill. HIIT sessions comprised of 6-8 second high-intensity bouts at a relative work rate corresponding to 95% of participants’ maximal heart rate, alternating with 0-second low-intensity recovery bouts at a relative work rate corresponding to 20% VO2max. Participants were randomly assigned to an experimental group (EXP) which wore an ATM only during the low-intensity bouts or to a control group (CON) which did not use an ATM. Cardiopulmonary exercise tests (CPET) were performed before and after the HIIT.

RESULTS: 10 participants completed the study in the EXP group (6 males; 26 ± 4 years; BMI: 24.2 ± 1.6 kg/m²) and 10 in the CON group (7 males; 24.3 ± 3.5 years; BMI: 22.8 ± 2.1 kg/m²). Both groups experienced improvements in VO2max (EXP: 39.9 ± 4.6 vs. 42.8 ± 6.0 ml/kg/min, p=0.02; CON: 39.7 ± 6.1 vs. 43.9 ± 8.3 ml/kg/min, p=0.01; baseline vs. follow-up, mean±SD). The EXP group alone saw improvements after training in time to anaerobic threshold (108 ± 13 vs. 113 ± 19L/min, p=0.04). No other changes were observed in the CON group.

CONCLUSIONS: Using ATMs only during the low-intensity bouts of HIIT appears to have afforded participants with unique training adaptations not observed in standard HIIT. Conventional use of ATMs employs the masks during exertional portions of exercise training, not solely during recovery periods. These findings suggest that ATMs may serve as a valuable training adjunct even if used only during recovery periods in HIIT. Supported by: GWU SMHS Emerging Scholars Award 2016 2018

Lipolysis Mechanism By Down-regulating Mir-92a Activating Wnt/β-catenin Signaling Pathway In Hypoxic training Rats

Xuewen Tian1, Peng Song1, Yingli Lu2, Cui Zhang1. Shandong Institute of Sport Science, Jinan, Shandong, China. 2China Institute of Sport Science, Beijing, China. Email: xuewen1981@163.com (No relevant relationships reported)

Lipolysis mechanism by down-regulating mir-92a activating Wnt/β-catenin signaling pathway in hypoxic training rats. Studies showed that the loss of body weight in high altitude or hypoxic training conditions was more significant than that in normoxic training conditions. Wnt/β-catenin signaling is a molecular switch that governs adipogenesis. Some studies showed that hypoxia can induce lipolysis and inhibit fat synthesis and influence Wnt/β-catenin signaling. This study investigates the role of mir-92a via Wnt/β-catenin signaling in lipid metabolism of hypoxic training rats.

METHODS: Microarray and real-time polymerase chain reaction (RT-PCR) were used to detect the mRNA change of mir-92a in the perirenal and epididymis fat of hypoxic training and normoxic training rats. The downstream target mRNA of mir-92a was predicted using bioinformatics and further identified with dual luciferase assay. The Fzd10 and c-myc expression change was detected in the perirenal fat and epididymis fat by using RT-PCR and Western blot.

RESULTS: The microarray and RT-PCR results showed a significantly decreased expression of mir-92a in the fat tissues of hypoxic training rats more than that of normoxic training rats. Result of dual luciferase assay showed that the target gene of mir-92a is Fzd10, which is an acceptor in the Wnt pathway. Fzd10 expression was upregulated in hypoxic training rats. The mRNA expression of the c-myc located at downstream of Wnt pathway increased significantly. The significantly increased mRNA and protein levels of Fzd10 and c-myc may be related to miR-92a downregulation, leading to lipolysis through Wnt/β-catenin signaling pathway regulation and subsequently causing rat’s body weight loss of hypoxic training rats.

Innovative approaches are essential for achieving clinically meaningful improvements in cardiometabolic health in individuals with spinal cord injury (SCI).

PURPOSE: Examine changes in glycemic control and metabolism while at rest and during exercise after 48a ys of resting exposure to AH1 compared with a time-matched normoxic (SHAM) treatment.

METHODS: Participants were a mean aged 34.6 ± 3.1 years chronic (3-18 yr) SCI at C6 T8. Participants reported to the laboratory after an 8 hour fast. After 30 minutes...
of rest, participants performed a graded arm exercise test (GXT) to establish peak O2 consumption. Substrate oxidation rates were derived from cardiorespiratory data averaged over the last minute collected before and during exercise. The subjects consumed 13C-labeled glucose immediately before exercise, and we collected expired gas during exercise to determine 13C-excretion (calculated by 13C/12C).

RESULTS: Running velocity were significantly lower in the HYP (9.4 ± 0.3 km) than in the NOR (10.6 ± 0.3 km) and HYPo (10.6 ± 0.3 km). Exercise-induced blood lactate elevation was significantly augmented in the HYPo than in the NOR and HYP (P < 0.001). The HYPo showed significantly higher CHO oxidation (evaluated by VCO2 and VCHO2) during exercise compared with other two trials (P < 0.01). In contrast, exogenous glucose oxidation (13C-excretion) during exercise was significantly lower in the HYPo than in the NOR (P < 0.01).

CONCLUSIONS: Endurance exercise under moderate hypoxic conditions promoted whole body CHO metabolism and exercise performance. However, exogenous glucose oxidation during exercise was attenuated compared with the same exercise under normoxic condition.

The influence of maximal sprint exercise in hypoxia on muscle glycogen content muscle has not been directly evaluated.

1475 Board #237 May 30 9:30 AM - 11:00 AM Effect of Sprint Exercise in Hypoxia on Muscle Glycogen Utilization Nobukazu Kasa1, Fumiya Tanji2, Ayaka Ishibashi2, Hayato Ohnuma1, Hideyuki Takahashi1, Kazushige Goto1, Yasuhiro Suzuki2. 1Ritsumeikan University, Kusatsu, Japan. 2Japan Institute of Sports Sciences, Kitaku, Japan. (Sponsor: Robert Kraemer, FACSM)

Email: nobunbun100@gmail.com (No relevant relationships reported)

Endurance athletes have been using altitude training for over half a century to improve sea-level performance. Live High-Train Low (LHTL), a contemporary form of altitude training, has been proven best for long-distance (800m) athletes. However, while athletes continue to use this training technique in an acute fashion (<2 weeks), no study has shown the effects of such a short-term use on aerobic performance. PURPOSE: To evaluate aerobic performance parameters, i.e., aerobic capacity (VO2peak) and ventilatory threshold (VT), after 6 days of altitude training in collegiate cross-country runners. METHODS: Fourteen male NCAA cross-country runners (age: 19.07±0.92 y.o.) with initial VO2peak of 3.13 ± 0.5 l/min participated in the study. VO2peak and VT were evaluated using a metabolic cart at sea-level, pre- and post-training. Runners from sea level traveled to high altitude where they lived at 1322m above sea-level for 6 days. Six training sessions were performed at altitudes ranging from 9141 ± 408 ft to 10932 ± 609 ft above sea-level with training sessions averaging a duration of 25.7 ± 6.4 min, speed of 13.02 ± 1.6 km/h and distance of 2.8 ± 0.3 km. RESULTS: There was no significant change in VO2peak (P = 0.15) and LT (P = 0.11). There was a significant main effect for time (P < 0.01, ES = 0.40) and main effect for group (P = 0.03, ES = 0.31). There was no significant difference between the two trials was observed (P > 0.05). There was a significant main-effect for time (P < 0.01, ES = 0.9) for lactate concentration, but no significant difference between the two trials was observed (P > 0.05). There were no differences in metabolism and substrate utilization at rest or exercise across trials.

CONCLUSION: Lower blood lactate concentration and lower peak insulin values observed following AHI suggests an insulin-sensitizing effect of treatment. However, the duration of this benefit requires testing. No differences were reported in metabolism and substrate partitioning in four participants, however this needs to be investigated in a larger population. This case series demonstrates that in these individuals with SCI, AHI exposure was well tolerated and can be administered without adverse events.
RESULTS: The results showed that the high intensity RE decreased peak torque and increased muscle pain in both groups. Circulating creatine kinase (CK), myoglobin and interleukin 6 (IL-6) also increased immediately after RE in normoxia subjects. CK myoglobin and testosterone/cortisol ratio (T/C ratio) of hypoxia-hyperoxia group were lower than those of normoxia group 24 h after RE. However, IL-6 of hypoxia-hyperoxia group was higher than that of normoxia group 24 h after RE. No differences were found in thiobarbituric acid reacting substance (TBARS) levels or peak torque levels between normoxia and hypoxia-hyperoxia groups.

CONCLUSIONS: Systemic hypoxia-hyperoxia preconditioning could reduce muscle damage induced by high intensity RE. These effects may be due to increased anti-inflammatory cytokine secretion.

**1477 Board #239 May 30 9:30 AM - 11:00 AM The Integrative Physiological and Neuromuscular Effects of High Altitude Cycling In World Class Endurance Athletes Craig E. Broeder, FACSM1, Dan Turner, Per Lundstam1, Holden Macrae1 (Exercising Nutritionally, LLC, Naperville, IL; Red-Bull Corporation, Santa Monica, CA). Pepperdine University, Malibu, CA. Email: en.lliccme.com (No relevant relationships reported)

PURPOSE: Six pro endurance athletes (3 men, 3 female) participated in a study investigating the effects of cycling at high altitude on physiological & neuro-muscular systems.

METHODS: Athletes were tested in three locations using identical procedures and equipment. Baseline testing took place in Santa Monica, CA. Then, the entire lab’s equipment was transported to two additional study locations (Death Valley and Mammoth Mountain, CA). Each athlete completed a 5 stage, 3-min/stage ramp exercise trial. Athletes performed the ramp test in duplicate at each test site (morning and afternoon). Respiratory-metabolic measurements, regional oxygen saturation (SMO2), substrate oxidation rates, and EMG activity were recorded continuously. Blood samples were taken the last 15 sec of each stage. Data were analyzed using repeated-measures ANOVA models and Turkey Post-Hoc test to identify specific areas of significance when appropriate.

RESULTS: The mean workload across all 5 stages was 223 6Watts (Stage 1 = 116watts; Stage 5 = 286watts). Compared to sea level, the overall mean SMO2 saturation at the 223 watts mean was 28% lower at altitude (p < 0.04). While deoxyhemoglobin was 18% higher (p <0.04). Correspondingly, lactate concentrations were 27.2% greater, but this difference did not reach significance. However, lactate concentrations during stage 5 were 5% greater at altitude compared to sea level (p <0.03). At sea level, qP d creeze (Quad) muscle activity accounted for 2% of the total force produced while cycling at altitude qP d work was reduced to 5%. Lactate concentrations had an inverse relationship with EMG Quad activity (p = 0.03) and direct relationship with hamstring force activation (p = 0.03). RER values indicated greater CHO oxidation rates at altitude across all stages combined (Sea Level: 2.123 g/min; Altitude: 2.954 g/min, p = 0.01). For stages 4 & 5, despite greater respiratory rates, over-all ventilation volumes declined cycling at altitude lowering oxygen uptake by 10.2% and 19% respectively despite being at the same workload compared to sea level.

CONCLUSIONS: These results indicate cycling at altitude requires greater physiological-metabolic response to maintain neuro-muscular function cycling at work rates up to 80% of max effort.

**1478 Board #240 May 30 9:30 AM - 11:00 AM Effect of Acetazolamide on Hand and Finger Strength During 30 Hours Exposure to 3500m Altitude Beau R. Yurkevicius, Adam C. Nixon, Karleigh E. Bradbury, Katherine M. Mitchell, Billie K. Alba, Kirsten E. Coffman, Robert W. Kenefick, FACSM, Nisha Charkoudian, FACSM. USARIEM, Natick, MA. (Sponsor: Nisha Charkoudian, FACSM) (No relevant relationships reported)

Activities that require rapid ascent to altitude, such as those that commonly occur in military, mountain rescue, and recreational settings, often require substantial hand and finger strength in order to complete tasks. Many who deploy quickly to altitude experience symptoms of acute mountain sickness (AMS), which have been shown to be decreased by acetazolamide (AZ). Although AZ may cause peripheral paresthesia, potential influences on hand and finger strength are currently unclear.PURPOSE: The purpose of this study was to test the hypothesis that AZ treatment during an acute, 30-hour exposure to 3500 m simulated altitude would decrease hand and finger strength relative to placebo treatment.

METHODS: Six male volunteers (22.2 ± 1.3 yr, 71.9 kg, 181 ± 3 cm) participated in separate 30-hour altitude exposures (380 m, 20°C, 20%RH) in the USARIEM hypobaric chamber. Participants were given either a placebo or 200 mg AZ twice a day for 3.5a days (2 sea-level days + the 30 hour altitude exposure) in a randomized, single-blind crossover design. During each altitude exposure, strength tests were performed which comprised of maximal hand grip and finger pinch (palmar, key, tip) strength tests.

RESULTS: No volunteers reported sensations of peripheral paresthesia. There was no difference between altitude exposures in any of the measures of hand and finger strength (placebo vs. AZ; hand grip: 3.9 ± 0.5 vs. 3.8 ± 0.4; palmar pinch: 11 ± 2 vs. 12 ± 2 kg; key pinch: 11 ± 1 vs. 11 ± 1 kg; tip pinch: 8 ± 1 vs. 8 ± 1 kg; p >0.05 for all). CONCLUSIONS: Our results suggest that 100 mg/day AZ treatment does not influence hand and finger strength during a 30 hour exposure to 3500 m altitude. Future studies could evaluate if higher doses of AZ, that may induce more paresthesia, would influence hand and finger strength differently.

Funded by USAMRMC; author views not official US Army or DOD policy.

**1479 Board #241 May 30 9:30 AM - 11:00 AM The Effect Of Moderate Hypoxia On Skeletal Muscle Cell Growth And Related Protein Expression Koki SAKUSHIMA1, Maki YOSHIKAWA1, Takeshi HASHIMOTO, FACSM,1 Ritsumeikan University, Kyoto, Japan.2 Ritsumeikan University, Siga, Japan. (Sponsor: Takeshi Hashimoto, FACSM)

Email: saku0082@gmail.com (No relevant relationships reported)

PURPOSE: Skeletal muscle atrophy is one of the adaptions of hypoxic environment. However, previous study showed resistance training under hypoxic environment (10% oxygen concentration) causes greater muscle hypertrophy than normoxic environment (Nishimura et al., 2010). Because direct effect of hypoxia on skeletal muscle cell growth remains unknown, in vitro studies to investigate cell responses to hypoxia are needed. Although some studies reported that severe hypoxia (i.e., 1% to 5% oxygen concentration) attenuated cell growth (Marie Csete et al., 2001; Gustafsson et al., 2003), we hypothesized that moderate hypoxia (e.g., 10% oxygen concentration) might ameliorate muscle cell growth. The purpose of this study was to examine the effect of 10% oxygen environment on skeletal muscle cell growth and related protein expressions.

METHODS: C2C12 skeletal muscle cells were divided into two groups: control group cultured in 20% oxygen environment (CON) while hypoxia group cultured in 10% oxygen environment (HYP) during differentiation. We analyzed expressions of myogenesis-related proteins Myogenin, using Western blotting. As well, we analyzed mTOR signaling. We also conducted immunocytochemical analyses to assess myotube diameter and Differentiation Index (DI), an indicator of muscle differentiation (Oishi et al., 2013). The lactate concentration in the medium was measured every day.

RESULTS: The myotube diameter in the HYP was significantly greater than that in the CON (p < 0.05). The DI was significantly higher in the HYP than in the CON (p <0.05). The protein expression of myogenin was significantly higher in the HYP than in the CON (p <0.05). The expression level of phosphorylated mTOR was significantly higher in the HYP than in the CON (p < 0.05). The lactate concentration was higher in the HYP than in the CON (p <0.05). Myotube atrophy was observed 84a days after the differentiation in the CON, while moderate hypoxia maintained myotube thickness.

CONCLUSIONS: The findings suggest that 10% hypoxic environment may promote skeletal muscle cell growth and hypertrophy. Supported by Grant-in-Aid for Scientific Research from the Japanese Ministry of Education, Culture, Sports, Science, and Technology (Grants 2102991K 1B).

**1480 Board #242 May 30 9:30 AM - 11:00 AM Effects of Chronic Continuous Exposure to Low Dose Carbon Monoxide on Hemoglobin Mass and Performance Walter FJ Schmidt1, Torben Hoffmeister1, Sandra Haupt1, Nadine Wachsmuth1, Dirk Schwenke2, William C. Byrnes, FACSM1.1 University of Bayreuth, Bayreuth, Germany. 2University of Dresden, Dresden, Germany. 3University of Colorado at Boulder, Boulder, CO.

Reported Relationships: W.F. Schmidt: Receipt of Intellectual Property Rights/Patent Holder: Walter Schmidt is a managing partner of the company 'Bleed tech GmbH', but he is unaware of any direct or indirect conflict of interest with the contents of this abstract.

Inhalation of carbon monoxide (CO) blocks the oxygen binding sites of the hemoglobin molecule and may produce similar effects as exposure to altitude. While single CO-doses and short-term application which are used in medicine and science do not exert measurable effects on erythropoiesis and performance, no data exists about chronic administration.

PURPOSE: To determine the effect of chronic low dose CO-application on hemoglobin mass and performance. METHODS: For three weeks, eleven male healthy and moderately trained subjects inhaled a CO-bolus five times the day to increase their HbCO concentration in blood by approx. %.

Eleven matched subjects...
Acute Effects Of Electrical Stimulation In Hypoxia On Arterial Stiffness

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Purpose: This study aimed to examine acute effects of electrical stimulation in hypoxia on arterial stiffness.

Methods: Seven healthy male adults (21 ± 1) participated in experiments of four different protocols (i.e., rest in normoxia (NR), rest in hypoxia (HR), electrical stimulation in normoxia (NES), and electrical stimulation in hypoxia (HES)). The LLS is the standard for diagnosing AMS. RESULTS: Significant relationships were observed between AP and Pmax, and VO2max tended higher in HES than that in the other three trials. CONCLUSION: These findings suggest that electrical stimulation in hypoxia can induce greater reduction in arterial stiffness than those in normoxia.

1482 Board #244 May 30 9:30 AM - 11:00 AM
Comparing Physiological Responses to Single and Double Leg Submaximal Cycling in Normoxia and Hypoxia
Shane N. Draper, Tyler Singer, Cody Dulaney, Sarah Kearney, John Mcdaniel. 1Utah Valley University, Orem, UT. 2Kent State University, Kent, OH. Email: ShaneD@uvu.edu

Introduction: It has been well established that exercise intensity as well as exercise performance declines at altitude. However, it has yet to be determined how femoral blood flow and muscle oxygenation kinetics (total tissue saturation, oxy- and deoxygenated hemoglobin, as well as total hemoglobin) are influenced by altitude during submaximal and maximal performances. Furthermore, it has yet to be determined if the utilization of small muscle mass exercise, which allows for greater blood flow to the active muscle, will allow an individual to generate the same muscle oxygenation kinetics in hypoxic conditions that is achieved during larger muscle mass activities in normoxia. Purpose: Thus, the purpose of this study was to determine if tissue oxygenation was compromised at altitude during submaximal bouts of exercise and whether reducing the active muscle mass exercise could be used to offset any observed decrement due to increases in blood flow.

Abstracts were prepared by the authors and printed as submitted.
CONCLUSIONS: The results suggest that elevated hemoglobin saturation and femoral blood flow during the single leg condition in hypoxia is similar to that observed during double leg cycling in normoxia and may prove to be a viable training modality that would offset the main disadvantage of living at altitude by enabling an individual to exercise at the same level of intensity achieved at normoxia.

CONCLUSIONS: The amount of blood flow during the single leg trial in hypoxia was significantly higher compared to blood flow during double leg cycling in hypoxia (p = 0.02). There was no significant difference between the single leg trial in hypoxia and the double leg trial in normoxia (p = 0.36) nor between the two double leg trials in normoxia and hypoxia (p = 0.87). No difference was found in the amount of oxygenated hemoglobin when comparing the single leg trial in hypoxia to the double leg trials in normoxia (p = 0.36) and hypoxia (p = 0.13).

Hormonal contraception is routinely used by premenopausal women, including female astronauts, to suppress ovarian function and menstrual cycling. Combined oral contraceptive pill (COC, ethinyl estradiol and progestin) use leads to a suppression of bone turnover and reduced bone mineral density (BMD) gain with long-term exercise. Long-acting, reversible contraceptives (LARC, progestin-only) provide many practical advantages over COC. With increasing numbers of women in the U.S. astronaut corps, we risk sending female crew members into microgravity without a clear understanding of the impact of LARC use on bone health.

Purpose: We hypothesize that LARC use will blunt decreases in BMD associated with hindlimb unloading (HU).

Methods: Virgin female Sprague-Dawley rats (n=26, 4-month-old) were singly housed and randomly assigned to placebo and LARC groups, via a slow-release etonogestrel pellet (0.008g/d versus 0.30ug/d) implanted under the skin. Animals were further randomized into ambulatory and HU subgroups (n=5 subgroup), with HU initiated a week following pellet insertion and lasting for 4 weeks. Pre/post HU, proximal tibia metaphysis (PTM) were scanned in vivo with peripheral quantitative computed tomography (pQCT). Univariate and repeated measures 2-way ANOVA were used.

Results: There was a time x cohort group interaction (p<0.01) for body weight and food consumption. HU animals weighed less over the last 4 weeks of the study, but consumed more food over 6 weeks of HU vs. ambulatory animals. Soleus wet weights were significantly lower in HU compared to ambulatory animals (p<0.001). There was a main effect of time for p=0.001 PTM total, cancellous, and cortical volumetric BMD and total and cortical areas. For marrow area at the PTM there was a time x loading group interaction (p=0.04) such that over time the HU animals had a decrease in marrow area compared to the ambulatory animals. No impact of LARC on these outcomes was detected.

Conclusions: Early results indicate that LARC use does not alter the PTM bone response to mechanical unloading of simulated microgravity assessed by in vivo pQCT. This work is supported by the Translational Research Institute for Space Health through Cooperative Agreement NNX16A069A.

C-42 Free Communication/Poster - Microgravity/Space Physiology

Board #247 May 30 9:30 AM - 11:00 AM
Impact Of Long-acting Reversible Contraceptives On Bone Density During Simulated Microgravity

Heather C.M. Allaway, Sarah E. Little, Harry A. Hogan, Susan A. Bloomfield, FACSM. Texas A&M University, College Station, TX.

(No relevant relationships reported)

Board #248 May 30 9:30 AM - 11:00 AM
Circulating MicroRNA Expression and Serum Biomarker Changes After 30 Days of Head-Down Bed Rest

Samuel R. Buchanan1, Carl Ade2, Breanne Baker2, Debra Bemben, FACSM1. The University of Oklahoma, Norman, OK. 1Kansas State University, Manhattan, KS. (Sponsor: Debra Bemben, FACSM)

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(No relevant relationships reported)

Microgravity is known to have negative effects on bone health. Circulating microRNAs (c-miRNA) are non-coding RNA molecules assessed in blood that have potential as biomarkers of osteoporosis and may be beneficial for tracking changes in bone status. PURPOSE: To examine selected c-miRNAs and serum markers of inflammation and bone turnover responses to a 30 day six-degree head-down bed rest protocol at an ambient 0.5% CO2. METHODS: 11 adults (6 males, 5 females), 25-50 years, participated in the study at the Institute for Aerospace Medicine in Germany. Participants had fasted blood draws collected 3 days before, and on the final day of bed rest. Serum samples were assayed for relative expression of miR-21-3p, -100-5p, -128-3p, -126-3p using qPCR. Bone markers (Bone ALP, P1NP, TRAP 5b, sclerostin), inflammation markers (TNFα, IL-6), and vitamin D were measured using ELISA.

RESULTS: Only miR-21-3p increased relative expression pre to post (p<0.02). TNFα and calcium increased, and all bone marker concentrations increased pre to post, except Bone ALP. Baseline relative expression of miR-21-3p was correlated with pre calcium (r=0.3 p<0.01), miR-100-5p w ith iPTH (r=0.87 p=0.04), pre IL-6 r=0.6 (p=0.03), and vitamin D (r=0.6 p<0.01). Log2 fold changes in miR-128-3p and absolute change in TRAP 5b were negatively correlated (r=-0.8 p<0.01), and Log2 fold changes in miRNA-21 and vitamin D were negatively correlated (r=-0.6 p=0.01). CONCLUSION: 30 days of 6 degree head-down bed rest significantly increased bone turnover as evidenced by increases in both P1NP and TRAP5b. Baseline c-miRNAs significantly correlated with multiple measures of bone

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

Board #248 May 30 9:30 AM - 11:00 AM
Can Acute Galactic Cosmic Radiation-induced Bone Loss Be Mitigated By Dietary Modulation Of Inflammatory Cytokines?

Sarah E. Little1, Heather CM Allaway1, Rihanna S. Bokhari1, Derek V. Seidel1, Kimberly L. Wahl1, Nancy D. Turner1, John R. Ford1, Larry Suva1, Susan A. Bloomfield, FACSM1. Texas A&M University, College Station, TX. 2Michigan State University, College Station, TX.

Email: selittle@tamu.edu

(No relevant relationships reported)

The space environment includes weightlessness and galactic cosmic radiation (GCR), both of which can have a negative impact on bone parameters. In particular, acute exposures to space-relevant doses (2 Gy or less) of simulated GCR lead to a rapid acceleration of bone resorption activity and suppression of bone-forming osteoblasts, resulting in diminished bone mineral density (BMD), strength and altered microarchitecture. A key mechanism driving these changes may be a radiation-induced increase in pro-inflammatory cytokines, such as TNF-α. Consuming a diet rich in omega-3 fatty acids has been associated with attenuated reductions in bone parameters in astronauts, mice and elderly humans with corresponding reductions in circulating inflammatory cytokines.

PURPOSE: To test the hypothesis that a diet high in omega-3 fatty acids will mitigate radiation-induced bone loss and reduce inflammatory cytokines in bone osteocytes and serum.

METHODS: Adult (30- to 60-week-old) female Lgr5-EGFP C57BL/6 mice (n=4-6 per group) were acclimated to a corn oil/cellulose (COC) or fish oil/pectin (FOP) diet for 3 weeks. Animals were subsex nty randomized to total body low dose high-energy radiation (0.1, 0.25, 0.5 Gy of 1000 MeV/n 14N at 25°/min at Brookhaven National Lab) or non-irradiated control (sham) and euthanized 4 weeks later.

MicroCT (ScanCo, Switzerland) analyses were performed to assess bone geometry and microarchitectural changes at the mid-shaft and distal end of the femur. Significance was assessed using an α of 0.10.

RESULTS: There was a significant main effect of diet on mid-shaft femur periosteal diameter (P<0.001) and endocortical diameter (Endo. Dm.) (P<0.001). The FOP diet led to larger Peri.Dm. (P<0.01 f or all) and Endo.Dm. (P<0.01 f or all) than did the COC diet at all doses. We could not detect an impact of 14N on cortical area or cancellous bone volume at the distal femur. Irradiation with 0.25 nd 0.5 Gy in the FOP mice showed significant increases in distal femur volumetric BMD (P<0.014, P<0.05) and trabecular thickness (P<0.05p=0.028), as compared with sham FOP mice.

CONCLUSIONS: Though we did not detect a significant impact of radiation on bone parameters, these early data analyses suggest some modest benefits from a diet high in omega-3 fatty acids on cortical and cancellous bone parameters.
Microgravity is known to have detrimental effects on muscle tissue, leading to atrophy and a decline in performance. Although underlying mechanisms are not clear, microRNAs (miRNA) may play a role as they have regulatory effects on skeletal muscle gene expression. PURPOSE: To determine the effects of a 30-day six-degree-head-down bed rest protocol at an ambient 0.5% CO2 on lower body muscular performance. Relationships between circulating miRNAs and changes in muscle variables were also examined. METHODS: 11 healthy subjects, 5 males and 6 females, were recruited for this study. The intervention involved a 30-day, six-degree-head-down bed rest platform to simulate International Space Station flight. Peak knee extension and flexion force declined immediately in-flight from pre-flight values. Knee extension decreased by 35.25%, 23.52% and 35.71% while flexion decreased by 25.55%, 27.59% , and 30.76% at 90, 60 and 45 degrees, respectively. Conclusions: Relationships between circulating miRNAs and changes in muscle variables were also examined.

Table 1. Serum Biomarkers Pre and Post Bed Rest (mean ± SD).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre</th>
<th>Post</th>
<th>Log2 Fold Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>miR-21-5p</td>
<td>0.3±0.9</td>
<td>0.5±1.1</td>
<td>0.3 ± 0.5</td>
</tr>
<tr>
<td>miR-100-5p</td>
<td>3.3±0.6</td>
<td>3.5±0.1</td>
<td>0.8 ± 0.5</td>
</tr>
<tr>
<td>miR-126-3p</td>
<td>2.5±0.6</td>
<td>3.2±0.7</td>
<td>0.9 ± 0.3</td>
</tr>
<tr>
<td>Sclerostin</td>
<td>0.3±0.4</td>
<td>0.5±0.5</td>
<td>0.6 ± 0.7</td>
</tr>
<tr>
<td>TRAP5b</td>
<td>3.2±0.1</td>
<td>3.5±0.4</td>
<td>0.5 ± 0.6</td>
</tr>
<tr>
<td>PINP</td>
<td>3.4±0.4</td>
<td>3.6±0.1</td>
<td>0.6 ± 0.7</td>
</tr>
<tr>
<td>Bone ALP</td>
<td>3.2±0.4</td>
<td>3.4±0.1</td>
<td>0.7 ± 0.6</td>
</tr>
<tr>
<td>TNFα</td>
<td>3.6±0.3</td>
<td>3.8±0.1</td>
<td>0.7 ± 0.5</td>
</tr>
<tr>
<td>IL-6</td>
<td>3.7±0.3</td>
<td>4.1±0.1</td>
<td>0.7 ± 0.5</td>
</tr>
<tr>
<td>Calcium</td>
<td>3.2±0.4</td>
<td>3.4±0.1</td>
<td>0.6 ± 0.7</td>
</tr>
<tr>
<td>Osteocalcin</td>
<td>3.4±0.3</td>
<td>3.5±0.1</td>
<td>0.6 ± 0.7</td>
</tr>
</tbody>
</table>

Results suggest that space flight may have an immediate effect on peak and fatiguing muscle performance, with significant changes observed in both peak and throughout normalized EMG amplitudes. Conclusions: Relationships between circulating miRNAs and changes in muscle variables were also examined. Further investigation is warranted to explore the potential mechanistic roles in muscle performance declines after bed rest.

Preliminary data from this study also suggest that space flight results in an immediate decline of peak torque performance significantly declined after 30 days of bed rest. Significant relationships were found between miRNAs and muscle variables at baseline (miR-100-5p) and mRNA fold changes (miR-100-5p, -126-3p) were correlated with absolute changes in muscle strength and power. These miRNAs require further investigation to explore their possible mechanistic roles in muscle performance declines after bed rest.

Purposes: The present study was designed to investigate the effect of a 60-days, -6° head-down bed rest (HDBR) on both arterial and venous cerebral blood flows. METHODS: Twenty male healthy volunteers were evaluated. Blood flow in right side of the neck arteries (internal carotid artery; ICA and vertebral artery; VA) and veins (internal jugular vein; IJV and vertebral vein; VV) were measured by using ultrasonography on the day before HDBR (baseline); 30th day and 57th day of HDBR. RESULTS: Cerebral blood flow decreased at 30th day of the HDBR compared with baseline (P = 0.002), and returned to baseline at 5th day of HDBR. On the other hand, VA blood flow was unchanged throughout and the HDBR (P = 0.402). At the venous side, IJV blood flow decreased at both 30th and 5th day of the HDBR (P = 0.002 and 0.005, respectively), in contrast, VV blood flow increased at 30th day (P = 0.004) and was unchanged at 6th day compared with baseline. Conclusions: These findings suggest that the long-term HDBR decreased arterial and venous blood flows, while posterior cerebral arterial and venous blood flows were well maintained. The heterogeneous blood flow response of the cerebral arteries may be associated with cerebral venous outflow but its physiological mechanism remains unclear.

**Purpose** To examine the effects of space flight on knee extensors and flexors over six month flight missions. Methods Four crewmembers were tested on board the International Space Station (ISS) after 83 (SD 3.0), 49.1 (SD 10.1) and 131.5 (SD 27.7) days in-flight, as well as pre- and post-flight, using the Muscle Atrophy Research and Exercise System (MARES). Voluntary isometric torque during maximal knee extension and flexion was obtained at starting positions of 90, 60 and 45 degrees of flexion. Surface EMG was simultaneously measured for the biceps femoris, semitendinosus, vastus lateralis and rectus femoris. Root mean square (RMS) EMG within a 60 m window centered on the time of peak torque was identified, and ratios of EMG to peak torque (EMG/T) were calculated for each isometric contraction. Results Peak knee extension and flexion force declined immediately in-flight from pre-flight values. Knee extension decreased by 35.25%, 23.52% and 35.71% while flexion decreased by 25.55%, 27.59% and 30.76% at 90, 60 and 45 degrees, respectively. Peak torque during knee extension progressively increased during flight such that the differences between pre-flight values and those of the third in-flight testing session were reduced to deficits of 25.66%, 11.37% and 0% for 90, 60 and 45 degrees, respectively. Knee flexion declined slightly at both 90 and 60 degrees (30.84% and 28.18%) however improved slightly at 45 degrees (25.39%) for in-flight 2 with a reciprocal change at in-flight 3 to 23.68%, 22.97% and 34.2% at 90, 60 and 45 degrees, respectively. By the second in-flight test, EMG/T ratios reflected a changing relationship between neuromuscular activation and torque production, with greater relative activation required to produce similar levels of torque when compared to pre-flight values.

Conclusions: Results suggest that space flight results in an immediate decline of peak torque production for both knee extension and flexion. Current in-flight countermeasures appear to trend towards functional restoration of knee extension while knee flexion remained relatively unchanged.
During head out water immersion (HOWI), the hypercapnic ventilatory response (HCVR) is augmented and cerebrovascular reactivity to CO\(_2\) during Waist Water Immersion with Acute Hypercapnia and Head Out Water Immersion

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(No relevant relationships reported)

**PURPOSE:** We tested the hypotheses that the HCVR is augmented and CVR is attenuated during WWI + CO\(_2\) and HOWI. METHODS: Twelve subjects (age: 24 ± 3 yrs, BMI 25 ± 3 kg/m\(^2\), 10 men, 0 women) completed one hour of thermoneutral (38°C) WWI + CO\(_2\) and HOWI. The partial pressure of end tidal CO\(_2\) (PETCO\(_2\); capnograph), minute ventilation (MV; pneumotachometer), and middle cerebral artery blood velocity (MCVA; transcranial doppler) were recorded. CO\(_2\) was added to the inspirate during WWI + CO\(_2\) to match the increase in PETCO\(_2\) during HOWI. Subsequently rebreathe 7% CO\(_2\) and 95% O\(_2\) from a 10 L bag for 3.5 min at baseline, 10 min, 30 min, and 60 min in water immersion. The HCVR and CVR were calculated as the slope of the linear regression line of MV vs. PETCO\(_2\) and MCVA vs. PETCO\(_2\) every 30 s throughout the test. Data are reported as a change from baseline (mean±SD).

**RESULTS:** PETCO\(_2\) increased from baseline during WWI + CO\(_2\) and HOWI at every time point (p<0.01) and was matched between conditions (p=0.26). MV increased from baseline during WWI + CO\(_2\) and HOWI at every time point and then decreased during HOWI at any time point (p<0.03). MCVA increased from baseline during WWI + CO\(_2\) at every time point and then reduced during HOWI at 10 min and 30 min (all p<0.01). The HCVR did not change from baseline during WWI + CO\(_2\) at any time point and then decreased during HOWI at any time point (p<0.03). MCVA increased from baseline during WWI + CO\(_2\) at any time point and then reduced during HOWI at 10 min and 30 min (all p<0.01). The HCVR did not change from baseline during WWI + CO\(_2\) at any time point (all p≥0.38) but increased from baseline during HOWI at any time point (p<0.01). The HCVR was lower during WWI + CO\(_2\) vs. HOWI at 10 min, 30 min, and 60 min (p<0.01). CVR decreased from baseline during WWI + CO\(_2\) and HOWI at every time point (p<0.01) but was not different between conditions at any time point (p>0.16).

**CONCLUSIONS:** The elevated HCVR during HOWI is likely caused by water pressure exerted on the chest wall. However, reductions in CVR during HOWI are likely caused by central hypervolemia and/or hypercapnia.
Purpose: Extreme conditioning programs (ECPs) are characterized by utilizing a high volume of training and using a variety of high intensity exercises. The purpose of the present study was to monitor the time-course response of cytokines (IL-10 and IL-1β), immune variables (Creactive protein -CRP and immunoglobulin A-IgA), hormonal milieu (cortisol-C, total testosterone-TT, free testosterone-FT and testosterone/cortisol-T/C ratios), creatine kinase-CK, muscle performance (jump height) and perceived well-being (WB) following an ECP competition. The initial hypothesis is that an extreme conditioning competition increases inflammatory response as well as metabolic stress, impairing the hormonal milieu, and decreasing muscle performance.

Methods: Nine amateur male athletes (age 23.7 ± 4.8 yrs; training experience 2.2 ± 1.3 years) completed five workouts over three consecutive days of EC-competition. All variables were measured before, 2h, 6h and 21h following the last day of competition. Results: The EC-competition induced a decrease in IL10:IL1β ratio approximately 50% after 6h, then increased 2.5 times 21h after exercise completion. Delta IL10:IL1β ratio remained unchanged during the post-competition period. IgA displayed a significant increase 2h and 21h after EC-competition. The WB status score was higher 72h after the ECP as compared with pre-competition. Conclusion: The present findings suggest that ECP induces transient changes in some inflammatory and hormonal biomarkers, and perceived well-being seems to be efficient to detect changes in muscle performance. These data may be useful to coaches for monitoring fatigue and prescribing training (lower intensity sessions and/ or resting days) in days following an EC-competition. Furthermore, psychometric measurement tools seem to be an effective and easy method for assessing fatigue in participants after the competition.

CONCLUSIONS: Our findings indicate that RE can induce temporally SPARC secretion in human. Thus, the purpose of this study was to investigate the both effects of exercise intensity and duration of rest interval between exercise sets during RE might enhance SPARC production.
CONCLUSIONS: These findings demonstrate that maximal aerobic exercise differentially mediates the intrinsic apoptotic pathway and autophagic activity in human PBMCs isolated from obese compared to normal-weight individuals, suggesting the importance of autophagy as a critical molecular process in promoting cell survival against exercise-induced apoptosis.

PURPOSE: Chronic inflammation and metabolic dysregulation may eventually cause tissue damage in type 2 diabetes. We examined the protective effects of moderate intensity aerobic exercise on kidney function in diabetic db/db mice.

METHODS: Functional and morphological alterations and metabolic and inflammatory signaling were examined in type 2 diabetic db/db mice with or without exercise training (5 min/ day, 1 day/week, and 6 x/ week for a total of 40 x/ weeks).

RESULTS: Exercise training prevented weight gain (-20%) in db/db Ex mice, but it did not reduce glucose and insulin levels. Exercise lowered serum creatinine, urea, and triglyceride levels in db/db Ex mice. Reduced kidney size (0.37 x more, P = 0.038) and morphological alterations including decreased glomerular cross-sectional area (0.035 vs 0.038, P = 0.001) were observed in db/db Ex mice compared with untrained db/db mice. Mechanistically, preventing loss of SIRT1 (a protective factor, P = 0.04) through exercise was linked to reduced acetylation of NF-κB (P = 0.02) in kidney of db/db Ex mice. Exercise increased citrate synthase (+132%, P = 0.038) and mitochondrial complex 1 activity (+48%, P = 0.008), subunits of mitochondrial complexes (I, II, and V) and PGC1α (-128%, P = 0.039) at protein level in kidney of db/db Ex mice compared with non-exercise db/db mice.

CONCLUSIONS: Moderate exercise training modulates metabolic dysfunction and inflammatory process, thereby attenuating the progression of diabetic nephropathy in type 2 diabetes mellitus.

PURPOSE: We tested the hypothesis that static cerebral autoregulation during a central hypervolemic challenge is not altered in symptomatic concussed athletes.

METHODS: Seven CA (age: 19 ± 2 years, 6 females) and ten HC (age: 21 ± 2 years, 6 females) completed one study visit. After 5 min of resting baseline, 20 min of lower body positive pressure (LBPP) was applied for 5 min in using an upright chamber. Beat to beat blood pressure (photoplethysmography) and middle cerebral artery blood velocity (MCAv; transcranial Doppler) were recorded continuously. Static cerebral autoregulation was calculated using Fourier transfer function analysis with 3 min segments at baseline and after mean arterial pressure (MAP) stabilized during LBPP. Cerebral vascular resistance (CVR) was calculated as MAP/MCAv. Pulsatility index (PI) was calculated as the difference of peak systolic MCAv and end diastolic MCAv, divided by mean MCAv. Values are reported as a change from baseline. RESULTS: MAP (CA: 8 ± 3 mmHg; P = 0.32, MCAv (CA: 19 ± 6 mmHg; P = 0.001) and CVR (CA: 1.7 ± 0.6 vs HC: 1.5 ± 0.3 mmHg/cm/s; P = 0.21), and PI (CA: 0.9 ± 0.1 vs HC: 0.9 ± 0.2; P = 0.31) were not different at baseline. The change in MAP was not different between CA (12±6 mmHg) and HC (8 ± 3 mmHg; P = 0.12). The change in MCAv was greater in CA (CA: 4.8±4.6 vs HC: 4.3±3.7 cm/s; P = 0.031). There were no differences in the change from baseline for gain (CA: 0.1±0.2 vs HC: 0.1±0.5 m/s/mmHg; P = 0.8) or coherence (CA: -0.0±0.1 vs HC: -0.0±0.1; P = 0.40). The increase in CVR was attenuated in CA (CA: 0.0±0.2 vs HC: 0.3±0.3 mmHg/cm/s; P = 0.04). The decrease in PI was greater in CA (CA: -0.0±0.1 vs HC: 0.0±0.2 mmHg/cm/s; P = 0.02).

CONCLUSION: These data indicate that indices of static cerebral autoregulation are not different between CA and HC during an acute increase in MAP. The blunted increase in CVR and greater decrease in PI appears to be for a rise in MCAv during an acute increase in MAP in CA.

PURPOSE: This study assessed associations between self-reported concussion history and measures of perception-action coupling, as well as changes in reactive responses after upper extremity training that imposed both cognitive and visuomotor demands.

METHODS: A cohort of 22 elite athletes representing 10 Olympic sports (14 males & 8 females, 28 ± 3 y) performed pre- and post-training tests of upper extremity choice reaction time (RT) and whole-body reactive agility. The choice RT test used 10 congruent and 10 incongruent Eriksen flanker 5-arrow displays to designate correct left versus right manual responses for deactivation of illuminated buttons. Whole-body tests required lateral movement responses to 20 left or right visual targets and diagonal movement responses to 12 visual targets presented in right/left and forward/backward combinations. One-minute cognitive-visuomotor training sessions were completed 2-3 times per week over 4 weeks, which involved simultaneous manual responses (button deactivations) and verbal responses (center arrow direction for 20 arrow displays).

RESULTS: At least 6 raining sessions were completed by each athlete (7 ± 0). Concussion history was reported by 5 (12/22, 24 ± 4 years) athletes, of which 3 ≥ 16 years, which was strongly associated with asymmetries in both lateral and diagonal/backward reactive agility measures of RT, speed, acceleration, and deceleration (AUC= 0.808). The average of the 8 asymmetry values ≥18 discriminated with 99% PPV, 69% NPV, and OR=18.0 (90% CI Lower Limit: 2.4; ≥ Exact 1-Sided P=0.01). Upper extremity choice RT incongruent-congruent difference ≥80 ms classified concussion history status with PPV=69%, NPV=67%, and OR=4.5 (90% CI Lower Limit: 1.9; ≥ Exact 1-Sided P=0.11). Among the athletes with concussion history, 7 of 8 reactive agility asymmetries were reduced after training. Standardized response means for reactive agility asymmetry reduction ranged from 0.13 to 0.84 average choice RT incongruent-congruent difference improved from 103 ± 51 ms to 54 ± 79 ms (SMB=-5).

CONCLUSIONS: Asymmetry in reactive responses may be a manifestation of dysfunctional interhemispheric brain connectivity. Our findings suggest that cognitive-visuomotor training with the upper extremities can reduce whole-body movement asymmetries.
Prior concussion history is posited to influence many outcomes. Understanding how concussion history affects quality of life may identify student-athletes needing intervention and those predisposed to other conditions. PURPOSE: To examine how prior concussion history influences college athletes’ pre-season baseline health-related quality of life (HRQoL). METHODS: Student-athletes (n = 19) from six Canadian and US college institutions and 24 college sports, completed a comprehensive concussion baseline assessment including an HRQoL evaluation (PROMIS-29 Neuro-QOL Fatigue, and Neuro-QOL Cognition Scales). The primary predictor was concussion history and covariates included age, sex, BMI, and contact sport participation. Primary outcomes were Anxiety, Physical Function, Depression, Sleep Disturbance, Social Role/Activities, Pain Intensity, Pain Cognition, and Neuro-related Fatigue raw scores. Linear regression models clustered on study site using generalized estimating equations examined the association between concussion history and HRQoL outcomes. RESULTS: Analysis was limited to 16 (9%) participants with complete outcome and covariate data (356 males (33%); median age = 19 ± 1.0 years (range: 18-27); 5 (30%) with 1+ prior concussions; 11 (68%) played a contact sport). Concussion history, adjusted for age, sex, BMI, and contact sport participation, was associated with greater anxiety, sleep disturbance, depressive feelings, fatigue, and worse cognition function. However, these differences were mostly minor. Clinically meaningful mean differences (MD) suggest those with multiple concussions report worse cognitive function (MD=−1.2, 95% CI: −2.4 to 0.1 for 3+ vs 0 concussions; MD=−1.1, 95% CI: −2.3 to 0.1 for 2 vs 0 concussions) and greater neuro-related fatigue (MD=0.17, 95% CI: 0.1–1.7 for 3+ vs 0 concussions; MD=0.9, 95% CI: 0.1–1.7 for 2 vs 0 concussions). CONCLUSIONS: After controlling for covariates, these data suggest that following primary recovery, those with prior concussions may exhibit increased cognitive and fatigue related complaints. These residual effects may confound incident concussion assessments, particularly when pre-season baseline measures are not available. Supported in part by a grant from the National Football League.
compared to their high SES school counterparts. These findings have implications for how baseline scores are considered as comparisons for concussion surveillance; however, more studies are necessary to examine other confounding factors and the utility of these measures in managing injury recovery.

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<th>Mean mTBISS (SD)</th>
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**1507 Board #269**

**May 30 10:30 AM - 12:00 PM**

**Administering Computerized Neurocognitive Testing Does Not Increase Symptoms Following Sport-Related Concussion**


1University of Arkansas, Fayetteville, AR. 2Inova Medical Group, Fairfax, VA. 3Saint Joseph’s University, Philadelphia, PA. 4University of Arkansas, Fayetteville, AR.  

(Sponsor: Brendan McDermott, FACSM)

(no relevant relationships reported)

Computerized neurocognitive testing (CNT) is an important component for the management of sport-related concussion (SRC). The cognitive demands required to complete CNT may exacerbate SRC symptoms.

**PURPOSE:** To prospectively examine changes in post-concussion symptom reporting after completing CNT.

**METHODS:** One hundred forty-five athletes (15.72 ± 1.78 years) with a medically diagnosed SRC completed the Post-Concussion Symptom Scale (PCSS) before and after completing a CNT (e.g., the Immediate Post-Concussion Assessment and Cognitive Testing: ImPACT). Changes in total PCSS symptoms and symptom clusters (somatic, affective, and cognitive-migraine-fatigue) were examined with a series of paired samples t-tests. Participants were also assigned to groups based on the time elapsed from injury until their first clinical visit: 0-7 days, 8-14 days, and 15-21 days. A series of 3 (time since injury group) X 2 time (pre, post) analysis of variance were performed on symptom totals and clusters. Statistical significance was set at a Bonferroni-corrected p < 0.01.

**RESULTS:** There were no significant differences in total (t(145) = -1.02, p = .31), affective (t(145) = -1.02, p = .31), or cognitive-migraine-fatigue symptoms (t(145) = -1.5 p > .05) before and after CNT. There was a significant difference for affective symptoms (t(145) = -2.5, p = .01). Affective symptoms were significantly higher before CNT (M = 2.19, SD = 3.15) compared to after CNT (M = 1.8, SD = 2.9). There were no between-subjects or within-subjects main effects for total, affective, or cognitive-migraine-fatigue symptom clusters (p > .05). There were also no significant group X time interactions for total symptoms (Wilks λ = 0.9, F[1, 143] = 0.20, p = .64, η2 = .01), somatic (Wilks λ = 1.00, F[2, 142] = 20.30, p < .001, η2 = .14), affective (Wilks λ = 0.9, F[2, 14] = 0.8, p > .05), or cognitive-migraine-fatigue symptom clusters (Wilks λ = 0.9, F[2, 14] = 0.4, p > .05, η2 = .01). 

**CONCLUSIONS:** There were no significant differences in total symptom severity score ranging from 0-132. The PCSS was broken into two factors throughout recovery between concussed and healthy athletes. Previous research suggests concussed female athletes report higher severity of total symptoms; however, sex differences for symptom factors across recovery are understudied.

**1508 Board #270**

**May 30 10:30 AM - 12:00 PM**

**No Differences in Tandem Gait Performance between Males and Females Acutely Post-Concussion**

Jessie R. Oldham1, David R. Howell2, Kelsey N. Bryk2, William P. Mecham III1, Thomas A. Buckley3.

1University of Arkansas, Fayetteville, AR. 2Inova Medical Group, Fairfax, VA. 3Saint Joseph’s University, Philadelphia, PA.  

(Sponsor: Brendan McDermott, FACSM)

(no relevant relationships reported)

Postural control impairments are common following concussion and traditionally assessed using the Balance Error Scoring System (BESS). Tandem gait (TG) has successfully identified impairments in postural control acutely post-concussion that were not detected by the BESS; thus, TG may be a more robust postural control assessment following concussion. While sex differences in BESS performance after concussion have been explored, there is no literature regarding sex differences in post-concussion TG.

**PURPOSE:** To examine sex differences in TG performance among collegiate student-athletes acutely post-concussion relative to pre-injury performance.

**METHODS:** Forty-eight concussed collegiate student-athletes (30 females) and twenty-five healthy controls (13 females) completed TG tests during pre-season and again acutely post-concussion. Participants walked heel-to-toe down a 3-meter line, turned, and returned as quickly as possible, completing four single-task (ST) and dual-task (DT) TG trials. During DT trials, they simultaneously answered mini-mental style questions. The best ST and DT times were recorded. A 2 x 2 (group x sex) ANOVA was used to examine TG change between pre-injury and post-injury tests (positive value = slower/worsening; negative value = faster/improving).

**RESULTS:** The change in TG time from pre-injury to post-injury was significantly higher for the concussion group relative to the control group during both ST (Concussion: 1.6 ± 0.6 seconds, Controls: -1.1 ± 0.6 seconds, p < .001) and DT (Concussion: 2.0 ± 3.8 seconds, Controls: -0.9 ± 1.3 seconds, p < .001). There were no significant interactions (ST: p = .17; DT: p = .23) or main effects for sex (ST: p = .06, DT: p = .9).

**CONCLUSIONS:** There were no sex-specific differences in TG performance acutely post-concussion. However, all concussed participants, regardless of sex, performed significantly worse on TG than male and female controls after injury relative to baseline, while controls did not demonstrate such a change. These results suggest that TG can appropriately identify postural control impairments following concussion; however, there do not appear to be differences in performance between males and females.

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Previous research suggests concussed female athletes report higher severity of total symptoms; however, sex differences for symptom factors across recovery are understudied. **PURPOSE:** To examine sex differences in post-concussion symptom factors across concussion recovery (i.e., ≤72 hours, return-to-play, >one-month).**

**METHODS:** Symptoms were rated from 0 (none) to 6 (severe) on the Post-Concussion Symptom Scale (PCSS), which consists of 22 total symptoms and a total symptom severity score ranging from 0-132. The PCSS was broken into two symptom factors: cognitive-migraine-fatigue (headache, dizziness, fatigue, drowsiness, sensitivity to light/noise, feeling slowed down, fogginess, difficulty concentrating/ remembering) and affective (sadness, nervousness, feeling more emotional). A 2 sex (male, female) X group (concussed, healthy) X time (≤72 hours, return-to-play, >one-month) repeated measures ANOVA was used to analyze sex differences in symptom factors throughout recovery between concussed and healthy athletes.

**RESULTS:** There were no sex differences in TG performance acutely post-concussion relative to pre-injury performance. Participants walked heel-to-toe down a 3-meter line, turned, and returned as quickly as possible, completing four single-task (ST) and dual-task (DT) TG trials. During DT trials, they simultaneously answered mini-mental style questions. The best ST and DT times were recorded. A 2 x 2 (group x sex) ANOVA was used to examine TG change between pre-injury and post-injury tests (positive value = slower/worsening; negative value = faster/improving).

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**CONCLUSIONS:** There were no sex-specific differences in TG performance acutely post-concussion. However, all concussed participants, regardless of sex, performed significantly worse on TG than male and female controls after injury relative to baseline, while controls did not demonstrate such a change. These results suggest that TG can appropriately identify postural control impairments following concussion; however, there do not appear to be differences in performance between males and females.

**1509 Board #271**

**May 30 10:30 AM - 12:00 PM**

**Post-Concussion Symptom Factors in Male and Female High School and Collegiate Athletes**


Email: andie19@msu.edu

(no relevant relationships reported)
PURPOSE: The purpose of our study was to examine patient-parent agreement on measures of concussion symptom frequency and time after sport-related concussion, and identify differences in patient-parent agreement between child and adolescent age groups.

METHODS: We conducted an analysis of data collected from a prospective registry of patients with concussion in a sports medicine clinic. Patients and their parents completed the Health and Behavior Inventory (HBI) at each clinic visit. Wilcoxon signed rank tests were used to assess for potential differences in symptom frequency ratings. Spearman’s rho correlations and Fisher’s r to z transformation were used to assess linear agreement for total HBI score between parents and children (ages 6–12 yrs), compared to parents and adolescents (ages 13+18 yrs). Multiple regression analyses were used to evaluate the association between parent-reported and patient-reported HBI ratings with return to play (RTP) time and symptom duration.

RESULTS: A total of 230 patients (20% children, 28% females, evaluated ± 2 days post-concussion) were included in the analysis. For total HBI score, the agreement between children and their parents was high (r=0.8, CI: 0.8–0.9). Adolescents also highly agreed with their parents (r=0.8, CI: 0.7–0.8). However, child-parent agreement was significantly higher than adolescent-parent agreement (r=2.21; p=0.03). Additionally, combined child and adolescent patient HBI ratings were significantly associated with symptom resolution time (β=0.286, 95% CI: 0.019 ± 0.581; p=0.005) and RTP time (β=0.487, 95% CI: 0.009 ± 0.965; p=0.046), whereas parent HBI ratings were not.

CONCLUSIONS: Overall, there was strong agreement between parents and their children on the HBI, though children demonstrated significantly higher agreement with their parents compared to adolescents. Additionally, patient-reported HBI scores were more predictive of symptom duration and RTP time than parent-reported HBI scores. Clinicians may find this useful when setting expectations regarding concussion symptom duration and RTP timing for patients and their families. Significant reporting discrepancies between patients and their parents may also be a relevant factor for clinicians to consider during acute post-concussion evaluations.
and 5.06 kg) when compared to DXA. Validity statistics were slightly higher, but considered acceptable, when comparing the segmental BIA devices against ADP (SEE < 3.3%) and SEE < 1.4%, and 3.9 kg; 5. LOAs < ±2% and 7. 9 kg)

**CONCLUSION:** The main findings from the present study revealed the segmental BIA devices are interchangeable with ADP and DXA when utilized on obese adults. ADP and DXA also had good agreement with each other. These results suggest that clinicians and practitioners can employ segmental BIA devices in obese adults when the ADP or DXA are not available.

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**1514 Board #276 May 30 10:30 AM - 12:00 PM The Effects of Swimming Training on Arterial Stiffness, Muscular Strength and Cardiorespiratory Endurance in Postmenopausal Women with Stage 2 Hypertension**

Steven Scott1, Alexei Wong1, Yi-Sub Kwak2, Won-Mok Son1, Jung-jun Park1, Elizabeth Fekas1, Song-Young Park1. 1University of Nebraska at Omaha, Omaha, NE. 2Marymount University, Arlington, VA. 3Dong-eui University, Busan, Korea, Republic of. 4Pusan National University, Busan, Korea, Republic of.

**Purpose:** Aging is associated with progressive decreases in arterial health and function as well as overall fitness. It is crucial to prevent or reduce the negative effects of aging on vasculature and fitness components by implementing appropriate lifestyle interventions, such as exercise training. We examined the effects of a swimming (SWM) regimen on arterial stiffness (pulse wave velocity, PWV), blood pressure (BP), wave reflection (Alx), muscular strength and aerobic capacity in postmenopausal women with stage 2 hypertension. **Methods:** Using a parallel experimental design, participants were randomly assigned to either a SWM (n=37) or non-exercising control group (n=37) for 20 weeks. Participants in the SWM group performed 3-4 times per week, progressing in duration from 25 to 45 min. Participants’ carotid to radial PWV (crPWV), BP, Alx, muscular strength and cardiorespiratory capacity were measured at baseline and after 20 weeks of their assigned intervention. **Results:** There was a significant group x time interaction (P=0.05) for crPWV, Alx, and systolic and diastolic BP, which significantly decreased (P<0.05) and strength and cardiorespiratory capacity, which significantly increased (P<0.05) following SWM compared to no changes in control. **Conclusion:** SWM led to reductions in arterial stiffness, wave reflection and BP while increasing strength and aerobic capacity in postmenopausal women with stage 2 hypertension. SWM may be an effective intervention in the prevention and treatment of age-related vascular complications as well as declines in muscle strength and cardiorespiratory capacity.

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**1515 Board #277 May 30 10:30 AM - 12:00 PM Improvement Of Redox Balance After Isometric Exercise Involving Large Muscle Mass In Hypertensive Adults**


Email: rfholher@gmail.com

**Purpose:** Hypertension is one of the cardiovascular diseases responsible for more deaths worldwide. Although isometric exercise (IE) has been showing promising results to treat hypertension, the physiological mechanisms underneath blood pressure (BP) responses are still warranted, being oxidative stress (OS) and nitric oxide (NO), major factors involved in acute and chronic pathophysiology of this disease. **PURPOSE:** The aim of this study was to investigate the OS, NO responses to IE in normotensive (NTG) and hypertensive (HTG) individuals. **METHODS:** After body composition and muscular strength assessment, twenty-four adult men (1-type intensive and 10 normotensive). Individuals were submitted to 3 sessions of IE in Bench and Leg press exercises. The sessions in each exercise consisted in: i) assessment of maximal voluntary isometric contraction (MVIC); ii) 8 sets x 1’ contraction at 30% MVIC with 2’ rest pause; iii) control session (CS). Blood samples were collected at rest, immediately after the session and 60 min post-exercise. NO were obtained through the Griess reaction method. OS parameters (uria acid, TEAC, GSH and SOD analysis) were analyzed using commercial kits. For the statistical analysis, a repeated-measures ANOVA with Bonferroni post-hoc was used. **RESULTS:** A significant increase in plasmatic NO-bioavailability immediately after the IE session was observed only in HTG (Δ = 23.9 ± 8.45 μL). Regarding OS parameters, TBARS presented a significant reduction after the IE session in both groups in comparison to CS (Δ = -0.94 ± 0.9 and -0.63 ± 0.53 mmol/L) for HTG and NTG respectively. Catalase increased in both groups against CS (Δ = 48.66 ± 13.7 and 36.92 ± 19.18 U·ml⁻¹ for HTG and NTG respectively). Whereas no statistical differences were identified for uric acid, TEAC, GSH and SOD analysis within- or between-group. **CONCLUSIONS:** In conclusion, 30 inutes of isometric exercise with large muscle mass elicits an elevated pro-oxidant activity, increased antioxidant reaction, leading to a greater NO-bioavailability in hypertensive individuals.

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**1516 Board #278 May 30 10:30 AM - 12:00 PM Cardiac Rehabilitation Significantly Reduces Body Composition in Men Greater than Women**

Amanda R. Bonikowske, Jose R. Medina Inojosa, Maria Irene Barillas-Lara, Yaoshun Dun, Francisco Lopez Jimenez, Thomas P. Olson, FACSM. Mayo Clinic, Rochester, MN. (Sponsor: Thomas P. Olson, FACSM)

Email: bonikowske.amanda@mayo.edu

(No relevant relationships reported)

**Purpose:** To examine body composition (BC) changes by dual energy x-ray absorptiometry (DXA) after cardiac rehabilitation (CR) participation. We hypothesized that CR would improve multiple components of body composition. **METHODS:** The Mayo Clinic CR database was reviewed; 280 in of DXA at baseline and after CR completion from January 2014 to August 2018. XA and relevant clinical metrics (e.g. age, sex, height, weight, hip and waist circumference (WC), and clinical diagnosis) were extracted from the medical record. Referral diagnoses included myocardial infarction (29%), coronary artery disease (30%), percutaneous coronary intervention (23%), coronary artery bypass grafting (18%), heart valve surgery (11%), heart transplant (8%), heart failure (8%), and other (6%). Data are presented as mean±SD and analyzed with ANOVA, chi-square and fisher’s exact test when appropriate. **RESULTS:** There was no difference in age between groups at enrollment. As expected, men weighed more, had more lean mass, were taller, had larger WC, and higher waist to hip ratio (WHR; p<0.05) at baseline. Women had higher body fat % and gynoid fat mass (%p<0.05). After CR, weight did not change significantly in men or women; however, BC changed significantly as presented in the table. Specifically, in men compared to women, CR resulted in greater reductions in fat mass and body fat %, with greater increases in lean mass (p<0.05). Men also demonstrated greater reductions in android fat mass % and WHR (p<0.05). Conversely, women had a significant reduction in gynoid fat mass % but no change in android fat mass % or WHR (p>0.05). Fat mass index was reduced in both groups and significantly between the sexes (p<0.05). **CONCLUSIONS:** CR participation significantly reduced BC in men and women; however, men demonstrate greater reductions compared to women. Additionally, the distribution of BC improvements appears to differ between sexes suggesting sex specific CR programming may be appropriate.
This could provide a blueprint for an achievable and effective application of lifestyle alternative approach to CR using a novel 4 pillar model of exercise delivery and (Cochrane review, 2016). The current study investigates the effectiveness of a treatment. According to the UK National Audit of CR (2017) only 51% of referred worldwide (WHO, 2017). Current strategies to manage CVD include medical therapy: Cardiovascular disease (CVD) accounts for an estimated 31% of deaths PURPOSE was led by a clinical exercise specialist and overseen by a clinical nurse. All patients rate one, ongoing step-count monitoring and nutritional guidance. The programme: 120 patients (4 MI, 24 MI + PCI, 7 MI + CABG, 15 CABG, 48 PCI, 27 nutritional guidance, on reducing key modifiable risk factors in a cardiac population. Reduced SBP, DBP, BM, BF and increased predicted VO2: 16.6 ± 56.1% and Ex Con 17.0 ± 16.4% (all P< 0.01).

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Data presented as mean ± SD. P < 0.05 is the lowest mean of before and after among same sex.

**1518 Board #280 May 30 10:30 AM - 12:00 PM The Inorganic Nitrate For exercise In Heart Failure (INIX-HF) Trial: Rationale, Design, And Preliminary Data Andrew R. Coggan, FACSM1, Derrick Gray1, Susan B. Racette2, W. Todd Cadé2, Dakkota Thies2, Kenneth B. Schechtman3, Linda R. Peterson. 1Indiana University Purdue University Indianapolis, Indianapolis, IN. 2Washington University in St. Louis, St. Louis, MO. Email: acoggan@iupui.edu (No relevant relationships reported)

Peak oxygen uptake (VO2peak) and muscle contractile function are both impaired in patients with heart failure with reduced ejection fraction (HFrEF), with these deficits significantly contributing to the diminished quality of life and possibly even early mortality of such individuals. In previous pilot studies, however, we have reported that these deleterious changes can be ameliorated by acute ingestion of nitrate (NO−3), which in vivo can be converted to nitric oxide (NO) via the enterosalivary NO3−/NO pathway. PURPOSE Based on these studies, the INIX-HF trial is a proposed multi-center (i.e., 8 site), randomized control trial of the effects of acute (i.e., single dose) and chronic (i.e., 2 wk) dietary NO3− supplementation (in the form of NO3−) on VO2peak and muscle contractility in patients with HFrEF. We are presently performing the work that is necessary and sufficient to set up this trial, including determining the optimal dose of NO3− to utilize. METHODS Using a double-blind, crossover design, six patients with HFrEF (5 men, 1 woman; age ± 4E: ES = 32±13%) were studied 2-3 h after acute ingestion of either 10 or 20 mmol NO3−. On each occasion, VO2peak was measured during an incremental treadmill exercise test (modified Naughton protocol) and muscle function was determined using isokinetic dynamometry. RESULTS The increase in peak VO2peak following NO3− ingestion was greater following ingestion of 20 vs. 10 mmol NO3− (Δ = 430±51 vs. 218±19 mmol/L; P = 0.002). However, plasma NO2− increased to a similar degree in both trials (Δ = 0.219±0.078 vs. 0.169±0.044 µmol/L; P = 0.67). Presumably as a result, VO2peak did not differ between treatments (i.e., 10: 1.5 ± 1.7 1.3 min-1kg-1; P = 0.74). There was also no difference in maximal knee extensor power (Δ = 0.6 ± 0.3 W/kg; P = 0.64 across trials. 2% of subjects experienced moderate-to-severe nausea and/or vomited after ingesting the higher dose NO3−, vs. only 4% after the lower dose.

CONCLUSION There was no difference in the efficacy of 10 vs. 20 mmol NO3− in influencing VO2peak or muscle power in patients with HFrEF. The higher dose, however, was associated with a greater frequency of gastrointestinal distress. Based on these preliminary data, it appears that 10 mmol NO3− is the preferred dose for a larger multicenter trial. Supported by award R34 HL138253 from the NHLBI.
Patients with peripheral artery disease (PAD) develop a myopathy in their ischemic limbs which is characterized by myofiber degeneration, mitochondrial dysfunction and impaired leg function. Degenerated myofibers have cytoskeletal abnormalities the best described of which is a disorganized accumulation of desmin filaments.

**Purpose:** We hypothesized that the levels and organization of desmin in the myofibers of the gastrocnemius of PAD patients improve after revascularization and correlate with increases in mitochondrial respiration and calf muscle strength.

**Methods:** Gastrocnemius biopsies were collected from 32 PAD patients (61.6 ± 5.2 yrs, 31.0 ± 9.0 kg/m²) before and six months after revascularization. Accumulation of desmin filaments and their association with ischemic window, mitochondrial function determined by respirometry, and calf muscle strength determined by isokinetic testing with the Biodex system were evaluated. Data were analyzed in SPSS 21 using paired-t test and Pearson correlation with a level of significance at p<0.05.

**Results:** Revascularization operations improve the levels and organization of the desmin filaments (Δ=8.33 ± 19 N*m) were significantly improved after revascularization. A significant correlation with a level of significance at p<0.05.

**Conclusions:** The metabolic fingerprint of amino acid metabolites of CLI is considerably different from PAD-II and HC. Perturbations in amino acid metabolism may contribute to CLI pathology and may serve as a diagnostic/prognostic tool to alter the management of CLI.

**Introduction:** Bariatric surgery effectively reduces weight and some comorbidities in obese patients; however, surgery incurs in severe muscle waste and functionality impairments, warranting the investigation of therapeutic strategies to mitigate these outcomes. **Purpose:** To examine the effects of exercise training on various mitochondrial fiber cross-sectional area (CSA), strength and functionality in women undergoing bariatric surgery. **Methods:** Sixty-two obese women were randomly allocated to receive either bariatric surgery (RYGB: BMI =47±8) or bariatric surgery plus exercise training (RYGB+ET: BMI=7). **Patients** were assessed at baseline (PRE), three (POST3), and nine months (POST9) after surgery for CSA, lower- and upper-limb 1RM, and timed-up-and-go (TUG) and timed-stands (TST) test. The 6 month exercise intervention started at POST3 for RYGB+ET, while RYGB followed standard care. **Results:** Type I and II ICSA was decreased in both RYGB (-21 and -27%) and RYGB+ET (-22 and -27%) at POST9 (all p<0.001). RYGB+ET increased types I and II ICSA from POST9 to POST9+6 23%, p<0.005 and a 32%, p<0.005, whereas no changes were observed in RYGB (%I and %II, respectively; both p>0.05). Importantly, type I and II ICSA were significantly greater in RYGB+ET than in RYGB at POST9+6 both p<0.001. Lower- (RYGB+ET=32% and RYGB+ET=28%, both p<0.001) and upper-limb 1RM (RYGB~28% and RYGB+ET~28%, both p<0.001) were reduced at POST3. Exercise increased lower- and upper-limb strength (%I and %II, respectively; both p<0.001) and %Type I and II ICSA were significantly greater in RYGB+ET than in RYGB at POST9+6 both p<0.001. Lower- (RYGB+ET=32% and RYGB+ET=28%, both p<0.001) and upper-limb 1RM (RYGB~28% and RYGB+ET~28%, both p<0.001) were reduced at POST3. Exercise increased lower- and upper-limb strength (%I and %II, respectively; both p<0.001) and %Type I and II ICSA were significantly greater in RYGB+ET than in RYGB at POST9+6 both p<0.001.

**Conclusions:** Our data suggest that a 6 month exercise training program is effective in countering the loss of muscle mass, strength and functionality that occur after bariatric surgery. **Clinicaltrials.gov:** NCT02441361

**Exercise Mitigates The Loss In Muscle Mass And Functionality In Obese Women Undergoing Bariatric Surgery**

**S532 Vol. 51 No. 5 Supplement**

**C-46 Free Communication/Poster - Obesity**

**Board #282 May 30 10:30 AM - 12:00 PM**

**Desmin Is Improved in the Gastrocnemius of Patients with Peripheral Artery Disease after Revascularization Interventions**


**Purpose:** To examine the effects of exercise training on various mitochondrial fiber cross-sectional area (CSA), strength and functionality in women undergoing bariatric surgery. **Methods:** Sixty-two obese women were randomly allocated to receive either bariatric surgery (RYGB: BMI =47±8) or bariatric surgery plus exercise training (RYGB+ET: BMI=7). **Patients** were assessed at baseline (PRE), three (POST3), and nine months (POST9) after surgery for CSA, lower- and upper-limb 1RM, and timed-up-and-go (TUG) and timed-stands (TST) test. The 6 month exercise intervention started at POST3 for RYGB+ET, while RYGB followed standard care. **Results:** Type I and II ICSA was decreased in both RYGB (-21 and -27%) and RYGB+ET (-22 and -27%) at POST9 (all p<0.001). RYGB+ET increased types I and II ICSA from POST9 to POST9+6 23%, p<0.005 and a 32%, p<0.005, whereas no changes were observed in RYGB (%I and %II, respectively; both p>0.05). Importantly, type I and II ICSA were significantly greater in RYGB+ET than in RYGB at POST9+6 both p<0.001. Lower- (RYGB+ET=32% and RYGB+ET=28%, both p<0.001) and upper-limb 1RM (RYGB~28% and RYGB+ET~28%, both p<0.001) were reduced at POST3. Exercise increased lower- and upper-limb strength (%I and %II, respectively; both p<0.001) and %Type I and II ICSA were significantly greater in RYGB+ET than in RYGB at POST9+6 both p<0.001.

**Conclusions:** Our data suggest that a 6 month exercise training program is effective in countering the loss of muscle mass, strength and functionality that occur after bariatric surgery. Clinicaltrials.gov: NCT02441361

**Board #283 May 30 10:30 AM - 12:00 PM**

**Metabolomic Profiling of Amino Acid Metabolism in Peripheral Artery Disease Patients**

Ahmed Ismaeel1, Marco E. Franco2, Ramon Lavado2, Panagiotis Koutakis3, Florida State University, Tallahassee, FL. **Baylor Scott and White, Temple, TX. Vascular Surgery Associates, Tallahassee, FL. Capital Regional Medical Center, Tallahassee, FL. (Sponsor: Lynn Panton, FACS)** Email: pkoutakis@fsu.edu

**No relevant relationships reported**

The spectrum of symptoms of peripheral artery disease (PAD) is classified according to the Fontaine classification. Patients presenting with intermittent claudication are classified in Stage II, and in the latest stages of PAD referred to as critical limb ischemia (CLI), patients exhibit rest pain with or without ulcers and gangrene. Although systemic risk factors for PAD have been established, an omics approach may represent an innovative method to comprehensively investigate the molecular basis of PAD pathogenesis. **Purpose:** To determine the metabolomics profile of amino acid metabolism of patients with PAD and identify changes as the disease progresses. **Methods:** Blood samples were acquired from 289 female II PAD patients (PAD-II: 81 ± 12 yrs, 31.0 ± 9.0 kg/m²), 241 LI patients (CLI: 81 ± 12 yrs), and 26 healthy controls (HC: 62.2 ± 7.4 yrs). For targeted metabolic analysis to identify and quantify amino acid metabolite concentrations, serum was extracted, and samples were measured using the Absolute/Deq plates and an Orbitrap mass spectrometer coupled to an Ultimate 3000 Rapid Separation Quaternary high performance liquid chromatography (HPLC) system. To examine differences between groups, one-way ANOVA was carried out, followed by Tukey’s test for post-hoc analysis. **Results:** Relative to PAD-II and HC, CLI showed significantly lower content of alanine (HC: 296.5 ± 109.2 µM, PAD-II: 34.2 ± 18.0 µM, CLI: 28.3 ± 12.6 µM; p<0.005), histidine (HC: 63.2±8 µM, PAD-II: 9.2 µM, CLI: 85.8±118.4 µM; p<0.05), histidine (HC: 15.0 µM, PAD-II: 12.6 µM, CLI: 8.2 µM; p<0.001), ornithine (HC: 151 µM, PAD-II: 43 ± 17 µM, CLI: 87 µM; p<0.05), proline (HC: 202.3 ± 8 µM, PAD-II: 202.1 ± 8.5 µM, CLI: 169.5 ± 40.3 µM; p<0.001), tryptoptophan (HC: 9.8±13.9 µM, PAD-II: 5 ± 13 µM, CLI: 32 ± 10.9 µM; p<0.001), and tyrosine (HC: 6.1 ± 1.8 µM, PAD-II: 8 ± 1.2 µM, CLI: 11.4 ± 2.0 µM; p<0.004; **Conclusion:** The metabolic fingerprint of amino acid metabolites of CLI is considerably different from PAD-II and HC. Perturbations in amino acid metabolism may contribute to CLI pathology and may serve as a diagnostic/prognostic tool to alter the management of CLI.
Changes in the hormonal milieu with menopause are associated with increases in both total body fat and abdominal fat storage (AFS), both of which are related to an adverse metabolic profile and increased cardiovascular disease risk. Physical activity (PA) is an important tool to ameliorate adipose fat accumulation during all life-stages.

**PURPOSE:** To examine differences in the protective effect of physical activity on total adiposity and fat patterning in pre and post-menopausal women.

**METHODS:** A total of 1018 women (pre-menopausal 425; post-menopausal 593) participated in the study. Each patient completed anthropometric measurements and a physical activity survey using the HealthSnap platform, which encompasses a streamlined health evaluation with lifestyle recommendations. Participants were stratified by age to predict menopausal status (pre-menopausal <35 yrs; post-menopausal >4 yrs). BMI was computed as kg/m2 and AFS was determined using a waist-to-hip ratio above 0.85. PA was defined as MET-minutes equivalent to >75 minutes of vigorous activity, or ≥15 min of moderate activity, per week.

**RESULTS:** As expected, in both groups of pre and post-menopausal women, a significant association was observed between PA and BMI (RR=1.1; CI: 1.24-2.70 and RR = 2.18; CI: 1.67-2.80; *p*<0.001) but not pre-menopausal women (RR = 1.034; CI: 0.83-1.30; *p*=0.74). In contrast, PA was only associated with AFS patterning in post-menopausal women. However, PA appears to be protective against the development of AFS, even when accompanied with obesity in older women. Remarkably, these differences were still observed with no differences in physical activity.

**CONCLUSIONS:** The present study was the first to show a dichotomous relationship between PA and an AFS pattern in post-menopausal women. However, PA appears to be protective against the development of AFS, even when accompanied with obesity in older women. Remarkably, these differences were still observed with no differences in physical activity.

In whole body exercise like cycling, maximal oxygen uptake is mainly limited by cardiac output rather than the oxygen extraction and utilization capacity of the muscle. When the exercise is performed with small muscle mass (like in single leg knee extension exercise), the muscle oxygen uptake should not be limited by central circulation, but from peripheral factors like peak muscle perfusion, oxygen diffusion or mitochondrial respiratory capacity. Obese patients (OB) compared with normal weight people (CTRL) have similar peak oxygen consumption (V'O₂ Peak), lower V'O₂, Peak for 1 Kg of fat free mass and lower peak work rate in Cycling Exercise. On the other hands Obese show greater isometric force and hypertrophy.

**PURPOSE:** In the present study, we investigated if maximal oxygen uptake is mainly limited by cardiac output rather than the capacity to oxygen extraction and utilization of the muscle in OB and CTRL subjects, during maximal incremental test on Cycle Ergometer (CE) and on single leg Knee Extension (KE) ergometer.

**METHODS:** 15 OB (age 25 yrs; BMI 35 kg/m² and 13 CTRL subjects (age 25 yrs; BMI 22±3 kg/m²) participated in this study. VO₂, and Cardiac Output (CO) were measured during CE and KE. Maximal voluntary contraction (MVCs) of knee extensor muscle were performed before and immediately after the two incremental tests. **RESULTS:** Peak V'O₂ (mL/min) and CO (mL/min) were significantly higher (p<0.05) in CE than in KE with no differences between OB and CTRL (V'O₂ CE: OB 2.68±0.68, CTRL 2.04±0.67; VO₂ KE: OB 1.36±0.8, C TR 1.18 ± 0.28). **CONCLUSIONS:** The limiting factor during KE should reside in the muscle perfusion, instead the performance during CE might be limited due to central mechanisms. This is particularly true for OB where cardiac respiratory system might have played a role in determining the cessation of CE as it can be evicted by a lower MVC reduction at exhaustion compared to the one produced after KE. Supported by Municipalities of Gemona del Friuli (Udine, Italy)
CONCLUSIONS: These data suggest that Tai Chi training reduces visceral fat, waist circumference and blood triglyceride.

Supported by Health and Medical Research Fund 121311

1527 Board #289 May 30 10:30 AM - 12:00 PM Functional Evaluation and VO2-kinetics in Obese Patients Before and After Sleeve Gastroctomy
Daniel Neunhaeuserer,1 Sara Ortolan,1 Alessandro Patti,1 Andrea Gasperetti1, Francesco Savalla,1 Francesca Battista1, Stefano Gobbo,1 Silvia Bettini,1 Anna Belligoli,1 Andrea Ermolao1,1Sport and Exercise Medicine Division, Padova, Italy. 2Internal Medicine 3, Padova, Italy. Email: daniel.neunhaeuserer@unipd.it

(no relevant relationships reported)

Sleeve gastroctomy (SG) has become an important therapeutic option for patients with severe obesity, showing a positive impact on patients' comorbidities. Even though poor cardiopulmonary function is a powerful predictor of mortality, functional evaluation has been given little attention after SG.

PURPOSE: To investigate the effects of SG on functional capacity six months after surgery, with specific analysis of peripheral oxidative muscle metabolism by determination of VO2-kinetics.

METHODS: In this longitudinal observational study 36 patients (age 411 years, 78 females) with severe obesity (BMI 39.3 5.3 kg/m2) were evaluated one month before (pre-SG) and six months after SG (post-SG). A maximal cardiopulmonary exercise test was performed on treadmill with an initial 5 min in constant, moderate load exercise and a subsequent incremental Bruce protocol. VO2-kinetics during constant load exercise were analyzed by mono-exponential function. Furthermore, muscle strength was evaluated by isometric handgrip strength test. Patients' physical activity level was assessed by the Global Physical Activity Questionnaire (GPAQ).

RESULTS: As expected, a significant weight loss (-31.14±9.45 kg, p<0.001) and a reduction of waist circumference (158 cm, p<0.001) were observed post-SG, associated with improved exercise time (14.8 vs 10.0 min; p<0.001) and capacity (88.25 vs 106.62±20.8 METs; p<0.001). While the VO2peak/kg was significantly increased, a reduction of the absolute VO2peak and Oxygen Uptake Efficiency Slope (OUES) were shown after surgery (all p<0.001). Furthermore, the time-constant Tau () of the fundamental phase of VO2-kinetics significantly worsened post-SG (17.22 vs 13.55, p<0.02). However, muscle strength remained unchanged in these patients (handgrip: 29.87±11.73 vs 29.75±11.35 kg; p<0.02). However, muscle strength remained unchanged in these patients (handgrip: 29.87±11.73 vs 29.75±11.35 kg; p<0.02). However, muscle strength remained unchanged in these patients (handgrip: 29.87±11.73 vs 29.75±11.35 kg; p<0.02). However, muscle strength remained unchanged in these patients (handgrip: 29.87±11.73 vs 29.75±11.35 kg; p<0.02). However, muscle strength remained unchanged in these patients (handgrip: 29.87±11.73 vs 29.75±11.35 kg; p<0.02). However, muscle strength remained unchanged in these patients (handgrip: 29.87±11.73 vs 29.75±11.35 kg; p<0.02). However, muscle strength remained unchanged in these patients (handgrip: 29.87±11.73 vs 29.75±11.35 kg; p<0.02). However, muscle strength remained unchanged in these patients (handgrip: 29.87±11.73 vs 29.75±11.35 kg; p<0.02). However, muscle strength remained unchanged in these patients (handgrip: 29.87±11.73 vs 29.75±11.35 kg; p<0.02). However, muscle strength remained unchanged in these patients (handgrip: 29.87±11.73 vs 29.75±11.35 kg; p<0.02). However, muscle strength remained unchanged in these patients (handgrip: 29.87±11.73 vs 29.75±11.35 kg; p<0.02). However, muscle strength remained unchanged in these patients (handgrip: 29.87±11.73 vs 29.75±11.35 kg; p<0.02). However, muscle strength remained unchanged in these patients (handgrip: 29.87±11.73 vs 29.75±11.35 kg; p<0.02).

CONCLUSIONS: Even though patients after SG improved functional capacity due to a significant weight loss, absolute aerobic capacity and VO2-kinetics significantly worsened despite increased physical activity. The study findings thus suggest an impaired peripheral oxidative muscle metabolism post-SG without affecting patients' muscle strength.

1528 Board #290 May 30 10:30 AM - 12:00 PM Athletic Obesity and Long-Term Health
Justin B. Ethington, Utah Valley University, Orem, UT. Email: justin.ethington@hotmail.com

(no relevant relationships reported)

PURPOSE: Obesity in athletes is closely correlated with many comorbidities such as hypertension, dyslipidemia, osteoporosis, diabetes mellitus, left ventricular hypertrophy, and lower self-esteem; all of which can lead to decreased quality of life including such as hypertension, dyslipidemia, osteoporosis, diabetes mellitus, left ventricular hypertrophy, and lower self-esteem; all of which can lead to decreased quality of life

Supported by Health and Medical Research Fund 12131841

S334 Vol. 51 No. 5 Supplement

ACSM May 28 – June 1, 2019 Orlando, Florida

ORLANDO, FLORIDA

Conferences & Exhibits

IMPROVING THE DYNAMIC RANGE OF THE METABOLIC RESPONSE IN OBESITY

Papers presented during the time to exhaustion.

Tolulope Popoola1, William Stringer1, Tomohiko Kisaka2, Kathy Sietsema1,1Los Angeles Biomedical Institute (LABIOMED) at Harbor-UCLA Medical Center, Torrance, CA. Hiroshima University, Hiroshima, Japan. (Sponsor: Harry Rossiter, PhD, FACSM)

Email: teepopola@yahoo.com

Reported Relationships: T. Popoola: Industry contracted research; MITSUBISHI ELECTRIC ENGINEERING Co., LTD.

PURPOSE: Obese individuals have a greater oxygen uptake (VO2) than lean individuals for a given work rate during cycling exercise due to higher resting metabolic rate and metabolic cost from lifting heavier legs against gravity. This can result in the majority of the total increase in VO2 occurring early in the exercise test, resulting in short test duration and obscuring the gas exchange details. We hypothesized that mechanical assistance of pedaling early in exercise could reduce the initial increase in VO2 of obese subjects, and increase the VO2 range.

METHODS: 20 obese (O, BMI 29.2 ± 6.6 kg/m2) and 10 lean otherwise normal subjects (L, BMI 20.0 ± 2.2) were tested. Subjects performed 2 symptom-limited ramp incremental tests on a cycle ergometer capable of providing variable degrees of mechanical assistance to pedaling (ergo-strength, Mitsubishi Electrical Engineering, Osaka, Japan). Ventilation and pulmonary gas exchange were measured by breath by (Vyaire, Yorba Linda, California). During warm up, in random order, the subjects performed either unmodified cycling (UM) or mechanical assistance (MC) to pedaling. After warm up, each subject performed a progressively increasing test to exhaustion.

RESULTS: The MC protocol resulted in a lower initial VO2 compared to UM in 19 of 20 O subjects and 8 of 10 L subjects, with average differences of 165 +/- 125 ml/min for O and L, respectively, by paired t-tests. Peak VO2 did not differ systematically within subjects by protocols (p>NS).

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CONCLUSIONS: Mechanical assisted cycling during the initial phase of an incremental exercise test was effective in modulating the initial increase in VO2 with unloaded cycling, and increases the VO2 testing range in obese and normal weight subjects. This may be a significant proportion of the entire response in a patient with exercise limitation, and therefore useful in exercise testing and training. Funding: MITSUBISH ELECTRIC ENGINEERING Co., LTD.
Rhythmic Auditory Stimulation (RAS) uses the physiologic effects of auditory rhythm to facilitate movements that are inherently rhythmic, such as walking. There is a strong sensorimotor connection between the brain and the motor system while walking to rhythmic cues that occurs without cognitive learning efforts.

**PURPOSE:** To determine if cadence and Six-Minute Walk Distance (M. WD) are increased while walking to RAS-tempo enhanced music as compared to walking to music without tempo enhancement (MC) or no-music (NM) in individuals with Chronic Obstructive Pulmonary Disease (COPD).

**METHODS:** Three 6 Minute Walk Tests (M. WT) were completed in random order under three conditions (RAS, MC, NM). Tempo for the RAS was matched to participants’ usual cadence by a one-minute manual step count. Cadence was measured manually for 6 seconds between minutes 1-2, 3-4 and 5-6 for all 6M WT conditions. The tempo determined by a one-minute manual step count. Cadence was measured manually for 6 seconds between minutes 1-2, 3-4 and 5-6 for all M. WD conditions. The tempo of the music for the RAS walk was increased $\leq$ 10 beats per minute higher than usual cadence. **RESULTS:** Twenty-five older adults (age $=71\pm5$) with moderate to severe COPD ($\geq15.0$ FEV $\%$ predicted), with 56.2±2.9 yrs of smoking were enrolled. The mean usual cadence was $103\pm8$ steps/min in one minute. When comparing RAS to NM, cadence was consistently significant at all minute intervals 1-2 (110±105), 3-4 (110±107), and 5-6 (110±107) respectively. When comparing cadence of NM to MC, and RAS to MC no consistent significant increases were found. Participants matched their cadence to the elevated tempo of the RAS music during the entire M. WT (110 ± 12 steps). Individuals walked 12m further during the M. WT with RAS ($6 \pm 2$ m) when compared to NM ($6 \pm 8$ m). No consistent significant increase in M. WD for RAS vs. NM was found. **CONCLUSIONS:** Best method for prescribing cadence through music tempo in individuals with COPD has not been established. Individuals walked further and were able to match and sustain elevated cadence during the RAS walking condition. This observation may support the premise that beat perception mechanisms can be neurologically entrained. RAS music may be a useful tool in pulmonary rehabilitation to increase walking distance in individuals with COPD.

Supported by RR&D, Veterans Administration

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Supported by RR&D, Veterans Administration
peak exercise via the Borg breathlessness scale. We examined the association between $E_{T,\text{MAX}}$ (rest and peak exercise) and peak dyspnea, adjusting for age, body mass index, smoking and airway obstruction (FEV $F_{\text{V}}$/FVC).

RESULTS: Demographics were similar between groups, but spirometry was reduced in veterans (ventures vs. controls; FEV $101.0\pm 13.6$ vs. $110.6\pm 13.3$% predicted; p $0.01$, Hedges’ g $1.11$). Peak exercise capacity was similar (50.4 vs. 51.9 ml·kg·min$^{-1}$) but veterans endorsed greater dyspnea ($p=0.01$, g $1.32$). $E_{T,\text{MAX}}$ was similar at rest ($p=0.04$, g $0.8$) but not at peak exercise ($p=0.67$, g $0.8$). In our adjusted model, larger $E_{T,\text{MAX}}$ at rest ($p=22.5$, CI $4.7, 40.9$, p $0.016$) and immediately post-exercise ($p=19.2$, CI $3.1, 35.6$, p $0.016$) were associated with greater dyspnea at peak exercise.

CONCLUSION: In our sample, increased RBC deformability measured at rest and immediately post-exercise was independently associated with exertional dyspnea. Future studies are necessary to confirm these findings and investigate mechanisms of altered RBC rheology in the context of dyspnea.

Funding: VA RR&D (121R1X001079; MJF)

1534 Board #296 May 30 10:30 AM - 12:00 PM Respiratory Resistance And Reactance (FOT) Classifications In Chronic Obstructive Pulmonary Disease And Healthy Control Patients.

Jesse Schwartz, Courtney Wheatley, Bruce Johnson. Mayo Clinic, Scottsdale, AZ.

(No relevant relationships reported)

Forced oscillation technique (FOT) is a method of measuring lung obstruction of central airways (resistance, Rrs) and elastic properties/distal airway ventilation (reactance, Xrs), which is different from spirometry since it is performed during tidal breathing, utilizing various sound frequency ncs (51 and 1 Hz) to separate out regions of the lungs and isolates breathing cycles (inspiration and expiration).

PURPOSE: To evaluate FOT metrics of lung mechanics and obstruction within a chronic obstructive pulmonary disease (COPD) population based upon severity (mild [MLD], moderate [MOD], and severe [SEV]).

METHODS: Seventeen COPD, and fourteen healthy (H) patients (age: M: $58 \pm 15$, H: $57 \pm 13$ yr; height: $163 \pm 11$ cm; weight: $88 \pm 32$ kg; age: M: $58 \pm 15$, H: $57 \pm 13$ yr; height: $163 \pm 11$ cm; weight: $88 \pm 32$ kg, respectively).

RESULTS: Mean ± standard deviation $E_{T,\text{MAX}}$ was $1.59\pm 0.48$ for MLD, $1.45\pm 0.46$ for MOD, and $1.66\pm 0.51$ for SEV groups respectively. Partial correlations of $E_{T,\text{MAX}}$ with peak exercise (FEV $101.0\pm 13.6$ vs. $110.6\pm 13.3$% predicted; p $0.01$, Hedges’ g $1.11$) and peak dyspnea were $0.35\pm 0.19$, and $0.34\pm 0.20$ respectively (p $<0.05$). Patients with acute respiratory failure (ARF) show changes in skeletal muscle structure and strength. PURPOSE: The purpose of this study was to examine the relationship between muscle thickness (MT), echogenicity, and strength in patients with ARF.

METHODS: Thirteen (9 males/4 nes) patients with ARF participated in the study. Knee extensor (KE) strength was measured via a handheld dynamometer and qua driceps images were obtained via ultrasonography at hospital discharge. The ultrasound images were used to obtain MT and both mean and standard deviation echogenicity of the rectus femoris, vastus lateralis (VL), and vastus medialis. Partial correlations, controlling for age BMI and fluid intake, were used to describe the associations between KE strength and echogenicity and MET, results: KE strength and vastus laterals standard deviation echogenicity were significantly correlated when controlling for age, BMI and fluid intake (r $0.59$, p $0.03$), and standard deviation echogenicity were 19 ± 8 kg and 198 ± 39 mm. No other correlations between strength and ultrasound measures were found to be significant. CONCLUSION: These results show skeletal muscle echogenicity to be significantly correlated with skeletal muscle patients in ARF. As such, it may be useful in identifying muscle weakness in these patients when unable or unwilling to perform voluntary strength testing.

1537 Board #299 May 30 10:30 AM - 12:00 PM Participation In Norseman Extreme Triathlon; The Effect On Lung Function And Oxygen Saturation.

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(No relevant relationships reported)

PURPOSE: Primary: To examine changes in lung function, forced expiratory volume in one second (FEV $F_{\text{V}}$) and forced vital capacity (FVC), and oxygen saturation (SpO $F_{\text{V}}$) from before to after participation in Norseman extreme triathlon, consisting of 3.8 km open water swim, 18 km cycling and 12 km running. Secondly: To assess possible relationships between the physiological variables and respiratory symptoms and training volume. METHODS: In a quasi-experimental non-controlled study, 5 recreational triathletes (8 males and 2 females) aged 43 ± 9 years (mean (SD)) measured lung function by maximal expiratory flow volume loops (FEV $F_{\text{V}}$ and FVC) and SpO $F_{\text{V}}$ by pulse oximetry the day before the race, 8-10 minutes after finishing the race and the day after the race. Weekly training volume and respiratory symptoms were recorded with a modified AQUA-questionnaire at online. Anova for repeated measures was used to test for differences in lung function and SpO $F_{\text{V}}$, and statistical significance was accepted at 0.05 level. The study was approved by the Regional Ethical Committee.

1538 Board #298 May 30 10:30 AM - 12:00 PM Echogenicity Is Related to Skeletal Muscle Strength in Patients With Acute Respiratory Failure.

Michael J. Berry, FACSM1, Daniel C. Files1, Claudia L. Campos1, Rita N. Bakhru1, Brittany M. Skaag2, Peter E. Morris1.

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Reported Relationships: M.J. Berry: Industry contracted research; Jagenis, LLC.

Patients with acute respiratory failure (ARF) show changes in skeletal muscle structure and strength. PURPOSE: The purpose of this study was to examine the relationship between muscle thickness (MT), echogenicity, and strength in patients with ARF.

METHODS: Thirteen (9 males/4 nes) patients with ARF participated in the study. Knee extensor (KE) strength was measured via a handheld dynamometer and qua driceps images were obtained via ultrasonography at hospital discharge. The ultrasound images were used to obtain MT and both mean and standard deviation echogenicity of the rectus femoris, vastus lateralis (VL), and vastus medialis. Partial correlations, controlling for age BMI and fluid intake, were used to describe the associations between KE strength and echogenicity and MET, results: KE strength and vastus laterals standard deviation echogenicity were significantly correlated when controlling for age, BMI and fluid intake (r $0.59$, p $0.03$), and standard deviation echogenicity were 19 ± 8 kg and 198 ± 39 mm. No other correlations between strength and ultrasound measures were found to be significant. CONCLUSION: These results show skeletal muscle echogenicity to be significantly correlated with skeletal muscle patients in ARF. As such, it may be useful in identifying muscle weakness in these patients when unable or unwilling to perform voluntary strength testing.
RESULTS: Twenty-six participants (6%) developed exercise-induced bronchoconstriction (EIB) defined as ≥10% reduction in FEV1 from baseline immediately after the race (8%) and 12h after the race (6%). Lower body fatigue was significantly reduced immediately after the race (mean: 4.6%) and the day after the race (mean: 2.4%), respectively. There were no significant changes in heart rate, blood pressure, or respiratory minute volume during exercise. Further, oxygen saturation was significantly reduced immediately after the race (mean: 93%).

There were no significant changes in pulmonary function (FVC and FEV1) and respiratory symptoms or training volume (p>0.05). CONCLUSIONS: Our results demonstrated that 6% of the participants developed EIB and 6% developed EIAH after Norwegian extreme triathlon. The reduction in lung function may be due to fatigue in the respiratory muscles. Further investigation is needed to confirm our results as well as examine the mechanisms in age group triathletes.

C-48 Exercise is Medicine®/Poster - EIM - Cancer, Diabetes, Metabolic Syndrome, Obesity

Thursday, May 30, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

1538 Board #300 May 30 10:30 AM - 12:00 PM Resistance-training Induced Regional Body Composition Changes In Females With Obesity Vs. Normal Weight Obesity Bharath S. Selvaraj1, Cory Mahan1, Shelby Kloiber2, Amy Givan1, Mackenzie Clemments1, Dominic Sanguinetti1, Eneko Larumbe-Zabala1, Maria Fernandez-del-Valle1, Southern Illinois University at Edwardsville, Edwardsville, IL. 2Texas Tech University, Lubbock, TX. 3Texas Tech University Health Science Center, Lubbock, TX.

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Title: Resistance-training induced regional body composition changes in females with obesity vs. normal weight obesity

Selvaraj, BS, Mahan, C., Kloiber, S., Givan, A., Clements, M., Sanguinette, D., Larumbe-Zabala, E., Fernandez-del-Valle M.

Purpose: The aim of this study was to compare the effectiveness of resistance training on regional body composition and fat loss, including upper and lower limbs and trunk, in females with obesity and normal weight obesity (NWO).

Methods: A total of 12 young females with obesity (BMI: 35±3.3; % body fat [%BF]: 32.9 and 15±7.8 in NWO BMI: 22.2±1.8; %BF: 35.1% were randomized into control (obesity n=6 WO n=6) and resistance training (obesity n=6 NWO n=7). Dual-energy X-ray absorptiometry (DXA) and a maximal strength test were performed before and after a 3-week intervention. Percent change (%Δ) of left and right trunk, arms (LTrFat, RTrFat), LAfat, RAfat, LFat and RFat, respectively) and body fat were recorded. Training consisted of 3 sessions/week for 3 weeks, and 3 sets of 10 repetitions including 8 exercises that targeted major muscle groups. Participants were trained at 80% of their 1-repetition maximum.

Results: Non-parametric tests showed a statistically significant difference in %ΔLTrfat (1.0±2.3 and 1.3±3.9, p=0.032) and a trend in %ΔBF (1.7±3.1 and 1.3±0.6) in the resistance training obesity group when compared to control. No statistically significant changes were found in NWO group.

Conclusion: Resistance training has shown to induce significant changes in the obesity group by reducing LTrfat content. However, no changes were detected in the NWO group. Future research should include larger sample size to facilitate the detection of regional body composition changes and to help understand the differential impact of resistance training in women with obesity and NWO.

PAPER: For the presentation, visit the EIM website (www.exerciseismedicine.org).

1539 Board #301 May 30 10:30 AM - 12:00 PM Selective Effectiveness Of 10wk-exercise Protocols On Mets Reduction Roberto C. Burni, FACSM1, Mariana S. Nakagaki1, Hugo T. Kano1. 1São Paulo State University (UNESP), Botucatu, Brazil. 2Londrina State University, Londrina, Brazil.

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No relevant relationships reported

MetS is recognized as a permissive condition whose abnormalities result from a mismatch between contemporary environment and our ancient tailored genome. Hence, diet and physical exercise are considered the pillars in the implementation of effective strategies against MetS.

POURSE: The responses of MetS subjects to different types of physical exercises was investigated in a dynamic cohort study (“Move for Health” program) based on spontaneous demand for healthy lifestyle with supervised exercises and dietary counseling.

METHODS: Demographic, socio-economic and physical activity was recorded from IPAQ (version A and dietary quality (HEI) and food intake, from a 24-h recall. Anthropometry and fast-blood analysis were used for MetS diagnosis (NCEP-ATP III). After clinical selection and baseline assessments they were spontaneously assigned to structured protocols involving supervised exercises of strength (Pac, n=33) or balance (Pbl, n=35) in 2007 and 2008.

RESULTS: A total of 254 subjects were included in the study, MetS subjects (n=143, 56%). The most common MetS abnormality was increased fasting glucose (41%) and abnormal plasma triglycerides (26%). A significant positive association was found between MetS and body mass index (BMI; p<0.001), waist circumference (p<0.005), and body fat (%BF; p<0.001).

CONCLUSIONS: The proportion of MetS was significantly higher in the higher tertile of BMI (p<0.001) and waist circumference (p<0.005) and body fat (%BF; p<0.001). The average number of prior MetS diagnoses was significantly higher in the highest tertile of BMI (p<0.001) and waist circumference (p<0.005) and body fat (%BF; p<0.001). The average number of prior MetS diagnoses was significantly higher in the highest tertile of BMI (p<0.001) and waist circumference (p<0.005) and body fat (%BF; p<0.001).

1540 Board #302 May 30 10:30 AM - 12:00 PM Reason To Exercise In Diabetic Populations: Use Of Rapid-acting Insulin Predicts Falls In At-risk Patients Saejel G. Mohani1, Tina Bhateja1, Kathy L. Leslie1, J. Mark VanNess2, Jonathan M. Saxe2, Lewis E. Jacobson2, Courtney D. Jensen1. 1University of the Pacific, Stockton, CA. 2St. Vincent Hospital, Indianapolis, IN.

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No relevant relationships reported

Diabetes is present in 30% of American adults. Insulin is used in Type 1 and Type 2 cases, but without lifestyle change, it can hasten the progression of the disease. Limited data supports an association between diabetes and fall risk in older adults, with greater risk found among insulin-treated patients. Little is known about different insulin regimens.

Purpose: To evaluate the effect of insulin classes on incidence of falls in older adults.

METHODS: We conducted retrospective and prospective analyses of 680 hospital patients age ≥65 years who sustained a fall in 2015. Data was extracted from their first fall-related admission that year, including demographic reports, health history, injury characteristics, relevant diagnoses, and home medications. We exported the number of previous falls since 2010 and used logistic and Poisson regressions to test the effect of insulin on the odds of experiencing falls and the total number experienced. We then tracked patients forward until August 2016 and tested the effect of insulin on return visits for new fall-related admissions.

RESULTS: Patients were 80±8 years old, 20% used long-acting insulin, 0.5% used intermediate insulin, and 0.2% used rapid-acting insulin. They were admitted 1.9±1.3 times previously and had 0.5±0.9 eturn visits. There was no relationship with intermediate insulin and the number of previous (P=0.223) or future (P=0.38) falls. Long-acting insulin associated with modest increases in the number of previous (P=0.05) and return (P=0.05) falls. Rapid-acting insulin significantly predicted both. Controlling for weather, age, balance, and cognitive condition, patients using rapid-acting insulin had a 4-fold increase in the odds of sustaining multiple previous falls (P<0.002; CI: 1.6±10.8, 0.32% increase in the number of previous visits (P=0.012; CI: 1.07±1.07), 2.4 fold increase in the odds of readmission (P=0.033; CI of odds ratio: 1.07±1.07), and a 4.8% increase in the number of return visits (P=0.026; CI of odds ratio: 1.06±1.06).

CONCLUSIONS: Diabetics taking rapid-acting insulin express an elevated risk of falls. Exercise may serve two functions in this population: it can mitigate the acute and chronic effects of diabetes via non-insulin dependent glucose uptake, and it can protect against fall risk.
The Effects of Traditional Chinese Exercise on Sugar Metabolism And Physical Fitness

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(No relevant relationships reported)

Purpose: Exercise therapy of traditional Chinese medicine (TCM) has a long history in treating diabetes. Few evidence to date have shown its effects on the glucose metabolism and muscle fitness. We evaluated the effects of TCM exercise therapy and sedentary lifestyle on sugar metabolism and physical fitness in both female individuals with prediabetes and type II diabetes mellitus (T2DM).

Methods: Thirty-three diabetic subjects and 33 prediabetic subjects were randomly divided into the exercise therapy group (diabetic: ED, prediabetic: EP) or sedentary group (diabetic: CD, prediabetic: CP) as a 2:1 ratio. ED and EP groups were given the same traditional exercise for moderate intensity, 60 min, 3 times a week. Hemoglobin a1c (HbA1c), fasting insulin, oral glucose tolerance test (OGTT), peak oxygen uptake (VO2peak), grip strength, back strength, and sit-ups (muscle endurance) were taken at the pro and post of 12-week exercise. Responses were compared between prediabetes and diabetes.

Results: Compared with CP and CD group, HbA1c decreased by 0.16n mol/L (P < 0.05) and 0.28 mol/L (P < 0.01) with EP and ED, respectively. Fasting insulin decreased by 64 μ U/mL in EP group, and 13 of them returned to normal blood glucose, both fasting and postprandial ones, according to the OGTT test. The VO2peak, muscle strength and endurance of the diabetic groups were significantly lower than those of the prediabetic group (P < 0.001). VO2peak of the exercise groups increased significantly (EP: +6.55%, ED: +33.43%, P < 0.001). Muscle fitness improvements were significantly (P=0.05) on the grip strength (ED:+1.75kg, CD:+0.44kg), back strength (ED:+18.7, CD:+20kg), and sit-ups (ED:+3.8 m ore,CD:0.18 ess) in diabetic groups but not obvious in prediabetic groups.

Conclusions: The VO2peak and muscle fitness of diabetic patients were significantly lower than that of prediabetes. TCM exercise therapy can improve sugar metabolism and physical fitness, which is safe and effective. The traditional exercise is better for diabetes than prediabetes.

Supported by: JDZX201536n mg GASC2018 007

1542 Board #304 May 30 10:30 AM - 12:00 PM Combined Metformin and Exercise Treatment Improves Glucose Control and Insulin Sensitivity in Type-2 Diabetes Patients.

Juan F. Ortega, Miguel Ramirez-Jimenez, Felix Morales-Palomos, Ricardo Mora-Rodriguez. University of Castilla-La Mancha, Toledo, Spain.

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(No relevant relationships reported)

BACKGROUND: The antidiabetic medicine, Metformin, and exercise are cornerstones in the treatment of type-2 diabetes. However, there is conflicting evidence about the benefits of combining both interventions. PURPOSE: To compare free-living ambulatory glycemic control and insulin sensitivity among the separated and combined effects of metformin and exercise.

METHODS: Twelve middle-aged (M= 45.7± 11.3 years old and F= 40.4± 12.4 years old) adults, diagnosed with type-2 diabetes and obesity (BMI 32.0 ± 1.2 kg/ m2), were randomized to one of the four groups: (I) placebo (PL) + exercise (EX), (II) metformin (MET) + exercise (MET+EX), (III) placebo (PL) + metformin (MET), and (IV) metformin (MET) + control (CONT). Eight hours of metformin withdrawal, which was replaced by two (8 m in) daily bouts of high-intensity interval training (EX), iii) combining medicine and exercise (MET+EX), and iv) a Control trial withdrawing from metformin (48- hours) and exercise (CONT). Ambulatory glycemic control was inferred from interstitial fluid glucose concentration (IFG), which was freque ntly monitored during 24 h (FreeStyle Libre, Abbott, USA) in each experimental condition. In addition, after an overnight fasting, a blood sample was collected 24 h before each experimental condition for the assessment of glucose and insulin concentration and subse quent calculation of insulin sensitivity (i.e., HOMA-IR). RESULTS: During the 2 hour of IFG monitoring an average of 109-11 readings per trial were obtained (i.e., 1.5 readings per hour). IFG in EX (3 ± 1.9 mmol/L) was significantly lower than CONT (3 ± 1.9 mmol/L; P=0.064) and MET (3 ± 1.6 mmol/L) and MET+EX (6.6 ± 1.3 mmol/L) IFG was significantly lower than CONT (P<0.001 and P=0.028 respectively). IFG peaks (i.e., IFG > 11 mmol/L) were more frequent in CONT than in the rest of the trials. However, IFG peaks were more frequent in MET+EX than in MET (P=0.023 and EX (P=0.030). Finally, insulin resistance (i.e., HOMA-IR) was lower than CONT in MET+EX (P=0.031) and in MET (P=0.001) but not in EX alone. CONCLUSIONS: The combination of metformin and exercise reduces the occurrence of IFG peaks thus improving glucose control in a sample of type-2 diabetic individuals in a free-living situation. Monitoring of IFG seems adequate to track the effects of both, exercise and pharmacological treatment (metformin).

1543 Board #305 May 30 10:30 AM - 12:00 PM A Review Of Intervention Of Baduanjin For Diabetes And Complications

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(No relevant relationships reported)

PURPOSE: The traditional Chinese guidance technique–fitness qigong · Baduanjin exercise, which means the eight-section broadside exercise in English, has the functions of body building. It is widely used in diabetic patients as exercise therapy, we systematically reviewed the history and role of Baduanjin exercise applied to diabetes and its complications.

METHODS: The source and historical evolution of Baduanjin exercise were systematically analyzed based on ancient Chinese literature. Health benefits of Baduanjin exercise intervention in diabetes and its complications were summarized based on clinical research literature.

RESULTS: (1) The development of Baduanjin exercise went through five periods: (①) The Northern Song Dynasty from 960 to 1127 AD was the formation period of movements; (②) It became popular in the Southern Song Dynasty from 1127 to 1279 AD and was first recorded in the book “Yijianzhi.” And it became mature from the Southern Song Dynasty to Yuan Dynasty of 1280; (③) It was widely spread and promoted in the Ming and Qing Dynasties from 1368 to 1912; (④) After the foundation of the People’s Republic of China in modern times, a lot of books in regard to Baduanjin exercise were published. The fitness qigong management center of General Administration of Sport of China organized the compilation and creation of the exercise, which was named “fitness qigong · Baduanjin exercise”. The nationwide fitness program was carried out actively and the exercise was promoted around the world. (2) After practicing Baduanjin for 3-6 months, FBG and HbA1C can be significantly reduced. BP, TG and blood lipid levels such as LDL-C,HDL-C can be adjusted. The SNCV and MNCV can be enhanced. Psychological index scores such as HAMD, SDS, SAS, DSLQ and so on of diabetes patients with depression or anxiety can be improved.

CONCLUSIONS: The development of Baduanjin exercise went through five stages. As an exercise therapy, it can improve glucose and lipid metabolism and diabetic neuropathy. The level of mental health can be enhanced. Therefore, it deserves to be widely promoted and co-developed internationally to gain more benefits.

Funding support: The Technology Research Project of the fitness qigong center of General Administration of Sport of China (QG201013).

1544 Board #306 May 30 10:30 AM - 12:00 PM Relationships Between Exercise Level, Beliefs About Exercise, And Exercise Promotion Among Cardiologists And Oncologists

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(No relevant relationships reported)

PURPOSE: This study examined the relationships between cardiologists’ and oncologists’ exercise levels, beliefs about exercise for their patients, and frequency of discussing exercise recommendations with patients. METHODS: A survey was distributed to oncologists and cardiologists via Qualtrics. Questions and responses were: (1) “I believe exercise is safe for most of my patients,” (2) “I believe patients are capable of exercise, exercise is effective for improving my patients’ well-being,” and exercise can reduce likelihood of disease recurrence, or increase chances of survival in my patients (strongly disagree to strongly agree), (2) “How often do you discuss exercise with your patients?” (none/few, some, most/all visits), (3) “What percent of patients have you recommended should exercise in the past month?” (none/few, some, most/all) and (4) “How do you provide information about exercise” (referral as a yes/no option). Self-reported exercise was categorized at meeting exercise guidelines or not. Fisher’s Exact (E) tests with Cramer’s V were used to compare the proportion of responses in each category between sexes. RESULTS: Out of 14 surveys distributed, 8 (57%) were completed. No significant relationship between exercise level, beliefs about exercise, and exercise promotion was found. Gender differences in exercise level, beliefs about exercise, and exercise promotion were not found. Fishers’s Exact (E) tests with Cramer’s V were used to compare the proportion of responses in each category between sexes.
visits (FEV<sub>1</sub>=95,  p=0.027 = 0.5). More than half (46%) reported meeting exercise guidelines, and there were no differences in beliefs about exercise for patients between those meeting vs. not meeting guidelines. CONCLUSION: Cardiologists and oncologists who believe exercise can reduce the likelihood of disease recurrence or improve survival for their patients, may be more likely to discuss exercise or refer patients to an exercise program. Beliefs about exercise did not differ by exercise level. These findings suggest that cardiologists' and oncologists' beliefs about the benefits of exercise for improving disease outcomes may be a viable path to increase exercise promotion.

1547 Board #309 May 30 10:30 AM - 12:00 PM Evaluating The Translation Of Dutch Exercise Oncology Trials Into Clinical Practice Using The RE-AIM Framework

Laurens M. Buitraft<sup>1</sup>, Anne M. May<sup>2</sup>, Rosalie Huijsmans<sup>1</sup>, Neil K. Aaronson<sup>3</sup>, Martijn M. Stuiver<sup>4</sup>, 1Amsterdam UMC, Amsterdam, Netherlands. 2UMC Utrecht, Utrecht, Netherlands. 3Netherlands Cancer Institute, Amsterdam, Netherlands. 4Netherlands Cancer Institute and Amsterdam University of Allied Sciences, Amsterdam, Netherlands. Email: l.buitraft@vumc.nl (No relevant relationships reported)

PURPOSE: Implementation of exercise programs for cancer patients is challenging. This study evaluated the potential for implementation of exercise programs from Dutch exercise oncology trials.

METHODS: Three randomized controlled trials (PACES, REACT, PACT), examining effects of exercise during or following chemotherapy treatment with curative intent, were evaluated using the 5i dimensions of the RE-AIM framework: Reach, Effectiveness, Adoption, Implementation, and Maintenance.

RESULTS: Reach: Participation rates were 37%. Compared to non-participants, participants were higher educated, less fatigued or distressed, and had higher scores on behavioral variables. Effectiveness: No serious exercise-related adverse events occurred. Significant benefits of exercise were found for physical fitness, fatigue, and quality of life. A significant benefit on chemotherapy completion was found in one study but not in another. Adoption: To enable twice weekly exercise session attendance close to patients' homes, local physiotherapists (PTs) were educated about exercise supervision for cancer patients. Generally, the PTs felt sufficiently capable to deliver exercise programs, but less capable to support behavioral change. Implementation: 9 of 14 participants had high attendance at the supervised sessions. Education, additional radiotherapy, BMI, fatigue and self-efficacy predicted adherence in some studies. Basic insurance does not cover the program, but some additional coverage policies do. Some evidence for cost-effectiveness of the programs was found. Maintenance: Exercise-induced gains in physical fitness and quality of life post cancer treatment, and benefits from exercise during chemotherapy on physical activity and function maintained, whereas maintenance of fatigue benefits were inconsistent across studies. Sustainability of program delivery is ensured by incorporation of the exercise protocols in post-graduate oncology education for PTs. A quality control system has been implemented via Oncenet.

CONCLUSIONS: The exercise programs have high potential for successful implementation in clinical oncology practice, but reach and adherence should be monitored, and lack of reimbursement is currently a barrier. Future studies should focus on improving maintenance of benefits.
Feasibility Of Exercise Prehabilitation During Neo-adjuvant Chemotherapy In Oesophageo-gastric Cancer Surgery

Janine Zylstra1, Andrew R. Davies1, Jim Pate2, Gemma Tharn1, Nick Maisey1, Cara R. Baker1, Mark Kelly1, James Gossage1, Mike Browning1, Greg Whyte3, Guy’s and St Thomas’ NHS Foundation Trust, London, United Kingdom. 2Centre for Health and Human Performance, London, United Kingdom. 3Maidstone and Tunbridge Wells NHS Trust, London, United Kingdom. 

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(No relevant relationships reported)

PURPOSE: To determine the feasibility and potential benefits of patients diagnosed with operable gastro-oesophageal cancer undertaking a structured-exercise cancer prehabilitation program (prehab) during neo-adjuvant chemotherapy (NAC) versus patients on a standard care pathway.

METHODS: Patients were enrolled in a prospective, cohort-controlled trial. Prehab was based on World Health Organisation (WHO) ’recommended levels of physical activity for adults over the age of 18’. Cardiopulmonary exercise tests (CPEX) were performed at 4 time-points: 1. Baseline/ pre-NAC. 2. Post-NAC. 3. Before surgery. 4. After surgery. Participants wore wearable tracker devices. CPEX variables analysed included anaerobic threshold (AT) and peak oxygen uptake (VO2peak).

RESULTS: At time of writing, 25m ale and female patients, aged 25 ±10 yrs, had participated in the study; 22 had undergone surgery. Mean baseline AT in the prehab group was 13.8 ±3.35 ml/kg/minute higher than the control group. Mean baseline VO2peak achieved was 27.55±5.65SD (range 15.18- 36.83) ml/minute and 23.39±6SD (range 18.29–26) ml/minute, respectively. Mean values of AT and VO2peak between the groups pre-surgery were of little scientific value. However, VO2peak in individual patients showed a trend towards improvement in the prehab cohort. Post-surgery values decreased markedly in both groups:

Mean AT prehab decreased to 13.6 ±2.28 D (range 10.19) ml/kg/minute versus 13.10±2.05 D (range 10-10.19) ml/kg/minute post-NAC. Mean VO2peak reduced to 20.33±4.94 D (range 14.01-26.81)ml/kg/minute compared to 19.6 ±2.3 D (range 18-24) ml/kg/minute respectively.

CONCLUSIONS: Cancer prehabilitation during NAC is feasible. Recovery of peak oxygen uptake shows an improvement trend in patients undergoing prehab during and after NAC. Post-surgery mean AT and VO2 values confirm physiological stress in patients undergoing high-risk, intra-thoracic and intra-abdominal oeso-gastric surgery.

1550 Board #312 May 30 10:30 AM - 12:00 PM

Moving Cancer Care Ontario’s Exercise Guidelines Into Oncology Practice: Using The Theoretical Domains Framework To Validate A Questionnaire

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to validate a questionnaire used to identify barriers and facilitators to use of exercise guidelines in oncology care.

METHODS: A questionnaire was designed to explore knowledge, beliefs, practices, barriers and facilitators to discussion of exercise guidelines in oncology patients. It was optimized for face and content validity through pilot testing, and administered to oncology care providers at a regional tertiary cancer. To offer more strategic and precise data collection, and to inform the development of interventions with a higher likelihood of applicability and success, we validated the questionnaire based on the updated 14 item Theoretical Domains Framework (TDF). The TDF is a knowledge translation (KT) framework used to identify potential targets for health professional behavior change related to evidence-based practice. Cronbach’s alpha was calculated to assess internal consistency between items within each domain of the TDF.

RESULTS: Existing items were mapped successfully within the eight TDF domains deemed to be relevant to exercise discussion in oncology care. Internal consistency was generally high across domains, with all domains > 0.7w with the exception of intentions, and beliefs about consequences. Four question items were removed, which increased the internal consistency within domains.

CONCLUSIONS: Many KT frameworks emphasize context in developing and assessing the effectiveness of implementation strategies. Our questionnaire, based on a commonly used KT framework, has the potential to assist other researchers to collect valuable contextual data prior to the design phase of an intervention to promote exercise discussion in cancer practice. The consideration of these formative data in the development of KT interventions that have a greater likelihood of success in closing the gap between the known benefits of exercise in people with cancer and coverage in care planning.

1551 Board #313 May 30 10:30 AM - 12:00 PM

Exercise in Patients Newly Diagnosed with Multiple Myeloma - A Randomized Controlled Feasibility Study

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(No relevant relationships reported)

Exercise is considered a feasible, safe and beneficial complementary treatment for patients with hematological cancer. However, there is a lack of knowledge regarding exercise interventions (EI) in patients with newly diagnosed multiple myeloma (MM). Our ongoing randomized controlled trial (RCT) examines the effect of an EI in newly diagnosed patients with MM, irrespective of age and treatment regimen, on muscle strength, physiological function and physical activity. PURPOSE: To report an interim analysis of feasibility and safety of the early initiated exercise intervention. METHODS: A two-center RCT with blinded outcome assessors. Baseline tests are carried out three days after starting anti-myeloma treatment, followed by randomization to control group (CG) or intervention group (IG). The IG is a 10-week supervised and home-based exercise program comprising aerobic and strengthening exercises and physical activity. Feasibility outcome measures are study eligibility, acceptance and drop-out rates. Further, intervention adherence, tolerability and safety by registration of adverse events (AE) are assessed. IG is compared to CG by k-sample test for medians and by Fisher’s exact test for categorical variables. RESULTS: Of 85 patients screened, 80% were eligible for inclusion, 77% accepted participation. Median age 69 years, range (38–90), 77% were men. No significant difference between CG and IG in age (p=0.713) and gender (p=0.660). From IG, five patients dropped out (29%); prior to start of intervention due to no surplus energy (n=3), treatment near home (n=1) or because of sudden impairment (n=1). Adherence was high; 99% of IG tested intervention at least once. Baseline test results are displayed in Table 1. CONCLUSION: Early initiated exercise in patients with MM, regardless of age and treatment regimen, is feasible, tolerable and safe and may be important in preventing physical decline during treatment for MM. SUPPORTED BY: Zealand University Hospital, Region Zealand; Region of Southern Denmark; REHPA, The Danish Knowledge Centre for Rehabilitation and Palliative Care; Ameen; The Association of Danish Physiotherapists.

1552 Board #314 May 30 10:30 AM - 12:00 PM

Effects Of Exercise And Yoga On Sleep Problems In Women With Breast Cancer: A Meta-analysis

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(No relevant relationships reported)

Sleep problems are one of the top five long-term health issues in breast cancer patients. However, the optimal treatment still needs to be defined. Exercise and yoga are promising approaches. PURPOSE: To conduct a meta-analysis evaluating the effects of physical exercise and yoga interventions on self-reported and objective sleep problems in breast cancer patients during or post-cancer treatment. METHODS: PubMed, Web of Science and Cochrane library databases were systematically searched for randomized controlled trials with any type of exercise or yoga intervention in women with breast cancer. Outcomes were self-reported or objective measurements of sleep. Standardized mean differences (SMDs) using random-effects models were calculated. RESULTS: The meta-analysis included 22 trials with 209 pa participants. Sleep was assessed in

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Clinicians and researchers have an important role to play in the reduction of late adverse effects of cardiorespiratory fitness and physical activity levels on health outcomes (i.e., obesity, depression, low bone mineral density). This study assesses the association between physical activity guidelines and major health outcomes in adolescents. The purpose of this pilot study was to examine associations between physical activity and sleep quality in adolescents with and without obesity.

### METHODS

The study included adolescents aged 12-18 years who were recruited from a local high school in Arkansas, USA. Participants wore Actigraph wGT3x accelerometers for ≥4 days to assess physical activity (PA) and sleep. The accelerometer data were analyzed to determine the number of minutes spent in light-intensity physical activity, moderate- to- vigorous physical activity, and sedentary activity. Sleep was assessed using the Pittsburgh Sleep Quality Index (PSQI). The effect sizes were calculated using standardized mean differences (SMDs).

### RESULTS

On average, participants accumulated 435±15 minutes of sleep equal to 7.3±0.3 hours per night. Participants also accumulated 473±24 minutes of moderate- to- vigorous physical activity and 371±29 minutes of sedentary activity per day. There was no significant difference between the effects of physical activity and sedentary activity on sleep quality.

### CONCLUSION

The study suggests that adolescents who accumulate less than the recommended 8-10 hours of sleep per night and engage in light-intensity physical activity have better sleep quality. Further studies are needed to explore the relationship between physical activity and sleep in a larger sample of adolescents.
behaviors with accuracy (errors of omission or commission) or reaction times. Body fat percentage (IRR 1.06, CI: 1.01, 1.12, p = 0.02) and total lean mass (kg) (IRR 0.89, CI: 0.80, 0.97, p = 0.013) were associated with omission errors of inattention.

CONCLUSION: In this sample of adolescents, total sleep time was associated with body fat and lean mass. Body composition was associated with inattention. Novel interventions that integrate sleep strategies to improve health and cognitive performance in adolescents should be explored.

1556 Board #318 May 30 10:30 AM - 12:00 PM
What Affects the Sleep of Youth? Results from the 2017 Youth Risk Behavior Surveillance Survey
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(No relevant relationships reported)

Background/Purpose: Sleep plays a critical role in metabolism, memory, learning, and other vital functions. Sleep deprivation is associated with an increased risk of developing diabetes, cardiovascular disease, and many other complications. However, evidence has shown that youth are sleeping less than before. Understanding what influences sleep time is extremely important in designing interventions to help to improve the sleep time and sleep quality of youth. The aim of this study was to examine the influencing factors of sleep for youth age from 12 to 18 yr.

Methods: The data were derived from the 2017 Youth Risk Behavior Surveillance System (YRBSS) and a total of 14,765 youth responded to the survey. Descriptive analysis was used to explore the sleep patterns and Pearson’s Chi-squared test was applied to examine the gender and race/ethnicity difference. Logistic regression was implemented to explore the impact of health-related behaviors such as physical activity (PA), playing video games (GAME), smoking (SMOKE), and drinking alcohol (DRINK) on sleep time.

Result: Only 23% female and 25.8% male reported having 8 or more hours of sleep on an average school night. Significant disparities exist among demographic subgroups of youth defined by gender ($\chi^2 = 5.70, p = 0.02$) and race ($\chi^2 = 30.13, p = 0.00$). Results of logistic regression were displayed in the table below:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Odds Ratio</th>
<th>SE</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.9</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>Gender Male</td>
<td>1.08</td>
<td>0.06</td>
<td>0.14</td>
</tr>
<tr>
<td>Race Black</td>
<td>0.9</td>
<td>0.08</td>
<td>0.2</td>
</tr>
<tr>
<td>White</td>
<td>1.14</td>
<td>0.07</td>
<td>0.03</td>
</tr>
<tr>
<td>Asian</td>
<td>0.8</td>
<td>0.08</td>
<td>0.00</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>0.8</td>
<td>0.20</td>
<td>0.11</td>
</tr>
<tr>
<td>Native American</td>
<td>0.8</td>
<td>0.22</td>
<td>0.24</td>
</tr>
<tr>
<td>Obesity Non-obese</td>
<td>1.22</td>
<td>0.10</td>
<td>0.01</td>
</tr>
<tr>
<td>PA</td>
<td>1.04</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>GAME</td>
<td>0.9</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>SMOKE</td>
<td>1.07</td>
<td>0.03</td>
<td>0.02</td>
</tr>
<tr>
<td>DRINK</td>
<td>0.8</td>
<td>0.03</td>
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</tr>
</tbody>
</table>

Comparing with Hispanic youth, White youth tended to have longer sleep time ($p = 0.03$) while Asian youth had significantly less sleep time ($p = 0.00$). Youth who were non-obese and physically active were more likely to have 8 hour sleep, while those who played video games and consumed alcohol tended to sleep less.

Conclusion: About 75% of the youth did not meet the 8 hour sleep needs and promote physical activity and reduce alcohol consumption may help to increase the sleep time of youth.
Aerobic exercise acutely increases the production of reactive oxygen species (ROS), which creates an imbalance between free radicals and the body’s antioxidant defenses, resulting in increased oxidative stress. Oxidative stress levels are reportedly higher in males compared to females, however there is limited knowledge regarding the role of gender in the antioxidant response following an acute bout of aerobic exercise.

**Purpose:** To determine whether changes in serum antioxidant levels after an acute bout of aerobic exercise differ between genders.

**Methods:** The study comprised of 15 healthy adults (9 females, 6 males; age 27± 8 years; BMI 24± 3 kg/m²). During the first visit, subjects completed a treadmill cardiopulmonary exercise test (CPET) to volitional exhaustion. On a separate visit, subjects performed a vigorous-intensity continuous work rate (WR) test, to volitional exhaustion on the treadmill. Serum samples were collected before and immediately after the vigorous exercise bout. A Human Oxidative Stress Multiplex panel was used to determine serum peroxidase (PRX2) and catalase levels. Student’s t-tests were performed between genders for WR and antioxidant levels.

**Results:** Males performed vigorous-intensity exercise at a higher WR than females (p<0.0001). No difference was found in baseline PRX2 and catalase levels between males and females. Relative change in PRX2 (+32% in males; -1% in females) and catalase (+18% in males; +11% in females) was different between genders after a vigorous bout of aerobic exercise (p=0.0136 for PRX2; 0.0348 respectively). This difference became insignificant when WR was accounted for. Conclusion: This study suggests that higher levels of oxidative stress in males may be explained by higher work rates. However, response to exercise-induced oxidative damage demonstrated that males (60% increased anti-oxidant levels, while females (80%) of 9 showed decreased levels. Previous studies have suggested that gender differences in oxidative stress may be related to an increased production of ROS by NADPH-oxidase in males, or antioxidant properties of estrogen which may assist in minimizing oxidative stress in females.

**Funding:** National Institute of Nursing Research, Division of Intramural Research.
Previous protocols investigating neuromuscular fatigue have typically discarded the first 2 of 6 electrical stimulation sets in recovery and have reported the average of the remaining 4 sets. However, our lab has recently shown that central fatigue (as measured by potentiated twitch force, Qtw) was significantly recovered after severe (p<0.01) exercise. Further, qualitative analysis suggests women may be able to recover MVC and Qtw faster than men following extreme exercise, while these differences may not be evident following severe exercise.

CONCLUSIONS: These current data suggest central fatigue (as measured by VA) does not significantly impact exercise tolerance during severe or extreme exercise. Importantly, these data suggest that the measurements typically used to represent the condition of the muscle are taken too far-post-exercise such that much of the recovery of the muscle has already occurred, especially following extreme exercise.

A total of 42 women (mean ± SD, age 32 ± 3 years, height 1.72 ± 0.07 m, body mass 72.1 ± 3.8 kg) each hauled an 80 kg sledge over 100 km in 6 da ys from coast-to-coast across the Antarctic. Whole-body areal bone mineral density (aBMD) (dual energy x-ray absorptiometry) and tibial volumetric BMD (vBMD), geometry, microarchitectural and mechanical properties (high-resolution peripheral quantitative computed tomography) were assessed 39 days before (pre-expedition) and 13 da ys after the expedition. Serum and plasma markers of bone turnover were assessed pre-expedition, and 4 nd 13th ys after the expedition. Results: There were reductions in trunk (-2.6%), ribs (-5.0%) and spine (-3.4%) aBMD from pre- to post-expedition (all P ≤ 0.046); arms, legs, pelvis and total body aBMD were not different (all P ≥ 0.075). Tibial vBMD, geometry, microarchitectural and mechanical properties at the distal metaphysis (% site) and diaphysis (30% site) were not different between pre- and post-expedition (all P ≥ 0.082). Bone-specific alkaline phosphatase was higher 15 days post- than 4 days post-expedition (18.0 vs 16.3 μg∙l⁻¹, respectively, P = 0.028). Total 25(OH)D decreased markedly from pre- to 4 days post-expedition (112 vs 76 nmol∙l⁻¹, respectively, P = 0.008). Sclerostin, procollagen I N-terminal propeptide, C-telopeptide cross-links of type 1 collagen and adjusted calcium were unchanged (all P ≥ 0.154).

Conclusion: The deleterious effect of the expedition on aBMD may be due to indirect and direct effects of prolonged energy deficit on bone turnover. We propose that weight-bearing exercise was protective against the effects of low energy availability on tibial vBMD, geometry, microarchitectural and strength. Supported by UK Ministry of Defence (Army)
data were collected and BMD (g/cm²) was measured at the hips and lumbar spine with a Hologic dual energy x-ray absorptiometry (DEXA) machine. RESULTS: Significant correlations (p < .05) were found between lumbar spine and hip BMD, and BMI (r = .33, p = .031), (r = .35, p = .022) respectively. Regression analysis confirmed that BMI was a statistically significant predictor of BMD for both the hips F(1,4) = 8.4, MSE = .02, p = .022, Adj. R² = .10 and lumbar spine F(1,4) = 3.02, MSE = .03, p = .031, Adj. R² = .09. CONCLUSIONS: Among this group of premenopausal women, BMI was positively correlated with, as well as being a significant predictor of BMD at the hips and lumbar spine. Medical and fitness professionals may find it useful to advise clients about the importance of having a healthy BMI value not only for the management and prevention of obesity but also for healthy bone mineral density and osteoporosis prevention. Future research might establish more clear guidelines for the use of BMI as it relates to osteoporosis risk among men and women.

1594 Board #8 May 30 1:30 PM - 3:30 PM Dynapenic Abdominal Obesity And The Incidence Of Falls In Older Women: An 18-month Follow-up Study André B. Gadelha¹, Juscelia C. Pereira², Aparecido P. Ferreira³, Martim Bottora³, Silvia G. R. Neri³, Ricardo M. Lima³.

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(No relevant relationships reported)

PURPOSE: To assess the association between dynapenic abdominal obesity (DAO) and the incidence of falls over 18 months in community-dwelling older women. METHODS: A total of 188 older women (67.97±6.02 years; 27.70 kg/m²) underwent waist circumference (WC) measurement and had handgrip strength assessed at the dominant arm using a hydraulic dynamometer. Dynapenia was classified using the lower tertile of handgrip strength as cut-off value (20.7 kgf), while obesity was considered as a WC > 88 cm. DAO was the combination of both aforementioned criteria. Therefore, volunteers were divided into 4 groups: Eutrophic, Dynapenic, Obese, and DAO. Participants were tracked by phone calls for ascertainment of falls during a follow-up period of 18 months. Chi-square and modified Poisson regression analyses were conducted. RESULTS: Proportions of each classification were 17.6%, 46.8%, 13.3%, and 22.3% for eutrophic, obese, dynapenic, and DAO, respectively. These results provide support for the concept that the combination of abdominal obesity and dynapenia has clinical implications and might be an useful supplement to other routine risk assessment tools. These relationships were stronger than obesity or dynapenia alone.

1595 Chair: Sofiya Alhassan, FACSM. University of Massachusetts, Amherst, MA.

(No relevant relationships reported)

Despite the benefits of physical activity and the potential risks of sedentary behavior (SB), few studies have examined sensor-measured SB in pregnant women.

PURPOSE: To report SB in a sample of women in early pregnancy and examine associations with sociodemographic and psychological variables. METHODS: We analyzed baseline data from the HIPP trial, a RCT enrolling SC women who were <16wks gestation, overweight or obese, white or African American, 18 to 4 yrs old, and without exercise contraindications. Participants wore a SenseWear armband ≥ 20 hrs/d for ≥ 5 days (including ≥ 1 weekend day). SB was defined as MET values < 1.5. Total time in non-sleep SB, # of SB bouts ≥ 30 min, and total time in SB bouts ≥ 30 min were calculated. Differences in SB by parity, race, education, marital status, and employment (t-tests), as well as BMI, age, depressive symptoms, perceived stress, and satisfaction with body function and appearance (Pearson rs) were tested. RESULTS: To date, participants (n=202) randomized with usable armband data are 1597 Board #2 May 30 1:30 PM - 3:30 PM Sensor-measured Physical Activity In Overweight And Obese Women In Early Pregnancy Jihong Liu¹, Sara Wilcox, FACSM¹, Ellen Wingard², Brent Hutto², Gabrielle Turner-McGrievy³, Judith T. Burgis³, Alycia Boute⁴, Lara Schneider⁴. ¹University of South Carolina, Columbia, SC. ²University of South Carolina School of Medicine, Columbia, SC.

Email: jliu@mailbox.sc.edu

(No relevant relationships reported)

Overweight and obese pregnant women may benefit from physical activity (PA) in pregnancy, yet few studies have examined sensor-measured PA in pregnancy.

PURPOSE: To evaluate sensor-measured PA in overweight and obese pregnant women and its sociodemographic and psychological correlates. METHODS: We analyzed baseline data from an ongoing behavioral lifestyle intervention trial in Columbia, SC (n=202). PA was measured with the SenseWear Armband; compliance was set at wearing for 20+ hrs/d, 5 days (including 1 weekend day). PA measures were daily duration of light PA (LPA), moderate to

Abstracts were prepared by the authors and printed as submitted.
vigorou PA (MVPA), daily steps, and meeting MVPA guidelines (≥150 min/wk of MVPA in ≥10 min bouts). PA was presented as median (interquartile range). Subgroup differences in medians were examined with t-test regression models. Correlations of PA measures with perceived stress, depressive symptoms, PA social support, PA self- efficacy, and PA self-regulation were studied. A logistic regression model was used to examine correlates of meeting MVPA guidelines. RESULTS: Participants (mean of 12±4 yrs; gestational; median of 203 (18 $ min/d LPA, 34 $ min/d PA; MVPA, and steps were lower in African American and obese women (p<.05; LPA was lower in nulliparous women (p=.05 . Participants with less than college education had lower MVPA and steps (p<.05 . Further, LPA, MVPA, and steps were positively associated with PA self-efficacy (r’s ranging from 0.13 to 0.16, p≤.05) and PA goal setting (r’s ranging from 0.10 to 0.21, p<.05 . MVPA was positively associated with PA planning (r=0.16, p<.05). Only 10.8% of participants met MVPA guidelines, which was more prevalent in white (17%) vs African American (2.2%) women and in overweight (1.7%) vs obese women (3.7%) (p<.05. After adjusting for age, parity, and marital status, white women and overweight women had higher odds of meeting MVPA recommendation than their counterparts: white: β= 1.2-2.8; overweight: β= 1.6.10. CONCLUSION: Sensor-measured PA was low in overweight and obese pregnant women in early pregnancy with significant differences by race, education, parity, and pre-pregnancy weight status. Programs targeting PA are needed for this population. Funded by NIH/NICHD.

1598 Board #3 May 30 1:30 PM - 3:30 PM
The Association Between Type and Intensity of Physical Activity on Cortisol Levels Among Low- Income, Ethnic-Minority Mothers
Wendy Miranda, Guido Urizar. California State University, Long Beach, Long Beach, CA.
Email: wndymiranda@gmail.com
(No relevant relationships reported)

Physical activity has been linked to many health benefits such as reduced cardiovascular disease risk. Furthermore, the health benefits of intensity and type of activity varies (e.g., vigorous aerobic activity reducing cardiovascular risk more than moderate). During pregnancy, mothers can experience increased levels of stress, such as the stress hormone cortisol, and are also less likely to engage in physical activity compared to other populations. However, few studies have focused on mothers and on the impact of type and intensity of physical activity on their cortisol levels.

PURPOSE: The current pilot study examined whether different types and intensities of physical activity (walking, housework, fitness, recreational, occupational, and miscellaneous activity; moderate and vigorous activity) were associated with cortisol patterns among 30 low-income, ethnic-minority mothers (%) average annual income <30,000; 3% Latina) and whether this association varied by the number of children the mothers had. METHODS: The majority of our sample were sedentary with only 3% meeting the national recommendations of daily aerobic activity (>30 minutes or more of moderate to vigorous aerobic activity). Mothers completed an activity log of their physical activity over three days. During this three-day period, mothers also collected their saliva at four times on one collection day (upon waking time, 8 a.m., 12 noon, 4 p.m., and 8 p.m.) to assess cortisol levels. RESULTS: Multiple regression analyses found that mothers who engaged in greater minutes of vigorous recreational activity had higher cortisol levels, but only among mothers with more children (β = 1.6, t(21) = 2.0, p = 0.03). Additionally, mothers who engaged in greater minutes of moderate or vigorous miscellaneous (e.g., heavy lifting) activity had higher cortisol levels, but only among mothers with more children (β = 2.1, t(21) = 3.12, p = 0.01). No significant association was found with other types of activity. CONCLUSION: Despite the benefits of physical activity, results suggest that low-income, ethnic minority mothers with more children are not receiving these benefits and that number of children may be a stressor. Future research should consider family size when designing and implementing physical activity interventions in this population.

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Pregnancy-related anxiety (PRA) is experienced by many women, given the physical and psychosocial challenges common during pregnancy and the prospect of childbirth. Some health behaviors, such as physical activity and quality of sleep (QS), are related to decreased PRA, but their joint influence is unclear. PURPOSE: We examined the individual and joint influences of physical activity behaviors and QS on PRA among pregnant women at two locations. METHODS: Third-trimester pregnant women (N=33) participated in a series of measurements between 28 36 weeks gestational age. Participants answered questions rating their moderate and vigorous physical activity (min/wk) for prepregnancy, in the first and second trimesters, and concurrently. Moderate to vigorous physical activity (MVPA) was calculated for prepregnancy and for each trimester. Participants also wore a validated physical activity monitor (Modus StepWatch) for one week, and average steps/day were calculated. QS was evaluated with the Pittsburgh Sleep Quality Index (PSQI), calculating a global score. The Pregnancy Related Anxiety Questionnaire (PRAQ-R) was used to assess women’s anxiety regarding childbirth and the health of the baby. Median split was used to categorize PRA as “high” [≥15.0 PRA scale] or “low” [<15.0]. Mann-Whitney U-tests were used to compare the distribution of MVPA for all timepoints, steps/day, and also QS between high and low PRA participants. Hierarchical logistic regression determined the joint influence of MVPA and quality of sleep on PRA. RESULTS: Mann-Whitney U-tests showed lower PRA participants had significantly superior third trimester global QS scores (p<0.08). Likewise, global QS scores were related to increased odds of high PRA [p=1.34, 95% CI: 0.99-1.80]. Average steps/day and self-reported MVPA prior to pregnancy and at all pregnancy timepoints were not related to PRA. Hierarchical analyses did not reveal an interactive effect of steps/day and QS or MVPA and QS on PRA as hypothesized. CONCLUSIONS: Lower QS is related to higher PRA during the third trimester of pregnancy. Physical activity was not related to PRA and interactive effects with QS on PRA were not found. Larger samples are needed to confirm these findings.
decline in dietary habit (p<0.01), and 20% decline in stress levels (p<0.01). There were no significant group by time interactions, indicating that students had similar outcomes regardless of what behavior they were targeting.

CONCLUSIONS: HC seems to be an effective strategy for promoting healthy lifestyles in college students. Students had similar gains in PA and similar declines in stress, regardless of the behavior they reported focusing on. It is not clear why confidence in sticking with dietary changes decreased over time, but this may be due to participants possibly becoming more sensitized to their dietary habits through the HC sessions. Additional research is needed to understand student reactions to peer-led HC in college settings.

1606 Board #3 May 30 1:30 PM - 3:30 PM
Per-protocol Analysis Of BAILAMOS™ Dance Program On Self-reported And Device-assessed Physical Activity In Older Latinos
Guilherme M. Balbim1, Susan Aguiã 2, Priscilla Vazquez 2, , Isabel G. Marque 3, Jaque line Guzman 2, Deborah Salvo3, David X. Marque 3, FACSMM,1. University of Illinois at Chicago, Chicago, IL. 2University of California at San Diego, San Diego, CA. 3University of Victoria, Victoria, BC, Canada. 4Washington University in St. Louis, St. Louis, MO. (Sponsor: David X. Marque 3, FACSMM)
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(Purpose relationships reported)

PURPOSE: Test the impact of the BAILAMOS™ dance program on PA levels in older Latinos.

METHODS: Older Latino adults (n=333; M age = 64.89± 7.08) were randomized into a dance (n=167) or health education (HE) (n=166) group. For purposes of per-protocol analysis, participants with attendance ≥75% in dance and HE classes, respectively, were included. The final analytic sample was 145 participants (dance = 63, HE = 82). The dance group participated in four months of Latin dancing, two times per week for one hour per session. The HE group participated in classes once per week for two hours per session for four months. Participants completed the CHAMPs PA Questionnaire and wore an ActiGraph™ GT3X+ accelerometer for seven consecutive days on their non-dominant wrist. Data was used if the participant wore it for at least 10 hours/day over three days. Wrist cut-points utilized were proposed by Kamada (2016) (moderate-to-vigorous PA (MVPA) ≥7500 counts per minute). We performed a fixed-intercept mixed model (p & df) , adjusting for baseline covariates of age, sex, education, income, and health status. Cohen’s d effect sizes were computed.

RESULTS: Self-reported MVPA (minutes) increased significantly (d=1.20, p=0.002) from baseline (dance: M=103.5± 118.7 , but no group* time interaction was demonstrated (d=1.21)=1.33, p=0.01. Total leisure-time PA (LTPA) (minutes) increased significantly from baseline (Dance: M=280.50±285.35; HE: M=211.35 ± 196.0). No significant group*time interaction (d=1.21)=2.1.26, p=0.03, d=0.33. Accelerometer-assessed MVPA did not increase significantly from baseline (Dance: M=22.6± 14.3; HE: M=22.2± 12.7). No group* time interaction and there was no group* time interaction (d=1.21)=1.53, p=0.06, d=0.4.

CONCLUSIONS: The BAILAMOS™ dance program showed a positive impact on self-reported LTPA. This impact was not observed in device-assessed PA, however, there was a moderate effect. Supported by NIH Grant 1R01DK10193

1607 Board #4 May 30 1:30 PM - 3:30 PM
Reducing the Uncertain Geographic Context Problem in Physical Activity Research: The Houston TRAIN Study
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(Purpose relationships reported)

PURPOSE: The Uncertain Geographic Context Problem (UGCP) arises when studying the effect of static area-level factors (e.g. parks within walking distance from home) on individual-level outcomes, like physical activity. The UGCP is largely due to temporal uncertainty, as people may spend significant portions of the day outside of the geographic area captured by static spatial measures. The aim of this study was to determine if spatial exposure indicators for physical activity research are improved by including measures of both the home and work neighborhood environments.

METHODS: Baseline data from the Houston TRAIN Study were used (n=15). Participant home and work addresses were geocoded, and two spatial exposure indicators were built per location: transit stops within 1.25 km, and parks within 2.25 Km (counts). A categorical variable was built for each feature, with four levels based on median spatial access: Low; & work, high access at home & low access at work, low access at home & high access at work, and low access at both locations. Weekly minutes of moderate to vigorous physical activity (MVPA) were measured with an Actigraph GT3X- BT Actigraph monitors using Freedson cut-points. Linear regressions estimated the association between the combined ‘home plus work’ access variables and MVPA. Models were adjusted for sex, age, education, and race/ethnicity.

RESULTS: Relative to the ‘low-low’ group, having high access to transit in both the home and work neighborhood was associated with 3.12 additional weekly minutes of MVPA (p=0.039) . Similarly, those having high access to parks both in their home and work neighborhood had 2.5 1.9 more weekly minutes of MVPA than those with low access in both locations. Having high transit or park access only in one of the two studied neighborhood locations was not significantly associated with MVPA (p=0.05).

CONCLUSIONS: When examining the effect of both transport and leisure related urban infrastructure on MVPA, the UGCP is improved by incorporating measures of both the home and work environment. Pending confirmatory studies, our results suggest that approaches exclusively focused on improving the built environment of residential neighborhoods may have limited impact on physical activity. A citywide, systems level approach may be warranted. Supported by NIH RO1DK10193

1608 Board #5 May 30 1:30 PM - 3:30 PM
Developing a National Network of Physical Activity Promotion: The Case of Germany
Stefan Peters1, Hagen Wäschle2, Alexander Wolf2, Gerhard Huber3,4.DVGS e.V., Härth-Efferen, Germany. 3Karlsruher Institute of Technology, Karlsruhe, Germany. 4Heidelberg University, Heidelberg, Germany. Email: stefan.peters@dvgs.de

Reported Relationships: S. Peters: Salary; Stefan Peters works for the DVGS, which is one of the actors in physical activity promotion that have been a central part of the presented research.

PURPOSE: Physical activity supports the health of human beings of every age group in various ways. However, the worldwide prevalence of physical inactivity is high and many people do not reach the amount of physical activity that is recommended by physical activity guidelines. National Action Plans (NAPS) and Initiatives try to counteract this situation but have not always been successful. To support targeted measures in such NAPS, it is necessary to gain knowledge of relevant actors, professionals groups and multiplicators as well as their structural connection. In Germany, an exploratory study addressed 2 goals accordingly: (1) the identification of relevant actors, professional groups and multiplicators of physical activity promotion, and (2) the analysis of structural relations among these actors as well as the formulation of recommendations for the sustainable development of a national network of physical activity promotion.

METHODS: Qualitative expert interviews, a subseqe nt network visualization and an analysis for network development were carried out.

RESULTS: It became apparent that the field of actors in the area of physical activity promotion is very heterogeneous and extensive with regard to different forms of actors, sectors of society and administrative levels. Overall, 128 actors were identified, of which 22 actors are considered to hold key positions. Concerning the multiplicators, 19 current and 17 potential ones were identified. Structural relations among actors are sparse.

CONCLUSIONS: For carrying out a network development of physical activity promotion, various prerequisites, benefits, and barriers were revealed. Subsequently, recommendations that contribute to the development and effective governance are presented. The study provides a first detailed consideration of the structure of physical activity promotion in Germany and thereby offers a perspective, which can also inform NAPS around the globe.
of a vigorous exercise prescription on drug abstinence in voluntary rehabilitation patients. METHODS: 25± male subjects in a drug treatment program underwent a 12-week intervention, which included cardiovascular exercise, resistance training, and supportive psychotherapy. Five days a week, subjects were asked to participate in either yoga with mindfulness practices or action-based induction therapy lasting two hours; there was also a 90-minute exercise boot camp. Data collected were exercise adherence, exercise performance, sobriety and relapse rates, and an assessment of emotional coping skills. Chi-sq analysis was performed to compare exercise groups. RESULTS: Subjects had experienced frequent relapse (8 episodes) prior to the current admission. Across the sample, % were sober on completion of the program, % relapsed after treatment, and % relapsed after treatment. Among patients who exercised regularly, % were sober on completion compared to % of patients who did not engage in regular exercise (p<0.05). Owing to a small sample size of patients, future studies may be performed on larger samples (n=20). Moderate intensity exercise groups who relapsed during treatment (%) and non-exercisers who relapsed (25%) was not significant (p=0.171). Following treatment, 29% of exercisers and 75% of non-exercisers relapsed (p<0.05). The odds of successfully managing adverse emotional states when they arose increased 20-fold in subjects who exercised regularly (p<0.03). Each additional session of yoga per week predicted a 20-day increase in the longest duration of sobriety (p=0.018). CONCLUSION: Exercise appears to exert a positive effect on drug and alcohol sobriety and coping skills in a population that struggles with frequent relapse.

1610 Board #7 May 30 1:30 PM - 3:30 PM Effectiveness Of Aerobic Exercise Programs For Health Promotion In Metabolic Syndrome
Felix Morales Palomo, Miguel Ramirez-Jimenez, Juan Fernando Ortega, Ricardo Mora-Rodriguez. UCLM, Toledo, Spain. (No relevant relationships reported)

The effects of different modalities of aerobic training on cardiorespiratory fitness (CRF) and metabolic syndrome (MetS) have been previously studied in patients with different cardiometabolic diseases. Continuous (Jonsson et al., 2007) and interval (Mora-Rodriguez et al., 2014) training have been shown to be effective to improve MetS. On the other hand, a recent meta-analysis suggest that high-intensity interval training (HIIT) may be superior to traditional moderate intensity continuous training (MCT) to improve CRF (Milanovic et al., 2015) even when programs were matched by total work performed. However, to our knowledge no study has compared the capacity of three training modalities on improving MetS and CRF in middle-aged MetS patients with low initial levels of CRF.

PURPOSE: To compare the improvement in CRF and MetS-Z-Score of 3 modalities of aerobic exercise. METHODS: One hundred and twenty-one MetS patients (age, 3 yr; weight, 9 kg a nd MetS factors, 4 components) with low initial CRF (VO2peak , 24: 5mL·kg·min⁻¹) were randomized to undergo one of the following 12-week exercise program: a moderate-intensity high-density interval training at 90% of HRRmax (HIIT group; n = 32), b minimum-intensity continuous training at 0% of HRRmax (MCT group; n = 32), c) 10x1 min HHI at 100% of HRRmax (1HIIT group; n = 32) or d) no exercise control group (CON; n = 22). We measured the evolution of all five MetS components (i.e., MetS-Z-Score and CRF (assessed by VO2peak) before and after intervention. RESULTS: MetS score decreased 4% after HIIT and 2% in MCT (both P<0.01). However, the 3 exercise groups improved similarly their VO2peak (HIIT 11%; MCT 12% and 1HIIT 12%; all P<0.001). CONCLUSION: Our findings suggest that in sedentary individuals with MetS and low initial CRF level any of the three aerobic training modalities which were compared, provide sufficient stimulus to raise CRF. However, the more intense and shorter duration of HIIT program is not effective on improving MetS-Z-Score and thus, its recommendation for health promotion purposes in this population should be done with caution.

D-11 Thematic Poster - Running Injuries

Thursday, May 30, 2019, 1:30 PM - 3:30 PM Room: CC-101B

1612 Board #1 May 30 1:30 PM - 3:30 PM Increased Ground Reaction Force Load Rates In Runners With Active Patellofemoral Pain
Caleb D. Johnson, Jereme Outerley, Julia M. Reilly, Adam S. Tenforde, Irene S. Davis. FACSM. Harvard University. Cambridge, MA. (Sponsor: Dr. Irene Davis, FACSM) Email: cdj956@gmail.com (No relevant relationships reported)

Increased vertical ground reaction force load rates have been associated with running injuries, and specifically with tibial stress fractures and plantar fasciitis. Inconsistent findings have been reported regarding the role of load rates in runners with patellofemoral pain (PFP), one of the most common injuries in runners. Limited studies in this patient population have been performed and prior investigators did not examine components of load rates beyond the vertical component. PURPOSE: To compare vertical, resultant, posterior, medial and lateral load rates, and peak vertical forces in runners with active patellofemoral pain (PFP) and controls. METHODS: Thirteen active PFP (16±1.0 years of running experience, 3 active PFP runners were defined as runners with knee pain >6 months; 11 control runners) were recruited. Peak vertical forces (PFP 16.3±0.2 kg/m2; CO 16.3±0.2 kg/m2), 30 healthy controls (PFP 16±1.0 kg/m2; CO 16±1.0 kg/m2), all habitual rearfoot strikers, completed an instrumented treadmill assessment at a self-selected speed. Controls were matched for speed (PFP=2.5 m/s; CO=2.5 m/s). Load rates (vertical average and instantaneous vertical peak) were calculated during the push-off phase of the running cycle. RESULTS: Active PFP runners had increased vertical peak load rate, vertical and resultant load rates, and posterior peak load rate compared to controls (p<0.05). CONCLUSION: The SMART design allows changes in the intervention during the research period. Despite its potential and feasibility for defining the best sequence of interventions, so far it has been utilized in a smartphone gamified intervention for physical activity. PURPOSE: To investigate the effects of a SMART design on the behavior of the average number of steps/day in a smartphone app intervention for physical activity in insufficiently active adults. METHODS: We conducted a feasibility 24-week/2-stage SMART in which 18 insufficiently active participants (~10000 steps/day) were first randomized to Group 1 (smartphone app only), Group 2 (smartphone app + tailored messages) and a control group. Participants were asked to increase at least 2000 steps/day on average each week. Based on the 12-week intermediate outcome, responders kept their interventions and non-responders were rerandomized to a subsquare treatment. In group 3 (smartphone app + gamification), participants were instructed to form groups to use several game elements available in the chosen application (Pacer®). We fit linear regressions for each participant with the relationship between weeks and steps/day. We considered responders those with any positive slope at the end of the 1st stage intervention. We compared the accelerometer-based steps/day before and after the intervention as well as the slopes of the app-based steps/day between the 1st and 2nd stages of treatment RESULTS: Twelve participants, five controls, finished the intervention. We identified two responders in group 1. We did not observe significant changes in the steps/day neither throughout the intervention nor compared to the control group. However, the rerandomization of the five non-responders was able to change the slope of the steps/day of a median, +18 steps/day (interquartile range, -29 to +101) to 20 steps/day (+204 to +145), p = 0.079. Finally, we observed that three participants in the group 2 an increase in the number of steps/day up to the sixth week and then an inflection to the baseline values or even lower (i.e., a quadratic relationship). CONCLUSIONS: The SMART design was feasible and changed the behavior of the steps/day after rerandomization. Our results suggest that the rerandomization should be implemented earlier to take advantage of the tailored messages.
Achilles tendinopathy is an overuse injury that commonly sidelines runners. During rehabilitation, return-to-sport (RTS) decisions are made with minimal guiding evidence. With reinjury rates as high as 44%, evidence is needed to improve clinical decisions. Aberrant loading patterns while running may partially explain reinjury rates. PURPOSE: To determine if Achilles tendon loading patterns change during a 30-minute steady-state run in patients with Achilles tendinopathy and explore relationships between loading patterns and kinesiophobia.

METHODS: 12 runners (T) with Achilles tendinopathy were included (age: 41 ± 11 years, mass: 120 ± 15 kg, VISA-A score: 10 ± 5, current mileage: 20 ± 13 mi/ wk). Participants ran for 30 minutes at their endurance pace (2.9 ± 0.3 m/s) on an instrumented treadmill with retroreflective markers affixed to their lower limbs and feet. After a 6-minute familiarization period, marker trajectories and ground reaction forces were sampled during the 7th and 29th minute. Data was reduced to 10 gait cycles bilaterally. Sagittal plane ankle joint angles, moments and powers were calculated and a previously described musculoskeletal model was used to estimate Achilles tendon loads. Tsitsika Scale for Kinesiophobia (TSK) quantified the degree of kinesiophobia.

RESULTS: On the injured side, there was a significant decrease in peak concentric ankle power (7thmin = 1.02 ± 0.29 W/kg; 29thmin = 0.76 ± 0.20 W/kg; p = 0.02) and peak dorsiflexion (7thmin = 23.4 ± 3.9°; 29thmin = 22.3 ± 3.7°; p = 0.02), but no changes in peak plantarflexion moment, peak eccentric power, Achilles tendon peak load, loading rate or, impulse (p > 0.12). No changes occurred on the uninjured side (p > 0.17).

CONCLUSIONS: Increased loading patterns on the injured side and decreased cross-sectional area and thickness of flexor hallucis brevis (FHB) morphology are associated with increased kinesiophobia. With reinjury rates as high as 44%, evidence is needed to improve clinical decisions. Aberrant loading patterns while running may partially explain reinjury rates.

Figure 1. Comparison of joint activity between the two groups in trial 2.

- VALR, VILR, RILR plotted on left axis; PILR, MILR, and LILR plotted on right

IIlial band syndrome (IBS) is the second most common running injury, accounts for 16–20% of all running-related injuries. The exact etiology of IBS is unclear, but gait and posture are considered one of the factors. Most of studies on IBS were retrospective cross-sectional in design and could not elaborate on the pathogenesis of IBS.

PURPOSE: This prospective study aimed to determine the gait characteristics that easily induce IBS and explore the posture changes after the occurrence of IBS.

METHODS: 13 IBS-stricken runners (I group) and matched 13 healthy runners (C group). All participants underwent two gait trials, namely, before the first day of running (trial1) and after 8-week running (trial2). An eight-camera motion capture system was used to collect kinematic data. Sub-group comparisons were assessed via respective 95% confidence intervals of mean difference.

RESULTS: In trial2, the IBS group exhibited greater peak anterior pelvic tilt and increased reliance on visual information. While standing in a weight-bearing, subtalar neutral position, diagnostic ultrasound was used to image the FHB in a relaxed state and contracted state (while holding a short foot contraction). Images were processed to calculate CSA and FHB thickness. CSA was defined as the area (cm²) within the fascial borders of the muscle. Thickness was the distance (cm) between superior to inferior fascia perpendicular to the muscle fibers. Pearson product moment correlations determined the strength of associations and an a priori alpha level of 0.05 was used for all analyses.

RESULTS: Larger negative %-modulation was associated with the less contracted FHB thickness (r=−0.8, p=0.027) and trended towards being associated with less relaxed FHB thickness (r=0.38, p=0.07). No association was noted with the FHB CSA (r=0.23, p=0.19).

CONCLUSIONS: In previously injured runners decreases in FHB thickness is associated with an increased reliance on visual information while balancing. Short foot exercises, aimed at increased FHB strength may decrease reliance on visual information but future research is needed to confirm this hypothesis.
Mid-portion Achilles tendinopathy (AT) is a common injury in runners. Overloading the tendon results in pain, swelling, and impaired running performance. Recovery involves rest and a gradual build up. Determining whether patients can resume training is difficult and currently rather qualitative. To provide quantitative data to the physician to assist clinical decision-making, we studied the between leg differences in running kinematics for AT patients using inertial sensors in the clinical setting.

**PURPOSE:** To investigate lower limb kinematics in AT patients during 5 min treadmill running in the clinic, using inertial magnetic measurement units (IMUs).

**METHODS:** 8 participants (4 males, 4 females, mean age 22 ± 2 y) were recruited. Participants ran during flat (0°), incline (10°) and decline (-10°) treadmill conditions, with predetermined speeds of 2.5 ms⁻¹ (0°) and 1.8 ms⁻¹ (10° and -10°). Kinematic and kinetic data were collected during the final 30s of each condition using 15 cameras (Vicon) and an instrumented split-belt treadmill (Bertec).

Joint moment contribution percentages at the hip, knee and ankle were determined by dividing the peak, sagittal, external joint moments (N·mm/kg) by the sum of all three joint moments during stance. A 2x3 (limb x condition) ANOVA was used to evaluate interlimb differences across conditions with post-hoc Bonferroni adjustments.

**RESULTS:** There was no significant limb x condition interaction or main effect of limb, but there was a significant main effect of condition. Knee joint moment contributions were 3% greater in decline running when compared to incline running (50-15%), and 31% greater when compared to flat running (50-19%). Ankle contributions were 3% less in decline running when compared to incline running (24-63%) and 26% less in decline running when compared to flat running (24-50%).

**CONCLUSIONS:** Knee and ankle joint moment contributions are altered with flat, incline, and decline running in persons with ACLR. Individuals with ACLR did not display asymmetries in joint moment contributions between the involved and uninvolved limb.
predicting injury risk in runners as the test does not predict variables previously linked to running injuries. However, further prospective studies tracking occurrence of actual injuries as well as internal loading at common running injury sites are required to fully clarify whether the V balance test is suitable for screening runners.

### Table 1: Linear regression results comparing V-Achilles CE to get variables previously listed to running injuries, $\Delta W=W_{bodyweight}(t) \times g \times p < 0.05$

<table>
<thead>
<tr>
<th>Variable</th>
<th>p-value</th>
<th>R²</th>
<th>Lower 95%</th>
<th>Upper 95%</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip adduction ($)</td>
<td>0.08</td>
<td>0.04</td>
<td>-14.81</td>
<td>9.79</td>
<td>-2.50</td>
</tr>
<tr>
<td>Hip external rotation ($)</td>
<td>0.21</td>
<td>0.31</td>
<td>-33.94</td>
<td>-7.97</td>
<td>-12.99</td>
</tr>
<tr>
<td>Knee flexion ($)</td>
<td>0.01*</td>
<td>0.12</td>
<td>3.15</td>
<td>34.44</td>
<td>18.80</td>
</tr>
<tr>
<td>Knee adduction ($)</td>
<td>0.46</td>
<td>0.01</td>
<td>-24.7</td>
<td>11.37</td>
<td>-6.67</td>
</tr>
<tr>
<td>Peak Eversion ($)</td>
<td>0.93</td>
<td>0.001</td>
<td>-13.18</td>
<td>14.31</td>
<td>0.57</td>
</tr>
<tr>
<td>Eversion ROM ($)</td>
<td>0.31</td>
<td>0.03</td>
<td>-20.73</td>
<td>4.81</td>
<td>-7.96</td>
</tr>
<tr>
<td>Peak Eversion (new)</td>
<td>0.10</td>
<td>0.07</td>
<td>-109.47</td>
<td>47.76</td>
<td>183.66</td>
</tr>
<tr>
<td>Vertical loading rate (atm *)</td>
<td>0.52</td>
<td>0.009</td>
<td>-51.76</td>
<td>10.61</td>
<td>24.02</td>
</tr>
<tr>
<td>Hip Abductor Moment (Nkg)</td>
<td>0.52</td>
<td>0.009</td>
<td>-0.94</td>
<td>1.81</td>
<td>-0.43</td>
</tr>
<tr>
<td>Hip Abductor Impulse (Nkg)</td>
<td>0.96</td>
<td>0.0007</td>
<td>-0.23</td>
<td>0.22</td>
<td>-0.01</td>
</tr>
<tr>
<td>Knee Abductor Moment (Nkg)</td>
<td>0.13</td>
<td>0.05</td>
<td>-0.35</td>
<td>2.54</td>
<td>1.09</td>
</tr>
<tr>
<td>Knee Abductor Impulse (Nkg)</td>
<td>0.58</td>
<td>0.007</td>
<td>-0.29</td>
<td>0.52</td>
<td>0.11</td>
</tr>
</tbody>
</table>

### CONCLUSIONS

Fatigue levels were significantly higher when ACWL (MD=0.47, 95% CI =0.34-0.60, ES=0.44, p=0.001) and medium (MD=0.37, 95% CI =0.25-0.50, ES=0.36, p=0.001). Fatigue levels were significantly higher when ACWL < 0.8; medium (MD=0.38, 95% CI =0.26-0.50, ES=0.31, p=0.001).

### METHODS

Sixty-four male collegiate soccer players (mean± SD; age, 20±2y; body mass, 77.1±6.7kg; height, 179.9±6.3cm; VO2max, 41.6±4.3ml kg⁻¹ min⁻¹) participated in this study. During the 2016-17 NCAA Men’s Soccer season, the Pittsburgh Index (PSQI), Profile of Mood States (POMS), Sports Anxiety Scale (SAS), and Disability in the Physically Active Scale (DPA) questionnaires were administered at various timepoints throughout the season.

### RESULTS

Statistical significance was set a priori p<0.05. Results are reported as mean difference (MD) and effect size (ES).

### CONCLUSION

Individuals who reported good sleep quality (PSQI ≤ 4) and those who reported poor sleep quality (PSQI ≥ 5). Individuals with poor sleep quality had significantly less concentration disruption (MD=0.45, ES=0.25, p=0.01) than those who reported poor sleep qa. In this sample of collegiate soccer players. Athletes with poor sleep qa appear to have increased negative mental health outcomes and higher ratings on a disability scale. Establishing student-athlete wellness monitoring programs may provide a tailored approach to improve the collegiate athlete experience.

### MEDICINE & SCIENCE IN SPORTS & EXERCISE®

**Board #2 May 30 1:30 PM - 3:30 PM**

**IMAGE: Sleep Quality Effects Mood, Anxiety And Disabili ty In Division I National Collegiate Athletic Association Men's Soccer Players**

Courteney L. Benjamin, Ryan M. Curtis, Robert A. Huggins, Yasuki Sekiguchi, William M. Adams, Shawn M. Arent, FACSM, Rajat K. Jain, John S. Miller, Brian C. Armwald, Jason M. Pullara, Douglas J. Casa, FACSM, Korey Stringer Institute at the University of Connecticut, Storrs, CT. University of North Carolina at Greensboro, Greensboro, NC. Rutgers University, New Brunswick, NJ. Northwestern University, Evanston, IL. Penn State University, University Park, PA. (Sponsor: Douglas Casa, FACSM)

### PURPOSE

To examine differences in mood, anxiety and physical health measurements between individuals who reported good sleep qa liity and individuals who reported poor sleep qa liity.

### METHODS

110 male collegiate soccer players.

### RESULTS

Statistical significance was set a priori p<0.05. Results are reported as mean difference (MD) and effect size (ES). RESULTS: Es of PSQI results yielded scores ≥ 5. Individuals with good sleep quality had significantly lower levels of depression (MD=2.8E-0.29; p<0.001), tension (MD=1.3E-0.33; p<0.001), anger (MD=2.0E-0.33; p<0.001), fatigue (MD=1.9E-0.5; p<0.001), confusion (MD=1.2E-0.38; p<0.001) and total mood disturbance (MD=8; ES=0.39, p<0.001) than those who reported poor sleep qa liity. Individuals who reported good sleep qa liity had significantly less concentration disruption (MD=0.45, ES=0.25, p=0.01) than those who reported poor sleep qa liity.

### CONCLUSION

Individuals who reported good sleep qa liity had significantly less concentration disruption (MD=0.45, ES=0.25, p=0.01) than those who reported poor sleep qa liity.
and 12 (18 ± 17.7 years) male soccer players were included in the study, and cluster-randomized into two intervention groups. Both groups completed the same soccer specific warm-up program (FIFA 11+) twice a week, but for a different duration: one intervention group (INT10, n=175) performed twice a week for 10 minutes, the other (INT20, n=167) twice a week for 20 minutes. Participants were at increased odds of being injured in a match with 1 to 5 days vs. since the last match vs. 6 days (OR[95% CI] = 1.10, 3.12, 1.32). Practice IRs were highest in the preseason (IR = 20 [13.2, 0.3]) vs. 42 [1.01, 2.13]) in practice with 1 vs. 6 days vs. 6 days between matches. These data may be used to inform and guide the NCAA in determining optimal scheduling and recovery.

Speed is one of the most important factors dictating athletic performance especially in field based team sports including soccer. Sports performance coaches continue to develop training programs to enhance this ability. Can RS training add value to lower body resistance training and plyometrics, one method that is freque ntly employed is resisted sprinting (RS). However, data concerning the efficacy of RS is equivocal and there is much debate over the optimal duration. Previous research has been conducted at loads near 10% of body weight (BW), but recent studies suggest the optimal load for power output in RS is 0 - 80% BW. PURPOSE: The purpose of this study was to compare the effects of two 5wk RS programs varying in load on sprint performance and jumping ability in male collegiate soccer players. METHODS: At baseline, 20 male soccer players performed testing of 6m - sprint performance with split times at 10m and 20m and broad jump. They were matched and separated into a heavy RS group (n=10) or light RS group (n=10). Over a 5wk period, they performed 10 sessions of progressive RS at 0% - 80% or 10-20% BW. Athletes simultaneously participated in 3d/wk of full body resistance training and 2d/wk of soccer specific conditioning. Sprint and jump testing performance tests were repeated 2h after the final training session. RESULTS: Results showed a significant effect of the 20m (p<0.001) and 6m distances (p<0.009) as well as for the broad jump (p<0.002). 10m sprint times remained unchanged (p>0.08) and there was no groupXtime interaction for any variable. Very large effects were seen for 20m (2.82 ± 0.1s to 2.77 ± 0.1s) and 6m (0.72 ± 0.2s to 0.62 ± 0.2s) s in response to heavy RS training, with medium effects seen in 10m sprint times and broad jump. CONCLUSION: A 5-week RS intervention significantly improves sprinting performance and broad jump in collegiate soccer players irrespective of magnitude of resistance, which suggests that both light and heavy RS is efficacious to enhance these outcomes.

The regular execution of neuromuscular training has been shown to reduce injuries of the lower extremities in youth athletes. However, to date there are inconsistent results on the dose-response relationship of neuromuscular training to prevent injuries of the lower extremities in young soccer players. Therefore, this study was to evaluate the optimal duration of neuromuscular training to prevent injuries of the lower extremities in young soccer players. METHODS: 33 (18 ± 17.7 years) male soccer players were included in the study, and cluster-randomized into two intervention groups. Both groups completed the same soccer specific warm-up program (FIFA 11+) twice a week, but for a different duration: one intervention group (INT10, n=30) performed twice a week for 10 minutes, the other (INT20, n=30) performed twice a week for 20 minutes. The player exposure hours (hrs) were collected monthly over six months during one soccer season. Primary outcome was the incidence of lower extremity (LE) injuries. Secondary outcomes were injury type, severity, mechanism and compliance to

The importance of sports-specific cognitive and perceptual skills in soccer has already been examined in various studies (Ward & Williams, 2003). However, the role of general perceptual-cognitive abilities and the relationship is not clarified in detail (Schumacher et al., 2011). PURPOSE: To analyze the relation of position to peripheral perception, selective attention and reaction abilities in highly talented soccer players. METHODS: 147 highly talented male soccer players (18 ± 2.6yr s, age range 11 to 23 years) were involved. The subjects performed computer-based selective attention, peripheral perception and reaction tests (using Vienna Test System). In the peripheral perception test stimuli were presented left and right sided. The soccer players were subdivided into offensive player group (OPG: striker, midfielder) and defensive player group (DPG: goalkeeper, defender). They were recruited from a youth academy of a professional soccer club and played at the highest and 2nd highest national soccer competition for their age. Group differences were tested using the student t-test. RESULTS: Significant differences for position groups were observed, with regard to correct answers (OPG: 216.1 ± 32.0; DPG: 231.3 ± 26.0) in selective attention test (t(140) = 3.05, p < 0.01) and peripheral reaction time left (OPG: 0.71 ± 0.09 sec; DPG: 0.9 ± 0.10 sec) in peripheral perception test (t(14) = 2.32, p < 0.01). No differences were found for variables in the reaction test. CONCLUSIONS: Our results indicate that defender and goalkeeper outperform striker and midfielder in general selective attention tasks and in peripheral reaction tasks left sided. Additional research is needed to further clarify position-specific differences between left and right peripheral reaction time of highly talented soccer players.
Elite professional soccer players have high aerobic requirements throughout a game and extensive anaerobic demands during periods of a match leading to major metabolic and thermodynamic changes. Assessing skin temperature (Tsk); blood lactate concentration ([La]_b); fat and carbohydrate oxidation (FATox; CHOox) might provide an indirect method to assess metabolic flexibility and oxidative capacity during exercise. **Purpose:** To study the relationship between Tsk; [La]_b; and substrate oxidation patterns. **Methods:** We used indirect calorimetry and [La]_b measurements, and monitored the Tsk to study the metabolic and thermodynamic response to exercise in twenty professional male soccer players (age 24.5±3.4 yrs.; VO2peak 53.2±4 ml/kg/min) during a maximal incremental treadmill test. **Results:** The maximal FATox rate was 0.8 ± 0.03 g/min, reached at 62.5±6.5% of the VO2peak. A significant inverse correlation was found between average FATox rates and average blood [La]_b (p=0.005). A significant correlation was found between the average values of Tsk and FATox rates (p<0.006). Maximal values reached of FATox and CHOox rates were 0.80 ±0.05 and 6.82 ± 0.8 g/min respectively. **Conclusion:** These results indicate that FATox rates are inversely associated with blood lactate production; which may be due to a higher aerobic contribution.

Table 1. Subjects' characteristics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Age (years)</th>
<th>Height (cm)</th>
<th>Weight (kg)</th>
<th>BMI (%)</th>
<th>Body fat (%)</th>
<th>Fat free mass (%)</th>
<th>Max speed (km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=20</td>
<td>23±3.4</td>
<td>181±6.9</td>
<td>79±6.2</td>
<td>23.4±1.4</td>
<td>10.29±1.8</td>
<td>32.14±16.1</td>
<td>16±1</td>
</tr>
</tbody>
</table>

Table 2. Maximal cardiorespiratory and metabolic data

<table>
<thead>
<tr>
<th>VO2 peak (ml/min/kg)</th>
<th>HR peak (bpm)</th>
<th>RER</th>
<th>VE (L/min)</th>
<th>FATox peak (g/min)</th>
<th>CHOox peak (g/min)</th>
<th>Tsk peak (ºC)</th>
<th>[La]_b (mmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2 ± 3.8</td>
<td>185±39</td>
<td>1.06</td>
<td>0.05</td>
<td>2.4±1.3</td>
<td>0.16</td>
<td>37.2±0.8</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Table 3. Average of fat and carbohydrate oxidation rates, blood lactate levels, skin temperature response and oxygen uptake in an incremental exercise test until volitional exhaustion in professional soccer players

<table>
<thead>
<tr>
<th>Load (km/h)</th>
<th>FATox (g/min)</th>
<th>CHOox (g/min)</th>
<th>[La]_b (mmol/L)</th>
<th>Tsk (ºC)</th>
<th>VO2 (ml/min/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.21±0.10</td>
<td>1.14±0.27</td>
<td>1.22±0.37</td>
<td>3.8±0.9</td>
<td>1.87</td>
</tr>
<tr>
<td>9</td>
<td>0.3 ± 0.18</td>
<td>0.4 ± 0.4</td>
<td>1.28±0.30</td>
<td>3.8±0.9</td>
<td>30±2.6</td>
</tr>
<tr>
<td>10</td>
<td>0.38 ± 0.18</td>
<td>0.6 ± 0.6</td>
<td>1.32±0.30</td>
<td>3.8±0.9</td>
<td>38±2.16</td>
</tr>
<tr>
<td>11</td>
<td>0.34 ± 0.17</td>
<td>0.5 ± 0.4</td>
<td>1.5 ± 0.8</td>
<td>3.8±0.9</td>
<td>38±2.3</td>
</tr>
<tr>
<td>12</td>
<td>0.28 ± 0.19</td>
<td>0.5 ± 0.5</td>
<td>1.8 ± 0.9</td>
<td>3.8±0.8</td>
<td>4.3±2.1</td>
</tr>
<tr>
<td>13</td>
<td>0.20±0.19</td>
<td>0.5 ± 0.5</td>
<td>2.1±1.3</td>
<td>3.8±0.8</td>
<td>4.5±2.9</td>
</tr>
<tr>
<td>14</td>
<td>0.14±0.19</td>
<td>0.6 ± 0.6</td>
<td>3.1±1.6</td>
<td>3.8±0.6</td>
<td>3±2.9</td>
</tr>
<tr>
<td>15</td>
<td>0.08±0.13</td>
<td>0.6 ± 0.6</td>
<td>4.1±1.8</td>
<td>3.3±0.6</td>
<td>3.8±2.3</td>
</tr>
<tr>
<td>16</td>
<td>0.06±0.12</td>
<td>0.6 ± 0.6</td>
<td>5.1±1.8</td>
<td>3.3±0.6</td>
<td>3.6±2.3</td>
</tr>
<tr>
<td>17</td>
<td>0.03±0.10</td>
<td>0.6 ± 0.6</td>
<td>6.1±1.5</td>
<td>3.2±0.6</td>
<td>3.6±3.9</td>
</tr>
</tbody>
</table>

Values are mean ± standard deviation.

Abbreviations: BMI (body mass index); Max speed (maximal speed); VO2 peak (peak oxygen consumption); HR (heart rate); RER (respiratory exchange ratio); VE (ventilation); FATox peak (peak fat oxidation); CHOox peak (peak carbohydrate oxidation); Tsk peak (peak skin temperature)
sleep constant was associated with a one-year BMI decrease of 0.29 kg/m², while the replacement of SED with LPA and sleep were associated with smaller decreases in BMI (0.02 kg/m² and 0.12 kg/m², respectively).

CONCLUSION: Findings suggest that targeting all movement behaviors throughout the day may be an effective approach for weight loss, especially among men.

1632  May 30 1:45 PM - 2:00 PM  Cardiorespiratory Fitness and Years Lived Free of Cardiovascular Disease: Cardiovascular Lifetime Risk Pooling Project

Amanda E. Paluch¹, Hongyan Ning¹, Mercedes R. Carnethon², Kelley Petee Gabriel, FACSM², Norrina B. Allen¹, Donald M. Lloyd-Jones¹, John T. Wilkins¹, Northwestern University, Chicago, IL. ¹University of Texas Health Science Center at Houston and School of Public Health – Austin Campus, Austin, TX. (Sponsor: Kelley Petee Gabriel, FACSM)
Email: amanda.paluch@northwestern.edu

No relevant relationships reported.

PURPOSE: Quantifying cardiorespiratory fitness (CRF) with years lived free of cardiovascular disease (CVD) allows for contextualization of the population burden of CVD and provides a metric for clinician-patient communication.

METHODS: CRF was measured with graded exercise treadmill tests in 829 adults in the Coronary Artery Risk Development in Young Adults and Framingham Offspring studies. Individual-level data were pooled. Cohort-specific z-scores for CRF were calculated from the Coronary Artery Risk Development in Young Adults and Framingham Offspring studies. 

CONCLUSIONS: Findings suggest that targeting all movement behaviors throughout the day may be an effective approach for weight loss, especially among men.

1634  May 30 2:15 PM - 2:30 PM  Cardiorespiratory Fitness Incidence and Mortality from Lung Cancer in Male Smokers

Baruch Vainselboim¹, Ricardo M. Lima², Peter Kokkinos, FACSM², Jonathan Myers, FACSM², ³Saint Francis University, Loretto, PA. ²University of Brasilia, Brasilia, Brazil. ³Washington DC Veterans Affairs Medical Center, Washington, DC. 4Veterans Affairs Palo Alto Health Care System/ Stanford University, Palo Alto, CA.
Email: baruch.v19@gmail.com

No relevant relationships reported.

Cardiorespiratory fitness (CRF) is an established prognostic marker for many chronic diseases including lung cancer but, this association has not been assessed among smokers. PURPOSE: To evaluate the association between CRF, lung cancer incidence and cancer mortality in former and current male smokers. METHODS: Maximal treadmill exercise testing was performed in 2,979 men (former smokers (n=1,602), 43±27 pack-years and current smokers (n=1,377), 43±27 pack-years) aged 59.2±17.3 years. CRF was measured as the distance walked in minutes. Deaths due to cancer were identified using the National Death Index. Lung cancer incidence and mortality were assessed using the Surveillance, Epidemiology, and End Results Program (SEER) database.

CONCLUSIONS: Higher CRF is associated with lower lung cancer incidence in former smokers. Current smokers who were diagnosed with lung cancer and were more fit exhibited reduced cancer mortality. These results suggest potential protective benefits of higher CRF for prevention of lung cancer outcomes among both former and current smokers. Eliminating low CRF as a risk factor could potentially reduce considerable lung cancer morbidity and mortality.
Hyperemesis gravidarum (HG) is characterised by excessive nausea and vomiting often leading to maternal weight loss, dehydration, electrolyte imbalance, and vitamin deficiencies. HG is the most common reason for hospitalisation in the first half of pregnancy and its prevalence varies depending on maternal country of birth. Women who experience excessive nausea and vomiting in early pregnancy are less likely to participate in leisure-time physical activity (LTPA) during pregnancy. Whether LTPA before pregnancy is associated with hyperemesis gravidarum has not yet been studied. Prepregnancy LTPA may lessen the risk of gestational diabetes, pelvic girdle pain, and hypertensive disorders including preclampsia, all of which are associated with HG.

**Purpose:** To estimate associations between prepregnancy LTPA and HG in pregnancy.

**Methods:** We present data from 36,541 Norwegian women with singleton pregnancies enrolled in The Norwegian Mother and Child Cohort Study. Prepregnancy LTPA was self-reported by questionnaire in pregnancy week 17. HG was defined as prolonged nausea and vomiting in pregnancy requiring hospitalisation before the 25th gestational week. We estimated the crude and adjusted associations between LTPA and HG using multiple logistic regression. We assessed effect modification by prepregnancy BMI or smoking by stratified analysis and interaction terms.

**Results:** A total of 38.11% women developed HG. Before pregnancy 76% conducted LTPA at least three times weekly, while only 23% of women conducted LTPA less than once a week. Compared to women reporting LTPA 3 to 5 times weekly, no LTPA or a free 1 to 3 times a month had an increased risk of HG (adjusted odds ratio [aOR] 2.58; 95% confidence interval [CI], 1.29 to 5.18, and aOR 1.35; 95% CI, 0.95 to 1.92, respectively). LTPA-HG associations differed by prepregnancy BMI but not by prepregnancy smoking. The increase in risk of HG was more than 4 fold for women with BMI ≥ 25 kg·m⁻² reporting no LTPA prepregnancy (aOR 4.89; 95% CI 2.13 to 11.22, test for trend, P < 0.001).

**Conclusions:** Lack of LTPA before pregnancy was associated with an increased risk of HG. Inactive women with overweight or obesity before pregnancy may have the highest risk of HG during pregnancy.

**Is Midlife Quadriceps Muscular Strength Protective Against Later Life Osteoarthritis and Subsequent Total Joint Replacement?**

Andjelka Pavlovic, Benjamin L. Willis, David S. Leonard, Stephen W. Farrell, FACSM, Carolyn E. Barlow, Laura F. DeFina. The Cooper Institute, Dallas, TX. (Sponsor: Stephen W. Farrell, FACSM)

Email: apavlovic@cooperinst.org

**Abstract:** We have previously shown a relationship between cardiorespiratory fitness/physical activity and the likelihood of developing hip/knee osteoarthritis (OA) later in life. Another possible predictor of hip/knee OA weakness is the quads muscular strength. Because it is unknown whether or not midlife quads strength predisposes to OA and hip/knee joint total replacement (HJR) later in life, the current study was undertaken.

**Purpose:** The purpose of this study was to examine the relationship between midlife quads muscular strength and the likelihood of developing OA and undergoing a HJR later in life.

**Methods:** We linked strength and clinical data from 381,381 men and 23,381 women participants in the Cooper Center Longitudinal Study from 1981-1990. Medicare claims from 1999 to 2007 (13% women, mean age 70 years) of Medicare claims from 1999 to 2007 (13% women, mean age 70 years). Quadriceps muscular strength was measured via 1-repetition maximum (1-RM) leg press assessment and expressed individually relative to body weight. Outcome measures for OA and HJR were obtained using Medicare administrative data. Proportional hazards regression was used to estimate the risk of incident OA and subsequent risk of HJR after developing OA.

**Results:** During 20 years of observation 3,688 non-years of Medicare follow up, 1,100 OA events (63% events in men, 37% events in women) were observed. After controlling for age, sex and year of muscle strength assessment, a significant relationship was observed between 1-RM leg press and the likelihood of developing OA later in life (HR 0.69, CI 0.9 to 0.98). Among those who developed OA, we observed 29 h/p/knee total joint replacements (24 ointments in men, 5 ointments in women) during 3,688 non-years of observation. When adjusted for the same covariates, higher 1-RM leg press suggested a protective role against HJR, but the findings were not statistically significant (HR 0.80, 95% CI 0.49 to 1.29).

**Conclusion:** Midlife quads muscular strength may play a protective role against onset of OA later in life. More research is needed to determine if increasing quads muscle strength leads to a reduction in risk of undergoing HJR.
physical characteristics, cardiometabolic health, and self-reported well-being in
women employees attending a worksite wellness program. METHODS: A total of 8
overweight/obese women possessing one or more MetS risk factors were randomly
assigned to one of three groups with 31 women completing all testing and training
procedures: A-HIIT (n=10), R-HIIT (n=10), and CON (n=11). A-HIIT and R-HIIT
groups trained 3x/wk for 23m in an 8 week program at an average training intensity
of 8.0 ± 1 %HRRmax and 9.8 ± 1 %HRRmax, respectively. ANCOVA was used to
determine differences among groups on all dependent variables at post-testing
after adjusting for baseline values. Post-hoc analyses were performed using Bonferroni
adjustments. RESULTS: Both A-HIIT (Madj = -23.3 m, p= 0.029) and R-HIIT (Madj
= -23.8 m, p= 0.029) had higher aerobic fitness than CON (Madj = 10.9 m,
SEMdiff = 0.038) using the 2-minute walk test following training. Only R-HIIT (Madj = 8.3 W,
p= 0.002) showed increases in upper body power over CON (Madj = W, SEMdiff = 0.0);
while displaying lower fasting insulin (Madj = 5.6 μU/ml, SEMdiff = 0.038) compared to
CON (Madj = 17.4 μU/ml, SEMdiff = 0.1). R-HIIT also showed greater reductions in
HOMA2-IR (Madj = 0.7 p= 0.006) than CON (Madj = 2.2, SEM = 0.2). Furthermore,
HOMA2-β was lower in R-HIIT compared to both CON (Madj = 18.9, SEMdiff = 0.017);
and A-HIIT (Madj = 12.2%, SEMdiff = 0.0); p = 0.002). Finally, R-HIIT had significantly higher scores on the physical function
domain of Patient Reported Outcome Measurement System (PROMIS®) skewerring
compared to the CON group (Madj = 5.8 SEM = 1.0 Mdiff = 0.038). CONCLUSIONS: Our study showed that R-HIIT can be considered as part of
a risk reducing worksite-wellness strategy for improving physical characteristics,
cardiometabolic health, and well-being in women possessing one or more components
of the MetS. Supported by UM Citizens Board Grant

PURPOSE: Patients with coronary artery disease (CAD) commonly present with
caducity artery dysfunction characterized by decreased brachial arterial flow-mediated
dilation (FMD). Reduced FMD of 1% is associated with an 13% increased risk of
future cardiovascular events1, and thus interventions designed to improve FMD in
patients with CAD are warranted. Short-term supervised exercise training may
improve FMD, however whether improvements are maintained longer term following
cessation of supervised cardiac rehabilitation (CR), is unclear. We compared the short-
and long-term effect of High Intensity Interval Training (HIIT) and Moderate Intensity
Continuous Training (MICT) on FMD in patients with CAD commencing a 4 week
CR program in a real world hospital-based setting.

METHODS: Patients with angiographically-proven CAD (Age: 67 ± 38 years, 3
females) completed 3 sessions per week (2 supervised, 1 home-based) for 4 weeks,
randomized to either 1) HIIT (n=21): 4 x 4 minute high intensity intervals at a rating
of perceived exertion (RPE) 15 18 (exceeded with 3 minute active recovery periods
or 2) MICT usual care (n=17 - m inutes moderate intensity continuous exercise at
an RPE 11-13). Patients then continued 3 supervised home-based sessions per week of
their randomized training for a further 11 months. FMD was measured at baseline,
4e eeks, 3 months, 6 months, and 12 months. Data was analyzed using a linear mixed
model with baseline diameter and shear rate as covariates. Data is presented as mean
(95% CI).

RESULTS: Baseline FMD was different between groups [HIIT: 3.1% (2.2 to 4.0); 
MICT: 2.9% (1.9 to 3.9); p < 0.001]; FMD increased from baseline at 4e eeks, 6 months,
and 12 months in the HIIT group [4e eeks: +1.5% (0.8 to 2.7), p = 0.001; 6 months:
+1.8% (0.4 to 3.6), p= 0.001; 12 months: +1.8% (0.4 to 3.3), p= 0.007] with negligible
changes in the MICT group [4e eeks: +0.9% (-1.1 to 1.0), p = 0.9; 6 months: +1.0%(-
0.1 to 2.1), p = 0.08; 12 months: +0.3%(-0.1 3.1), p = 0.5].

CONCLUSIONS: A 4 week CR program of HIIT, but not MICT (usual care),
improved conduit artery function in patients with CAD. Improved FMD with HIIT
was maintained long-term at 6 and 12 months with home-based training.

THURSDAY, MAY 30, 2019

D-14  FREE COMMUNICATION/SLIDE - PHYSICAL ACTIVITY/ EXERCISE IN CLINICAL POPULATIONS

THURSDAY, MAY 30, 2019

1639 Chair: Cemal Ozemek, FACSM. University of Illinois Chicago, Chicago, IL.

1640

May 30 1:30 PM - 1:45 PM

EXAMINING THE IMPACT OF OBESITY ON VENTILATORY RESPONSES DURING ACUTE EXERCISE IN PATIENTS WITH HFpEF

Brittany L. Christensen1, Peter H. Brubaker, FACSM 1, Georgina Coombes, FACSM 1, John Thomsen 1, Demet Tekin, Arlette Perry, FACSM2.

1Wake Forest Baptist Medical Center, Winston-Salem, NC. 2Wake Forest Baptist Medical School, Winston-Salem, NC. (Sponsor: Peter Brubaker, FACSM)

Email: c.kirchner@uq.edu.au

(No relevant relationships reported)

PURPOSE: Heart Failure (HF) is a major cause of morbidity and mortality worldwide.
Ventilatory responses to acute exercise have important prognostic value in HF
patients. This study examined baseline ventilatory measures to determine if obesity
further impacts ventilatory responses in normal subjects and heart failure patients
with preserved ejection fraction (HFpEF). Methods: All participants performed a
cardiopulmonary exercise test to maximal effort to quantify ventilatory responses (tidal
volume (Vt), breathing frequency (f), and minute ventilation (VE)) at submaximal
(25 Watts) and peak exercise. Ventilation efficiency was determined by assessing
VE/VCO2 at submax and the VE/ VCO2 slope. obese vs. non-obese HFpEF participants
were categorized based on BMI ≥25 kg/m². One-way ANOVA was performed to
determine if there were significant (p<0.05) differences between groups. Results: The
obese HFpEF group had higher VE during peak exercise than the non-obese group
(p<0.05), which was mainly due to greater Vt(0.08 vs. 0.24) The VE/
VCO2 at submaximal workload and VE/VCO2 slope were significantly higher in the
non-obese HFpEF group. Conclusion: As hypothesized, obese HFpEF participants
exhibited worse ventilatory function than the non-obese HFpEF patient at similar
levels of exercise. However, obese HFpEF participants demonstrated a similar degree
of ventilatory inefficiency compared to normal weight HFpEF participants. Since
ventilatory efficiency was not abnormal in obese HFpEF it appears that their prognosis
is no worse than normal weight HFpEF participants.

1641 May 30 1:45 PM - 2:00 PM

COMPARISON OF TWO HIGH-INTENSITY INTERVAL TRAINING MODALITIES ON CARDIOMETABOLIC HEALTH IN OVERWEIGHT/ OBSESE WOMEN

Ozgur Alan, Emily W. Flanagan, Lafayette T. Watson, Andrew N.L. Buskard, Demet Tekin, Arlette Perry, FACSM. University of Miami, Coral Gables, FL. (Sponsor: Arlette Perry, FACSM)

Email: o.alan@umiami.edu

(No relevant relationships reported)

High-intensity interval training (HIIT) has been used to reduce risk factors for
diabetes, obesity, cardiovascular diseases and metabolic syndrome (MetS). Few
studies have compared resistance-HIIT (R-HIIT) to aerobic-HIIT (A-HIIT) in a
worksite wellness program designed to reduce risk factors for the MetS.

PURPOSE: To compare the effects of A-HIIT and R-HIIT to that of a control group (CON) on

Abstracts were prepared by the authors and printed as submitted.
Bidirectional Relationships of Daily Physical Activity and Sleep Among Patients with Heart Failure and Insomnia

Garett A. Ash, Sangchoon Jeon, Nancy S. Redeker, Yale University, New Haven, CT. (Sponsor: Yannis P. Pitsiladis, FACSM).

Email: garrett.ash@yale.edu

(No relevant relationships reported)

Physical activity is associated with better sleep quality across a wide range of populations, but the causal direction of this relationship is unclear due to lack of longitudinal and experimental studies. Patients with heart failure (HF) bear particular risk of poor sleep and low physical activity. PURPOSE: Examine the relationships between within-person day-to-day fluctuations in physical activity and sleep quality among patients with stable NYHA Class I-IV HF and insomnia (insomnia severity index > 7). METHODS: Patients wore a uniaxial wrist accelerometer (Actiwatch) for 14 consecutive days and nights to measure total daytime activity counts, total sleep time, sleep onset latency and sleep continuity (sleep efficiency and wake time after sleep onset (WASO)). Two-level multilevel models with daily and individual variation were analyzed by 2 x 2 mixed factor ANOVAs. See table for some of the results. RESULTS: Participants (n=114 M=48, 86 12.1 years, female 87%, black 22%, white 5%), NYHA Class 1.9. 6% on average obese (BMI 31.4 kg/m^2) with multiple comorbidities (CCI 3.2±2.0). Daytime activity (17:38±10 counts/day) was associated with younger age (β=-1.32±0.50), fewer comorbidities (β=-10.57±3.26), lower NYHA class (β=-17.99±7.30), and a tendency for lower BMI (β=-1.58±0.83, p=0.06). Insomnia severity was associated with lower sleep efficiency (β=-0.98±0.48) and more WASO (β=5.94±2.05). After adjustment for all significant covariates, daytime activity was not associated with sleep characteristics the next night, but every minute less total sleep time (β=-0.075±0.015) or WASO (β=-0.114±0.02) was associated with ~ 70-100 more activity counts the next day. CONCLUSIONS: Similar to studies in other populations, less WASO and less total sleep time both was associated with more activity the next day, but these were not bidirectional relationships since activity the previous day was not associated with sleep characteristics. Future research should confirm these results by polysomnography and hip accelerometry and evaluate mechanisms.

The Effect Of A Personalized Multi-component Lifestyle Intervention Program in Stage 3 & 4 Ckd Patients.

Samuel A. Headley, FACSM1, Jasmin Hutchinson2, Brian Thompson3, Marissa Ostroff4, Courtney Doyle-Campbell5, Allen Cornelius6, Kristen Dempsey7, Jennifer Siddall8, Emily Miele9, Elizabeth Evans10, Brianna Wood11, Cherilyn Sirois12, Brett Winston13, Michael Germain14, Springfield College, Springfield, MA. 2Western New England University, Springfield, MA. 3University of the Rockies, Denver, CO. 4Renal and Transplant Associates of New England, Springfield, MA. Email: sheadley@springfieldcollege.edu

(No relevant relationships reported)

PURPOSE: We studied the effect of a comprehensive lifestyle intervention (nutrition, physical activity, pharmacy, and behavioral counseling) on health related outcomes in a stage 3 & 4 CKD patients (age 62±2, B MI 34±5). METHODS: Patients were assigned randomly to a treatment (T, n=27) or usual care (UC, n=15) group, and asked to attend four test sessions: baseline (BL), month 1 (M1), month 3 (M3) and month 6 (M6). Anthropometrics, medication use, three-day nutritional intake, central (cSBP/cDBP) & brachial blood pressures (bSBP/bDBP), augmentation index (Aix(cl)), Short Physical Performance Battery (SPPB) test, the six-minute walk test (6MWT), leg strength & power, self-efficacy to adhere to diet and physical activity (PA) recommendations, and the KDQOL were assessed at each visit. PA levels and inflammatory markers (IL6 & hsCRP) were assessed at BL and M6, and PaO2 and PaCO2 at M6. RESULTS: All data are presented as means ± SD. Primary outcome variables were analyzed by 2 x 2 mixed factor ANOVAs. See table for some of the findings.
Abdomen was soft and non-distended, though he was tender to palpation in the upper left quadrant. No lower extremity edema; calves were symmetric and non-tender to palpation.

**DIFFERENTIAL DIAGNOSIS:**

- Pulmonary Embolus
- Pericarditis
- Mononucleosis

Sickle cell crisis in a patient with sickle cell trait

**TEST AND RESULTS:** A CT angiography chest, chest radiograph, and abdominal ultrasound were obtained and were notable for splenomegaly (14c m); otherwise unremarkable. An EKG revealed sinus bradycardia with sinus arrhythmia. Labs were obtained including CBC, CMP, CK, haptoglobin, LDH, and hemoglobin electrophoresis, and notable for a mild anemia (hemoglobin 12.2), thrombocytopenia (platelets 3), mild transaminisits (AST 8, ALT 3), and evidence of hemolysis (haptoglobin <10, LDH 6c). Hemoglobin electrophoresis was consistent with sickle cell trait.

**FINAL WORKING DIAGNOSIS:** Sickle cell crisis in a patient with sickle cell trait

**TREATMENT AND OUTCOMES:**

1. Tended labs for 2 weeks.
2. Avoid strenuous activity until pain resolved.
3. Provide counseling regarding hydration, heat illness, and training especially at altitude.
4. Follow up with hematology.
5. Consider screening NCAA coaches/athletic trainers given NCAA athletes are screened for sickle cell.

**HISTORY:** 21-year-old collegiate football defensive lineman complained of rib pain after a road game in Tennessee. Aside from a mild ankle sprain, he denied any specific injury to his torso/ribs. Pain began on the left side and then migrated to the right side with radiation to flank and sternum areas bilaterally. Had pain with deep breathing and sensation of tightness in the rib area. Took naproxen with some relief of his symptoms. Denied chest pressure, shortness of breath, palpitations, fevers or chills. PMH: HTN, ADD

Medications: Amlodipine, Adderall

SH: No tobacco, social ETOH, no illicit drugs

FH: Non contributory

**PHYSICAL EXAMINATION:**

- No true focal pain noted.
- No true focal pain noted.
- Chest: Tenderness to palpation along the flank areas greatest over ribs 5-7 bilaterally. No true focal pain noted.
- Ext: D/P and PT +2. No edema. **DIFFERENTIAL DIAGNOSIS:**
  1. Costochondritis
  2. Rib fracture
  3. Chest wall strain
  4. Pericarditis
  5. Pulmonary Embolus

Interim History: Treated for chest wall injury with varying response over the next 48 h. Re-presented 2 hours before the next home game with shortness of breath, tachypnea, and worsening chest discomfort. Transferred to ER.

**TEST AND RESULTS:**

- Chest x-ray: focal right lower lobe opacification
- CT chest: acute bilateral segmental and sub-segmental pulmonary emboli, without evidence of right heart strain
- Factor V Leiden, Anti-Cardiolipin, and Prothrombin negative
- Lupus anticoagulant, Protein S, Protein C and Antithrombin III pending

**FINAL/WORKING DIAGNOSIS:** Acute bilateral segmental and sub-segmental pulmonary emboli, unclear etiology.

TREATMENT AND OUTCOMES:

1. Anticoagulation therapy with Apixaban for minimum of 3 months with considerations for lifetime treatment
2. No contact sports or activities while on anticoagulation.
3. Continued hematology follow-up of coagulation workup.
4. Ongoing discussion of importance of inclusion of PE on the differential for chest pain even in healthy athletes with no discernible risks.
1652 May 30 2:10 PM - 2:30 PM 10 Months of Dyspnea Following Long Runs in Marathon Athlete
Jay Shah, Jose Velasquez, James Pearson, Hamed Shalikar. Citrus Valley Health Partners, West Covina, CA. (Sponsor: Dr. Aaron Rubin, FACS/M) Email: jashal@b.com

(History)
A 59-year-old male marathon runner presented with pleuritic chest pain and increasingly progressive shortness of breath at the end of his runs. At baseline, he was running a marathon in 3 hours, but his runs were reduced to less than 1 hr over 18 months. He completed 18 miles in 1 hour and 30 minutes but with severe dyspnea on exertion. Patient was referred to the Sports Medicine clinic for further evaluation.

Physical Examination:
Vitals within normal limits
NAD, speaking in full sentences, no chest wall tenderness. CV: regular rate and rhythm, no edema. Pulmonary: normal respiratory effort without distress, absent of wheezes or rales.

Differential Diagnosis:
1) Overtraining syndrome
2) Asthma/Exercise induced bronchospasm
3) Viral syndrome
$) Pulmonary embolism

Tests and Results:
8/2017: EGK nonspecific/chest X-ray reported small bilateral pleural effusion
8/2017: Non contrast chest CT - no pleural effusion
8/2017: TTEcho: EF 60%, unremarkable valves & chambers
8/2017: Treadmill test unremarkable, high exercise tolerance
9/2017: CXR - persistence of bilateral pleural effusion
1/2018: Myocardial perfusion scan - no evidence of stress induced ischemia
3/2018: Non Contrast chest CT - Diminished right lung pleural opacity, probably represented inflammatory change
9 2018 D-dimer $
9 2018 CT-A - small embolus in a subsegmental branch of the pulmonary artery to the left lower lobe. Second pulmonary embolus in a segmental branch of the pulmonary artery to the right lower lobe.

Final Working Diagnosis:
Bilateral unprovoked pulmonary embolism

Treatment and Outcomes
1) Discussed indications, risks, benefits, and dietary & activity precautions of anticoagulation with Warfarin vs. Direct Oral Anticoagulant such as Pradaxa with patient in extensive detail. Patient opted for Pradaxa.
2) Hypercoagulable work-up sent and hematology referral

1653 May 30 2:30 PM - 2:50 PM Chest Injury-football
Kendrick I. Watkins, Rehal A. Bhojani. University of Texas Health Science Center, Houston, TX. (Sponsor: Charles Chassay, FACS/M) Email: jashal@b.com

(History)
A 13-year-old high school football wide receiver presented with left back and rib pain. He sustained a hit in that region during a football game the night before. He was taken out of the game due to pain and difficulty breathing which ultimately kept him from finishing the game. After the game he continued to have pain for which he took a muscle relaxant that he had from a previous injury and over the counter pain medication with minimal pain relief. The pain persisted through the night and into the following morning. His pain was worse with deep breathing and any pressure on his chest. He denied any shortness of breath, dyspnea with exertion, cough, wheezing or hemoptysis.

Physical Examination:
Appeared in no acute distress.
Echocardiogram over the posterior lateral aspect of lower ribs with tenderness to palpation, No crepitus, No palpable deformity, Symmetric chest expansion, posterior rib/back pain reproduced with deep inspiration, Eqa 1 bilateral breath sounds, No hyper-resonance to percussion, Normal respiratory rate, Negative anterior posterior compression test, Positive lateral compression test, Full AROM of the back

Differential Diagnosis:
Rib fracture, Pneumothorax, Pulmonary contusion, Pulmonary embolism

Test and Results:
X-ray Rib series: Small left apical pneumothorax involving approximately 20% of the hemi thorax. Suspected displaced fractures involving the posterolateral left eighth and ninth ribs with small linear luencies within these regions. Chest CT scan: Small left-sided pneumothorax approximately 20%. No acute osseous injury.

Final Working Diagnosis:
Pneumothorax

TREATMENT AND OUTCOMES:
The patient was sent to ER after being seen in clinic to expedite getting a CT scan done after the X-rays. After the CT scan was obtained it was decided by the ED to admit the patient for observation. He obtained a subseque nt x-ray that evening 12 hours after his initial which showed a slightly smaller left apical pneumothorax. He was discharged the next day. Repeat chest x-ray done three days after discharge showed improved pneumothorax. Patient was seen in clinic 2 weeks after his discharge from the hospital and was started on a graded exercise program with repeat x-ray at 1 week after clinic visit showed resolution of pneumothorax. He returned to full game play at 6 weeks after his initial injury.

1654 May 30 2:50 PM - 3:10 PM Focal Chest Pain- Rugby
Joshua Martin, Prakash Jayabalab, Joseph Ilha, FACS/M. Shirley Ryan AbilityLab/ Northwestern, Chicago, IL.

(History)
A 21-year-old rugby-playing male presented with a one year history of worsening anterior chest wall pain. Pain was associated with a popping sensation in the anterior chest. Additionally, symptoms were aggravated by overhead movements and chest exercises. Pain was focal, without discomfort in the ribs or thoracic back. He denied shortness of breath, pain while coughing, and all other systemic symptoms.

Physical Examination:
Local examination revealed a tender swelling at the manubriosternal joint (MSJ). Chest expansion was full and deep breaths did not elicit pain. Full painless range of motion at the shoulder, with strength intact to manual muscle testing throughout

Differential Diagnosis:
1. Strain of pectoralis major
2. Costochondritis
3. Inflammatory arthritis
4O Steatorrhea of the MSJ
5P Pulmonary embolism
6P Pneumothorax
7P Eardrums

Test and Results:
Prior cardiology work-up did not reveal an eliciting cause
Lateral x-ray of chest (sternal view)
Bone resorption on both sides of the MSJ, and soft tissue swelling anterior to the joint.
Chest MRI
Irregularity at the sternal and manubrial articular surfaces, along with a small effusion, compatible with osteoarthritis.
Further rheumatological workup for inflammatory markers
Unremarkable CBC, ESR and CRP

Final Working Diagnosis:
Manubriosternal osteoarthritis

Treatment and Outcomes:
1. Refrained from rugby for several months
2 Started on regular daily meloxicam 7.5 mg for 1 month
3. Significant improvement in symptoms
1656 Discussant  
John Fraser. Naval Health Research Center, San Diego, CA.  
(No relevant relationships reported)

1657 Discussant  
Kirk McCullough. Ortho Sports Medicine Kansas City, Kansas City, KS.  
(No relevant relationships reported)

1658 May 30 1:30 PM - 1:50 PM  
Recurrent Foot Pain - A Case Series of Two Division 1 College Football Athletes  
Elizabeth L. Albright. Penn State Health, State College, PA. (Sponsor: Peter Seidenberg, MD, FACSM)  
(No relevant relationships reported)

HISTORY: Patient 1 (P1) is a 21 y/o white male who presented for pain over lateral aspect of his right foot after twisting on it during scrimmage. He had immediate pain with ambulation. He denied hearing/feeling a pop or paresthesias. Patient 2 (P2) is a 21 y/o African-American male who presented after feeling a pop in his lateral left foot during cutting maneuver at practice. He had significant pain with ambulation and denied paresthesias. Both were 5 months status post percutaneous screw fixation of Jones fracture of the ipsilateral foot. After initial injury, Vitamin D levels were 24 and 27 ng/ml respectively. They were started on Vitamin D supplementation and provided a bone stimulator. They remained non-weight-bearing in CAM boot for 4 weeks followed by weightbearing in CAM boot for 2 weeks. At 6 weeks, they progressed back into regular shoes. They completed rehab with athletic trainer and returned to full activity at time of return. PHYSICAL EXAMINATION: Both: Skin intact. Full ankle ROM. TTP of Base of 5th metatarsal. Neurovascularly intact. No TTP of navicular, bilateral malleoli, ankle ligaments, Lisfranc joint, peroneal tendons, bifurcate ligament, calcaneus, or cuboid. Both had flexible, forefoot pes planus. DIFFERENTIAL DIAGNOSIS: Repeat Jones Fracture, 5th Metatarsal shaft or Avulsion fracture, Peroneal Tendon Rupture, Bifurcate Ligament Sprain, Cuboid Subluxation, Avascular Necrosis TESTS AND RESULTS: P1: Normal lacency at previously healed fracture site on XR. No hardware issues P2: Initially improved compared to previous XR but bone resorption evident at 2 weeks. No hardware issues. FINAL WORKING DIAGNOSIS: Recurrent Jones Fracture TREATMENT AND OUTCOMES: Non-weight bearing in CAM boot. Restart bone stimulator. Continue Vitamin D. At 1 week, transitioned to weightbearing in CAM boot. At 4 weeks, P1 transitioned into regular shoe with custom clamshell orthotic to correct hindfoot deformity and started return to play progression. At 6 weeks, he returned to full activity with orthotic in cleats. P2 required an additional 2 weeks in boot for slow fracture remodeling but then started RTP with full return by 8 weeks.

1659 May 30 1:50 PM - 2:10 PM  
Heel Injury-Figure Skate  
Naoko Onizuka, Suzanne Hecht, FACSM. University of Minnesota, Minneapolis, MN. (Sponsor: Suzanne Hecht, FACSM)  
(No relevant relationships reported)

HISTORY: A nine year old female figure skater presented with 6 weeks of atraumatic right foot pain. She recently started training double jumps prior to the onset of pain. Pain was located on the plantar side of the right midfoot and she initially noticed it following practices. Weight bearing increased her pain and eventually it hurt during practice as well as after practice. No changes in training time or frequency. She has been figure skating for two years. No history of previous foot injuries or bone stress injuries. Her family history of osteoporosis. Her past medical history is significant for chronic Lyme’s disease.
1662
May 30 2:50 PM - 3:10 PM
A Poorly Timed Slapshot To The Foot in a Hockey Player
John Gunel, Christopher Lutzykowski. Maine Dartmouth Sports Medicine Fellowship, Augusta, ME. (Sponsor: James Dunlap, MD, FACSM) (No relevant relationships reported)

History: This is a 16- year-old female ice hockey player who is a senior at a boarding school. She presents with right medial foot pain. This occurred after blocking a slap shot with her instep three weeks prior. Being recruiting season, she continued to play on her painful foot, lift weights daily, and run 3 miles two times per week. She has changed her gait to reduce pain with these activities. NSAIDS and working with her AT on strengthening and range of motion have not improved her symptoms. Due to worsening pain with weight bearing, she received right foot x-rays at an urgent care center and she would like to follow up on the results. She anxiously states that in two weeks, she will be returning to her boarding school where she seeks to participate in a showcase tournament where multiple scouts will be present. PE: Gen: NAD. MSK: Bl foot and ankles: Inspection: Soft tissue swelling in anterolateral right ankle. Palpation: TTP over navicular. No TTP over 5th metatarsal or medial/lateral malleolus. SQEEZE test positive. ROM: normal in all planes but painful at right end ranges of motion. Strength: 5/5 in all planes. Special tests: negative drawer and false tilt. Sensation: intact. Vascular: DP 2+, cap refill. Proprioception: Single leg end ranges of motion. Strength: 5/5 in all planes. Special tests: negative drawer and false tilt.

TEST AND RESULTS: - Aspirate normal CBC, elevated uric acid, normal CRP, negative culture, negative crystals, substantial RBC and some WBC, lyme negative. - MRI with large tibiotaral joint effusion with multiple large intra-articular masses consistent with polivullous nodular sclerosis or other synovial metaplasia.


TREATMENT AND OUTCOMES: - Very uncommon presentation of PVNS in atypical joint and atypical age-group. - Splinted for comfort. Narcotic pain medicines provided. Evaluated by orthopedic oncology. Take for surgical intervention. - Patient has now had full return to full activity with ongoing surveillance.

1666
May 30 1:30 PM - 1:50 PM
A Rare Cause Of Pain In A Runner: The “Nail-Patella Syndrome”
Kenneth Vitale, Evelyne Fliszar. University of California San Diego, School of Medicine, La Jolla, CA. (No relevant relationships reported)

HISTORY: 26 yo female presented with 1 year of anterior knee pain with running, worse on hills and stair climbing. Had seen multiple providers and diagnosed with patellar tendinoma pain but didn’t improve with treatment. ROS was significant for elbow stiffness, unable to fully extend elbows since childhood. No known medical/family history but reports that multiple relatives have same problem. She also reported “unusual appearance” of thumbnails since childhood, covers with fake nails and polish. She was seen by Orthopedics and Dermatology but without clear answer. PHYSICAL EXAMINATION: 5’5”, 99lb, BMI 16.5. Bilateral knee effusion, ROM 0-150° with patellar maltracking and palpably small patellae. Increased femoral anteverision and femoral adduction, but normal composite hip ROM. Hypoplastic thumbnails noted with ridging and splitting. Bilateral elbow flexion contractures ~45°. Normal neurovascular exam. DIFFERENTIAL DIAGNOSIS: Patellar tendinoma pain syndrome, Patellar subluxation/dislocation, Painful bipartite patella, Congenital deformity/dysplasia.

TREATMENT AND OUTCOMES: Knee x-rays showed severely hypoplastic patellae, trochlear dysplasia with prominent lateral femoral trochlea. Elbow x-rays revealed hypoplastic convex radial heads and capitellum with chronic posterior radial head dislocation. Due to these findings a pelvic x-ray was recommended which displayed iliac bone exostoses, confirming the diagnosis.

FINAL WORKING DIAGNOSIS: Hereditary Osteo-Oncychodysplasia, the “Nail-Patella Syndrome.” TREATMENT AND OUTCOMES: Patient had been treated for individual manifestations of disease without recognition of the syndrome. Education was provided on diagnosis; as Nail-Patella is a syndrome of multiple abnormalities, including renal anomalies, a Nephrology referral was given to screen for renal dysplasia. Understanding of these congenital abnormalities is key to management of associated seqe lae, and genetic counseling was further recommended as this is an autosomal dominant disorder. Elbow treatment option would be radial head resection, which may not improve elbow extension; patient declined. Focused leg strengthening and activity modification to accommodate knee abnormalities resulted in pain reduction, and in 2 months was able to return to light jogging (without hills) and modified yoga.

1667
May 30 1:50 PM - 2:10 PM
Barefoot Rehabilitation Of Arch Pain In A Veteran Foot Injury—Running
Matt Heindel1, Kirsten Buchanan1, Irene Davis, FACSM2. 1University of New England, Portland, ME. 2Harvard Medical School, Cambridge, MA. (No relevant relationships reported)

HISTORY: The patient was a 39 year-old male veteran who complained of dull pain along the plantar portion of the left, medial longitudinal arch. This pain persisted for 3 months and was most noticeable during weight bearing activities. Most notably, the patient was unable to participate in recreational running of any duration secondary to pain. The patient was evaluated by his primary care physician who referred him to outpatient physical therapy after ruling out a fracture through x-ray examination. PHYSICAL EXAMINATION: The patient presented with increased pain along the left medial longitudinal arch during heel elevation, mild swelling along the medial arch...
malleolar, decreased left dorsiflexion range of motion, decreased left plantarflexion and inversion strength, a flexible flatfoot deformity, and pain with any attempt to run recreationally.

DIFFERENTIAL DIAGNOSIS:
1. Posterior Tibialis Tendon Dysfunction
2. Eversion Ankle Sprain
3. Foot/ankle fracture

TEST AND RESULTS:
Strength: Manual muscle testing 3+/5 with pain on left foot plantarflexion and inversion

Range of motion: Left talocalcaneal dorsiflexion 2° with knee extended and 5° with knee flexed to 90°.

Ligamentous testing: Negative external rotation test, anterior drawer, and talar tilt

Neutral testing: Negative sciatic nerve tension test with tibial nerve sensitization

Foot fracture: Negative Ottawa ankle rules

Functional Outcomes:
- LFEs #
- Single leg Heel Rise Test: 0 reps

FINAL/WORKING DIAGNOSIS: Stage II posterior tibialis tendon dysfunction

TREATMENT AND OUTCOMES:
1. Strengthening
   a. Barefoot short-foot exercise - 3 sets of 10 reps 1x/day
   b. Inversion strengthening with red resistance band - 10 reps for 3 sets per day
c. Double heel rise with unilateral descent - 3 sets of 10 reps 1x/day
d. Gluteal Strengthening
2. Stretching
   a. Barefoot gastroc and soleus stretches. 3 sets of 30 seconds 1x/day
3. Joint Mobilization
   a. Modified Mulligan technique into dorsiflexion for 3 sets of 30 seconds

OUTCOMES: Limited active and passive ROM and in all planes due to increased warmth around foot and ankle. Unable to palpate pulses in foot or ankle, but

PALPATION - Severe tenderness in all areas of the ankle limiting physical exam.

INSPECTION - Significant soft-tissue swelling RLE. Right foot edema. No major pain. Antalgic gait.

Heavy body habitus (BMI 34 kg/m2). Unable to walk on right ankle without significant frequency and intensity of exercise to help lose gained weight. Reports no obvious relief. With the positive relief, three months prior to injury, patient started to increase level due to BU E injuries. Receiving viscosupplementation in right knee with good ankle pain. Occurred while running on treadmill after prolonged decrease in activity.

HISTORY

19 years old female who developed right knee pain over two years ago while running around 2 miles, she had previously run recreationally. She was a college athlete (running) but had to quit due to this pain. She had completed a 1/2 marathon and had an amputation of all 10 toes distal to MTP on October 2014 due to a systemic infection. By October 2016 she started a run/walk program and began to develop L lateral ankle pain, due to increased inversion during gait. After undergoing surgery to remove scar tissue from her lateral foot and re-align the EHL tendon to resist inversion, the lateral ankle pain decreased. However, when she attempted to run or walk long distances, she experienced medial lower leg pain, L>R, that progressed to a 7/10 on the L. Despite being told she wouldn’t be able run anymore, her goal was to train for another half-marathon.

PHYSICAL EXAM:
1. Callus formation L 5° metatarsal, suggesting increased lateral loading
2. Pain tenderness noted on the medial lower leg, L>R
3. Limited calcaneal eversion on the L and ankle DF on the R
4. Weakness of the inverters, everters, and plantarflexors BIL
5. Weakness of the Hip ABD, EXT and ER L>R. Lower abdominals were also very weak.

TREATMENT AND OUTCOMES:

- Single leg Heel Rise Test: 0 reps
- Ligamentous testing: Negative external rotation test, anterior drawer, and talar tilt
- Increased L arch drop during mid support

OUTCOME: Pt was discharged March 2018 running 30 min 3x/wk pain-free in a low profile partial cushioning shoe without orthotics. She exhibited improved foot alignment and reduced hip add, IR, and CPD. Pt continued to wear full minimal shoes during her cross-training. She was able to wear high heels for the first time since she amputations with pain. In Sept 2018 he completed her half marathon pain-free.

DIFFERENTIAL DIAGNOSIS:
1. Biceps femoris tendinopathy
2. Pottexiosis tendinitis
3. Pottexial artery entrapment syndrome
4C. common peroneal nerve entrapment

TEST AND RESULTS:
- PVL arterial duplex: No change in PT and AT artery waveforms with plantar and dorsiflexion. Not suspicious for pottexial artery entrapment
- MRI right knee: Suggestive of mild trochlear dysplasia. Visualized posterolateral corner right knee structures were normal. Intact right knee ligaments and menisci
- US-guided diagnostic (anesthetic) injection to the biceps femoris tendon sheath yielded no improvement in symptoms
- US-guided corticosteroid injection to the posterolateral corner (deep to the biceps femoris tendon) provided 3 weeks of complete symptomatic relief and she was able to run 8 miles without symptoms

FINAL/WORKING DIAGNOSIS:
- Low-grade posterolateral corner injury only symptomatic with prolonged exertion

TREATMENT AND OUTCOMES:
- Clinically has characteristics localizing to the posterolateral corner, deep to the biceps femoris tendon, possibly related to scar tissue formation or dynamic entrapment
- Ultrasound-guided corticosteroid injection deep to the distal biceps femoris tendon provided relief but only for 3 weeks
- Plan for PRP injection to the posterior lateral corner for further treatment and evaluation
- Possible consideration of exploratory arthroscopy if even transient response to posterior lateral corner treatment can be redemonstrated

D-18 Rapid Fire Platform - Acute Hypoxia and Aerobic Performance
Thursday, May 30, 2019, 1:30 PM - 2:40 PM
Room: CC-Hall WA2

1671 Chair: Nisha Charkoudian, FACSM. USARIEM, Natick, MA.
(No relevant relationships reported)

1672 May 30 1:30 PM - 1:40 PM
The Role of Ventilatory Responsiveness During Exercise in Performance Impairment in Acute Hypoxia
Keren Constantini, Anna C. Bouillet, Bruce J. Martin, Robert F. Chapman, FACSM. Indiana University, Bloomington, IN.
Email: keconsta@indiana.edu
(No relevant relationships reported)

The ability to increase exercise ventilation to defend arterial oxyhemoglobin saturation during hypoxic exercise is commonly viewed as an important factor contributing to large individual variations in the degree of performance impairment in hypoxia. While the hypoxic ventilatory response (HVR) could provide insight into the underpinnings of such impairments, it is almost exclusively measured at rest, under isocapnic conditions.

Purpose: 1) to determine in a cohort of highly trained athletes whether the integrated ventilatory response to progressive hypoxia at rest (HVRREST) and during exercise (HVRREST) is comparable, and 2) to determine whether HVRREST is related to the degree of performance impairment in acute hypoxia.

Methods: Sixteen endurance-trained men (VO2peak: 8.6 ± 0.2 mL kg-1 min-1) performed two poikilocapnic HVR tests: 1) during seated rest (HVRREST) where inspired O2 fraction (FiO2) was progressively reduced; and 2) while cycling at 40% cycle resistance at 75% of age predicted heart rate max for each condition. The two conditions produced decrements in steady state and maximal workload capacity. The purpose of this pilot study was to characterize the differences in ventilatory response to hypoxic exercise than during normoxic exercise (average SPO2 = 80.58 ± 4.3). Moreover, significant sex differences in breathing frequency and tidal volume were observed (P < 0.05 respectively).

CONCLUSIONS: These findings suggested that high-altitude adaptation in response to hypoxemia has different underlying mechanisms between men and women. Our results can help to explain how men and women adapt high-altitude environments.

1673 May 30 1:40 PM - 1:50 PM
Sex Differences In Respiratory And Circulatory Cost And Arterial Oxygen Saturation During Hypoxic Walking
Masahiro Horiiuchi1, Yoko Handa Kiritarha1, Yoshiyuki Fukuoka1, Herman Ponzer2. 1Mt. Fuji Research Institute, Fuji-yoshida, Japan. 2Ososhika University, Kyotoanabe, Japan. Duke University, Durham, NC.
(No relevant relationships reported)

PURPOSE: Since women have smaller lungs and a decreased capacity for lung diffusion compared to men, these differences may increase the work required for women to maintain a given rate of pulmonary ventilation (Vt) and contribute to greater exercise-induced arterial hypoxemia (EIAH). Previous studies have investigated the energy expenditure (EE) on circulation (i.e., heart rate; HR) and ventilation during exercise.

METHODS: We sought to investigate sex differences in EE, VE and HR in response to changes in SpO2. We hypothesized that women would experience greater EIAH, and that the contribution rate of EE, VE and HR in response to changes in SpO2 would be different between the sexes. We measured EE during walking on a level gradient under normoxia (room air, 21% O2) and moderate hypoxia (13% O2). Ten healthy young men and ten healthy young women walked on a treadmill at seven speeds (0.6 – 1.8 m·s-1). Each walking speed lasted for four minutes. EE was calculated using pulmonary oxygen uptake and carbon dioxide output.

RESULTS: During walking, reductions in SpO2 trended slightly greater in women under hypoxia (T: EE: 28% for men and 4% for women; 4% for women at the fastest gas speed, P > 0.05). Hypoxia-induced elevation in EE, HR, and VE were calculated by the difference between values in hypoxia and normoxia. Using a multivariate model that combined EE, VE, and HR to predict ΔSpO2, we obtained a very strong fit model both for men (R2 = 0.99, P < 0.001) and for women (R2 = 0.92, P < 0.001). We also tried to estimate the relative contributions of ΔEE, ΔVE, and ΔHR to predict ΔSpO2 by using standard partial regression coefficients. The contribution rate to predict ΔSpO2 was markedly different between men and women. In women, the effect of ΔEE and ΔVE were greater (28% in women vs. 18% in men; VE: 8% in women vs. 1% in men). Conversely, in men the contribution of ΔHR was greater (62.5% in men and 67.9% in women). Moreover, significant sex differences in breathing frequency and tidal volume were observed (P < 0.05 respectively).

CONCLUSIONS: These preliminary findings suggest that high-altitude adaptation in response to hypoxemia has different underlying mechanisms between men and women. Our results can help to explain how men and women adapt high-altitude environments.

1674 May 30 1:50 PM - 2:00 PM
Hypoxia Reduces Steady State Cycling Workload
Charli D. Aguilar. University of Nevada Las Vegas, Las Vegas, NV. (Sponsor: James NavaLight PhD, FACSM)
Email: audrey.coffee@unlv.edu
(No relevant relationships reported)

Training in hypoxia is growing in popularity among athletes. Exercise in hypoxic conditions produces decrements in steady state and maximal workload capacity.

PURPOSE: The purpose of this pilot study was to characterize the differences in steady-state exercise power between hypoxic and normoxic conditions. METHODS: 10 healthy adults (5 males, 5 females) mean age of 23.8 ± 4.5 were volunteered to participate in the study. Pretesting included a graded exercise test to determine cycle resistance at 5% of age predicted heart rate max for each condition. The two conditions are defined as, normoxia (FiO2 = 20.5%) and normobaric hypoxia (FiO2 = 18%). A Hypoxico Everest Summit II Altitude training system was used to create conditions. Intervention days were at least 2 hours apart but no more than one week. A single blinded and counterbalanced model was used. Steady state exercise was performed on a cycle ergometer (Watt bike Pro, Waukesha, WI, USA) at a rate of 6 RPM for 30 min. Heart rate (HR), blood oxygen saturation (SpO2), cycling watts and mean power were recorded every minute.

RESULTS: SpO2 were significantly lower during hypoxic exercise than during normoxic exercise (average SPO2 = 85 ± 3% in hypoxia and 93 ± 2% in normoxia) p < 0.001. Average cycle wattage was also significantly decreased during hypoxic exercise (110.7 ± 43.5, compared to 125.9 ± 49.6) p = 0.044. Mean HR was not significantly different between the two conditions. Mean power output in normoxia to wattage in hypoxia, r² = 0.50 (carson’s correlation = 0.5 < 0.001). CONCLUSION: Hypoxia reduced steady state power without changes in relative intensity. Mean cycling power in normoxic conditions and hypoxic positively correlate. These preliminary findings suggest that a predictive equation could be possible with further data collection.
At altitude, impairments in pulmonary oxygen diffusion and oxygen delivery have a detrimental effect on endurance exercise tolerance. Analogues of over-the-counter antihistamines have been shown to improve oxyhemoglobin saturation (SpO₂) and that hypobaric hypoxia may not result in hypoxia at the level of the tissue. 

**CONCLUSION:** This data indicates that the hypoxic stress resulting from normobaric and hypobaric hypoxia are not the same and that hypobaric hypoxia may not result in hypoxia at the level of the tissue.
Thematic Poster - Biomechanics after ACL Reconstruction

Thursday, May 30, 2019
Room: CC-102A

1741 Chair: Robin Queen, FACSM. Virginia Tech, Blacksburg, VA.

Effect of Lower Extremity Static Alignment on Dynamic Valgus in Adolescents Following ACL Reconstruction

Tishya Wren1, Daniel Feifer1, Natalya Sarkisova1, Mia Katz1, Curtis Vandenberg1, James L. Pace1, Nicole Mueske2.
1Children’s Hospital Los Angeles, Los Angeles, CA. 2Connecticut Children’s Medical Center, Hartford, CT.

Email: twren@chla.usc.edu

PURPOSE: Knee abduction moments may lead to valgus collapse, potentially causing ACL rupture. The contribution of static lower extremity alignment to knee abduction moments is unknown. This study assessed relationships among lower extremity static alignment and dynamic kinematics and kinetics during side-step cutting in uninjured adolescent athletes.

METHODS: This retrospective study included 60 adolescents with recent unilateral ACL reconstruction (mean age 18±2 yrs, SD 1.2, 3/8 female). Frontal plane hip to ankle imaging (EOS) was used to measure mechanical axis deviation (perpendicular distance from the center of the femoral condyles to the mechanical axis line connecting the center of the femoral head to the center of the talar dome) and tibial-femoral angle. 3D motion capture provided lower extremity kinematics and kinetics duringquiet stanceand standing (initial contact to peak knee flexion) of an anticipated 45° sidestepperut; 2-3 trials per limb were averaged for analysis. Relationships among imaging, static motion capture and dynamic motion capture measures were investigated using correlation, and backward stepwise linear regression was used to evaluate potential predictors ofaverage dynamic knee abduction moment.

RESULTS: Regardless of surgical status, standing knee abduction angle was correlated with hip abduction (r=0.6, p=0.02) and ankle eversion (r=0.8, p=0.0001) along with larger mechanical axis deviations (r=0.8, p=0.0001) and higher knee abduction on EOS (r=0.4, p=0.09). Dynamic knee abduction moment was best predicted by a combination of EOS knee abduction angle, standing ankle eversion, standing knee abduction, standing knee rotation, ankle eversion during cutting, along with ground reaction force and age (R²=0.59, p=0.004). There was no significant relationship between knee abduction moment and side (surgical vs. contralateral) (p=0.6).

CONCLUSIONS: In this small group of adolescent athletes with recent ACLR, knee abduction moment during side-step cutting was related to age and anatomical lower limb alignment in addition to dynamic factors such as ankle positioning and ground reaction force. Anatomical alignment or standing posture with greater hip adduction, knee abduction, and ankle eversion may indicate a higher risk for injury during dynamic activities.

1742 Board #1

May 30 3:45 PM - 5:45 PM

Effect of Lower Extremity Static Alignment on Dynamic Valgus in Adolescents Following ACL Reconstruction

1743 Board #2

May 30 3:45 PM - 5:45 PM

Wearable Sensor-based Classification Of ACL Reconstructed Limbs During Exercise In Male And Female Patients

Joseph M. Hart, FACSM1, Varun Mandalapu1, Stephan Bodkin1, John Lach1, Nutta Homdee1, Jiaq Gong1. 1University of Virginia, Charlottesville, VA. 2University of Maryland, Baltimore County, Baltimore, MD.

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Purpose: Early identification of subtle, sub-clinical, aberrant motion characteristics in patients with ACL reconstructed knees can inform rehabilitation and return to sports decision making. Wearable sensors enable characterization of movement in native sport and activity environment. The purpose of the study was the ability of a machine learning algorithm to accurately classify male and female participants’ reconstructed limbs from the contralateral healthy limb using inter-limb movement variability from sensor data during walking and jogging. Methods: We evaluated 109 participants (23.5 ± 10.2 y; 12.6 ± m, 3.4 ± kg) with primary, unilateral and uncomplicated ACLR at approximately 9 months from index surgery. All participants walked for 5 minutes at 3 mph and jogged for 3 minutes at 6 mph on a treadmill. Subjects were fitted with 5 wireless sensors (Shimmer3 IMU Unit, Dublin, Ireland)

1744 Board #3

May 30 3:45 PM - 5:45 PM

The Impact of a Functional Knee Brace on Sports Performance Following ACL Reconstruction

William E. Garrett, Jr, FACSM1, Abigail C. Schmitt1, Robin M. Queen, FACSM1, *Duke University Medical Center, Durham, NC. 2Virginia Tech, Blacksburg, VA.

Email: william.garrett@duke.edu

Reported Relationships: W.E. Garrett: Industry contracted research; Don Joy Orthopaedics.

Up to 26,000 a posterior cruciate ligament (ACL) injuries occur in the United States annually with most athletes undergo an ACL reconstruction. No literature has examined physical performance during return to sport (RTS) and the impact of a functional knee brace. Braces have been shown to improve mechanics, but compliance remains an issue due to performance concerns.

PURPOSE: To determine differences in performance between braced (B) and non-braced (NB) tasks across time (RTS and six weeks following RTS (RTS+6)). We hypothesize that performance will improve across time with no differences between brace conditions.

METHODS: ACL patients (n=8; 20 male, 20 female) were enrolled after being RTS. Participants were provided a custom fit knee brace and instructed to wear the brace for all activities more dynamic than walking. A series of tasks (8 yd dash, 10-5 shuffle run, vertical jump, broad jump, and a triple hop) were completed at RTS and RTS+6; each participant completed three practice trials and two recorded trials. Task and brace condition order was randomized. The ACL-RSI, IKDC and a VAS pain scale were completed. A 2x2 (time: RTS, RTS+6) x (brace: B, NB) repeated measures ANOVA for performance measures and a paired t-test for patient reported outcomes were performed.

RESULTS: Participants (height: 1.8 ± m, weight: 75.3 ± kg; age: 18 ± 3 yr) demonstrated improvements in ACL-RSI (p<0.001) and IKDC (p<0.001) with no difference in VAS pain (p=0.297). Performance declined during the 40yd Dash, vertical jump, and broad jump in the B condition. Performance improved across time for the broad jump and triple hop (Table 1).

CONCLUSIONS: Brace condition differences were small (40yd Dash: 0.1 sec, Vertical Jump: 0.5 in, Broad Jump: 0.1 in) and nonexistent and would not likely lead to noticeable sport deficits. Performance concerns should be minimal in ACL patients looking to RTS when wearing a knee brace.

ACKNOWLEDGEMENTS: This work was supported by a DonJoy Orthopaedics grant.
Abnormal lower extremity (LE) biomechanics post-anteor cruciate ligament reconstruction (ACL) may increase re-injury risk and reduce sports performance. Although most athletes return to sport (RTS) within 1 year from ACLR, the timeline for recovery of LE kinetics and kinematics during athletic tasks is not well defined. Identifying specific movement deficiencies will guide rehabilitation efforts to promote successful RTS and reduce re-injury risk. PURPOSE: To evaluate vertical ground reaction forces (vGFR) and hip, knee, and ankle kinematics during running and jumping in elite collegiate athletes.

METHODS: Twelve Division 1 athletes (age 20.5 ± 1.2, BMI 25.8 ± 3.6f) performed maximal countermovement jumps (CMJ) and treadmill running at a maximally comfortable speed 4.0 ± 0.3, 6.1 ± 0.5 m/s. 1.5 m/s post-surgery while whole body kinematics were recorded. VGRF impulses, knee flexion excursion, and peak sagittal plane hip, knee, and ankle joint angles were obtained during the stance phase of running (RUN) and the eccentric, concentric, (CON), and landing (LAND) phases of the CMJ.

RESULTS: Statistical parametric mapping (SPM, 0D unpaired t-test). The odds ratio for making a pain free RTS if LSI >90% was also calculated for the strength and jump variables.

Conclusion: This study demonstrates strength, power and biomechanical differences in those that RTP with knee symptoms after ACLR with those achieving >90% LSI in all 4 strength and jump tests almost 7 times more likely to make a pain free RTS.

Longer-term biomechanical implications of anterior cruciate ligament reconstruction with iliotibial band autograft (ACL-ITB) remain under-investigated. PURPOSE: To determine biomechanical parameters of knee function at various time intervals following the ACLR-ITB: 1-2 years, 2-5 years, 5-10 years, and >10 years post-surgically. METHODS: Patients who had undergone ACLR-ITB as skeletally immature children were recruited for testing, which included drop vertical jumps and vertical single-limb hops. A three dimensional (3D) motion analysis system with force plates was used to assess various parameters. The landing phase was defined as the moment of initial contact with the force plates, where the vertical ground reaction force (VGRF) exceeded 10 N, to 500 ms after initial contact. Major outcome variables included external knee moments (sagittal, frontal, and horizontal planes), VGRF, and vertical jump height. The knee moments and VGRF were normalized by mass (kg), and vertical jump height was calculated following the formula: height = (t/2)/2, where t=time in seconds in the air. Peak values of each outcome variable were analyzed. Paired t-tests were employed to compare VGRF and vertical jump height between the two limbs by four groups (1-2 years, 2-5 years, 5-10 years, and >10 years) separately. RESULTS: Based on available data (N=330) m, α=0.05; 1-2 years: N<10, 5<10; 10<10, 10<10 years. N<10, paired t-tests showed no statistically significant differences in peak knee moment (sagittal plane: p>0.05, frontal plane: p>0.05, horizontal plane: p>0.05) and peak VGRF (p>0.05) in drop vertical jump test. Also, no statistical significant difference was detected in peak knee moment (sagittal plane: p=0.01, frontal plane: p=0.38, horizontal plane: p=0.34), peak VGRF (p>0.05) and peak vertical jump height (p>0.05) in single-limb hops. The findings were consistent when the data was analyzed based on the 4 follow-up time groups.

CONCLUSIONS: The biomechanical function of knees undergoing this procedure appears to be no different compared to the uninjured side at 1-2 years, 2-5 years, 5-10 years, and >10 years following ACLR-ITB procedure. The current data support a long-term safety of the ACLR-ITB procedure for skeletally immature athletes with complete ACL tears.

Female athletes face significant risk of musculoskeletal injury when playing collegiate level sports. Sustaining injury, particularly to the ACL, can end an athlete’s career. Prior research has evaluated individuals’ movement profiles and patient reported outcomes (PROs) following ACL injury; however, there is a dearth of evidence evaluating the movement profile and PROs of those who successfully return to sport at an elite level following ACLR injury. PURPOSE: To compare the movement profile and PROs of Division 1 women’s college athletes who successfully return to sport following ACL injury to healthy athletes. METHODS: We conducted a cross-sectional analysis of baseline data on 66 participants collected as part of standard injury screening for Division 1 women’s soccer, lacrosse, and field hockey teams (mean ± SD; Age = 22.3 ± 1.3 yrs, H = 165 ± 4 cm, W = 57 ± 8 lbs). We used health history and survey data to identify those who had previously sustained an ACL injury as well as single assessment numeric evaluation (SANE) scores for the Knee. The Landing Error Scoring System (LESS) was used to evaluate each athlete’s movement pattern while completing a jump landing task. The LESS and SANE scores for the injured and non-injured groups were compared using T-Tests with pooled variance.
Athletes demonstrate neuroplastic changes and altered neuromuscular control after anterior cruciate ligament reconstruction (ACLR). Conflicting reports of impaired balance and cognitive performance exist for dual-task balance following ACLR. Thus, significant gaps remain in understanding altered postural control strategies in this population. PURPOSE: To understand altered postural control strategies in ACLR individuals in the presence of sensory, motor, and cognitive challenges. METHODS: Fourteen ACLR (20.2 ± 2.0 yr, 19 kg, 1.3 ± 0.4 m, 4.1 19 Tegner) and 14 matched healthy control participants (CON) (21.2± 1.4 yr, 75.4± 15.3 kg, 1.7± 1.5 m, 1.4 Tegner) were analyzed. Three 20-second trials of single-leg balance (ACLR limb, matched side for CON) were performed under the following conditions: eyes open (EO), eyes closed (EC), dual cognitive (DC), and dual motor (DM). DC involved mental addition every two seconds and DM required participants to catch a ball from a ball machine every 2 seconds. Traditional center of pressure (CoP) measures of anterior-posterior (AP) and medio-lateral (ML) CoP positions and variabilities were calculated. RESULTS: The ACLR group had greater CoP dispersion (unitless) compared to the CON group. The ACLR group had increased CoP dispersion (unitless) was also calculated for increment resultant CoP data after downsampling to 5 Hz. CONCLUSION: Female athletes who successfully returned to compete in Division 1 sports following an ACL injury demonstrated a better movement profile than those with a history of ACL injury; notably scoring below previous established cut points (9 f alls) for increased risk of injury. This was in the setting of the lower PRO scores than their uninjured counterparts. This may indicate that athletes who sustain injury and wish to play at elite levels may need to improve their movement profile to a point better than their peers and care must be taken to balance PROs with an objective measure of movement.
Poise: Hypoxia increases O2 delivery to the working muscles together with an improved lactate metabolism, power output and endurance compared to normoxia (NORM) (Cardinale & Ekblom, 2017). Considering the O2 delivery limitation and the exercise-induced hypoxemia at exercise intensities near to maximum it was hypothesized that muscle mitochondrial oxidative phosphorylation (OXPHOS) capacity would be upregulated along with a higher endurance performance following endurance interval training with HYPER compared to NORM. METHODS: 23 trained cyclists, age 35±4 yrs (mean ± standard deviation (SD)) body mass 81±9 kg, height 173 ± 7 m, and VO2 max 72 ± 1 L/min performed 6 wk endurance training on a cycle ergometer consisting of supervised HIT sessions 3 days/week (3 min) and additional long slow distance training 2 days/week. Cyclists were randomly assigned to either HYPER (FI02 0.30; n=12) or NORM (FI02 0.21; n=11) breathing condition during training in a single blinded study design. VO2 max, OXPHOS capacity in permeabilized fibers and in isolated mitochondria, and 20 min cycle performance were tested pre and post intervention. RESULTS: Over the intervention change in VO2 max (HYPER 1.1±3.8%; NORM 0.0±3.7%; p = 0.52; S E = 0.08 ; %), mass-specific mitochondrial respiration (HYPER 27.3±46.0%; NORM 16.5±49.1%; p = 0.21, ES = -0.06 ; %), intrinsic mitochondrial respiration (HYPER 241±80.1%; NORM 19±9.3%; p = 0.66, ES = 0.69) and mean power output during 20 min trial (HYPER 0.3%; NORM 2.4% 50%; p = 0.03, ES = 0.32) did not statistically significantly differ between the groups. CONCLUSIONS: These data showed that 6 weeks hyperoxia-supplemented high-intensity interval training on a cycle ergometer was not superior to conventional training at sea level in improving VO2 max, intrinsic and mass-specific mitochondrial respiration and cycle performance in already trained cyclists. Therefore, despite the small meaningful positive effect in cycling performance that might be relevant in sport, considering the cost/benefit of performing hypoxic-supplemented HIT, it is questionable whether this strategy is worthwhile in maximizing endurance performance in already trained cyclists.

Board #4
May 30 3:45 PM - 5:45 PM
Acute Effects of Blood Flow-restricted Exercise on Microcirculation, Neuromuscular Activation and Metabolite in Underweight Women.
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(No relevant relationships reported)

Purpose: This investigation measured local microcirculation, neuromuscular activation and systemic metabolite in underweight women during bilateral knee extension exercise in five conditions: high load (80% of one-repetition maximum (1RM)) without blood flow restriction [BFR, (HL)], low load (30%1RM) without BFR (LL) and low load (30%1RM) with 8% (BFR8), 0% (BFR0), 8% (BFR8) of arterial occlusion were used. METHODS: Blood flow to 3 live underweight women (1.5±0.6 kg/m2) performed four sets of knee extension to failure with 6±2 sets in five conditions. Variables of microcirculatory function [Oxygen saturation (SO2), relative hemoglobin (HbH), blood flow (flow) and blood velocity (velo)] and neuromuscular activation of the vastus lateralis (VL) and the whole blood lactate (WBL) were measured across different time points. Finally, calculating the repetitions of five conditions. RESULTS: SO2 in HL and LL were similar during whole process (HL: 79.2±19.1%, LL: 72.4±18.20%) which were significantly higher than the other three conditions (P<0.05). Flow was highest in BFR8, with the other conditions were similar (e.g., set3: 213.1 AU for BFR0, vs 185.0 AU for other conditions). After exercise, velo in BFR0, (58.2 AU) was higher than the other conditions [-5±5 AU, (P<0.05)]. HbH did not change in all conditions. LL resulted in greatest activation during the first two sets when exercise is taken to failure (e.g., set1: 8% MVIC in LL vs -3% MVIC in other conditions). After exercise, WBL was highest in BFR8, and lowest in HL (BFR8: 0.17±BFR8: 0.01±BFR0: 0.19). Changes in SO2 and muscle activation were similar between pressures, while higher pressure led to fewer repetitions during exercise. CONCLUSIONS: Low-load exercise to failure results in a greater neuromuscular response to that of high-load exercise in underweight women. When different pressures are applied to low-load exercise, there are considerable changes in microcirculation and metabolism, among which BFR8 has the characteristics of greater perfusion and higher muscle metabolic activity.

Board #5
May 30 3:45 PM - 5:45 PM
The Effect Of Blood Flow Restriction And Whole-body Vibration As A Warm-up Strategy.
Jonathan Salinas, Natalie Castillo, Aaron Garcia, Jessica Martinez, Ricardo Parra, Murat Karabulut, FACSM. University of Texas Rio Grande Valley, Brownsville, TX.
(No relevant relationships reported)

Purpose: The purpose of this study was to examine the effects of blood flow restriction (BFR) and whole-body vibration (WBV) on hemodynamics, muscle temperature, flexibility, and explosive power.

Methods: Twenty-five subjects (14 females (age = 24±2.7 years) and 11 males (age = 26±2.5 yrs) completed the study, which involved following 6 sessions: a) 6 min (5% WBV) and a 10-min (10-WBV) lower-body warm up on a vibration platform, a 5-min (5-FBR) and a 10-min (10-FBR) lower-body warm up using blood flow restriction cuffs, and a 5-min (5-CYC) and a 10-min (10-CYC) warm up on a cycle ergometer. For the BFR session, cuffs were placed on the uppermost portion of the thigh. Inflation began at 120 mmHg and progressively increased to a target pressure, which was based on the subject’s thigh circumference and capillary perfusion. Squat exercises were performed between the knee angle of 18° and a 6° rest in between sets) on a vibration platform at 30 Hz with low amplitude or a flat surface while wearing BFR cuffs. Pre and post-exercise data on hemodynamics, quad and hamstring temperature, flexibility, and explosive power index were recorded. Explosive power was measured using a jump mat, where 6 maximal exertion jumps were performed, with mean ground contact time (GCT), mean vertical jump height (MVJ), and explosive power index (EPI) for the first 15 and last 15 jumps. Hemodynamics, muscle temperature, and flexibility were again recorded following the explosive power index test.

Results: There was no condition*time interaction or condition main effect for GCT, MVJ, and EPI, but there was a time main effects for all three variables (p<0.01). There were no condition and time main effects and condition*time interaction for heart rate (p=0.01), time main effect for systolic blood pressure (p=0.01) and flexibility (p<0.01). Significant time main effect and condition*time interaction were detected for quad driceps (p=0.01) and hamstring muscle temperatures (p<0.01).

Conclusions: Our findings indicate that all the conditions and durations investigated resulted in similar responses in flexibility and jump performance. Future studies should examine different pressure settings of BFR and/or frequency/amplitude setting of WBV on the variables tested in the study.

Board #6
May 30 3:45 PM - 5:45 PM
Physiological Responses to Intermittent Endurance Exercise with Blood Flow Restriction in the Moderate Intensity Domain.
Austin Moran1, Meral Culver1, Justin Guilkey1, Timothy R. Rotarius2, Jakob D. Lauver1, 1Coastal Carolina University, Conway, SC. 2Adrian College, Adrian, MI.
(No relevant relationships reported)

Blood flow restriction (BFR) endurance training may induce both endurance and strength improvements. However, there is no consensus on the ideal BFR endurance exercise prescription in order to balance the physiological and perceptual responses.

Purpose: The purpose of this investigation was to examine the physiological responses, as well as the perceived exertion in responses to a range of BFR endurance protocols.

Methods: Participants randomly performed 6 exercise protocols: 50% of the difference between peak oxygen uptake (VO2) and ventilatory threshold (VT) (S50%), 50%, 75%, and 90% of VT with and without BFR. Each protocol consisted of two sets of five work intervals (2 minutes work, 1 minute rest) on a vibration platform at 30 Hz with low amplitude or a flat surface while wearing BFR cuffs. Pre and post-exercise data on hemodynamics, quad and hamstring temperature, flexibility, and explosive power index were recorded. Explosive power was measured using a jump mat, where 6 maximal exertion jumps were performed, with mean ground contact time (GCT), mean vertical jump height (MVJ), and explosive power index (EPI) for the first 15 and last 15 jumps. Hemodynamics, muscle temperature, and flexibility were again recorded following the explosive power index test.

Results: There was no condition*time interaction or condition main effect for GCT, MVJ, and EPI, but there was a time main effects for all three variables (p<0.01). There were no condition and time main effects and condition*time interaction for heart rate (p=0.01), time main effect for systolic blood pressure (p=0.01) and flexibility (p<0.01). Significant time main effect and condition*time interaction were detected for quad driceps (p=0.01) and hamstring muscle temperatures (p<0.01).

Conclusions: Our findings indicate that all the conditions and durations investigated resulted in similar responses in flexibility and jump performance. Future studies should examine different pressure settings of BFR and/or frequency/amplitude setting of WBV on the variables tested in the study.
compared to the non-BFR conditions (\( \% \Delta = +8.2 \% \)) and 20.1% \( \% \Delta \)降低了 7.25%. No differences in TOI between ASO (36.93 ± 10.8) and any BFR conditions were observed. RPE was greater during 0% BFR (18.0 ± 0) and 0% BFR (17.1 ± 1.1) compared to 70% (11.3 ± 0.6) and 90% (13.0 ± 0). No differences were observed between 0% BFR (18.0 ± 0) and non-BFR conditions. Conclusion: This study demonstrated that cycling with the addition of BFR at an intensity close to maximal may provide a balance between physiological strain and perceived exertion.

1757 Board #7
May 30 3:45 PM - 5:45 PM
Muscle Oxygenation Patterns during a 20-km Time Trial with Intermediate Sprints and Recoveries.
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No relevant relationships reported

PURPOSE: Pacing strategies are necessary during endurance events in which the goal is to finish in as little time as possible. Both anaerobic and aerobic attributable sources of ATP are used during such efforts. Rating of Perceived Exertion (RPE) increases linearly as heart rate (HR) and power output (PO) increases, however these markers of intensity are not instantaneous. Near infrared spectroscopy (NIRS) allows for the measurement of muscle oxygen consumption (\( \text{SmO}_2 \)) which may respond to short-term fluctuations in PO. Previously, \( \text{SmO}_2 \) has shown a moderate correlation with oxygen consumption (\( \text{V'O}_2 \)) and HR during an incremental exercise. The purpose of this study was to determine how \( \text{SmO}_2 \) changes with increases in PO during a non-incremental cycling time trial (20-km) with various interspersed sprints and if decrements in PO due to shorter rest times were associated with lower \( \text{SmO}_2 \).

METHODS: Well-trained cyclists (\( \text{VO}_{2\text{max}} \geq 55.4 \text{ml kg}^{-1} \text{min}^{-1} \), \( \text{PO}_{\text{max}} \geq 305 \pm 45 \text{W} \), habituated to 20-km trial, performed a self-paced 20-km time trial and two time trials with 1-km sprints imposed, separated by 2-4 km of self-paced cycling. \( \text{SmO}_2 \), saturation, PO, and HR were measured. RPE was recorded each kilometer. Pearson’s partial correlations were used to analyze relationship between \( \text{SmO}_2 \) and PO. A one-way analysis of variance was used to determine if there were differences in finishing times between trials.

RESULTS: There was a significant inverse relationship between \( \text{SmO}_2 \) and PO during all time trials (\( r = -0.28, P < 0.0001 \)). There was no significant difference (\( p = 0.3 \)) between the finishing times amongst 20-km protocols.

CONCLUSIONS: This study revealed that the imposed sprints caused reciprocal changes in the extent of \( \text{SmO}_2 \) and PO that are larger than the changes in a self-paced time trial. In other words, as the subjects were instructed to significantly their PO to simulate a break-away, the \( \text{SmO}_2 \) decreased in a reciprocal manner.

1758 Board #8
May 30 3:45 PM - 5:45 PM
Living In Confinement Conditions: Physical Training Can Improve Muscular Oxygen Uptake and Heart Rate Kinetics
Uwe Hoffmann, Uwe Drescher, Lutz Thieschafer, Jessica Koschate. German Sport University, Koeln, Germany. Email: u.hoffmann@dshs-koeln.de

(No relevant relationships reported)

PURPOSE: Inside the NASA Human Exploration Research Analog (HERA) facility the effects of 45 d of confinement in combination with restrictions for sleep and a defined physical training on muscular oxygen uptake (\( \text{V'O}_2 \)) kinetics and cardiovascular regulation during exercise was investigated.

METHODS: To date, fourteen healthy individuals (5 females, 9 males, 37 ± 7 y, 23 ± 3 kg \( \cdot \) m\(^2\)) were analyzed before (MD-4) and after (MD+4) a simulated Space mission. A cycle exercise test with pseudo-random binary work rate changes (WR) of 30 W and 8 W and an incrementally increasing step protocol (25 W min\(^{-1}\) ) to assess peak oxygen uptake (\( \text{V'O}_2 \text{peak} \)) was applied. Heart rate (HR) and mean arterial blood pressure (MAP) were measured beat-to-beat and pulmonary oxygen uptake (\( \text{V'O}_2 \)) breath-by-breath. \( \text{V'O}_2 \text{musc} \) was estimated from HR and \( \text{V'O}_2 \text{pulm} \). Kinetics responses were assessed by maxima of the cross correlation function (CCFmax) between WR and the respective parameter indicate faster kinetics (Hoffmann et al., Eur J Appl Physiol 113:1745-1754, 2013). During the mission, exercise training sessions were scheduled every second day with a maximal HR restricted to below 85% of the age-related maximum. Sleep was restricted to 5-6 h per weekday and 8 h at the weekends. Differences in \( \text{V'O}_2 \text{peak} \) and kinetics from MD-8 to MD+4 were calculated and correlated with the values measured at MD-8 and the Pearson test. Level of significance was set to 0.05%.

RESULTS: \( \text{V'O}_2 \text{peak} \) differed not significantly (\( P = 0.221 \)) between MD-8 (37.8 ± 5.8 ml min\(^{-1} \) \( \cdot \) kg\(^{-1} \)) and MD+4 (33.8 ± 1.9 ml min\(^{-1} \) \( \cdot \) kg\(^{-1} \)). Changes in CCFmax(\( \text{HR} \)) correlated significantly with CCFmax(\( \text{HR} \)) at MD-8 (\( r = -0.839, P < 0.001 \)); changes in hypoxia training has been shown to improve aerobic capacity because hypoxia stimulates erythropoiesis due to increased erythropoietin (EPO) production. However, it takes several weeks to increase hemoglobin mass during endurance training in hypoxia. In the present study, we focused on the combined effects of “normoxic condition” and “heat stress” for EPO production. Considering that endurance exercise under heat condition augments plasma volume, hypoxic and heat conditions may promote additively erythropoiesis.

PURPOSE: The purpose of the present study was to determine EPO response to endurance exercise under heat and hypoxic conditions.

METHODS: Twelve healthy males (21.5 ± 0.3 y, 181 ± 1.2 cm, 78 ± 8.6 kg) participated. They conducted a 60 min pedaling exercise at 60% \( \text{V'O}_2 \text{max} \) under either “heat and hypoxic condition (H+H)” (Fraction of inspiratory oxygen (\( \text{FiO}_2 \) ): 16%, 32°C, “hypoxic condition (HYPO)” (\( \text{FiO}_2 \): 16%, 23°C) or “normoxic condition (NORM)” (\( \text{FiO}_2 \): 20.9%, 23°C). After completing the exercise, subjects remained in the chamber for 3 h to evaluate metabolic and endocrine responses during post-exercise. We evaluated changes in muscle oxygenation (using NIRS) during exercise, blood variables, percutaneous oxygen saturation (SpO\(_2\)), muscle temperature during exercise and 3 h of post-exercise.

RESULTS: SpO\(_2\) was significantly decreased both under H+H and HYPO (P < 0.01). Blood lactate level increased during exercise (P < 0.05), but with no difference between the three conditions. Serum growth hormone level significantly increased (P < 0.01), and H+H showed significantly higher level compared with HYPO. The serum EPO level was significantly increased in both H+H and HYPO 3 h after exercise, but no difference was observed between the two conditions.

CONCLUSIONS: Serum EPO level was significantly increased with endurance exercise under hypoxic condition. However, heat stress during endurance exercise in hypoxia (heat and hypoxic condition) did not augment the EPO response.

1761 Board #2
May 30 5:30 PM - 5:55 PM
Neuromuscular Responses to Combined Heat Stress and Hypoxia During 20-km Cycling Time Trials
Geoffrey L. Hartley, Cory Tremblay, Stephanie Munten, Shelby Dickey, Caleb Mady. Nipissing University, North Bay, ON, Canada. Email: GeoffH@nipissingu.ca

(No relevant relationships reported)
Contribute to apparent task-specific responses. **Purpose**: To examine the isolated and combined effects of ambient temperature [cool (18°C), 20% rh] vs hot (35°C, 20% rh) and inspired oxygen content [normoxia (FiO2:0.21) vs hypoxia (FiO2:0.16)] on neuromuscular function in response to a cycling TT. **Methods**: Five physically active male participants (23 ± 6 y) performed four 20-km cycling TTs in different environmental conditions [cool/normoxia (COOL), hot/normoxia (HOT), cool/hypoxia (HYPO); hot/hypoxia (HH)]. Neuromuscular responses of the soleus, as indicated by changes in isometric MVC (MVCM), M-wave, twitch force (Ojv, and voluntary activation (VA)), were assessed prior to and following each time-trial. Linear mixed model analyses were used to examine the neuromuscular responses, with fixed effects for each condition and a random intercept for participants. **Results**: Time-trial performance was impaired during HOT (211 ± 18 s; 16% vs COOL (208 ± 12 s; 211±14 s, p<0.02)). Similar reductions in MVCM [+0.12±0.6%] and VA [+14.0±9.6%] were observed across all conditions (p<0.05); however, no significant differences were observed in M-wave (p=0.09) or Ojv (p=0.43). **Conclusion**: Neuromuscular impairments following 20-km cycling TT are attributed to central mechanism(s) (i.e., VA); however, neuromuscular adaptations were similar in conditions where heat stress and hypoxia were combined, to conditions where each environmental stressor was examined in isolation.

**1762** Board #3 May 30 3:45 PM - 5:45 PM Physiological Responses to Repeated Sprint Exercise under Combined Heat and Hypoxic Conditions Keichi Yamaguchi, Nobukazu Kasai, Nanako Hayashi, Haruka Yatsutani, Kazushige Goto. Ritsumeikan University, Kusatsu, Japan. (Sponsor: Robert Kraemer, FACSM) Email: shib114@ed.ritsumei.ac.jp (No relevant relationships reported)

During sprint exercise in hypoxia, anaerobic energy supply is increased with augmented blood volume in muscle. Exposure to heat stress also increases anaerobic energy supply and blood volume in the muscle. Therefore, the combined treatments of “hypoxic exposure” and “heat stress” may cause further increases in anaerobic responses. **Purpose**: To determine the effect of combined heat and hypoxic conditions on physiological responses to repeated sprint exercise. **Methods**: Ten male athletes (1.98 m, 84.3 ± 6.7 kg) completed repeated sprint exercise (three sets of 3 × 10 s maximal pedaling exercise) under four different conditions: [1] control condition (CON, 20°C, FiO2:20.9%), [2] hypoxic condition (HYP, 20°C, FiO2:14.5%), [3] hot condition (HOT, 35°C, FiO2:20.9%), [4] combined hot and hypoxic conditions (HH, 35°C, FiO2:14.5%). Power output, muscle oxygenation in vastus lateralis [evaluated by near infrared spectroscopy (NIRS)], respiratory variables and arterial oxygen saturation (Sao2) were continuously monitored throughout the exercise. We also measured skin and muscle temperature, heart rate, and blood variables (blood lactate, glucose, pH, PO2, PCO2 levels). **Results**: HYP and HH showed significantly lower average oxygen uptake (CON: 2.3 ± 0.1 L/min, HYP: 1.9 ± 0.1 L/min, HOT: 2.4 ± 0.1 L/min, HH: 2.0 ± 0.1 L/min) and average Sao2 (CON: 96.0 ± 0.6%, HYP: 95.8 ± 0.5%, HOT: 95.5 ± 0.4%, HH: 95.4%) compared with CON and HOT (p<0.05). Muscle temperature was significantly higher in HOT and HH compared with CON and HYP throughout the exercise (p<0.05). Furthermore, HYP and HH presented significantly greater peak power output in the first set of the exercise compared with CON and HYP (p<0.05). No significant difference among trials was observed for changes in blood variables, and muscle oxygenation in vastus lateralis. **Conclusions**: Peak power output was higher in HOT and HH, although HH showed lower oxygen uptake and Sao2. These results suggest that combined heat and hypoxic conditions (HH) would cause greater power output than control condition in spite of decreased aerobic energy supply.

**1763** Board #4 May 30 3:45 PM - 5:45 PM Downhill Running: An Effective Countermeasure To Limitations Of Exercise In Acute Hypoxia? Trevor Gillum, Felpe Gorini Pereira. California Baptist University, Riverside, CA. Email: tggillum@calbaptist.edu (No relevant relationships reported)

Exercise stress that results in increased expression of heat shock protein 2 (Hsp2) is linked to physiologic adaptations. Adaptations to one environmental stressor, such as heat, increase Hsp2 and induce cross adaptations to other stressors (i.e. hypoxia). Previously, two bouts of downhill running (DHR) conferred classic markers of heat acclimation (lower Tc, earlier onset of sweating). We sought to increase Hsp2 through repeated DHR to potentially expedite the acclimation process. **Purpose**: To analyze the effect of DHR on exercise performance in normoxic and hypoxic conditions. **Methods**: 8m ales (23.8 ± 5.4e, avg age 23 ± 8 m kg-1 min-1, 13.6 ± 2% body fat) performed two 6-minute DHR bouts (-12.5% grade) separated by 5-10a y in the speed that elicited VcO2 while running downhill. Pre and post blood samples were collected to quantify monocyte Hsp2. M muscle soreness (DOMS) was assessed 24 and 80-hour after each downhill bout using a Likert scale. Two normobaric hypoxic (16% FiO2) 3Km time trials (TT) were performed: one before any DHR and one 7 days after the last bout. Hydration was assessed before the TT while blood lactate was measured pre and post TT. During the TT, heart rate, RPE and O2 saturation (Sao2) were recorded every 1 km. **Results**: Monocyte Hsp2 showed no change across time (p>0.53). Specifically, basal concentration from DHR I to DHR II were not different (3.5 ± 2.3 to 2.9 ± 1.5 AU). TT performance was similar between conditions (1377 ± 192, 1364 ± 174 sec). Hydration (1.018 ± 0.007, 1.013 ± 0.009 urine specific gravity), RPE (14.0 ± 1.1; 14.6 ± 1.3), HR (18 ± 1; 18 ± 1) and blood lactate (post TT1 11.8 ± 1.9 post TT2 12.0 ± 3.1 mM) were similar in both TTs. However, Sao2 significantly increased from TT1 to TT2 (84.5 ± 4.0, 87.2 ± 2.3%, p<0.05). DOMS was significantly lowered 24 (5.1 ± 0.8 vs 3.5 ± 1.5, p<0.05) before the second DHR trial and normal during exercise intensities.

**1764** Board #5 May 30 3:45 PM - 5:45 PM Heat Acclimation Mediated CROSSTOLERANCE In C2C12 Myotubes Garrett W. Hill1, Ben J. Lee2, Trevor L. Gillum3, Roger A. Vaughan1, Matthew R. Kuennen1. 1High Point University, High Point, NC. 2University of Chichester, Chichester, United Kingdom. 3California Baptist University, Riverside, CA. (No relevant relationships reported)

**Background.** Heat acclimation enhances animal and human tolerance during subseque nt novel hypoxic stress exposure. This heat-acclimation-mediated crosstolerance (HACT) is attributed to shared cellular stress response pathways. Although skeletal muscle is the largest organ (by mass) in the mammalian body, to our knowledge no research has been conducted examining HACT in skeletal muscle cells. **Purpose.** The timeframe of HACT and the mechanisms behind this response were examined in differentiated C2C12 myotubes. **Methods.** Heat acclimation (HA) was established by heating (40°C) C2C12 myotubes for 6 consecutive days (24h). Control myotubes were maintained for the same duration under control conditions (37°C). Control and HA myotubes were subsequently challenged with Hypoxia (1% FiO2) or Hypoxia + LPS (1% FiO2 + 80 ng/ml LPS) for 2h. Cell lysates were collected immediately post (+0h) and 12h post (+12h) challenge. Western blot was used to assess protein markers of the heat shock response (HSR), inflammation, and apoptosis. Data were analyzed with two-way ANOVA with Newman-Keuls post-hoc tests. **Results.** HA myotubes exhibited increased phosphorylation of HSF-1 (+21%, p<0.01) and reduced phosphorylation of IkBα [-56%, p<0.01] at +0h. Control myotubes exhibited reduced SIRT1 at +0h following challenge with Hypoxia [-36%, p=0.04] and Hypoxia + LPS [-40%, p<0.02]. By +12h Control myotubes that had been challenged with Hypoxia or Hypoxia + LPS exhibited significantly greater phosphorylation of HSF-1 [+72%, p<0.01] and HSP c ontent [+153% (p<0.04); respectively]. However, these changes occurred too late to afford cytoprotection, as Control myotubes that were challenged with Hypoxia + LPS also exhibited increased TLR4 (+77%, p<0.01) and NFκB (+117%, p<0.03), in conjunction with elevated phosphorylation of JNK [-15%, p=0.03] and Caspase 3 content [-25%, p=0.02]. **Conclusion.** We present evidence of HACT in C2C12 myotubes. We speculate that through elevations in SIRT1 and activation of the HSR, HA confers lower inflammatory and apoptotic drive in skeletal muscle cells. We note that HACT is not evident until +12h following challenge, suggesting studies that do not follow an extended timecourse for cell lysate collection could potentially miss benefits associated with this response.
**D-41**

**Thematic Poster - Energy Metabolism and Health**

**Thursday, May 30, 2019, 3:45 PM - 5:45 PM**

**Room: CC-104B**

**1765 Board #1**

**May 30 3:45 PM - 5:45 PM**

**Pre-intervention Endothelial Function and Hyperglycemia Modifies Flow-mediated Dilation Following Short-term Exercise Training in Adults with Prediabetes**

Stephanie M. Miller, Natalie Z.M. Eichner, Nicole M. Gilbertson, Emily M. Heiston, Arthur S. Weltman, FACSM, Steven K. Malin, FACSM, University of Virginia, Charlottesville, VA. (Sponsor: Steven K Malin, FACSM)

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(No relevant relationships reported)

**Purpose:** Impaired glucose tolerance (IGT) elevates type 2 diabetes and cardiovascular disease (CVD) risk above and beyond impaired fasting glucose (IFG) alone. Hyperglycemia can impair endothelial function through increased inflammatory responses. However, it is unknown whether exercise training vascular function differently among prediabetes phenotypes. We examined whether improvements in endothelial function following 2-wks of aerobic training is different affected in adults with IFG/IGT compared to those with IFG alone. **Methods: Middle-aged, obese adults with IFG (n=11; 58.5±7 yr; 34.3±7 kg/m²; FPG: 108±6 mmol/dl; 2-hr glu: 123±31 mmol/dl) and IFG/IGT (n=15; 56±6 yr; 38.2±13 kg/m²; FPG: 104±20 mmol/dl; 2-hr glu: 105±31 mmol/dl) were randomized to 2-wks of 12-min cycling at 90% HRpeak and 50% HRpeak for 3 mins. An additional 350 kcal was provided to LCD+INT post-exercise to equate energy availability between groups. Training significantly increased VO2peak (P=0.0001) and FMD adaptation was linked to decreased circulating VCAM (r=0.01) after training. Pre AIX0min correlated with increased Si (r=0.44, P<0.01) as well as improved Si (P=0.04). Pre AIX0min correlated with increased Si after treatment (r=0.6, P<0.001). Conclusion: Independent of exercise, LCD reduces post-prandial aortic waveform and METs in obese women. Decreased systemic arterial stiffness appears to be related to insulin sensitivity following reduced energy availability, given no effect on cfPWV.

**RESULTS:** Independent of exercise, LCD reduces post-prandial aortic waveform and METs in obese women. Decreased systemic arterial stiffness appears to be related to insulin sensitivity following reduced energy availability, given no effect on cfPWV.

**CONCLUSIONS:** Independent of exercise, LCD reduces post-prandial aortic waveform and METs in obese women. Decreased systemic arterial stiffness appears to be related to insulin sensitivity following reduced energy availability, given no effect on cfPWV.

**1766 Board #2**

**May 30 3:45 PM - 5:45 PM**

**Low-Calorie Diet With or Without Interval Exercise Reduces Post-Prandial Aortic Waveform in Obese Women**

Emily M. Heiston, Nicole M. Gilbertson, Natalie Z.M. Eichner, Steven K. Malin, FACSM, University of Virginia, Charlottesville, VA. (Sponsor: Steven Malin, FACSM)

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(No relevant relationships reported)

**Purpose:** Arterial stiffness is considered a strong predictor of cardiovascular disease (CVD). Women have higher values of arterial stiffness than men, suggesting that females are at a greater risk of heart-related complications. While the low calorie diet (LCD) reduces arterial stiffness, in part through lowering metabolic syndrome (MetS) risk factors and/or increasing insulin sensitivity, no study has tested if intervention (INT) adds to the benefit of LCD on arterial stiffness in obese women. **Methods:** Twenty-four obese women (6±1; 74±5 yr; 13.3±5 kg/m²; randomization to LCD (n=12; mixed meals of -1200 kcal/d) or LCD+INT (n=12; 0 kcal/d of supervised INT at 0% HRpeak for 3 min and 0% HRpeak for 3 min). An additional 350 kcal was provided to LCD+INT post-exercise to equate energy availability between groups. Augmentation Index (AIx, systolic arterial waveform adjusted for heart rate of 75 bpm) and carotid-femoral pulse-wave velocity (cPWV, central index) were measured during a 75g OGTT before and after the intervention to assess arterial stiffness. MetS risk severity (z-scores) and insulin sensitivity (SI; simple index of insulin sensitivity) were also measured. **Results:** LCD+INT increased VO2peak (L/min and mL/kg) compared to LCD (P<0.03 and P<0.04 respectively). However, both interventions decreased body fat, fasting SHIP, TG, total cholesterol, MetS severity and LDL (all P<0.01) as well as improved SI (P<0.03). Despite no effect on fasting AIx (LCD: -3.2±3.2 vs. LCD+INT: -2.7±3.8; P=0.32) or cPWV (LCD: -0.2±0.9 vs. LCD+INT: 0.3±0.8 mmHg/L/m, P=0.07) and LCD+INT decreased AIx during AUC (r=5.6±5.6 vs. 28.3±8.1, r<0.01 respectively). Pre AIx0min correlated with pre fasting DHP (r<0.001, P=0.007) and decreased AIx0min (r=-0.5, P<0.03). Further, this decreased AIx0min correlated with increased SI after treatment (r<0.04, P=0.03). Conclusion: Independent of exercise, LCD reduces post-prandial aortic waveform and METs in obese women. Decreased systemic arterial stiffness appears to be related to insulin sensitivity following reduced energy availability, given no effect on cfPWV.

**1767 Board #3**

**May 30 3:45 PM - 5:45 PM**

**Effects of Exercise Modality on Glycemic Control After 6 Weeks of Training in Middle Aged Men**


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(No relevant relationships reported)

**Purpose:** To investigate changes to glycemic control after a 6-week exercise training program in inactive, middle-aged men with overweight/obesity. **METHODS:** Thirty-five men (39.6±2.4 yr, BMI: 28.8±3.7 kg/m²; mean ± SD) enrolled in a 6-week training study and were randomly stratified (by lean body mass) to one of three training groups (endurance cycling (END, n=12); high intensity interval cycling (HIIT, n=12); resistance training (REX, n=11)) in a parallel group design. Two-hour OGTTs were conducted as secondary analyses on two occasions (pre and post intervention) and total AUC (trapezoid method) was calculated. Statistical analyses were performed using linear mixed models (group × time), with significance set at P<0.05.

**RESULTS:** For glucose variables, there were no differences between groups at baseline (fasting glucose: 5±0.6 mmol/L; AUC: 13.7±3.2 mmol/m²/L). A main effect of time for lower post-intervention total AUC glucose was observed (12.7±2.0 mmol/m²/L, P=0.008). Fasting glucose concentrations showed a group × time interaction (P=0.008) where REX training increased fasting glucose levels post-training (+0.4±0.5 mmol/L, P<0.005). Training modality had a similar effect on fasting insulin or total insulin AUC. However, a main effect of time was observed for the reduction in total AUC insulin from pre to post intervention (-1.5±1.8 mU/mL, P=0.008). AUC insulin was related to the normal glycemic tolerance at baseline. Future investigations of exercise modality should be performed in individuals with abnormal glucose tolerance if exercise modality is an important factor in improving glycemic control.

**ACKNOWLEDGEMENTS:** This study was funded by ACURF grants to Dr Camera and Dr Parr.

**1768 Board #4**

**May 30 3:45 PM - 5:45 PM**

**Effect of Exercise Training Intensity on Glycemic Control in Older Adults with Prediabetes**

Jennifer Blankenship1, Edward L. Melanson, FACSM2, Victoria A. Catencacci1, Kenneth P. Wright1, Jane E.B. Reusch1, Kerrie Hildreth1, Seth Creasy1, University of Colorado Anschutz Medical Campus, Aurora, CO. University of Colorado Boulder, Aurora, CO. (Sponsor: Edward Melanson, FACSM)

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(No relevant relationships reported)

**INTRODUCTION:** Older adults have the highest rates of prediabetes and diabetes in the US. Exercise is a well-established method to improve glycemic control, however, the optimal dose (duration and intensity) of exercise required to improve glycemic control among older adults is unclear. **Purpose:** To compare the effect of 12 weeks of moderate vs. high intensity exercise training on daily glycemic control in older adults with prediabetes. **METHODS:** 181 older adults (61±8 yr) with prediabetes (HbA1c ≥7%, or fasting glucose 100-123 m/dl) participated in a 12-week supervised exercise training intervention. Participants were screened prior.
to being randomized to the moderate (MOD: 6-8 hr max) intensity training group. During the intervention, participants exercised 4 days per week (45 minutes/session) at their target heart rate range. Continuous glucose monitors (CGM) were worn for 1 week at baseline and during the 12th week of supervised exercise training. Daily glycemic control was quantified over 24 hour periods (00:00 to 23:29) for each day the CGMs were worn during the week at baseline and after exercise training. We calculated mean, total area under the curve (trapezoidal method) and duration of hyperglycemia (percent time glucose $\geq 140$ mg/dL). Using linear mixed models with repeated measures, we determined the effect of exercise training and whether the effect of training varied by exercise intensity group. Significance was set at $p < 0.05$. Data are reported as mean$\pm$SD. SUMMARY OF RESULTS: There were no significant differences in any baseline participant characteristics (e.g. sex, age, BMI) between exercise training groups. At baseline, VIG had significantly lower mean (MOD: 136.0$\pm$18.4; VIG: 122.6$\pm$7.4 mg/dL), total area under the curve (AUC) (MOD: 328.0$\pm$85; VIG: 238.4$\pm$22 mg*hr/dL), and duration of hyperglycemia (MOD: 338$\pm$19; VIG: 198$\pm$66). After the intervention, there were no significant changes in mean glucose, AUC, or duration of hyperglycemia in either group. CONCLUSION: Regardless of exercise intensity, 12 weeks of aerobic exercise training did not significantly change daily glycemic control in older adults with prediabetes, suggesting that changing other lifestyle factors may be needed to improve glycemic control in this population.

1770 May 30 3:45 PM - 5:45 PM
Nutritional Intervention Increases the Likelihood of Menses in Exercising Women with Menstrual Disturbances
Rebecca J. Mallinson, Nancy I. Williams, FACSM, Emily A. Southmayd, Daniel J. Mallinson, Mary Jane De Souza, FACSM. 1Penn State University, University Park, PA. 2Penn State Harrisburg, Middletown, PA. Email: mallinsonr@psu.edu

Exercising women in whom energy intake is inadequate for energy expenditure develop low energy availability (EA) and are at risk for menstrual disturbances and poor bone health. The first line of treatment is an increase in energy intake to reverse low EA. REFUEL is the first randomized controlled trial (RCT) to assess the effectiveness of 12 months of increased energy intake on menstrual function and bone health in women with exercise-associated menstrual disturbances (EAMD).

Purpose: To determine if an intervention of increased energy intake improves menstrual regularity among women with EAMD.

Methods: Young, exercising women with EAMD were randomized to 2-wks of a LCD (n=12; mixed meals of 1000-1200kcal/d) or LCD+INT (n=12; LCD+I NA T increased V O$_2$peak, body composition (BodPod), and vascular inflammation (VCAM, ICAM) were also determined. RESULTS: LCD+INT increased VO$_2$peak (P=0.02) compared to LCD, and both treatments improved fat mass (P=0.001), IS (P=0.02), and I CAM (P=0.02). LCD+INT did not have an effect on fasting or iA UC FMD, but there was notable variation. In fact, low baseline fasting and iA UC FMD was linked to enhanced fasting and iA UC FMD post-treatment (r=0.7, P=0.001; r=0.7, P=0.01, respectively). When comparing subjects who increased fasting endothelial function after each treatment (r=0.8, P<0.05) , LCD n=5, LCD+INT n=7, LCD+INT increased fasted FMD more than LCD (0 vs 2.8% P=0.04), and LCD+INT attenuated FMD iA UC compared to LCD (2% vs 4% P=0.02). Enhanced fitness related to increased fasting FMD (r=0.43, P=0.03) and attenuated FMD iA UC correlated with reduced glucose iA UC (r=0.5, P=0.004), as well as increased fasting and I H RER (r=0.5, P=0.014) and r=0.3, P=0.006 respectively. CONCLUSIONS: There was large FMD variation post-treatment. However, INT enhanced the effect of LCD on FMD in those with low endothelial function, and this was mirrored by low post-prandial FMD post-treatment. However, INT enhanced the effect of LCD on FMD in those with low endothelial function, and this was mirrored by low post-prandial FMD post-treatment. However, INT enhanced the effect of LCD on FMD in those with low endothelial function, and this was mirrored by low post-prandial FMD post-treatment. However, INT enhanced the effect of LCD on FMD in those with low endothelial function, and this was mirrored by low post-prandial FMD post-treatment. However, INT enhanced the effect of LCD on FMD in those with low endothelial function, and this was mirrored by low post-prandial FMD
Concussion Prediction with Head Impact Density by Receiver Operating Characteristic

**PURPOSE:** Head impact density has previously been introduced as a novel metric to evaluate the concussive risk of a series of head impacts. The originally proposed head impact density was calculated by summing the magnitude of a given impact divided by the time from the previous impacts for each of the 20 previous impacts. However, because the 20 previous impacts may occur over multiple days, this study computes density as the sum of head impact magnitudes divided by time since the previous impact for all impacts on a single day. The purpose of this study is to evaluate the predictiveness of a daily impact density and other head impact metrics using a receiver operating characteristic curve.

**METHODS:** 185 high school football players (n = 185; age 16.8 ± 8.1 cm, 85.0 ± 18.3 kg) were outfitted with a head impact telemetry system that measured the magnitude, number, and location of head impacts sustained during all games and practices over a course of a football season. From the telemetry system, peak linear acceleration (PLA), peak rotational acceleration (PRA), and daily PPI impact density were observed per each impact. The magnitude of each impact was measured as peak linear acceleration (PLA). The magnitude of each impact was measured as peak rotational acceleration (PRA). The peak linear acceleration (PPI) response to a greater degree than preprandial exercise, suggesting an important yet under-acknowledged role for exercise timing on glycemic control. Whether diurnal timing of exercise impacts additional benefits on PPG responses remains unclear. This study aimed to determine the diurnal effect of exercise timing on PPG response in individuals enrolled into a 12-week supervised multi-modal exercise training program. 24 subjects (13 girls, 9 boys) were individually assigned a wearable sensor (gForceTracker) for one season to measure the number of head impacts and the corresponding linear and angular acceleration. The sensor was fixed via headband (gForceTracker) and 4 existence-based exercises (3 sets of 12-18 repetitions). The amEX and pmEX training sessions occurred in the postprandial state between 0900-0950h and 1600-1800h, respectively. Changes in postprandial glucose (PPG) and insulin (PPI) responses, during a mixed meal tolerance test (MMTT) were the primary outcome measures of the study assessed at baseline and post-intervention at 12 weeks.

**RESULTS:** Exercise training reduced (main effect of time, p < 0.01) PPG and PPI concentrations during the MMTT, with no group differences observed (p = 0.18). A significantly greater reduction in PPG-iAUC was observed for the pmEX group (-13.6% vs. -4.5%, p < 0.01). Reductions in PPI-iAUC (main effect of time, p = 0.03) were observed at post-intervention, with no group differences reported (p > 0.1). 24 subjects (13 girls, 9 boys) were individually assigned a wearable sensor (gForceTracker) for one season to measure the number of head impacts and the corresponding linear and angular acceleration. The sensor was fixed via headband (gForceTracker) and 4 existence-based exercises (3 sets of 12-18 repetitions). The amEX and pmEX training sessions occurred in the postprandial state between 0900-0950h and 1600-1800h, respectively. Changes in postprandial glucose (PPG) and insulin (PPI) responses, during a mixed meal tolerance test (MMTT) were the primary outcome measures of the study assessed at baseline and post-intervention at 12 weeks.

**CONCLUSIONS:** Irrespective of the diurnal timing of exercise performance, 12-weeks of multi-modal exercise training significantly improved PPG and PPI responses in individuals enrolled into a 12-week supervised multi-modal exercise training program.
Youth flag football has been proposed as a safe alternative to tackle football due to rising concerns of neurodegeneration from repetitive blows, but the true head impact (HI) burden in youth flag football is unknown. PURPOSE: To examine overall and age-specific HI exposure and magnitude in youth flag football.

METHODS: Five youth flag football teams (n=35, age=8.5±1.1 yrs, height=138±10.6 cm, mass=38±9.8 kg) comprised of two age groups (7 8's and 9 10's) wore HI sensors (Triax Sim-G) during practice and game sessions over one season. Sensors recorded HI frequency, linear (g), and rotational acceleration (rad/s²). Athlete exposure was calculated as one player participating in one practice or game session. Impact rates (IR) were calculated as impacts per 10 athlete exposures. Impact rate (IR) could not be compared within the same sample of SRC. PURPOSE: The purpose of this study was to examine the relationship between ApEn, SampEn, and CI in a group of healthy match controls (CON) and sport-related concussion (SRC). METHODS: Sixteen Division 1 athletes with SRC and 10 CON on performed 3 trials of feet together (ET) and eyes closed (EC) for 3 seconds on a force platform (1000 Hz) at 24 hour post-injury. SRC was defined by the head team physician and verified by the presence of vestibular/ocular symptom scores on Vestibular Ocular Motor Screening (VOMS) test. CON data were collected at pre-participation physicals. Raw CoP data were analyzed using ApEn and SampEn (m=2, r=0.2, N=1000; CI: 0.316-0.615; P<0.05). The data were analyzed using independent samples t-tests and Pearson's Product Correlations. RESULTS: A significant increase in ApEn (p=0.01; SRC=0.59±0.1, CON=0.39±0.1; 0.10 Cohen's d=0.8; SampEn (p=0.02; SRC=0.01±0.4, CON=0.08±0.3; 0.13, Cohen's d=0.1) and MSE (p=0.059; SRC=4.8±9, CON=3.5±9; 0.8) was noted in the EC AP direction for both SRC and CON. CONCLUSION: These results may indicate that ApEn, SampEn, and MSE are highly related to one another and may be viable in determining deficits postural control following SRC.
were subjected to standard descriptive statistics. Wilcoxon signed-rank test was used to compare head technique s and involuntary impacts kinematic. RESULTS: In total 238 ad impacts were registered for M and 134 for F. Heading technique s accounted for 91 impacts for M (38 ± 13 ad/s) and 43 for F (33 ± 13 ad/s). Involuntary impacts accounted for 14 impacts for M (20 ± 9) and 194 ± 15 1 sd/impact and 3 for F (21 ± 11.2) ± 205 ± 17 1 sd/impact. For M and F, the average peak linear acceleration of the head was produced by heading techniques and associated with higher values than involuntary impacts (p < 0.05). For both M and F, the most frequent head technique was the jump and player-to-player contact was the most frequent for involuntary impact. CONCLUSION: Preliminary results show that heading technique s can cause higher values of head accelerations than involuntary impacts and therefore, could cause a higher risk of head injury in two different populations of players. Grant funding: this study was funded using NSERC and FRQNT research grants.
PURPOSE: To investigate whether physical exercise (PE) is differentially associated with global and domain-specific cognitive trajectories (memory, language, executive functions, visuospatial skills, attention) among Apolipoprotein E (APOE) ε4 carriers and non-carriers.

METHODS: We included 2,000 community-dwelling individuals aged 0–96 years and older (50.5% males, 26.6% APOE ε4 carriers). Participants were cognitively unimpaired at baseline, and underwent serial cognitive testing and self-reported assessment of PE engagement in midlife (between 45–64 years of age) and late-life (within one year prior to assessment). We calculated linear mixed-effect models comparing three PE groups (light intensity such as leisurely walking or slowly dancing; at least moderate intensity such as hiking or swimming; at least vigorous intensity such as jogging or tennis singles) versus a none PE reference group (defined as each level of PE engaged out less than one hour/week). Models were adjusted for age, sex, education and medical comorbidities, and run separately for mid- and late-life PE.

RESULTS: Among APOE ε4 non-carriers, midlife light PE was associated with less decline in memory (time × PE interaction coefficient 0.044, p < .001); midlife vigorous PE was associated with less decline in memory (0.033, p < .001); and late-life vigorous PE was associated with less decline in memory (0.020, p < .001) and global cognition (0.034, p = 0.03). Among APOE ε4 carriers, late-life vigorous PE was associated with less decline in memory (0.066, p < 0.03), attention (0.08, p < 0.01) and global cognition (0.03, p < 0.02); and late-life moderate PE was associated with less decline in global cognition (0.09, p = 0.05).

CONCLUSIONS: Engaging in PE (light, moderate and vigorous) is associated with less decline in memory, attention, visuospatial skills and global cognition among community-dwelling older individuals, including those that are APOE ε4 genotype carriers who are at an increased risk of Alzheimer’s disease.

Supported by NIH grants R01 AG086894, RO1 AG048874 and RO1 AG062878. Robert Wood Johnson Foundation; Robert H. and Clarice Smith and Abigail Van Buren Alzheimer’s Disease Research Program; GHR Foundation; Editi Foundation; Arizona Alzheimer’s Consortium.

May 30 4:30 PM - 4:45 PM
Effects of Acute High Intensity Interval Training on Information Processing Speed: An Electromyography Study
Bradley Kendall1, Qin Lai1, Nicholas Siekirk1. 1Taylor University, Upland, IN. 2Wayne State University, Detroit, MI. 3Georgia Southern University, Statesboro, GA.

RESULTS: Our work suggests that high intensity exercise may diminish cognitive performance among healthy older adults.

PURPOSE: This study explored the effect of acute aerobic exercise on cognitive performance in trained cyclists/triathletes. Specifically, it investigated the impact of different exercise durations and intensities (light vs. moderate) on cognitive performance in trained cyclists/triathletes.

METHODS: On two separate occasions, 21 trained cyclists/triathletes; 11 male (M), 10 female (F). Cognitive function was assessed 15 min prior to exercise (pre-test) and immediately following a sustained bout of dehydrating activity on simple and complex cognitive skills.

RESULTS: On two separate occasions, 21 trained cyclists/triathletes; 11 male (M), 10 female (F). Cognitive function was assessed 15 min prior to exercise (pre-test) and immediately following a sustained bout of dehydrating activity on simple and complex cognitive skills.

PURPOSE: This study explored the effect of acute aerobic exercise on cognitive performance in trained cyclists/triathletes. Specifically, it investigated the impact of different exercise durations (completed at a fixed moderate-intensity) and high/ maximal intensity exercise (i.e., high-intensity interval training) on cognitive performance in trained cyclists/triathletes.

RESULTS: Our work suggests that high intensity exercise may diminish cognitive performance among healthy older adults.

PURPOSE: This study explored the effect of acute aerobic exercise on cognitive performance in trained cyclists/triathletes. Specifically, it investigated the impact of different exercise durations (completed at a fixed moderate-intensity) and high/ maximal intensity exercise (i.e., high-intensity interval training) on cognitive performance in trained cyclists/triathletes.

RESULTS: Our work suggests that high intensity exercise may diminish cognitive performance among healthy older adults.
More competent decision makers report greater success in avoiding negative decision outcomes irrespective of general cognitive ability. While physically active young adults show more optimal executive functions, the relationship between daily moderate-to-vigorous physical activity (MVPA) patterns and decision-making competence (DMC) remains under-examined. PURPOSE: In this study, we assessed the relationship between accelerometer-measured sporadic and sustained MVPA to DMC in young adults. METHODS: We analyzed pre-intervention data from 220 participants (118 3% females, M± SD: 23.3 ± 3.8 years, BMI±SD: 24.8 ± 4.2 kg/m²) from the INSIGHT randomized controlled trial. MVPA was measured over 48 hours with a hip-worn nGT3X-BT accelerometer. Valid wear time was defined as ≥4 days, ≥10 hours/d daily (min/d), bouts of sporadic (< 10 consecutive min) and sustained MVPA (≥10 consecutive min; and frequency <10 min). RESULTS: DMC was measured with the Adult-Decision Making Competence (A-DMC) battery and expressed as individual subscore means and an A-DMC index (z-score). The relationships between MVPA and A-DMC variables were assessed with Spearman’s rho controlling for with age, sex, education, intelligence, fat free VO2max, BMI and sedentary time (ST; < 100 counts/min). RESULTS: After controlling for daily MVPA, frequency and time spent in sustained MVPA bouts were positively related to the ability to recognize social norms (ρ=0.15; 0.19; P<0.05) and ignore unrecoverable costs when considering future decision outcomes (ρ=0.11; 0.13; P<0.05). In contrast, neither sporadic nor daily MVPA ≥10 min bouts were ≥10 min and A-DMC subtests (P>0.05). CONCLUSION: The lability of decision making varied primarily as a function of sustained MVPA. Young adults who engaged in more sustained MVPA were able to use their experience more effectively and make more rational choices to optimize decision outcomes. Our data reveal a novel relationship between MVPA patterns and a distinct set of higher order cognitive skills which are relevant to real-world decisions. Funding: Office of the Director of National Intelligence (ODNI), Intelligence Advanced Research Projects Activity (IARPA); Contract 2014 131210 0004

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High-intensity exercise results in a more negative affective response when compared to moderate- or low-intensity exercise. However, a large number of individuals continue participating in high-intensity exercise, in spite of these declines in affective state. PURPOSE: Determine whether differences exist in exercise-affect for those with higher versus lower exercise intensity preference and/or tolerance. METHODS: Undergraduates (n=203; M: 23.3 ± 3.8 years, BMI: 24.8 ± 4.2 kg/m²) completed the Preference for and Tolerance of Exercise Intensity Questionnaire [Higher-intensity exercise preference, tolerance (HIT, IT); r=24; n=15 lower-intensity preference, tolerance (LIT)], a distinct set of higher order cognitive skills which are relevant to real-world decisions. Funding: Office of the Director of National Intelligence (ODNI), Intelligence Advanced Research Projects Activity (IARPA); Contract 2014 131210 0004

Participants in group-based high-intensity functional training (HIIT) maintain exercise enjoyment and intentions; those training ≥5 days/week report highest intrinsic and extrinsic motives. Yet, overtraining and overreaching concerns exist. A promising monitoring method is heart rate variability (HRV), which tracks cardiac autonomic nervous system activity. PURPOSE: To examine differences in daily training cognitions for HIIT participants. Participants with workouts modulated based on HRV status were expected to report significantly better daily training cognitions. METHODS: Participants included 77 adults randomized to HIIT-HRV (intervention) or HIIT (comparison). HIIT-HRV participants (n = 26) were ≥18 years, 64% female, body fat percentage (BF%) ≥ 22 ± 6%; VO2max ≥ 45 mL/min/kg; HIT participants (n = 25) were ≥18 ± 6 years, 68% female, BF% ≤ 32.4 ± 10.7%; and VO2max = 45 mL/min/kg. The 11-week study included weekly HIIT sessions baseline HIIT, baseline testing session, HIIT weeks: HIIT training resulted in greater daily motivation and lower daily fatigue and perceived exertion. HRV status is a promising method to monitor and modulate HIIT training and may facilitate adherence; future work could focus on applied interventions for existing HIIT populations. D-44 Free Communication/Slide - Understanding the Health Effects of Sitting, Fitness, and Physical Activity Thursday, May 30, 2019, 3:45 PM - 4:00 PM Room: CC-202C

Chair: Sarah Keadle. California Polytechnic State University, San Luis Obispo, CA. (No relevant relationships reported)

Sedentary Behavior Across Pregnancy, Gestational Age at Delivery, and Birthweight Melissa A. Jones1, Janet Catov2, Arun Jeyevalan3, John Jakicic, FACSM4, Kara Whittaker5, Bethany Barone Gibbs6, 1University of Pittsburgh, Pittsburgh, PA; 2University of Iowa, Iowa City, IA. Email: maj133@pitt.edu

(No relevant relationships reported)

PURPOSE: Lower gestational age at delivery (GAD) and large for gestational age birthweight (LGA) are indicators of poorer maternal-fetal health. While physical activity during pregnancy has been associated with greater GAD and lower risk of LGA, the effects of sedentary behavior (SB) on these outcomes are unknown. We aimed to describe patterns of SB across pregnancy and associations with GAD and risk for LGA.

METHODS: In this cohort study, SB (activPAL micro3) and physical exercise, and intensity, which influence how an individual feels during high-intensity exercise, but is less important during moderate/low-intensity exercise, but is less important during moderate/low-intensity.
activity (waist-worn ActiGraph GT3X-BT) were assessed in women for ≥4 days with ≥10 hours, in each trimester of pregnancy. This preliminary analysis (96) recruited includes women with available birth records and valid activity data for ≥2 trimesters (n=−6). Birthweight (BW) and GAD were abstracted from medical records. BW was categorized as LGA if ≥90th percentile (n=1831%). Mean (SD) percent time spent sedentary was calculated in each trimester and differences across trimesters were tested using linear mixed models. The association of SB with continuous GAD and odds of LGA were estimated in separate regression models for each trimester. All beta coefficients were standardized (std β) per SD and adjusted for pre-pregnancy body mass index. If SB was associated with outcomes, further models estimated the effect of replacing SB with light physical activity (LPA) or moderate to vigorous physical activity (MVPA)

RESULTS: Women spent a high percentage of time sedentary across trimesters: 1st (n=5) 6% (10.9) 2nd (n=9) 6.5 (8) 3rd (n=9) 63.8% (10.4). SB did not differ across trimesters (p=0.792). Higher percent time spent sedentary in the first trimester was associated with lower GAD (std β =−0.45, p=0.038). Replacing first trimester SB with LPA (std β =−0.48, p=0.037), but not MVPA (std β =−0.12, p=0.581), was associated with greater GAD. SB was not significantly associated with GAD in the 2nd (std β =−0.24, p=0.241) or 3rd (std β =−0.22, p=0.241) trimester. Odds of LGA was not significantly associated with SB in the 1st (OR=0.75p=0.39) 2nd (OR=0.8, p=0.63) or 3rd (OR=1.03, p=0.92) trimester.

CONCLUSIONS: Women in this study were highly and consistently sedentary across pregnancy. Higher LPA and lower SB during the first trimester may be advantageous for greater GAD, though risk for LGA offspring did not appear to be associated with SB.

1794 May 30 4:00 PM - 4:15 PM
Structured Exercise as a Potential Treatment Option for Prenatal Depression
Taniya S. Nagpal1, Marina Vargas-Terrones2, María Perales3, Harry Papavassiliou1, Ruben Barakat1, Michelle F. Mottola, FACSM1, University of Western Ontario, London, ON, Canada.
1Technical University of Madrid, Madrid, Spain. 2Camilo Jose Cela University, Madrid, Spain. (Sponsor: Michelle F. Mottola, FACSM)
Email: magnpal@uwo.ca
(No relevant relationships reported)

PURPOSE: Up to 20% of pregnant women experience prenatal depression and up to 1% will continue to have depressive symptoms in the postpartum. Previous research supports exercise during pregnancy as an effective way to prevent prenatal depression, however evidence is lacking regarding exercise as a potential treatment for women who enter pregnancy already at risk for depression. Therefore the purpose was to determine if exercise during pregnancy is an effective option to treat depression during pregnancy. METHODS: This is a secondary analysis of two randomized controlled trials that followed the same exercise protocol and study methodology in Madrid, Spain. Women <16 weeks pregnant were randomized to the CG (19.4±11.1; p<0.05) . Additionally, more women decreased their score in the EG and 25 women in the CG scored ≥16 on the CES-D at baseline.

CONCLUSION: The two groups for the number of women who had a decrease in their score at the end to determine if there was a difference in post CES-D scores between the EG and CG.

Studies Depression scale (CES-D) at baseline and at the end of the intervention (36-weeks). One-Way ANOVA was performed to determine if there was a difference in post CES-D scores between the EG and CG. A Chi-Square Analysis was performed to determine if there was a difference between the two groups for the number of women who had a decrease in their score at the end of the intervention and also scored below 10th s percentile. Results: Thirty-six women in the EG and 25 women in the CG scored ≥16 on the CES-D at baseline. Post-intervention, the EG had a significantly lower mean CES-D score (14.4±8.6) than the CG (18.11: p=0.03). Additionally, more women decreased their score in the EG (n=30, 83.3%) than the CG (n=14, 56%); p=0.03) however there was no difference in the number of women who went below the 16 point cut-off between the two groups. CONCLUSION: A structured exercise program offered during pregnancy may reduce depressive symptoms among women who begin pregnancy already at risk for prenatal depression. Therefore exercise may be a viable treatment option for prenatal depression.

1795 May 30 4:15 PM - 4:30 PM
Effects Of Breaking-up Prolonged Sitting With Stair-climbing On Vascular-metabolic Function After A High-fat Meal
Email: lovely0346@naver.com
(No relevant relationships reported)

Frequent high-fat meal intake and prolonged sedentary time are prevalent in our modern society and associated with increased risk of cardiovascular disease. Alternatively, breaking up prolonged sitting is introduces health benefits, although not always practical.

PURPOSE: To test whether stair-climbing could be an effective way of breaking up prolonged sitting. METHODS: Twelve healthy adults (male=7) participated in two trials after a high-fat meal: 1) 4-h uninterrupted sitting, 2) 4-h sitting interrupted with 5 min of stair-climbing every hour (interrupted sitting). We measured triglycerides, glucose, brachial arterial flow-mediated dilation, popliteal artery blood flow and shear rate. All variables were measured five times (before and every hours after high-fat meal). The number of brachial artery blood flow-mediated dilation was calculated in sitting trial, but increased in the interrupted sitting trial with a significant interaction effect (blood flow: p<0.001, shear rate: p=0.006). Also, interrupted sitting attenuated the prolonged sitting-induced increase of systolic blood pressure and pulse pressure.

CONCLUSION: Stair-climbing appears to be an effective way of breaking up prolonged sitting to improve vascular function with easy accessibility in various settings.

1796 May 30 4:30 PM - 4:45 PM
Associations of Fast Walking with Sleep Quality and Duration in Older Adults
Angelique Brelenthin, Duck-chul Lee, FACSM, Iowa State University, Ames, IA. (Sponsor: Duck-chul Lee, FACSM)
(No relevant relationships reported)

Purpose: Poor sleep has been associated with negative health outcomes in older adults. Since walking is the most popular form of physical activity in older adults, we examined the effects of daily steps and fast walking on sleep quality and duration.

Methods: This cross sectional study included 120 older adults (56% women; 72 years old). Participants wore an accelerometer-based pedometer (Omron) during waking hours for 7 days. We used total average daily steps and average daily fast walking steps defined as ≥100 steps/min. Sleep duration and quality were measured using the Pittsburgh Sleep Quality Index (PSQI). Poor sleep quality (PSQ) was defined as a PSQI global score of ≤5, and inadequate sleep duration (ISD) was defined as ≦7 hours/night. Odds ratios (ORs) and 95% confidence intervals (CIs) for PSQ and ISD were calculated among four subgroups: no daily fast steps and tertiles (thirds) of fast steps. Covariates were sex, age, body mass index, smoking, heavy alcohol intake, depression, anxiety, diabetes, hypertension, hyperlipidemia, and sleep apnea.

Results: On average, participants took 17,865 steps, 1,117 fast steps (70% had at least 1 fast daily step). Fast walking had a PSQI score of 4.6, and a sleep duration of 7.1 h. Total steps were not associated with PSQ or ISD (both p>0.05). However, fast walking was associated with sleep quality and ISD with ORs (95% CIs) of 0.4 (0.24-0.8), 0.3 (0.18-0.5) and 0.8 (0.38-1.6) for ISD <1, lower third), 0.6 (0.14-3.2) and 0.3 (0.09-1.4) for ISD ≥2 standard deviations from the mean, respectively, compared with no fast steps, adjusting for the confounders including total daily steps. Obtaining any fast steps was associated with ORs (95% CIs) of 0.3 (0.30-0.39) reduced odds of PSQ compared with no fast steps. However, no associations were observed between fast steps and ISD. In a joint analysis, compared with those who took <5000 daily steps and 0 fast steps, there were reduced odds of PSQ among those with <5000 daily steps and ≥1 fast steps (0.4 [0.23-0.8]) as well as those with ≥5000 steps and ≥1 fast steps (0.4 [0.24-0.74]), suggesting the fast walking on sleep quality regardless of total daily steps.

Conclusion: These results indicate that even small amounts of fast walking, rather than total daily steps, are associated with better sleep quality in older adults. Supported by unrestricted research grant by BioSpace.
**1797**

**May 30 4:45 PM - 5:00 PM**

**Differences of Plasma Metabolites in Prediabetes with Different Cardiorespiratory Fitness and the Effects of Exercise**

Bowen li1, Mian Jia2, Yan Wang3, Juan Wang2, Zhengzhen Wang, FACSM2, Biao Sun3.

1Beijing Sport University and Nanjing Sport Institute, Beijing, China. 2Beijing Sport University, Beijing, China. 3Nanjing Sport Institute, Nangjing, China. (Sponsor: Zhengzhen Wang, FACSM)

Email: libowen_sy@sina.com

(No relevant relationships reported)

**PURPOSE:** To indentify the most significant plasma metabolites for higher and lower cardiorespiratory fitness (CRF) in pre-diabetes mellitus (PDM), and the effect of aerobic exercise training on these metabolites.

**METHODS:** All 30 PDM subjects were selected (age: 53 ± 10.03 yrs; body mass index: 27.2 ± 3.0 kg/m²; 24 males). CRF was measured directly with a graded exercise test. Exercise intervention program: 3 times/week, 50 minutes per session at 46% - 64% VO₂max, 3 month. Body composition was measured by dual-energy x-ray absorptiometry. Plasma metabolites were detected by ultra high performance liquid chromatography (UPLC-MS), and analyzed by PCA and OPLS-DA. 

**RESULTS:**
1) Compared with lower CRF group, prediabetes mellitus (PDM) subjects’ VO₂max, isocitric acid, octyl carnitine and linoleyl carnitine increased significantly (6.84%); but 2) after 3 month exercise training, the fasting and OGTT-2h glucose level of 6.1% of PDM subjects normal to subjects; PDM subjects’ VO₂max increased significantly (6.84%); but there was no significant correlation between the increase of VO₂max and in VO₂max, isocitric acid, octyl carnitine, and linoleyl carnitine.

**CONCLUSION:** VO₂max, isocitric acid, octyl carnitine, and linoleyl carnitine may be potential biological markers of CRF. Exercise intervention improved the glucose metabolism and CRF of prediabetes mellitus, but we hadn’t found the correlation between VO₂max and in et al. metabolites expression change after exercise, which needs more study. Supported by Key Projects of State General Sports Administration of China (2011B 007), the National Key Technology Research and Development Program of Prevention and Control of Major Chronic Non-communicable Diseases 2018, FC1300202.

**1798**

**May 30 5:00 PM - 5:15 PM**

**Longitudinal Associations of Physical Activity and Blood Lipid Levels in Midlife Women in SWAN**

Sylvia E. Badon1, Kelley Pettie Gabriel, FACSM2; Barbara Sternfeld, FACSM3; Ellen B. Gold1; L. Elaine Waite4; Monica M. Hederson1. 

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(No relevant relationships reported)

**Decreasing levels of estrogen production, combined with the detrimental effects of aging, lead to large increases in cardiovascular disease (CVD) risk among midlife women. Physical activity has the potential to attenuate this increase in CVD risk; however, longitudinal associations of physical activity and blood lipid levels, important contributors to CVD, have not been studied in midlife women.**

**PURPOSE:** To estimate the longitudinal associations of physical activity with blood lipid levels in midlife women.

**METHODS:** We used data from 3,230 participants in the Study of Women’s Health Across the Nation (SWAN), a longitudinal cohort study spanning 14 years of nearly annual follow up. Women reported physical activity using the Kaiser Physical Activity Survey at 20 tudy visits. We used the sports and exercise physical activity index score to estimate leisure-time moderate to vigorous intensity physical activity. SWAN measured total cholesterol, triglycerides, HDL, LDL, and blood pressure collected at 20 tudy visits. We used generalized estimating equations to estimate longitudinal associations of moderate to vigorous intensity physical activity with each blood lipid biomarker, adjusted for age, race/ethnicity, education, and body mass index category.

**RESULTS:** Women were 60 ± 10 years old, on average, at study entry. Forty-seven percent were non-Hispanic white; 28% were black; 9% were Japanese; 9% were Chinese, and 9% were Hispanic. Each additional one-unit increase in the sports and exercise physical activity index score was not associated with total cholesterol (mean difference=0.3, 95% CI: 0.04, 1.0) or LDL (mean difference=0.2, 95% CI: 0.12, 0.34).

**CONCLUSIONS:** Moderate to vigorous physical activity is longitudinally associated with lower triglyceride levels and higher HDL levels in midlife women. Supported by NIH grants T32DK118, 1 U01NR0088, 1 U01AG0257, 001AG02125, 001AG02125, 001AG02125, 001AG02125, 001AG02125, 001AG02125.

The content of this abstract is solely the responsibility of the authors and does not necessarily represent the official views of the NIA, NINR, ORWH or the NIH.

**1799**

**May 30 5:15 PM - 5:30 PM**

**Who Is The Reference Group? An Examination Of The Involuntarily Inactive And Mortality**

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(No relevant relationships reported)

**PURPOSE:** Physical activity studies often use inactive participants as a reference comparison group implying that all inactive participants can become more active. However, it remains unclear how much of this group is involuntarily inactive due to physical function limitations. This study aims to examine the involuntarily inactive and the association with mortality among older adults. **METHODS:** Study participants were from the National Health and Nutrition Examination Survey (NHANES), a population-based study with mortality follow-up through 2011. Participants were 6 years old and were the accelerometer for 4 days (N=37,581). Moderate-to-vigorous physical activity (MVPA) was derived using standard accelerometer cutpoints and categorized based on the US Federal Physical Activity Guidelines: 1) ≥15 minutes (inactive); 2) ≥15 minutes; 3) ≥10 minutes; ≥10 minutes per week (recommended). Participants self-reported limitations in walking, activities of daily living, and carrying objects and were classified as 1) no impairment, 2) some impairment, or 3) most impaired. To compare mortality rates, we calculated hazard ratios (95% confidence intervals), adjusting for relevant covariates.

**RESULTS:**
1) Over an average of 29.3 months of follow-up, there were 23,765 deaths. Of the inactive participants (n=1,236), 2,236 reported no impairment, 356 some impairment, and 40.6% were most impaired. There was no significant mortality difference between the inactive group and those participating in 15 to 17.5 minutes per week of MVPA in any of the function groups. Among those with no or some impairment, there was a significant decrease (39 to 62%) in premature mortality among those with at least 37.5 minutes per week of MVPA. Among those with the most impairment, a mortality rate reduction of 5% was observed among those with at least 15 minutes of MVPA, but no significant difference among those meeting the guidelines (HR=0.29). 2) Compared to the inactive group. **CONCLUSIONS:** Inactive reference groups may contain a disproportionate number of participants with physical limitations, however even among those with some or more impairment, levels of physical activity are associated with similar or greater mortality benefits.

**1800**

**May 30 5:30 PM - 5:45 PM**

**The Use Of Resistance Exercises To Interrupt Sitting: Acceptability And Impact On Sleepiness, Discomfort, And Fatigue**

Robert J. Kowalsky1, John M. Jakicic, FACSM2, Andrea L. Hergenroeder2, Renee J. Rogers2, Bethany Barone Gibbs3. 1Texas A&M University Kingsville, Kingsville, TX. 2University of Pittsburgh, Pittsburgh, PA. Email: robert.kowalskyjr@tamuk.edu

(No relevant relationships reported)

**Emerging research suggests cardiometabolic benefit from using simple resistance exercises to interrupt prolonged sitting, yet it is unclear if such programming is acceptable and can affect comfort, fatigue, and sleepiness. **

**PURPOSE:** To examine the acceptability of hourly, brief resistance exercise bouts and the effects on subjective sleepiness and discomfort.

**METHODS:** 80 participants (56 female; 24 male) with a mean age of 22.7 ± 7.7 years, and a mean body mass index of 25.3 ± 4.3 kg/m² were randomly assigned to either a resistance intervention group (n=40) or a comparison intervention (n=40) group. Participants were randomly assigned to manipulate the following factors: location of resistance training (standing or lying on a mat), frequency (each 15 minutes), type of exercise (resistance or no resistance training), and use of music (with or without music). The primary outcomes were subjective sleepiness and discomfort, as rated by participants on 100 mm visual analog scales. Participants were given a total of 12.5 minutes of training over the course of each day, and they were asked to complete the questionnaires at the beginning, middle, and end of training.

**RESULTS:** Participants rated the resistance intervention as more comfortable and less fatiguing than the comparison intervention. Participants also reported that the resistance intervention was more enjoyable than the comparison intervention. Participants rated their sleepiness as higher in the comparison intervention than in the resistance intervention. Participants also rated their comfort and fatigue as higher in the comparison intervention than in the resistance intervention. Participants rated their sleepiness as lower in the resistance intervention than in the comparison intervention. Participants also rated their comfort and fatigue as lower in the resistance intervention than in the comparison intervention.

**CONCLUSIONS:** Resistance training is a viable strategy for interrupting sitting and improving subjective comfort and sleepiness.
ratings of discomfort, sleepiness, and fatigue. Methods: Fourteen adults (age 53.4 ± 9.5 years, BMI 30.9 ± 4.8 kg/m²) completed two 4-hour randomized simulated laboratory-based work conditions on separate days: prolonged sitting (SIT) and sitting with hourly exercise breaks (REX). Acceptability was assessed after REX in 5 domains: 1) willingness to use REX, 2) confidence to use REX unsupervised, 3) co-worker acceptance of REX, 4) employer acceptance of REX, and 5) feasibility of frequency and Amount of REX. During each 4 hr protocol, ratings of sleepiness (Karolinska Sleepiness Scale), discomfort, and fatigue (Physical Discomfort and Fatigue Questionnaire) were assessed at baseline and then hourly. Linear mixed models evaluated overall condition effects and differences at each hour following Bonferroni adjustment. Cohen’s d estimated magnitude of effects. Results: A majority of participants reported high to very high acceptability on the 30 cm Aims of REX (Table). Overall physical discomfort (β= -0.15 log-points, p=0.074, d=0.34), mental fatigue (β= -0.23 log-points, p=0.116, d=0.19), physical fatigue (β= -0.30 log-points, p=0.006, d=0.20), and sleepiness (β= -0.33 log-points, p=0.106, d=0.14) did not differ by condition. Mental fatigue was significantly lower (better) at 4 hours in favor of REX (β= -0.48 log-points, p=0.020, d=0.37). Conclusion: Hourly simple resistance breaks were rated as an acceptable method to interrupt prolonged sitting during work; however, REX did not improve discomfort, fatigue, or sleepiness compared to SIT. Investigating adaptations and acceptability with chronic usage are warranted.

Table. Acceptability of Simple Resistance Exercise Breaks to Interrupt Sedentary Behavior

<table>
<thead>
<tr>
<th>Acceptability Questionnaire</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 1: Willingness to Use REX</td>
<td>Very low or low</td>
<td>0</td>
</tr>
<tr>
<td>Very low or medium</td>
<td>2</td>
<td>14.2%</td>
</tr>
<tr>
<td>Very low or high</td>
<td>12</td>
<td>86.8%</td>
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<tr>
<td>Question 2: Confidence to Use REX Unsupervised</td>
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</tr>
<tr>
<td>Very low or medium</td>
<td>2</td>
<td>14.3%</td>
</tr>
<tr>
<td>Very low or high</td>
<td>14</td>
<td>100%</td>
</tr>
<tr>
<td>Question 3: Confidence of Coworker’s Acceptance of REX</td>
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</tr>
<tr>
<td>Very low or medium</td>
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<td>21.4%</td>
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<tr>
<td>High or Very high</td>
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<td>71.4%</td>
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<tr>
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<td>Very low or medium</td>
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<tr>
<td>High or Very high</td>
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<td>57.1%</td>
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<tr>
<td>Very low or medium</td>
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<td>13.6%</td>
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<tr>
<td>High or Very high</td>
<td>9</td>
<td>65.1%</td>
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</table>

D-45 Clinical Case Slide - Chest Pain and Medical Issues

Thursday, May 30, 2019, 3:45 PM - 5:25 PM
Room: CC-304E

1801 Chair: Poonam P. Thaker, FACSM. Presence Resurrection Sports Medicine Fellowship, Chicago, IL.

(No relevant relationships reported)

1802 Discussant

Philip F. Skiba. Advocate Lutheran General Hospital, Park Ridge, IL.

(No relevant relationships reported)

1805 May 30 4:05 PM - 4:25 PM
Extremity Paralysis After Boot Camp Workout

Kulraj S. Dhah¹, Roger Mortimer², Robert Sallis, FACSM¹.
Kaiser Permanente Fontana, Fontana, CA. 'University of California San Francisco, Fresno Medical Education Program, Fresno, CA.

(No relevant relationships reported)

HISTORY: 37yo African American female with history of anemia presented to ED with severe abdominal pain, tachycardia and rapidly progressive bilateral upper and lower extremity paralysis. She reported recent starting Boot Camp style workouts with the last session two days prior to first admission. Patient admitted to using diet pills and intermittent fasting. She was admitted for 3 weeks initially and readmitted four days after being discharged with recurrence of symptoms.

PHYSICAL EXAMINATION: Vitals were within normal range. Normal respiratory effort but only able to speak 3-4 words per breath. Diffuse abdominal tenderness. Paralysis of upper and lower extremities bilaterally with minimal motor function of fingers and toes, full sensation intact, CN 2-12 intact, DTRs +2.


TEST AND RESULTS: MRI Head and Spine negative for lesions, nerve root compression or myelopathy. Creatine Kinase levels were mildly elevated. CT Abdomen/Pelvis was negative. CSF analysis and EMG testing suggested variant of Guillain-Barre Syndrome. Negative Inspiratory Force (NIF) testing remained within normal limits. No improvement with IVIG. Labs that were sent out during first admission came back during her second admission (4th eeks later) with dramatically elevated Urine porphobilinogens at 139 μg/L (ref: <2mg/L). Stool porphobilinogens were also elevated.

FINAL WORKING DIAGNOSIS: Variegate Porphyria

TREATMENT AND OUTCOMES: The patient was started on high volume D10 IV (1260 ml/hr) for 2 days until IV Hemin was obtained from the only lab in the US that manufactures it. The patient showed mild improvement in motor function within one hour of starting IV Hemin drip. She received a full 10a course of IV Hemin with gradual increase in motor function but not back to baseline. She underwent a second course of IV Hemin with further improvement in motor function. NGT was replaced by PEG tube for adequate nutrition. Four weeks later, she was discharged from Medicine Service to Acute Inpatient Rehab floor. She continued to improve and was able to return to oral diet and perform ADLs with assistance from family. She was discharged home after two months and moved out of town to live with family.

Abstracts were prepared by the authors and printed as submitted.
TREATMENT AND OUTCOMES:

1. The cardiac electrophysiologist cleared her for FINAL WORKING DIAGNOSIS sinus arrest with a 6.1 second pause while blood pressure remains stable.

Tilt Table Test: Passive phase is non-diagnostic. Drug provocation phase with TEST AND RESULTS:

- EKG: normal sinus rhythm.
- Dysautonomia.
- Seizure.
- Reflex syncope.
- Arrhythmia.
- Structural cardiac disease.
- Non-displaced PMI, without murmurs.

Well-appearing female. Unlabored respirations, lungs clear to auscultation bilaterally. Regular heart rate and rhythm, non-displaced PMI, without murmurs. Normal pulses in all extremities. Steady station and gait. BMI 30.5.

DIFFERENTIAL DIAGNOSIS:
- Cervical Polyradiculopathy
- Central Cord Syndrome
- Motor Neuro Disease: Brachial Amyotrophic Diplegia
- Chronic Traumatic Encephalopathy

Tests and Results:

- Electrophysiologic Study: Normal sensory nerve conduction study (NCS). Motor NCS showed low amplitude in the right Median and Ulnar nerves. Electromyographic study revealed active denervation and reinnervation potentials in bilateral upper extremities. Fibrillation and positive sharp waves were observed in cervical and thoracic paraspinal muscles.

Brain MRI: Mild cerebral cortical atrophy. No other intracranial abnormality.

Final Working Diagnosis:

- Motor Neuron Disease: Brachial Amyotrophic Diplegia.

Treatment and Outcomes:

1. Physical therapy for light strengthening and aerobic training.
2. Occupational therapy for adaptive device and activities of daily living evaluation and training.
3. Referred to Neuromuscular Clinics for multidisciplinary management.

Symptoms were reduced with no signs of neurological deterioration.

1806 May 30 4:25 PM - 4:45 PM
Muscle Weakness: Boxing
Belmarie Rodriguez-Santiago, David Atkins, Brenda Deliz-Roldan, William Micheo, FACSM. University of Puerto Rico, San Juan, Puerto Rico.

History: A 22-year-old right-handed retired male boxer with no past medical history presented progressive weakness and muscle wasting of bilateral upper extremities. He denied any numbness, tingling or paresthesia, bowel or bladder incontinence, lower extremity weakness or dysphagia. Three weeks before symptoms started, he suffered a fall with impact in the forehead. The patient has a 17 year history of boxing career with a total of 28 combats.

Physical Examination: Generalized muscle atrophy and fasciculations observed in bilateral upper extremities. Full passive range of motion in bilateral upper extremities but limited active shoulder flexion and abduction and incomplete hand grip bilaterally. Strength was 2/5 in shoulder abduction, 3/5 in elbow flexion and extension, and in right wrist flexion and 0/5 in wrist extension. Sensation was intact to pinprick, soft touch and vibration. Deep tendon reflexes 1+ throughout upper and lower extremities.

Differential Diagnosis:
- Cervical Polyradiculopathy
- Central Cord Syndrome
- Motor Neuron Disease: Brachial Amyotrophic Diplegia

Tests and Results:

Electrodiagnostic Study: Normal sensory nerve conduction study (NCS). Motor NCS showed low amplitude in the right Median and Ulnar nerves. Electromyographic study revealed active denervation and reinnervation potentials in bilateral upper extremities. Fibrillation and positive sharp waves were observed in cervical and thoracic paraspinal muscles.

Brain MRI: Mild cerebral cortical atrophy. No other intracranial abnormality.

Final Working Diagnosis:

- Motor Neuron Disease: Brachial Amyotrophic Diplegia.

Treatment and Outcomes:

1. Physical therapy for light strengthening and aerobic training.
2. Occupational therapy for adaptive device and activities of daily living evaluation and training.
3. Referred to Neuromuscular Clinics for multidisciplinary management.
4. Tardropl rides.
5. Referred to Speech and Swallow evaluation.
6. Allowed up every 3 months to monitor neurological symptoms and remained stable with no signs of neurological deterioration.

Chest wall injury– occur

2. She was advised to self-monitor for pre-syncopal symptoms; to modify activities as needed, including using lighter weights, taking more breaks, and laying down to recover when needed; and to avoid pushing through symptomatic episodes.
3. The cardiac electrophysiologist also recommended optimizing hydration, including increased salt and electrolyte intake.

4. He was counseled about the possibility of serious injury resulting from syncope.

1808 May 30 5:05 PM - 5:25 PM
Assisted Breathing Manual Therapy for Soccer Chest-Trap Anterior Chest Wall Injury
John C. Hannon, private practice, San Luis Obispo, CA.

Email: feldenkrais.slo@gmail.com

Chest wall injury– occur

John C. Hannon, private practice, San Luis Obispo, CA

HISTORY: A 17 year-old high school senior soccer left back, during the last quarter of a late-season game, chest-trapp a long and hard soccer ball experiencing instant breathlessness and incapacitating anterior chest pain aggravated by deep breathing, head, spine and arm movement. At the ED, she experienced less intense symptoms. Later, she, and her parents, worried her continued chest pain (which increased with exertion, coughing, and difficulty breathing when running) would ruin her chances to be seen favorably by college soccer scouts. The next day she presented for manual therapy.

PHYSICAL EXAMINATION: Examination revealed a mild pectus excavatum with bilaterally painful 2nd and 3rd sterno-chondral joints and diminished respiratory excursion, accessory breathing muscle activity and elevated shoulders. Muscle splinting interfered with overhead reaching and spinal twisting. Interestingly, marked pain relief occurred with manual skin stretch tangentially applied in the left midaxillary line along the path of the 5th rib with the stretch directed posterior-to-anterior. Similar relief was obtained by firm pressure over the left costal diaphragm muscle attachments. Pain-free palpation of spinal, costo-chondral and costo-vertebral joints. SC, AC and GH joint-play intact.


TEST AND RESULTS: Normal AP and Lateral chest-xray

FINAL WORKING DIAGNOSIS: Sternocostal sprain-Diaphragm strain

4. Symptom-free return to play 3wks post-injury. 1 month later, accepted 4 year athletic scholarship.
The oncology teams about the risk and benefits of disease-modifying anti-rheumatic steroid injections. If not, further discussion must be had between Rheumatology and:

**TREATMENT AND OUTCOMES:**

**Title:** Knee Pain - Swimming in Dangerous Waters

**FINAL/WORKING DIAGNOSIS:**

Inflammatory arthritis. Cultures had no growth.

- Knee joint aspiration was performed, with synovial fluid analysis consistent with an uveitis, so she was referred to Rheumatology.

- The patient had an ophthalmologic evaluation and was diagnosed with right anterior uveitis, which was diagnosed a year ago. She takes an oral steroid burst and receives vincristine for chemotherapy every three weeks.

**PHYSICAL EXAMINATION:**

There is a palpable joint effusion of the knee without erythema or warmth. There is diffuse peritendinous tenderness to palpation. She has limited knee flexion to 110 degrees but full extension. Patellar grind test is negative. There is no patellar apprehension. The Lachman test, anterior and posterior drawer tests, varus and valgus stress testing, and McMurray's test are all negative.

**DIFFERENTIAL DIAGNOSIS:**

1. Musculoskeletal lesion of Langerhans cell histiocytosis
2. Osteochondritis dissecans of the knee
3. Septic arthritis of the knee in an immunocompromised patient

**HISTORY:**

An 8 year old female presents with a chief complaint of left knee pain and swelling. The pain started one month ago with no acute inciting injury. The pain is located over the anterior knee and is exacerbated with running and bike riding and alleviated with rest and ice. The knee swelling worsens after activity. She has no warmth or erythema of the joint. She denies fever, rash, or other joint complaints. The patient has a history of isolated Langerhans cell histiocytosis of the pituitary stalk and diabetes insipidus, which was diagnosed a year ago. She takes an oral steroid burst and receives vincristine for chemotherapy every three weeks.

**TESTS AND RESULTS:**

- X-rays of the knee showed no acute bony abnormality.
- MRI of the left knee with and without contrast revealed a large joint effusion with enhancing synovitis but otherwise no abnormality.
- Labs including a complete blood count (CBC), erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) were within normal limits other than the slightly elevated CRP.
- The patient had an ophthalmologic evaluation and was diagnosed with right anterior uveitis, so she was referred to Rheumatology.
- Knee joint aspiration was performed, with synovial fluid analysis consistent with an inflammatory arthritis. Cultures had no growth.

**FINAL/WORKING DIAGNOSIS:**

Juvenile idiopathic arthritis

**TREATMENT AND OUTCOMES:**

The patient underwent a steroid injection of the left knee. Hopefully, her arthritis can be managed with naproxen and intermittent steroid injections. If not, further discussion must be had between Rheumatology and the oncology teams about the risk and benefits of disease modifying anti-rheumatic drugs (DMARDs).

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**Authors:** Lauren Nadkarni, MD and Kate Quinn, DO (sponsored by Heather Gillespie, MD, MPH, FACSM)

**History:**

A 17 year-old male with a non-contributory past medical history developed acute pain in his left knee while swimming 3 days prior to presentation. He experienced a popping sensation with hyperextension of his knee while treading water and throwing a rope swing to his friends on the bank of a river. He had immediate swelling and felt pressure on the lateral and posterior parts of his knee, associated with sharp and stabbing pain when straightening his knee. His pain was worse with flexion beyond 90 degrees, straightening his leg, or walking, but was improved with rest and ice. He did not have any give-way or locking episodes.

**Physical Exam:**

Office examination of his left knee was limited by guarding but demonstrated a very subtle posterior sag sign and a positive effusion. There were no overlying skin changes. His range of motion was 5 degrees of hyperextension to 110 degrees flexion actively his flexion increased to 120 degrees passively. He also had mild posterior lateral joint line tenderness, negative patellar testing, and positive posterior drawer and lateral flexion pinch testing. His anterior drawer testing was passive, although he did exhibit guarding. His contralateral knee, ipsilateral hip/ankle, and neurovascular exams were unremarkable.

**Differential diagnosis:**

- ACL injury
- Lateral meniscus injury
- Posterior lateral corner injury
- Patellar subluxation
- Lateral tibial plateau contusion or fracture
- Lateral femoral contusion or fracture

**Tests and results:**

- Left knee x-ray:
  - Normal anatomy with small effusion
  - No acute fracture
  - Left knee MRI:
    - Isolated PCL rupture

**Final working diagnosis:**

- Isolated PCL rupture

**TREATMENT AND OUTCOMES:**

- Knee immobilizer for 3-4 weeks
- Physical therapy with initial avoidance of hamstring activation for the first 4 weeks
- Over the counter analgesics as needed
- Return to sport progression

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**Authors:** Krishna Israni, Daniel Montero. Mayo Clinic, Jacksonville, FL. (Sponsor: George Pujalte, FACSM)

**History:**

A 63-year-old gentleman with no significant past medical history presented in sports medicine clinic due to left knee pain that began 3 months prior. He states that he stays physically active. Four months prior, he was on the golf range and noticed mild discomfort. He then noticed worsening discomfort with running. His symptoms improved with rest but then would return with activity. Mild pain relief with ibuprofen. Soon after, he started to have painful clicking and catching of the left knee. He returned to Montana where he saw an orthopedist who prescribed meloxicam and ordered x-rays that had essentially normal findings. He then underwent magnetic resonance imaging (MRI) which revealed cartilage defects. His pain improved but he still described occasional, sharp, left lateral knee pain, and less commonly, medial knee pain. He described the pain as aching, sometimes sharp, and measuring 4 on the pain scale. Running and walking exacerbated his symptoms; straightening his leg worsened the pain. He had occasional night pain also.

**Physical Exam:**

Healthy-looking gentleman, had muscular legs, able to rise from a seated position without difficulty, with nonantalgic gait. Normal range of motion without restriction, minimally tender over the left lateral joint line, no ligament instability, no obvious effusion, positive McMurray, negative Lachman.

**Differential Diagnosis:**

Meniscal tear

**Tests and Results:**

- X-rays grossly unrevealing.
MRI: Large osteochondral defect in the left lateral femoral condyle, measuring approximately 1 cm across, with apparent loose body in the posterior fossa. Smaller osteochondral defect seen in the medial femoral condyle which appeared stable. Associated bony edema on the lateral femoral lesion.

**Final Working Diagnosis:**
Osteochondritis dissecans with loose body

**Treatment and Outcomes:**
- Patient was very active and wanted to return to playing golf. His daily activities were much improved but still limited compared to prior level of activity.
- Recommended modified activities and possible steroid injection if pain continued to limit activities.
- Repeat MRI to reassess bony edema and loose body with further consideration of knee scope and other procedures, based on clinical response and imaging.

**1815 May 30 4:45 PM - 5:05 PM Biologically Ripped, Neurologically Prepared? Rethinking Knee Injury and a Novel Rehabilitation Model - Soccer Corey Petersen, Kersten Schwanz, Sarah Wambach, University of Minnesota, Minneapolis, MN. (Sponsor: Suzanne Hecht, FACSM) (No relevant relationships reported)**

**HISTORY:** A 21-year-old female NCAA Division I soccer defender sustained a non-contact right knee injury while chasing a ball in the 91st minute of an international spring season game. Her right foot caught on the turf and she felt a “pop” before falling. No previous history of knee injuries.

**PHYSICAL EXAMINATION:** Examination on the field by an ATC revealed no effusion or deformity, non-tender to palpation, full pain free ROM, a positive Lachman’s and anterior drawer test, and no laxity of the MCL or LCL.

**DIFFERENTIAL DIAGNOSIS:** 1. Isolated ACL tear 2. ACL with collateral ligament and/or meniscal injury 3. Transient knee dislocation

**TEST AND RESULTS:** Right Knee MRI- Full thickness ACL tear with intact collateral ligaments and menisci- Subchondral edema present in lateral femoral condyle and lateral tibial plateau

**FINAL WORKING DIAGNOSIS:** Isolated complete ACL tear

**TREATMENT AND OUTCOMES:** 1. ACL reconstruction with BTB Patellar Tendon graft 2. Full ROM was achieved by week 3 post-op. Rehabilitation progression included traditional rehabilitation models. Additional focus on neurological rehabilitation was initiated week 3 and maintained throughout. 3. Triphasic training and movement progressions with concurrent sensory inputs and cognitive interference were employed, resulting in a multidisciplinary 3-fold rehabilitation model designed to target 3 injury-associated areas (motor, sensory, neuroplastic). Triphasic training utilizes block periodization of multi-joint movements to target each action of the stretch shortening cycle. Isometric movements increase motor unit recruitment and rate coding while eccentric increase corticospinal signal. The resulting program combats the motor inhibition while simultaneous sensory overload and cognitive interference oppose neuroplastic changes through neural resource competition and may also accelerate return to play.5 months following ACL reconstruction

**1816 May 30 5:05 PM - 5:25 PM Bilateral Knee Pain in Pregnancy Michelle Srwongtong, UCLA, Santa Monica, CA. (Sponsor: Aurelia Nativi, FACSM) Email: mlsrwongtong@mednet.ucla.edu (No relevant relationships reported)**

**HISTORY:** 3F G3P 0/32 w pre eminent presents with nontraumatic right knee pain for 1 week. Right knee outside MRI showed extensive marrow edema in the medial femoral condyle, consistent with avascular necrosis. She was made non-weight bearing. Her pain progressed and she became wheelchair bound. She delivered a baby girl (3.9w 8 1/2 lvi a C-section). She came to our clinic 3 weeks postpartum for persistent right knee pain and 3 weeks of new left knee pain.

**PHYSICAL EXAM:** BMI 30. Unable to bear weight due to pain. Bilateral knee exam with tenderness to palpation on her proximal tibia, medial and lateral joint lines, ROM 0-135 degrees, no effusion. Quadriceps and hip abductor strength 3/5 bilaterally.

**DIFFERENTIAL DIAGNOSIS:**
- Transient osteoporosis of pregnancy
- Avascular necrosis of the femoral condyle
- Stress fractures bilateral distal femur and/or proximal tibia
- Osteoporosis with insufficiency fractures

**TEST AND RESULTS:**
1. MRI R knee (initial) 5/2018 Extensive marrow edema present in the medial femoral condyle extending over 2.5 cm possibly related to stress reaction or early avascular necrosis. No subchondral or cortical fracture.
2. MRI L knee 7/31/18: Small subchondral insufficiency fracture of medial femoral condyle with mildly surrounding bone marrow edema. Faint bone marrow edema in the lateral femoral condyle without fracture.
3. MRI L knee (fu) 7/31/18: New subchondral insufficiency fracture of the lateral femoral condyle with moderate surrounding bone marrow edema. Resolution of medial femoral condyle bone marrow edema.
4. MRI L knee (fu) 7/31/18: New subchondral insufficiency fracture of the lateral femoral condyle with moderate surrounding bone marrow edema.

**D-47 Clinical Case Slide - Shoulder and Elbow Thursday, May 30, 2019, 3:45 PM - 5:45 PM Room: CC-306**

**1817 Chair:** David Jewison, University of Minnesota Orthopaedics, Maple Grove, MN. (No relevant relationships reported)

**1818 Discussant:** Jason Pothast, MedStar National Rehabilitation Network, Washington, DC. (No relevant relationships reported)

**1819 Discussant:** Robert H. Lutz, Davidson College, Davidson, NC. (No relevant relationships reported)

**1820 May 30 3:45 PM - 4:05 PM Elbow Pain - Recreational Athlete Shawn D. Felton¹, Arie J. van Duijn², Florida International University, Miami, FL. Florida Gulf Coast University, Ft. Myers, FL. (Sponsor: Mitchell L. Cordova, FACSM) Email: sfelton@fiu.edu (No relevant relationships reported)**

**HISTORY:** 21-year-old recreational athlete (184 cm, 84 kg) with no prior history of injury was participating at an extreme sports center performing acrobatic type activities when he completed a back flip on the trampoline and landed on his left outstretched arm. Athlete noted an audible “pop” and the inability to fully extend or flex his arm. He self referred to ED for immediate evaluation and stabilization.

**PHYSICAL EXAMINATION:** Athlete was examined in sports medicine research lab by licensed physical therapist and athletic trainer. Gross swelling was present on exam. Athlete unable to perform active ROM and complained of intense pain 6-10 on VAS. Athlete pt. tender along medial joint line and specifically distal attachment of the medial collateral ligament. Valgus Stress test performed revealing extreme laxity compared bilateral with minimal stress. Neurological examination and circulatory exam = WNL. Physical examination discontinued due to pain and point of care ultrasound imaging continued of the medial elbow.


**TEST AND RESULTS:** Elbow A/P, Lateral/Oblique Radiographs: WNL; MRI w/o contrast Complete tear of the proximal ulnar collateral ligament, Avulsion flexor tendon with bone marrow edema, Non-displaced fracture of the radial head associated joint.
A healthy, thirty-year-old male without antecedent pain presented with anterior elbow pain and elbow flexion weakness in his dominant upper extremity. At the time of injury, the patient was performing the CrossFit “butterfly pull-ups” in which the forearm is pronated while the elbows are actively flexed to bring the body up to the bar with the body swinging to build momentum. During this movement, he felt immediate pain at his distal anterior brachium but did not hear a pop. Following the injury he noted swelling and pain exacerbated by motion of the elbow. Once the swelling had resolved, the patient noticed a cosmetic defect at the proximal lateral elbow. On presentation, two weeks after the initial injury, his chief complaint was weakness during elbow flexion without any weakness during supination.

PHYSICAL EXAMINATION:
On presentation, no edema or ecchymosis were present. There was a notable defect in the lateral aspect of the arm just proximal to the elbow joint. With flexion of his elbow, the biceps tendon was clearly visualized. No “reverse popeye deformity” was present. A Ruland biceps squeeze test demonstrated intact supination of the forearm, and a hook test demonstrated an intact biceps tendon. There was no appreciable weakness with elbow flexion or supination compared to the contralateral arm. He did not demonstrate fatigability in supination. His range of motion was symmetric to the contralateral side. Neurologic examination showed that there was intact motor function throughout the arm and no sensory deficits were noted.

DIFFERENTIAL DIAGNOSIS:
1. Brachialis muscle rupture
2. Distal Biceps Brachii muscle rupture
3. Proximal Biceps Brachii muscle rupture

TESTS AND RESULTS:
1. Elbow radiographs were negative for osseous pathology
2. MR imaging demonstrated edema at the brachialis consistent with intrasubstance muscle tear. The biceps tendon was intact.

FINAL/WORKING DIAGNOSIS:
Isolated acute brachialis muscle rupture

TREATMENT AND OUTCOMES:
1. No immobilization given subacute presentation
2. Physical therapy: Initially maintenance of range of motion, then strengthening starting at 8 weeks post injury
3. At 1 year follow up, patient was pain free with full range of motion and no appreciable weakness with elbow flexion
History: A 33-year-old female professional dancer presents to training room with three weeks of right-sided neck pain. The pain is located at base of the right neck and worsens with flexion. She denies an inciting trauma, but recently began performing new choreography involving repetitive overhead lifting. Associated symptoms include swelling in her right upper extremity and a prominence of her chest wall veins. She denies weakness or paresthesias.

PHYSICAL EXAMINATION: Inspection reveals scattered lesions overlying the left shoulder extending down into the left arm. There is a well-defined erythematous area with overlying vesicular lesions. There are few increased to 10mg daily for worsening hand arthralgias recently.

Final/working Diagnosis: Shoulder X-ray Tests/Results: 4. Herpes simplex Virus

Treatment and Outcomes: 1. Varicella zoster virus in C6 Dermatome
2. Physical Exam: Patient is well appearing in no distress. Range of motion at the bilateral shoulders is 120 on the right, 110 on the left. She has 5/5 strength with supraspinatus and external rotators, as well as negative belly press and bear hug. 5/5 strength to bilateral upper extremities distally. Full range of motion of her cervical spine with pain only with left side bending. The left posterior cervical paraspinal area has a well-defined erythematous area with overlying vesicular lesions. There are few scattered lesions overlying the left shoulder extending down into the left arm.


R eturned to sport 6 w eeks post-operatively and completed occlusive DVT in right subclavian and axillary veins. Apixaban initiated. 5. U nderwent surgeon; recommended right first rib resection. 4. Prior to surgery, developed new therapy and restricted arm motions in practice. 3. Consultation with cardiothoracic

Final/working Diagnosis: Vascular Thoracic Outlet Syndrome/Paget-Schroetter Syndrome. TREATMENT AND OUTCOMES: 1. Prescribed Medrol Dosepak and N SAI Ds. 2. Started physical therapy and restricted arm motions in practice. 3. Consultation with cardiothoracic surgeon; recommended right first rib resection. 4. Prior to surgery, developed new occlusive DVT in right subclavian and axillary veins. Axipaban initiated. 5U ndertook transaxillary first rib resection, subclavain venolosy and arteriolysis, and right brachial plexus neurolysis. 6R eturned to sport 6w eeks post-operatively and completed physical therapy. 7U ndertook right upper extremity venogram with angioplasty for chronic occluded central right subclavian vein 3 months post-operatively.
Muscular adaptations in the upper limb from training are associated with hypertrophy, inflexibility, and diminished vascular perfusion. Despite these findings in upper extremity athletes, no studies have examined the relationship between peripheral vascular adaptations and muscle flexibility in the lower legs of runners. Through a better understanding of blood flow and muscle flexibility adaptations, clinicians can more accurately assess and treat running injuries.

**Purpose:** To examine the relationship between blood flow in the posterior tibial artery and sagittal plane ankle range of motion (ROM) among a sample of collegiate runners.

**Methods:** Blood flow in the posterior tibial artery and sagittal plane ankle ROM were measured bilaterally on 25 symptomatic collegiate track athletes (10m ales, 9 females, age = 20.0 ± 1.2 years, height = 175.5 ± 10.2 cm, mass = 68.3 ± 13.3 kg). Pearson correlation analysis was used to analyze the relationship between blood flow in the posterior tibial artery and ROM of the talocrural joint.

**Results:** Findings revealed no significant relationship between blood flow in the dominant leg’s posterior tibial artery and dorsiflexion \( r = -0.32, \ P = 0.12 \) and no significant relationship between blood flow in the non-dominant leg’s posterior tibial artery and dorsiflexion \( r = -0.20, \ P = 0.39 \).

**Conclusion:** Although muscle inflexibility contributes to compromised blood flow in other body regions, findings of this study demonstrated no relationship between flexibility of the plantarflexor muscles and blood flow in the posterior tibial arteries of competitive runners. Future research should conduct examining blood flow in the lower limb as one, among many, physical adaptations runners may experience from training.

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**Effect of Increased Respiratory Muscle Activation on Blood Flow to Inactive and Active Limb Muscles**

Kana Shizawaz1, Kanako Got1, Koji Shimizu2, Koji Ishida1, Lyu Zhang1, William Sheel3, FACSM3, Keisuke Katayama1, Nagoya University, Nagoya-city Chikusa-ku, Japan.

Purpose: To determine the effect of increasing inspiratory muscle activation on blood flow to inactive limb muscles.

**Methods:** Twenty healthy young men (n=7, 20±2 yrs) performed two mild bilateral dynamic knee-extension and -flexion exercises for 10 min. The trials consisted of spontaneous breathing for 3 min in followed by voluntary hyperinflation either with or without inspiratory resistance for 7 min (0% maximal inspiratory mouth pressure, inspiratory duty cycle of 0% and a breathing frequency of 8 breaths/min). Mean arterial blood pressure (MAP) was monitored using finger photoplethysmography. Blood flow to the bicipital artery (inactive limb) and in femoral artery (active limb) were recorded using Doppler ultrasound.

**Results:** MAP during exercise was higher \( P < 0.05 \) with inspiratory resistance (121±15 mmHg) than without resistance (96±6 mmHg). Brachial artery blood flow increased during exercise without inspiratory resistance \( (121±15 \text{ mmHg}) \) than without resistance \( (98±6 \text{ mmHg}) \). However, CO, SVR and stroke volume were not significant different between three postures.

**Conclusions:** These results suggest that recurrent bicycle exercise may have the advantage of reducing myocardial workload by regulating HR and SBP in patients with atrial fibrillation.

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**The Effects of Recurrent Angle on Cardiac Responses and Hemodynamics during Bicycle Ergometer Exercise in Patients with Atrial Fibrillation**

Ilyu Jeong1, Hee-Hyok Lee1, Myungjin Oh2, Jae-Hyun Lee1, Ilyu Jeong1, 1Hannam University, Daejeon, Korea, Republic of.

**Purpose:** To determine the effect of recurrent bicycle ergometer exercise on hemodynamics in patients with atrial fibrillation.

**Methods:** In randomized, double-blind, crossover study, three female and eight male patients with atrial fibrillation (63.3±16.1 yrs) were asked to perform the incremental bicycle ergometer exercise three times in the upright, 60° recumbent (R), and 30°R postures with a week interval, respectively. Exercise intensity was set initially at 10W and increased by 5W every 2 minutes to 60W. Cardiac output (CO) and systemic vascular resistance (SVR) measured at rest, 3 minutes during exercise and 10 minutes during exercise using electrical cardiometry. Rate pressure product (RPP) was calculated by systolic blood pressure (SBP) and heart rate (HR).

**Results:** HR in 30°R and 60°R was significantly lower than upright posture at 5 minutes during exercise (86±12 vs. 112±16 bpm, \( p < 0.05 \)) and 10 minutes during exercise (95±11 and 94±13 vs. 113±18 bpm, \( p < 0.05 \)). RPP in 30°R and 60°R was significantly lower than in upright posture at 5 minutes during exercise (104±10 vs. 159±18 mmHg.mL/min, \( p < 0.05 \)) and 10 minutes during exercise (121±10 vs. 218±16 mmHg.mL/min, \( p < 0.05 \)). However, CO, SVR and stroke volume were not significant different between three postures.

**Conclusions:** These results suggest that recurrent bicycle exercise may have the advantage of reducing myocardial workload by regulating HR and SVR in patients with atrial fibrillation.

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**Blood Flow Patterns during Flow-Mediated Dilation**

Francisco Morales-Acuna, Carolina Valencia, Alvaro N. Gurovich, FACSM, The University of Texas at El Paso, El Paso, TX.

**Purpose:** To evaluate the influence of MVC-based intensity on blood flow during FMD under pulsatile conditions in their ESS estimations. Therefore, normalization of FMD to endothelial shear stress (ESS) has been proposed to solve clinical setting due to a lack of standardization and a large inter-subject variability. Flow mediated dilation (FMD) has been the most common assessment to evaluate the effect of increased blood flow velocity (CBFV) induced-changes of CBFV might be associated with cardiac output (CO) and respiratory response remains unclear.

**Methods:** Eight healthy male (21.3±0.7 yrs) were asked to perform the 45° knee extension isometric contractions during 6 seconds. All participants performed four times in random order at the isometric intensity of 100%, 90%, 80% and 70% with a week interval. The intensity of %MVC was determined by root mean square (RMS) of EMG at right rectus femoris muscle. Each participant was asked to conduct and maintain the predetermined intensity of %MVC confirming the figures on a monitor. MVC \( V_{\text{max}} \) was measured at rest, 30 and 6 seconds during exercise, 30 seconds recovery, 10 seconds recovery using transcranial-Doppler sonography. CO and respiratory variables were measured by electrical cardiometry moniter and gas analyzer. All data were analyzed using two-way ANOVA \( (4 \times 2 \times 2) \) with repeated measures.

**Results:** MVC \( V_{\text{max}} \) in 90%, 80% and 70% MVC was significantly higher than MVC \( V_{\text{max}} \) in 100% and 80% MVC at 6 seconds during exercise (2.3±0.2 vs. 1.0±0.1 ml/min/cm², \( p < 0.01 \)). On the other hand, CO were not significant different between 100%, 90%, 80% and 70% %MVC, Vco, CO and %MVC were significantly lower than in 100% MVC at 6 seconds during exercise (0.22±0.02 vs. 1.23±0.89 mmHg.mL/min, \( p < 0.05 \)) and had significantly negative correlation with the changes of MVC \( V_{\text{max}} \) \( r = -0.50 \) \( p < 0.01 \).

**Conclusions:** These results suggest that MVC \( V_{\text{max}} \) might have the tendency of decrement over the intensity of 0% isometric MVC \( V_{\text{max}} \) and negatively relate to Vco.
THURSDAY, MAY 30, 2019

1850 Board #6 May 30 2:00 PM - 3:30 PM Relationship Between Increased Resting Muscle Blood Flow And Muscle Force Loss After Repeated Eccentric Contractions

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(No relevant relationships reported)

Uncustomed eccentric contractions (ECs) induce muscle force reduction and increased resting muscle blood flow. Whereas muscle force reduction has been well accepted as an index of exercise-induced muscle damage (EIMD), physiological meaning of increased resting muscle blood flow is not fully understood.

PURPOSE: The purpose of the present study was to assess the relationship between increased resting muscle blood flow and muscle force reduction after repeated ECs in healthy individuals.

METHODS: Eight healthy young men (age, 20.9 ± 1.3 y; height, 1.73 ± 0.05 m; body mass index, 21.8 ± 1.9 kg/m²) participated in this study. Maximal voluntary contraction (MVC) force of isometric elbow flexion at elbow joint angle of 90°, heart rate, and blood pressure were measured before and after 24 h of repeated ECs task. Resting forearm blood flow as an index of muscle blood flow was also measured by plethysmography. Subjects performed five sets of 20 repetitions of eccentric contractions of elbow flexors (no contractions at concentric phase) with a load equal to 6% of MVC force with the use of dumbbells. Each action was performed through the same range of motion at a rate of 4 s.

RESULTS: MVC force significantly decreased by 44% (17.4 ± 2.2 kg to 9.7 ± 3.2 kg, P < 0.01) after 24 h of repeated ECs. Resting forearm blood flow increased by 22% (5.8 ± 1.2 mL/min/100 g to 8.6 ± 1.1 mL/min/100 g, P < 0.05) after 24 h of repeated ECs. The change of resting forearm blood flow was negatively correlated with the change of MVC force (r = 0.36, P < 0.01). CONCLUSION: Increased resting muscle blood flow was associated with muscle force reduction after repeated ECs. Our results suggested that increased resting muscle blood flow could result from EIMD-induced inflammatory vasodilation after repeated ECs.

1852 Board #8 May 30 2:00 PM - 3:30 PM Does Capsaicin Ingestion Affect Functional Sympatholysis And Vascular Functions?

Gaia GIUARIETO 1, Meaghan LYNCH 2, Brian LORA 2, Maximo VENTURELLI 1, Stephen J. IVES 1. University of Verona, Verona, Italy. Skidmore College, Saratoga Springs, NY. (No relevant relationships reported)

During exercise, heat and metabolites (e.g. H+ , etc.) attenuate sympathetically-mediated vasconstriction in contracting muscle, known as functional sympatholysis, remains poorly understood. Previous work has shown that activation of transient receptor potential vanilloid type 1 (TRPV1) receptors with Capsaicin (CAP, an ingredient in peppers), elicits a sympatholytic effect in vitro in humans. PURPOSE: To determine if acute ingestion of CAP elicits or enhances sympatholysis at rest and during exercise in vivo in humans. METHODS: In a single blind crossover design, in 10 young healthy males we measured forearm microvascular responses (oxyhemoglobin and myoglobin HbO2+MbO2) using near infrared spectroscopy (NIRS) and central/peripheral hemodynamic (cardiac output, CO, and mean arterial pressure, MAP) under Placebo (PL) and CAP (100 mg 800 mg pepper extract). RESULTS: No differences (P>0.05) were found between PL and CAP in microvascular and central hemodynamics at rest. At rest the CAP-induced change in HbO2+MbO2 (+1.5 ± 2.3 vs 0.3 ± 2.3 %△) and conductance index (HbO2+MbO2/MAP) (5.5 ± 2.6 vs 6.0 ± 3 %△) were not different (P>0.05). During exercise, HbO2+MbO2 were not different (105 ± 28 vs 105 ± 21 μM), though tissue oxygen saturation tended to be higher (96 ± 3 vs 95 ± 3 %) and desoxymyoglobin lower in CAP (47 ± 5 vs 37 %). CO (4.4 ± 0.8), and MAP (141 ± 2.0 vs 139 ± 1.8 mmHg) were not different, despite the tendency to be attenuated during exercise in CAP. CONCLUSION: Acute CAP does not affect sympathodynamics or the response to sympatholypotic LBNP. During exercise, CAP seems to improve microvascular responses, but does not impact the response to LBNP, despite trends for CAP to mitigate the LBNP-induced reductions in both systemic and local conductance.

Given the high rates of cardiovascular disease morbidity and mortality in the United States, and worldwide, finding strategies that might mitigate CVD is paramount. Vascular dysfunction is a critical component and likely precursor measure to CVD. Recently, the passive leg movement (PLM) method has been developed to assess nitric oxide (NO)-dependent vascular function. The nutraceutical Capsaicin has been shown to have cardioprotective effects, enhancing vasorelaxation and attenuating sympathetic vasoconstriction in an endothelium dependent manner via activation of transient receptor potential vanilloid type 1 (TRPV1) channels; this however has only been demonstrated using in vitro or animal models. PURPOSE: In this study, a single-blind, crossover design was used to examine the potential effects of capsaicin-induced improvement of leg blood flow in response to PLM. METHODS: Femoral artery blood flow and microvascular perfusion of the vastus lateralis was examined in 12 young, healthy men, using Doppler ultrasound and multi-distance frency domain based near-infrared spectroscopy. Central hemodynamics (stroke volume, SV; heart rate, HR; cardiac output, CO; and mean arterial pressure, MAP) were measured using finger photoplethysmography. Hemodynamic measurements were continuously taken at rest and during a single bout of PLM (sPLM), a variant of PLM which minimizes the central hemodynamic response. RESULTS: A significant hyperemic response was recorded in response to PLM under both conditions (Capsaicin and Placebo); however the microvascular perfusion response to PLM was not significantly altered (p > 0.05) following ingestion of Capsaicin compared to Placebo (P= 0.8 3.1%, Placebo: 14:1±3.9%). Femoral artery blood flow was also not significantly augmented (p > 0.05) under Capsaicin (Capsaicin: 362± 119% Placebo: 295± 61% in response to PLM). Expectedly, there were no significant differences in basal microvascular perfusion, basal femoral blood flow, and central hemodynamic responses (HR, SV, CO, MAP) between conditions (p<0.05). CONCLUSION: These results indicate Capsaicin does not further augment hyperemia in response to sPLM in young healthy males. Further study of this nutraceutical is warranted in populations at high risk, or prevalence, of cardiovascular disease.
PURPOSE: Passive leg movement (PLM)-induced hyperemia has been found to be an invasive test for vascular endothelial function. This study sought to determine the impact of movement speed and ROM on the hyperemic response to PLM and determine if currently recommended protocols of moving the leg through a 90° ROM at 180°/s provides an optimal peak hyperemic response to PLM.

METHODS: 11 healthy adults underwent multiple bouts of PLM, in which either movement speed (60-240°/s) or ROM (30-120° knee flexion) were varied. Femoral artery blood flow (Doppler Ultrasound) and mean arterial pressure (MAP; photoplethysmography) were measured throughout.

RESULTS: Movement speed generally exhibited positive linear relationships with the hyperemic response to PLM, eliciting >20% increase in hyperemia and conductance for each 60°/s increase in speed (P<0.05). However, increasing the movement speed above 180°/s, which was physically difficult, did not elicit significant increases in hyperemia in many cases. ROM exhibited curvilinear relationships (P<0.05) with hyperemia and conductance, which peaked at 90°, such that a 30° increase or decrease in ROM from 90° resulted in a 10-40% attenuation (P<0.05) in the hyperemic response. Alterations in the balance of antegrade and retrograde flow appear to play a role in this attenuation.

CONCLUSIONS: Movement speed and ROM have a profound impact on PLM-induced hyperemia, as well as the feasibility of the test. When using PLM to assess vascular endothelial function, it is recommended to perform the test at the traditional 180°/s with 90° ROM, which offers a large hyperemic response, while maintaining test feasibility.
Infrared thermography (IR-T) is a non-invasive mobile tool to measure and portray changes of the body surface radiation (Tsr) or the surface radiation pattern (Tsr) in real-time. PURPOSE: The comparison and examination of the Tsr of the back of the legs during an exercise test, between endurance athletes and patients with cystic fibrosis (CF).

METHODS: F patients (G1) and 14m endurance athletes (G2) performed a step-wise incremental exercise test on a treadmill. Tsr was measured via IR-T with a high-resolution detector. Tsr was calculated as the difference in temperature (°C) between the 10% of the darkest and 10% of the lightest pixels in the region of interest. Tsr data were analyzed at “resting condition” (rest), “individual anaerobic threshold” (IAT) and “maximum load” (max), by repeated measures ANOVA. RESULTS: By looking at the complete optical information of temperature patterns over time in high-resolution, we were able to recognize the anatomy of subcutaneous arterioles and their sensitive adjustments due to exercise over time. For G1 global testing for Tsr resolution, we were able to recognize the anatomy of subcutaneous arterioles and their sensitive adjustments due to exercise over time. For G2 global testing was highly significant (rest: 2.3°C; IAT: 3.4°C; max: 3.8°C SD: 0.1°C; p<0.01), and all between-group comparisons were highly significant (p<0.01). The course of the Tsr during the load does not differ significantly between G1 and G2 (p=0.128). CONCLUSION: The Tsr increases across groups during an exercise test. The Tsr can be distinguished between rest, IAT and max for endurance athletes. In short-term healthy individuals, the increase in the difference of Tsr appeared to be pronounced, which could be due to the limited capacity of the patients. The adjustment of arterioles during exercise was therefore dependent on the intensity of exercise and on individual pre-requisite sites. High-resolution IR-T measurement has the potential to become a performance diagnostic tool, to generate sensitive insights into individual exercise physiology. Technological innovations like improved algorithms, automated data processing as well as deep learning should be applied in further research studies to improve IR-T diagnostics and the detection of the Tsr.

In the chronically ill patients, the increase in the difference of Tsr was dependent on the intensity of exercise and may have similar modest beneficial effects on microvascular oxygenation.

CONCLUSION: Based on our results, accepted risk factors for CVD, including blood pressure, plasma lipoproteins, and body composition, are not related to indices of vascular health as assessed with PWV and FMD.

Gait speed decline is a well-established predictor of disability and mortality in older adults. Compromised energetic efficiency (i.e. walking economy) is a strong contributor to gait speed decline, but the underlying mechanisms influencing walking economy are undefined. Impaired vascular function is common with aging and may be an important contributor to the development of compromised walking economy and slow gait speed, yet the relationships among blood flow within skeletal muscle, walking economy, and gait speed in older adults are unknown. PURPOSE: To examine the relationship between measured forearm blood flow and (i) walking economy and (ii) gait speed in older men and women. METHODS: Resting arterial inflow and reactive hyperemic blood flow (RHBf) of the left forearm was measured in 55 participants of the Longitudinal Aging Study at Towson (LAST; 53% male, mean age 71 ± 9.8 years) using venous occlusion plethysmography. Walking economy was measured as the average rate of oxygen consumption during the final 2 minutes of a 5 minute standardized treadmill-based walking test at 1.5 mph per hour. Gait speed was assessed during 2.5 in unites of normal-paced walking over a 20-meter course. The association between RHBf and walking economy and RHBf and gait speed was modeled using linear regression, adjusting for age, height, and fat-free mass. Sobel tests were used to assess possible mediating effects. RESULTS: In fully adjusted models, RHBf (mean RHBf: 1.0 ± 0.1 mmol/L min; r = −0.5, p < 0.01), indicating that walking economy was 7.5 mmol/min lower for each one-unit increase in blood flow. Gait speed (mean 1.3 ± 0.2 m/s) was positively associated with blood flow (β = 0.01, p = 0.01), indicating that gait speed was 0.01 m/s faster for each one-unit increase in blood flow. Mediation analyses further suggested that blood flow may mediate the association between walking economy and gait speed (p<0.01). CONCLUSION: RHBf is
a significant predictor of both walking economy and gait speed in older adults, suggesting that better overall vascular health is related to enhanced walking economy and gait speed. Therefore, interventions aimed at improving vascular health in the aging population may be beneficial in maintaining gait speed and mobility with age.

**1861**

**Board #17**

May 30 2:00 PM - 3:30 PM

**Racial Differences In Vascular Function And Blood Flow Responses During Upper And Lower Limb Exercise**

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(No relevant relationships reported)

**PURPOSE:** Recently, it has been shown that young African American males display lower hyporenic responses, but preserved shear-induced dilation, in response to dynamic handgrip exercise when compared to Caucasian American counterparts; however, it is unknown whether this blunted exercise hyporexia is also present in the lower limbs.

**METHODS:** Young African American (AA) (n = 3) and Caucasian American (CA) (n = 3) males performed two separate incremental exercise bouts of rhythmic handgrip and plantar flexion exercise while blood flow and diameter were evaluated in the brachial and superficial femoral arteries, respectively. Mean arterial pressure (MAP) and blood flow/vascular function variables (blood flow, shear rate, flow-mediated dilation) were measured in the last minute of each 3-minute workload.

**RESULTS:** The data revealed no significant group differences during handgrip exercise when examining blood flow (e.g. 24 kg: AA: 66 ± 52; CA: 71 ± 60 mL/min; p = 0.3), MAP (e.g. 24 kg: AA: 109.5 ± 9; CA: 109 ± 7; p = 0.3), or vascular conductance (e.g. 24 kg: AA: 0.6 ± 0.7; CA: 0.6 ± 0.8 mL/min; p = 0.3) across all workloads. During plantar flexion exercise, no group differences were reported when evaluating blood flow (e.g. 32 kg: AA: 993 ± 83; CA: 713 ± 97 mL/min; p = 0.2), MAP (e.g. 32 kg: AA: 104 ± 10; CA: 106 ± 9; p = 0.3), or vascular conductance (e.g. 32 kg: AA: 0.8 ± 0.3; CA: 0.7 ± 0.3 mL/min; p = 0.3) across all workloads. Slopes derived from the relationship between shear rate and arterial dilation across all exercise workloads were not different between groups when examined in the brachial (AA: 0.00136; 0.00034; CA: 0.00004; 0.00003; p = 0.7) or superficial femoral artery (AA: 0.0013 ± 0.00003; CA: 0.0002 ± 0.0007; p = 0.7).

**CONCLUSIONS:** Preliminary data revealed no differences in exercise-induced blood flow or vascular responses in the upper or lower limbs when comparing young African American and Caucasian American males.

**1862**

**Board #18**

May 30 2:00 PM - 3:30 PM

**Improved Maximal Oxygen Uptake Following High-intensity Interval Training Relates To An Increase In Blood Volume**


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(No relevant relationships reported)

Improved maximal oxygen uptake following high-intensity interval training relates to an increase in blood volume

High-intensity interval training (HIIT) is an effective training mode for improving maximal oxygen uptake (VO_{max}). As past research has focused on peripheral adaptations to HIIT, little is known about central factors governing cardiac output and thus VO_{max}. **PURPOSE:** The aim of this study was to test the hypothesis that HIIT-induced improvements in VO_{max} are accompanied by increases in blood volume (BV) and cardiac stroke volume. Further, we investigated if inter-individual differences in the increase in VO_{max} could be attributed to changes in BV.

**METHODS:** Twenty-five older adults (60 ± 6 years; 30 ± 5 kg/m²) completed body composition assessments via dual x-ray absorptiometry (Lunar iDXA, GE, Waukesha, WI). Absolute LM, FM, and VF volumes were obtained and also made relative to total body weight, i.e. LM (kg)/total body weight (kg). Mean BV (MCV) was assessed using a 2-MHz transcranial Doppler ultrasound probe on the right temporal window. Mean CCA conductance (MCAC) was calculated as MCV (mean arterial pressure, MAP), with MAP obtained from finger photoplethysmography. **RESULTS:** The range of values for this sample was: MCV (30 - 105 mL/min), MCA (110 ± 10 mL/min), MAP (96 ± 11 mmHg), LM (30.73 - 68.80 kg), FM (15.55 - 63.25 kg), VFA (20 - 3.2 kg), and body weight (5 - 123 kg). Absolute LM and VF were negatively associated with MCV and MCAC; however, only VF remained after controlling for body weight (p < 0.05 Table). No relationship was observed for relative LM or FM (either absolute or relative). **Conclusion:** These results indicate that increased visceral adiposity is negatively related to cerebral blood flow in older adults, whereas whole body fat mass was not as sensitive. This suggests the importance of visceral adipose interacting with cerebrovascular physiology in contrast to whole body fat mass among older adults.

**D-55**

**Free Communication/Poster - Cardiorespiratory Disease**

**THURSDAY, MAY 30, 2019**

**Board #20**

May 30 2:00 PM - 3:30 PM

**An Exaggerated Muscle Metaboreflex In Diabetic Rats Is Mediated By Potentiated Skeletal Muscle Afferent Responsiveness**

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(No relevant relationships reported)

Patients with type 2 diabetes (T2D) exhibit an excessive increase in blood pressure during exercise. Evidence suggests that the skeletal muscle metaboreflex is exaggerated in T2D. However, the underlying mechanisms remain poorly understood. Metaboreflex sensory signals from exercising muscles are generated by activation of chemically-sensitive group IV afferent neurons. It is logical to suggest that heightened metaboreflex function in T2D may be caused by enhanced muscle afferent responsiveness to chemical stimulation. **PURPOSE:** The purpose of this study was to assess the effects of T2D on skeletal muscle metaboreflex responsiveness. **METHODS:** Young healthy adult male rats (n = 6) were randomly assigned to a control group (a/non diabetic) and a T2D group (db/db). Rats in the T2D group were fed a high-fat diet from weaning, while controls were fed a regular diet. After 12 weeks, metabolic parameters were measured. The metaboreflex was assessed by measuring the increase in blood pressure in response to intravenous administration of 2 mM potassium chloride. The metaboreflex was calculated by subtracting the arteriolar dilation in the T2D group from the arteriolar dilation in the control group. **RESULTS:** The results showed that the metaboreflex in the T2D group was significantly higher than in the control group. **CONCLUSIONS:** The results suggest that the metaboreflex is exaggerated in T2D. This may be due to enhanced muscle afferent responsiveness to chemical stimulation.
1) examine whether the heightened cardiovascular response to exercise in T2D results from muscle metaboreflex overactivity in vivo, and 2) investigate the impact of T2D on neuronal responses to chemical stimulation in skeletal muscle afferents in vitro.

METHODS: For 14-16 wk rats, rats were given either a normal diet (control group) or a high fat diet in combination with a low dose (33 g kg⁻¹) of streptozotocin (T2D group). In vivo, we measured changes in renal sympathetic nerve activity (RSNA) and mean arterial pressure (MAP) in response to capsaicin administration (0.3 and 1.0 μg/100 μl) in the hindlimb arterial supply. In vitro, the function of chemically (1 μM capsaicin) activated group IV neurons were assessed by obtaining single-fiber recordings using a muscle-neural preparation. RESULTS: T2D rats exhibited hyperglycemia after overnight fasting (104 ±16  mg/dl, P<0.05). Compared to control, capsaicin administration evoked significantly greater increases in RSNA (0.3 μg: 36±25 vs. 246±24, P<0.05) and MAP (0.3 μg: 15±1 vs. 45±9 mmHg; 1.0 μg: 23±8 vs. 70±5 mmHg, P<0.01) in T2D rats. The discharge of group IV muscle afferents to 1μM capsaicin exposure was likewise significantly greater in T2D rats compared to control (0.8±0.3 vs. 2.9±0.7 Hz, P<0.05).

CONCLUSIONS: These findings suggest that the heightened cardiovascular response to exercise in T2D may be caused by an exaggerated muscle metaboreflex made overactive via a potentiation in muscle afferent responsiveness to chemical stimulation. Supported by Lawson & Rogers Lacy Research Fund in Cardiovascular Disease and to exercise in T2D may be caused by an exaggerated muscle metaboreflex made overactive via a potentiation in muscle afferent responsiveness to chemical stimulation. Supported by Lawson & Rogers Lacy Research Fund in Cardiovascular Disease and

ACSM May 28 – June 1, 2019 Orlando, Florida
Muscle samples were obtained using biopsy before exercise (PRE) and 2 hrs after maximum with 2 min of rest between sets. Immediately after exercise participants derived exosomal contents. The target cells for skeletal muscle derived exosomes and exercise training (LN: Pre=1.0, Post=0.75; OB: Pre=0.98, Post=0.76) consistent with toll like receptor signaling (TLR), and NF-κB pathways in which RELA, an NF-κB (TGFβR1) is common; 2) exercise training decreases miR targeting IL-10, IL-8, catenin, and neuroinflammation in which transforming growth factor β receptor 1 derived exosomal miR indicated: 1) obesity increases miR targeting cancer, Wnt/β-catenin, angiogenesis, and senescence. Consumption of alcohol after resistance exercise (RE) is a common practice and might have negative effects on muscle recovery. Separately, alcohol and RE have opposite effects on signaling through mTOR complex 1 in skeletal muscle, a key pathway involved in muscle protein synthesis. PURPOSE: To investigate the effect of alcohol consumption after heavy RE on the phosphorylation of key proteins upstream of mTOR in skeletal muscle of resistance trained men. METHODS: Eleven recreationally resistant trained men (28 ± 2.4 kg) completed 2 sessions of 6 sets of 10 repetitions of Smith machine back squats at 80% of 1 repetition maximum with 2 min of rest between sets. Immediately after exercise participants consumed 30 g of whey protein, followed by a drink (10 min after exercise) containing either alcohol (ALC: 1.09 g EtOH/kg fat free body mass) or no alcohol (PLA). Muscle samples were obtained using biopsy before exercise (PRE) and 2 hrs after exercise (2H2) and analyzed for phosphorylation at mTOR[188], TSC2[293], TSC2[132], and AMPK[772] using western blotting. Blood was collected at PRE and 24 hour after exercise (24H) and analyzed for creatine kinase (CK) activity. RESULTS: Significant (p < 0.05) main effect of time was observed for mTOR[188], mTOR phosphorylation was (2.9 ± 1.3) times greater at 2H compared to PRE (F[1,10] = 153.5, p < 0.001, η² = 0.774). No significant main or interaction effect was observed for TSC2[293], TSC2[132], or AMPK[772]. A significant main effect of time with a large eta squared effect size was observed for CK activity. CK activity was greater at 24H (312 ± 137 U/L) compared to PRE (135 ± 69 U/L) (F[1,10] = 28.1, p < 0.001, η² = 0.74) indicating that the exercise protocol effectively induced a modest amount of muscle damage on both trials. CONCLUSION: Ingestion of a large bolus of alcohol after heavy resistance exercise did not affect phosphorylation at mTOR[188], TSC2[293], TSC2[132], or AMPK[772] at 2 hours after exercise in resistance-trained men. Supported in part by grants from the National Strength and Conditioning Association Foundation and the Texas Chapter of the American College of Sports Medicine.
migration. This study provides evidence that exosomes function as part of the SASP in satellite cells and may propagate a senescent phenotype to neighboring endothelial cells in skeletal muscle with aging.

**1872** Board #28  May 30 2:00 PM - 3:30 PM  
*Effects Of Different Doses Of D-galactose On Skeletal Muscle In C57bl/6j Mouse*  
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*(No relevant relationships reported)*

**PURPOSE:** Pharmacologically inducible models of aging could help to understand the pathogenesis of sarcopenia and to establish better exercise prescriptions for the elderly. Administration of D-galactose (0-100 mg/kg/day) has been used to induce aging phenotype including accumulation of oxidative stress, muscle atrophy, and cognitive impairment. A recent paper has shown that a higher dose of D-galactose (80 mg/kg/day) accumulated greater oxidative stress, compared with the commonly used dose (100 mg/kg/day). These observations suggest that there might be room to reconsider the optimal dose of D-galactose. We hence examined whether higher dose of D-galactose (above 100 mg/kg/day) exacerbate skeletal muscle atrophy.  

**METHODS:** Male C57BL/6J mice (8w old) were divided into 4 groups as follows: 1) Control (0 mg/kg/day, n=10), 2) D-Galactose (18 mg/kg/day, n=10), 3) D-Galactose (1000 mg/kg/day, n=10), and 4) D-Galactose (2000 mg/kg/day, n=10). We intraperitoneally injected D-galactose solution at indicated dose every day for 8w ex. On the day before tissue collection, we performed grip strength measurement. Twenty-four hours after the final injection, we collected and weighed gastrocnemius muscle, and then conducted histological analysis to measure cross-sectional area.  

**RESULTS:** We first confirmed that body weight and food intake during the intervention were not different among any groups of D-galactose injection. There were also non-detectable changes in muscle mass and grip strength among groups. We found that D-galactose injection decreased muscle fiber cross-sectional area at 150 mg/kg/day (-13.7%, P=0.03), but not at 1000 mg/kg/day (-11.5%, P=0.10) and 2000 mg/kg/day (-10.5%, P=0.19).  

**CONCLUSIONS:** Daily injection of D-galactose at 150 mg/kg/day sufficiently induces muscle fiber atrophy. Even if the dose was increased up to 1000 or 2000 mg/kg/day, the muscle fiber atrophy was not aggravated but rather alleviated.

**1873** Board #29  May 30 2:00 PM - 3:30 PM  
*Exercise Activate Tendon Cells through HGFA*  
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*(No relevant relationships reported)*

Regular exercise enhances the musculoskeletal systems including tendon strengthening. Tendon cells, consisting of tendon stem/progenitor cells (TSCs) and tenocytes, are essential for the maintenance and repair of tendinous tissues when injured. Previously, we showed that TSCs increase in their number and quality after tendon cells, are essential for the maintenance and repair of tendinous tissues when injured. Previously, we showed that TSCs increase in their number and quality after tendon cells are activated from G0 to GAlert by exercise. Positive cells were present in patellar tendons in OTR group than control group. There were also non-detectable changes in muscle mass and grip strength among groups. We hence examined whether higher dose of D-galactose (above 100 mg/kg/day) exacerbates skeletal muscle atrophy.  

**EXERCISE ACTIVATION OF TENDON CELLS THROUGH HGFA**

**PURPOSE:** To test the hypothesis that HGFA is elevated and activates tendon cells in response to exercise.  

**METHODS:** Total 16 mice were equally divided into cage control and exercise groups. Exercise was mimicked by one-time treadmill running (OTR), with which mice ran at 13 meter/min for 6 hours. Twelve hours before OTR, both groups of mice were injected with 1 mg of bromodeoxyuridine (BrdU) per mouse to determine cell proliferation. One day after OTR, all mice were sacrificed and Achilles and patellar tendons were harvested. The HGFA levels in both tendons and serum were measured using ELISA, and BrdU incorporation was assayed by immunofluorescence staining. Student t-test was performed to assess statistical significance.  

**RESULTS:** OTR increased HGFA levels in both Achilles and patellar tendons of OTR mice compared to cage control mice. Exercise-elevated HGFA possibly may determine differences following CLI injury.  

**CONCLUSION:** Overall, these data indicate that as a regenerative response to critical limb ischemia, the neurovascular network of myofibers are remodeled and newly generated myofibers exhibit MuSC-derived myonuclear expansion to allow enhanced transcriptional support and an increase in mitochondrial content for a bioenergetic need of the energy-demanding tissue regeneration.  

Supported by NIH R21AR023393 and the YC13 and Regenerative Engineering and Medicine research grant.

Peripheral artery disease (PAD) is a significant medical condition caused by blockages in the arteries of the leg. Some PAD patients progress to critical limb ischemia (CLI) and major amputation. While recent regenerative medicine approaches on collateral vessel formation have made some progress, the myopathy and dysregulation of the skeletal muscle in CLI have not been thoroughly investigated. **PURPOSE:** To determine the regenerative mechanism of the muscle stem cell (MuSC) and its niche components in response to ischemic insults, we assessed interactions between MuSC, vascular- and neural-network, and myofibers at different times points. **METHODS:** The femoral artery ligation mouse model of PAD on different reporter mice were used in the study. Immunofluorescence, single fiber staining, and biochemical blotting from harvested hindlimb muscles were used for data analysis. One-way ANOVA with Tukey’s post hoc test and a paired two-tailed t-test were performed to determine differences following CLI injury. **RESULTS:** Skeletal muscle regeneration persisted up to 6a ws while the number of eMH C+ fibers (p<0.01) was highest 14 days following CLI surgery compared to the contralateral sham control. In addition, muscle regeneration was accompanied by significant alterations in the motor unit, as demarcated by the presence of denervated synapses, regeneration of the neuromuscular junction (NMJ), and increased number of subsynaptic nuclei (p<0.05). Furthermore, the size of the myonuclear domain was decreased at 14 and 14a ws (p<0.01), corresponding to greater RNA content (p<0.01) and MuSC fre quency (p<0.05) while the mitochondrial domain was increased 28a ws (p<0.01) following CLI injury.  

**CONCLUSION:** Overall, these data indicate that as a regenerative response to critical limb ischemia, the vascular network of myofibers are remodeled and newly generated myofibers exhibit MuSC-derived myonuclear expansion to allow enhanced transcriptional support and an increase in mitochondrial content for a bioenergetic need of the energy-demanding tissue regeneration.

Our previous study showed that 5α-dihydrotestosterone (DHT), an active androgen, can be synthesized in skeletal muscle by 5α-reductase. Recently, we revealed that the increase in muscle DHT level by resistance training was associated with improvement of glycemic control in type 2 diabetic rats. **PURPOSE:** To determine the regenerative mechanism of the muscle stem cell (MuSC) and its niche components in response to ischemic insults, we assessed interactions between MuSC, vascular- and neural-network, and myofibers at different times points. **METHODS:** The femoral artery ligation mouse model of PAD on different reporter mice were used in the study. Immunofluorescence, single fiber staining, and biochemical blotting from harvested hindlimb muscles were used for data analysis. One-way ANOVA with Tukey’s post hoc test and a paired two-tailed t-test were performed to determine differences following CLI injury. **RESULTS:** Skeletal muscle regeneration persisted up to 6a ws while the number of eMH C+ fibers (p<0.01) was highest 14 days following CLI surgery compared to the contralateral sham control. In addition, muscle regeneration was accompanied by significant alterations in the motor unit, as demarcated by the presence of denervated synapses, regeneration of the neuromuscular junction (NMJ), and increased number of subsynaptic nuclei (p<0.05). Furthermore, the size of the myonuclear domain was decreased at 14 and 14a ws (p<0.01), corresponding to greater RNA content (p<0.01) and MuSC frequency (p<0.05) while the mitochondrial domain was increased 28a ws (p<0.01) following CLI injury.  

**CONCLUSION:** Overall, these data indicate that as a regenerative response to critical limb ischemia, the vascular network of myofibers are remodeled and newly generated myofibers exhibit MuSC-derived myonuclear expansion to allow enhanced transcriptional support and an increase in mitochondrial content for a bioenergetic need of the energy-demanding tissue regeneration.  

Supported by NIH R21AR023393 and the YC13 and Regenerative Engineering and Medicine research grant.
these signaling pathways in type 2 diabetes. PURPOSE: This study aimed to clarify whether acute resistance exercise-induced increase in muscle DHT level contributes to muscle glucose metabolism-related signaling pathway in type 2 diabetic rats.

METHODS: Male 20-week-old type 2 diabetic (OLETF) rats were randomly divided into 4gr groups: resting control and immediately, an hour and three hours after acute resistance exercise (climbing ladder) with and without treatment of 5α-reductase inhibitor (N=6 per group).

RESULTS: Muscle 5α-reductase protein expression and DHT level were significantly increased immediately and an hour after acute resistance exercise (p<0.05). These exercise responses were significantly suppressed by the treatment of 5α-reductase inhibitor (p<0.05). Muscle AMPKα1/2, TBC1D1 and AktSer473 phosphorylation were significantly increased immediately and an hour after acute resistance exercise (p<0.05). In addition, muscle AS160 (Thr642) phosphorylation and GLUT4 translocation were significantly increased one and three hours after acute resistance exercise (p<0.05). However, the treatment of 5α-reductase inhibitor was significantly suppressed the up-regulations of GLUT4 translocation and Akt/AS160 phosphorylation (p<0.05), but did not alter the AMPK/TBC1D1 phosphorylation.

CONCLUSIONS: These results suggest that the increase in DHT secretion by acute resistance exercise may partially contribute to enhancement of muscle GLUT4 translocation via activation of Akt/AS160 phosphorylation in type 2 diabetic rats. Supported by Grants-in-Aid for Scientific Research (#17H02182 and #16K13059, M. Iemitsu).

1876 Board #32 May 30 2:00 PM - 3:30 PM The Development of Cancer Cachexia Negatively Impacts Skeletal Muscle Extracellular Matrix Remodeling
Wesley Haynie, Jacob Brown, David Lee, Megan Rosa-Caldwell, Richard Perry, Lemuel Brown, Nicholas Greene, Tyrone Washington. University of Arkansas, Fayetteville, AR. Email: wsh001@uark.edu (No relevant relationships reported)

Cancer cachexia is the largely irreversible wasting of lean body mass as a result of cancer progression, affecting ~80% of all cancer patients with as much as ~40% of cancer-related deaths being attributed directly to cachexia. Cachexia has been associated with increased fibrosis and reduced physiological function in cardiac muscle, but the possible role and development of fibrosis and associated extracellular matrix (ECM) remodeling in skeletal muscle has lacked evaluation. PURPOSE: To examine the effects of cancer cachexia on ECM remodeling and the development of fibrosis in skeletal muscle.

METHODS: C57BL6/J mice were injected with either Lewis Lung Carcinoma cells or a PBS control into their hind-flank at 8 wks of age. The tumor was allowed to develop for 1, 2, 3, or 4 wks (n=8 per group). Tibialis anterior (TA) muscle was extracted and immediately frozen for morphology and mRNA abundance analysis using RT-qPCR. RESULTS: There were no changes in TA muscle weight until 4wks post-tumor implantation which resulted in a ~22% lower muscle wet weight compared to PBS control (p<0.05). Sirius Red staining of TA muscle sections resulted in no change in collagen abundance in all groups with the exception of a 2-3 fold increase at 4wks relative to all other groups (p<0.05). Collagen 1 gene expression was ~50% lower than control at 3 and 4wks post tumor injection, respectively, (p<0.05). Collagen 1 gene expression was ~2-fold higher at 1 and 2 wks but there was no difference at 3 or 4wks, all relative to control (p<0.05). The ratio of Collagen 3:1 gene expression decreased ~30-50% from 1-3wks compared to control (p<0.05), but there was no difference at 4wks. MMP-2 gene expression was ~50% higher at 1-wk compared to control (p<0.05), but was not different 2-4wks from control (p>0.05). MMP-13 gene expression was 3 and 6 fold greater than control at 3 and 4-wks post-injection, respectively (p<0.05). There was a main effect of tumor implantation to reduce TIMP-1 gene expression ~20% (p<0.05). CONCLUSION: The development of cancer cachexia results in dysregulation of ECM remodeling and increased collagen deposition within skeletal muscle. This dysregulation could negatively affect skeletal muscle’s ability to maintain muscle mass and respond to other environmental stressors.

1878 Board #34 May 30 2:00 PM - 3:30 PM LINE-1 Retroposition Increases with Age in Rodent Skeletal Muscle
Petye W. Munford1, Matthew A. Romero1, Shelby C. Osburn1, Paul A. Roberson1, Kaelin C. Young2, Michael D. Roberts1. 1Auburn University, Auburn, AL. 2Edward Via College of Osteopathic Medicine-Auburn Campus, Auburn, AL. Email: pwm0009@auburn.edu (No relevant relationships reported)

Long interspersed nuclear element-1 (LINE-1 or L1) is termed a genomic parasite due to its ability to randomly insert itself back into the genome. This may be a result of an increase in the ratio of MCT4/ Kir6.2 muscle protein expression correlated (r=0.6; P<0.05) to YYYIE1 performance. Kir6.2 protein expression also correlated (P<0.05) with muscle Na+-K+ ATPase β1 and the FXYD1 subunits (r=0.3 and 0.5, respectively). Kir6.2 correlated to the expression of Myosin Heavy Chain 1 (MHC1; r=0.5) and Phosphofructokinase (PFK) protein (r=0.8). In contrast, no relationship was observed between Kir6.2 and oxidase enzymes. Nxa-K ATPase subunits correlated (r=0.5) to Kir6.2 protein expression. The sum of all ion transporters correlated to VO2max (r=0.7), RST (r=0.5) and YYYIE1 performance (r=0.7). CONCLUSIONS: Skeletal muscle KATP channel abundance appears to associate with the capacity to regulate ions such as H+ and K+. Moreover, the capacity to regulate ion homeostasis is associated with exercise tolerance in trained human skeletal muscle.
Follistatin inhibits the actions of the TGFβ family to oppose inhibition of skeletal muscle growth, whereas growth and differentiation factor (GDF-15) may inhibit muscle growth. The PURPOSE of this project was to determine if predominately aerobic exercise can induce changes in concentrations of circulating follistatin and GDF-15 and if these changes are dependent on exercise intensity and/or duration.

METHODS: Fifteen recreationally trained young (28.2 ± 2.0 years) males (n=7) and females (n=7) participated in two bouts of treadmill running: a vigorous intensity/short duration (ViSd) bout at 15% ventilatory threshold for 30 minutes and a moderate intensity/long duration (MiLd) bout at 5% ventilatory threshold for 90 minutes. Blood was collected pre-exercise, 15 minutes from the start of exercise, mid-exercise, and immediately, 1 hr, 2 hr, and 3 hr post-exercise. Serum was analyzed with commercially available ELISA kits for follistatin and GDF-15.

RESULTS: At 15 minutes into the exercise bout follistatin was higher (p < 0.0001) in MiLd (2.8 ± 0.8 ng/mL) than ViSd (0.6 ± 0.3 ng/mL) and GDF-15 was higher (p < 0.0002) in MiLd (20.8 ± 8.0 ng/mL) than ViSd (18.5 ± 3.2 ng/mL). Follistatin was higher in ViSd 1 hr post-exercise (MiLd 9.7 ± 3.1 ng/mL vs. ViSd 12.1 ± 2.5 ng/mL; p < 0.0001), and higher in MiLd 2 hr post-exercise (MiLd 11.2 ± 3.4 ng/mL vs. ViSd 6.4 ± 2.4 ng/mL; p < 0.0001) and 3 hr post-exercise (MiLd 10.1 ± 3.3 ng/mL vs. ViSd 18.6 ± 5.6 ng/mL; p < 0.0001). GDF-15 was higher in MiLd immediately post-exercise (MiLd 33.0 ± 13.0 ng/mL vs. ViSd 18.5 ± 4.0 ng/mL; p = 0.026). In both exercise protocols, RCR increased (+28%, P < 0.01) and ROS level (+62%, P < 0.001) were increased; in NC group, RCR increased (+42%, P < 0.01), complex V activity (+49%, P < 0.05), PHB1 expression (+48%, P < 0.01) and ROS level (+75%, P < 0.001) was reduced; in OFE group, RCR (+50%, P < 0.05) and ROS level (+50%, P < 0.05) were increased, and ROS level (-75%, P < 0.001) was reduced. Mitochondrial respiratory control rate (RCR), PHB1 expression (+28%, P < 0.01) and ROS level (+62%, P < 0.001) were increased in the post-exercise group compared to pre-exercise group. Conclusion: The exercise-induced follistatin and GDF-13 response is intensity-dependent. The differences post-exercise imply that there may also be a duration effect. Intensity and duration need to be considered to increase follistatin in response to running.
Doxorubicin (DOX) is a chemotherapy drug used to effectively treat a variety of cancers. Its clinical use, however, is limited by its toxicities commonly attributed to increased oxidative stress in cardiac and skeletal muscle. The DOX-induced rise in oxidative stress can overwhelm endogenous antioxidants yet exercise (both endurance and resistance) has shown promise in attenuating this decline. Little information, however, is available on how DOX and resistance exercise affect antioxidant enzymes in type II skeletal muscle. PURPOSE: To determine the effects of resistance training before and during DOX treatment on superoxide dismutase (SOD) and SOD2 expression in the primarily type II extensor digitorum longus (EDL) muscle. METHODS: Thirty-six male Sprague-Dawley rats were randomly assigned to one of four groups: sedentary+saline (SSS), sedentary+DOX (SSD), resistance training+saline (RTS), or resistance training+DOX (RTD). The resistance training protocol incorporated a raised cage model where food and water were elevated progressively which provided hind limb loading 10 weeks prior to DOX injection and 4 eks during DOX treatment. Groups treated with DOX received 3 mg/kg DOX weekly for 4 eks (12 mg/kg cumulative), and saline-treated groups received 0.9% NaCl as a placebo. Five days following the final DOX or saline injection, EDL muscles were excised, and Western blotting was performed to quantify SOD1 and SOD2 expression. RESULTS: Although no significant drug effects, activity effects, or drug x activity interactions were observed with SOD1 and SOD2 expression (F < 0.05; a trend toward SSD compared to SSS was observed (-2% and -3%, respectively). This trend was also observed in SOD1 and SOD2 expression, however, was not observed in RTD (+3% and -3%, respectively vs SSS). CONCLUSIONS: The DOX dosing regimen used in the current study had no effect on SOD1 and SOD2 expression in the EDL muscle, and the resistance training protocol also did not affect SOD1 and SOD2 expression. These results suggest that resistance exercise may play a limited role in modulating oxidative stress of DOX in type II skeletal muscle.

Periarterial peripheral arterial disease is the third leading cause of death of atherosclerotic cardiovascular mortality in the United States and the incidence of PAD increases age. Previous studies have shown that PAD displays impaired mitochondrial respiration, decreased expression of mitochondrial enzymes, increased oxidative stress, and mitochondrial DNA mutations within their ischemic limb muscles. We identified a potential transcriptional regulator of mitochondrial gene expression, PGC-1/ ERR-induced regulator in muscle (PERM1) which is induced in patients with severe PAD. Interestingly, PERM1 regulates the expression of only a subset of genes induced by PGC-1a or ERRs expression in C2C12 myotubes, suggesting that PERM1 selectively functions in specific PGC-1/ERR-driven pathways. PURPOSE: The purpose of this study is to determine whether PERM1 is a potential gene target to aid in tissue recovery and regeneration from hypoxia in C2C12 myotubes. METHODS: We generated AAVs to overexpress the PERM1 gene or a green fluorescent protein (ZsGreen1). Following AAV infection, C2C12 myoblasts were differentiated into mature myotubes for assessments of mitochondrial biogenesis, mitochondrial respiration, and myogenesis were performed. To determine if PERM1 plays a role in recovering myotube respiration and myotube atrophy from hypoxia, C2C12 myotubes infected AAV-PERM1 were placed in hypoxia for 6 hours and mitochondrial respiratory function, content, and myosin heavy chain area were assessed during the recovery from hypoxic insult. RESULTS: AAV-PERM1 resulted in a ~16 fold increase in mRNA expression which drove a ~20% increase in complex I-supported respiration compared to the control cells (P<0.05). Additionally, Phosphorylation of 4E BP1 was significantly lower in PERM1-infected myotubes compared to control. CONCLUSION: Our results indicate that PERM1 is a strong regulator of mitochondrial biogenesis in skeletal muscle cells, capable of increasing mitochondrial content and function compared with controls. More research is needed to further investigate molecular signaling after deloading paradigms.
**Board #43**

**May 30 2:00 PM - 3:30 PM**

**Xbp1 Promotes Skeletal Muscle Regeneration And Growth In A Cell Non-autonomous Manner**

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(No relevant relationships reported)

Kyle R. Bohnert1,2 and Ashok Kumar2
1University of Louisville
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**Purpose:** Skeletal muscle exhibits a remarkable capacity for regeneration following injury. However, the molecular mechanisms governing skeletal muscle regeneration remain poorly understood. X-box binding protein (XBP1) is a downstream target of the endoplasmic reticulum (ER) stress inducer inositol-requiring enzyme 1 (IRE1). The purpose of this study was to determine the role of XBP1 in regulation of skeletal muscle regeneration and growth.

**Methods:** To investigate the role of XBP1 in the regulation of skeletal muscle regeneration and growth, we generated muscle-specific knockout (KO) mice of XBP1. Control and KO mice were then injected with 100μl of 1.2% BAC into the tibialis anterior muscle to induce a necrotic injury. In a separate experiment, control and KO mice were subjected to the synergistic ablation model of overload hypertrophy of the plantaris muscle. Skeletal muscle was collected and analyzed using histological and biochemical techniques.

**Results:** Protein levels of XBP1 are increased in regenerating muscle fibers (1 ± 0.21 vs. 1.6 ± 1.39 p < 0.05). Moreover, genetic deletion of XBP1 inhibits regeneration due to reducing the number 2 or more centrally nucleated fibers (44.2 ± 2.8 vs. 30.7 ± 1.7, p < 0.05) and the number of satellite cells per 100 myofibers (26.5 ± 2.4 vs. 19.3 ± 2.4, p < 0.05). Moreover, genetic deletion of XBP1 inhibits regeneration due to reducing the number 2 or more centrally nucleated fibers (44.2 ± 2.8 vs. 30.7 ± 1.7, p < 0.05) and the number of satellite cells per 100 myofibers (26.5 ± 2.4 vs. 19.3 ± 2.4, p < 0.05). Moreover, genetic deletion of XBP1 inhibits regeneration due to reducing the number 2 or more centrally nucleated fibers (44.2 ± 2.8 vs. 30.7 ± 1.7, p < 0.05) and the number of satellite cells per 100 myofibers (26.5 ± 2.4 vs. 19.3 ± 2.4, p < 0.05).

**Conclusions:** XBP1 does not affect the rate of protein synthesis during muscle growth. Rather, deletion of XBP1 prevents skeletal muscle hypertrophy through reducing the total number of satellite cells per 100 myofibers (9.5 ± 1.1 vs. 5.8 ± 0.8, p < 0.05).

**Board #44**

**May 30 2:00 PM - 3:30 PM**

**Effects of Obesity and Acute Resistance Exercise on Skeletal Muscle Intercellular Communication Pathways**

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(No relevant relationships reported)

Obesity (OB) disrupts cellular communication consistent with lower skeletal muscle capillarization. Exosomes, small microvesicles, transport and deliver mRNA, miRNA, and proteins in an endocrine manner and are released by muscle during aerobic exercise. The effects of resistance exercise (REX) on exosome biogenesis is unknown.

**PURPOSE:** Investigate if resistance exercise increases skeletal muscle exosome biogenesis pathways and if this response is impaired in obesity.

**METHODS:** Lean (LN) and obese (OB) (n=8/group) sedentary men and women performed 3 sets of 8 12 repetitions/set of acute, single leg knee extension resistance exercise at 8% of 1-RM. Vastus lateralis biopsies were obtained at rest and at 1min in, 3 hr post-exercise. Muscle mRNA, protein expression, fiber typing, and capillary staining were measured.

**RESULTS:** The gene expression of the exosome biogenesis components hepatocyte growth factor-regulated tyrosine kinase (HGS) and vacuolar protein sorting mutant VPS131 mRNA were lower in OB than LN at rest (−25% ) and 1min in (−20%), but not 3 hr post-exercise. Expression of exosome surface markers apoptotic linked gene-2 interacting protein X (Alix) was lower (OB −35% and LN −20% 1hr in post-exercise) and tumor susceptibility gene-101 (TSG-101) was higher (OB −6% and LN −39% 3hr post-exercise) in response to REX in both groups. Acute resistance exercise increased vascular endothelial growth factor (VEGF) mRNA similarly in LN and OB. Interestingly, anti-angiogenic thrombospondin-1 (TSP-1) mRNA was increased by acute REX only in OB (−30% 3hr post-exercise), miR-130a (angiogenesis), miR-206 (myoblast to myotube differentiation) and miR-503 (repressor of cell proliferation) were increased in OB at rest and following exercise. Type II fiber size was greater and capillary density was lower in OB.

**CONCLUSION:** Obesity alters skeletal muscle exosome biogenesis, angiogenic, and muscle differentiation pathways possibly contributing to greater muscle fiber size and lower muscle capillarization. Resistance exercise alters skeletal muscle exosome marker expression similarly in both lean and obese.

**Board #45**

**May 30 2:00 PM - 3:30 PM**

**Preliminary study: Leucine Supplementation Exacerbates Muscle Wasting Independent of the Ubiquitin-Proteasome System**


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(No relevant relationships reported)

Cancer cachexia is a distressing syndrome that affects around 50-80% of cancer patients and is characterized by a rapid, drastic fat and muscle mass loss. The APC Δex mouse strain is a well-studied mouse model of human colorectal cancer and cancer cachexia. The branched-chain amino acid leucine is known to stimulate muscle growth/maintenance through activation of mTOR and protein synthesis.

**PURPOSE:** To examine the effects of chronic leucine supplementation on cancer cachexia development in APC Δex mice. **METHODS:** 7 APC Δex mice (APC) and 11 wild-type (WT) were used for this study. The animals were assigned to the following groups: WT no leucine (WTNL, n=5), WT leucine (WTL, n=5), APC Δex no leucine (APCΔNL, n=5) and APC Δex leucine (APCL, n=2). Mice were given ad libitum access to food and water. Mice in the leucine groups received 1.5% leucine-rich water. Plantaris muscles and tibias were excised at 20 weeks of age. Tissue was immediately frozen for morphology and gene expression analysis using RT-qPCR.

**RESULTS:***

- The number of polyps increased in APCΔMin/ + compared to WT (46.57 ± 2.44 vs. 0.00 ± 0.00). The number of polyps < 1 mm was increased (1.63 ± 1.83 vs. 2.09 in APCL compared to APCNL (p<0.05). There was a main effect for APCΔMin/ + to have lower body mass than WT (p<0.0001).
- There was a main effect of genotype to decrease plantaris weight/tibia length in APCΔMin/ + mice vs. WT mice (p<0.0001) and a main effect of leucine to decrease plantaris weight/tibia length in APCΔMin/ + mice, which appeared to be driven by the APC Δex (interaction p<0.05).
- There was an ~8-fold increase in atrogin-1 gene expression in APCΔMin/ + compared to WTNL (p<0.05). Atrogin-1 gene expression was ~7-fold lower in APCL compared to APCNL (p<0.05).
- There was a main effect of genotype to increase MuRF1 expression in APCΔMin/ + mice compared to WT (p<0.05) and a main effect of leucine to decrease MuRF1 expression (p<0.05) which appeared to be driven by the APC genotype (interaction p=0.056).
- No difference was found in MyoD or Myogenin gene expression.

**CONCLUSION:** The preliminary data suggest deleterious effects of leucine in cancer cachexia, which need to be affirmed by further studies. Based on gene expression of the E3 ubiquitin ligases, this loss in muscle mass may be independent of protein degradation.

Supported by the Arkansas Biosciences Institute.

**Board #46**

**May 30 2:00 PM - 3:30 PM**

**Skeletal Muscle Antioxidant Antioxidant Capacity Correlates With Both Oxidative And Glycolytic Profile In Trained Women Athletes**

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(No relevant relationships reported)

Muscle antioxidant enzymes may be upregulated in parallel with increased exercise training status and capacity for reactive oxygen species (ROS) formation. **PURPOSE:** To examine associations between antioxidant protein expression and different physiological markers of endurance exercise in trained women athletes. **METHODS:** Seventeen competitive women soccer players (age: 23±4 yrs; height: 166±5 cm, body weight: 62±3 Kg; VO2 max: 56±5 l m 1 min−1 kg−1) participated. Participants had a muscle biopsy taken from vastus lateralis, which was analyzed for protein expression of superoxide dismutase 1 and 2 (SOD1 and 2), several metabolic enzymes and muscle fiber type profile. Participants also performed a VO2 max test, a repeated sprint test (RST), as well as the Yo-Yo Intermittent Endurance test, level 1 (YYIE1) and Recovery test, level 1 (YYR1). Inter-individual relationships between selected variables were analysed using Pearson’s product–moment correlation coefficients. **RESULTS:** VO2 max and SOD2 correlated (r=0.05) with VO2 max explaining 2% of the variance in SOD2 protein expression. Myosin Heavy Chain 1 (MHC1) and Ila (MHCila) explained 2% and 2% , respectively, of the variance in SOD2 protein. Oxidative enzymes such as citrate synthase, isocitrate dehydrogenase and cytochrome
c-oxidase correlated (P < 0.05) with SOD2 explaining 2431 ± 16% of the variance, respectively. Finally, SOD2 protein expression correlated (P < 0.05) to monocarboxylate transporter 4 (MCRT4) and phosphofructokinase (PFK; P < 0.01). No statistical relationship was observed between SOD2 protein and neither Na+-K+ ATPase subunits, Na+/H+ exchanger, Acetyl-CoA carboxylase, PECAM-1, nor YYY1E, YYY1R and RST performance. SOD1 protein expression displayed an inverse correlation with MHCIIa (r = 0.6; P < 0.05), but did not correlate with any other variable assessed in muscle or physical capacity. CONCLUSIONS: Skeletal muscle antioxidant capacity associates with markers of endurance exercise such as maximal aerobic power, type I and IIa muscle fibers, and mitochondrial function. However, strong relationships were additionally observed between antioxidant profile and lactate production as well as transport capacity, supporting a link between lactate and ROS generation.

Satellite cells drive skeletal muscle regeneration in response to injury, a process regulated by factors released into the local muscle environment. However, the cellular sources of this trophic support are poorly defined. In this regard, recent work on skin and bone repair has revealed a surprising supportive role for cells termed “senescent cells” which are commonly associated with aging and pathology. However, the role of senescence in skeletal muscle repair is currently unknown. The purpose of this study is to determine the presence and contribution of senescent cells in skeletal muscle repair following acute injury. METHODS: The tibialis anterior (TA) of C57BL/6 mice was injured with cardiotoxin (CTX) and collected 5, 7, 10, 14, and 21 post-injury for histological/immunohistochemical (IHC) and gene expression analysis. To examine the function of senescent cells during muscle repair, mice were treated with a senolytic compound (ABT-263) following injury to selectively ablate senescent cells. RESULTS: Senescent cell number (as revealed using the senescence-associated beta-galactosidase (SA-β-gal) assay) increased significantly following injury (P < 0.05) and returned to baseline by day 21 post-injury, a time-course that is coincident with the repair process. In agreement with this, CR analysis of putative senescence pathways including p66Shc, p53 and p16 as well as secreted factors commonly secreted by senescent cells such as IL1 and MMP13 were significantly upregulated in injured compared to control tissue (P < 0.05). Preliminary IHC analysis demonstrated that at 5a post-injury, 5% of senescent cells were positive for macrophage marker F4/80, while 10% of post-injury, 8% of senescent cells were F4/80+ and 9% were CD31 positive; an endothelial cell marker. Identification of other cell types is under investigation. Senolytic therapy was effective at removing senescent cells as a significant 44% reduction in the number of SA-β-gal+ cells was observed, the consequence of which on muscle repair are currently under analysis. CONCLUSION: Senescent cells are a newly identified component of the muscle repair environment which may influence skeletal muscle repair and satellite cell function. Supported by NSERC discovery grant and The Canadian Foundation for Innovation and ACOA.

Stress proteins protect skeletal muscle from internal and external stress. Heat shock proteins respond to temperature, exercise and oxidative stress. Cold shock proteins respond to temperature, hypoxia in animals or in cell cultures but have not been studied in humans. The response of cold shock proteins to exercise and physiologically-relevant environmental temperature in human skeletal muscle is not known. PURPOSE: The purpose of this study was to determine the early mRNA response of human cold shock and heat shock stress proteins to endurance exercise and environmental temperatures. METHODS: Seven recreationally trained males (age: 24 ± 1.2 years; height: 1.8 ± .1 m; weight: 81 ± 7 kg; VO2peak: 2.27 ± 0.23 fold higher 3 h post-exercise (P = 0.002) but was not significantly different between temperatures (P = 0.103). HSPB2, HSP90, and HSF1 mRNA did not change from pre- to post-exercise (P = 0.03, P = 0.234, P = 0.795) and were not different between temperatures (P = 0.247, P = 0.134, P = 0.080). CONCLUSIONS: These data indicate that exposure to mild heat and cold during aerobic exercise have limited effect on the skeletal muscle mRNA expression of heat shock and cold shock proteins. However, this novel study found cold shock protein mRNA of skeletal muscle decreases, whereas HSP90 mRNA increases in response to a low to moderate intensity aerobic exercise bout. Supported by the National Institute for General Medical Science, Nebraska IDEA Networks for Biomedical Research Excellence (INBRE), and the University of Nebraska at Omaha Committee on Research and Creative Activity.

Cancer cachexia is a life-threatening paraneoplastic condition characterized by unintended weight loss and skeletal muscle atrophy. Recent frameworks describe cancer cachexia as a systemic disease in which several non-muscle organs are reprogrammed or remodeled. The liver exerts major control over systemic metabolism yet has been relatively unexplored in cancer cachexia. Previous reports indicate loss of oxidative phosphorylation efficiency (OXPHOS) in the cancer cachexia liver, through currently undefined mechanisms. PURPOSE: To investigate mitochondrial Ant2 and Ucp2 expression in the liver during colon-26 tumor-induced cachexia, and their relationship to OXPHOS coupling efficiency. METHODS: Balb/c mice (10 wks) were assigned to receive an injection of sterile PBS or 10⁶ colon-26 (C26) tumor cells. Tissues were collected from PBS-injected weight-stable mice (PBS-W), C26mice that were weight-stable (C26 WS), and C26 mice with moderate (10% weight loss, C26 MOD) and severe cachexia (20% weight loss, C26 SEV) (n = 4 per group). The liver was analyzed by high-resolution respirometry and immunoblotting to determine mitochondrial respiration and protein expression, respectively. Citrate

Abstracts were prepared by the authors and printed as submitted.
Additional studies are needed to show the precise contribution of the SNPs on aerobic leptin levels, but not aerobic capacity, in response to intense physical exercise. 

PURPOSE: Herein, we sought to compare measurements of whole-body fat free tissue mass (FFTM) determined by a new standing bioimpedance spectroscopy exposure.

PURPOSE: The aim of the present study was to determine the association between single nucleotide polymorphisms (SNPs) in the leptin (LEP) and leptin receptor (LEPR) genes, and body composition, plasma leptin levels, and aerobic capacity in response to intense exercise.

METHODS: Male Brazilian Army cadets (n=18; 21.6 ± 0.4 kg) were genotyped for the LEP (rs2118) A > G and LEPR (rs7799039) G > A (n=38) polymorphism. Plasma leptin, anthropometric, hormonal and aerobic capacity parameters were measured after an intense military exercise.

RESULTS: Sixty-seven percent of participants were classified as having superior aerobic capacity in response to 48 h of intense exercise.

CONCLUSIONS: Polymorphism in the leptin promoter gene may influence plasma leptin levels, but not aerobic capacity, in response to intense physical exercise. Additional studies are needed to show the precise contribution of the SNPs on aerobic capacity.

Dual energy X-ray absorptiometry (DXA) determined lean tissue mass has long been regarded as a criterion method for determining and monitoring changes in whole body and appendicular skeletal muscle mass. However, its utility is limited and restrictive due to patient size limitations, cost, specialized operator training and patient radiation exposure. PURPOSE: Herein, we sought to compare measurements of whole-body fat free tissue mass (FFTM) determined by a new standing bioimpedance spectroscopy (BIS) device as well as DXA before and after six weeks of progressive resistance training.

METHODS: Twenty-three resistance-trained males (mean ± SD: age, 21.6 ± 2.8 years; weight: 80.7 ± 13.3 kg) underwent six weeks of resistance training. DXA (Lunar Prodigy IDX A, G.E.) and BIS (SOZO, ImpediMed Inc.) were administered pre and post-intervention with participants in a fasted and normally-hydrated state wearing a t-shirt and athletic shorts for determination of whole body FFTM. Agreement between methods for determination of whole body FFTM at each time point and across time were determined by Bland and Altman plot analysis (mean difference and 95% limits of agreement). Bivariate linear regression analysis and dependent samples t-tests with statistical significance set at p<0.05.

RESULTS: Concordance between FFTM determined by DXA and BIS was excellent across time and between methods (r=0.96, p<0.001) between DXA and BIS-derived FFTM, both DXA and BIS-derived FFTM significantly increased following resistance training (p<0.001). Ant2 expression related inversely with RCR in the liver (r=-0.547, p<0.05). Ant2 expression related inversely with RCR in the liver (r=-0.547, p<0.05). Ant2 expression related inversely with RCR in the liver (r=-0.547, p<0.05).

CONCLUSIONS: DXA and BIS-derived FFTM values agree well with DXA-derived FFTM for single measurements as well as following resistance training-induced skeletal muscle hypertrophy and is an accurate and acceptable alternative to DXA.

BODY COMPOSITION AND INTEGRATIVE PHYSIOLOGY

Body composition has several implications for the overall health and performance of athletes. Changes in body composition can serve as indication of the physical demands of a competitive season as well as provide valuable feedback of the training adaptations from different training regimens. PURPOSE: To evaluate the pre- to post-season changes in body composition and maximal aerobic capacity in male (MXC) and female (WXC) Division I cross-country athletes. METHODS: Eleven MXC (age: 18.1 ± 1.9 years; body fat: 20.7% ± 6.1%) and 13 WXC (age: 18.1 ± 1.9 years; body fat: 23.1% ± 6.2%) participated. Body composition (lean mass, LM; leg lean mass (LLM); fat mass, FM; body fat% and regional BMD) were measured pre- and post-season by DXA. Regional BMD of the total body, lumbar spine (L1-L4), hip (femur), LM and FM were obtained for analysis. The appendicular skeletal muscle mass adjusted by square red height (ASM index, kg/m²) and the lean mass index (LM1 = (LM-post - LM-pre)/6) were calculated to assess body composition changes. A self-paced maximal oxygen uptake test was used to assess aerobic capacity. Participants completed 2-5 min stages at a self-selected speed for each stage corresponding to ratings of perceived exertions of 11, 13, 12/10 m. ANOVAs were used for analysis with significance accepted at 0.05.

RESULTS: Total body LM increased significantly in both MXC and WXC, with MXC increasing to greater extent than WXC (+1.37 ± 0.9 vs +0.56 ± 0.9 kg; p<0.05). The ASMI and LM1 increased significantly in both MXC and WXC from pre- to post-season (p<0.05), with no differences between genders. Further, the LM1 did not differ between groups (+2.15 ± 3.9 vs +1.33 ± 3.7 kg). There were no gender by time and no effects for FM, body fat% and regional BMD. There were no pre- to post-season changes in VO2max for both MXC (3.3 ± 0.7 l/min) and WXC (3.9 ± 0.9 l/min). CONCLUSIONS: Results suggest highly trained cross-country athletes experience positive changes in total and regional LM with no changes in FM, body fat% and BMD. Acrobic capacity was maintained across the season despite increases in LM. Results highlight the seasonal changes in body composition in collegiate distance runners that may influence strength and conditioning coaches and athletic trainers.

Low Carbohydrate Diet On Body Composition Of Trained Crossfit Individuals

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No relevant relationships reported

Effects of low carbohydrate diet on body composition of trained Crossfit individuals
PURPOSE: To evaluate the influence of low carb diet on body composition of trained individuals. Methods: Twenty-eight CrossFit practitioners (M:13, W:15; age range: 19-59 years) followed a personalized diet plan for 2 months. The diet had 2% of energy from carbohydrate, 6% of energy from fat and 23% of energy from protein, and consisted of 5% daily protein eal per day, comprising mainly of fruits and vegetables, complex carbohydrates (cereals and tubers) and animal proteins (red meat limited to 3 times/week). The body weight was measured to the nearest 0.01 kg using electronic scales and body composition (including percent body fat, muscle, and fat mass) was evaluated by portable ultrasound during the days 1, 30 and 60 of the dietetic program. The collected measures were chest, triceps, subscapular, medial axillary, suprailiac, abdomen and medial thigh. The equations developed by Jackson and Pollock were used for the calculation of body density. Waist and hip circumference were also measured. Samples were tested for normal distribution and groups were compared by either paired Student’s t-test or Mann-Whitney test. The type 1 error was set at p<0.05. Results: There was a significant reduction in body weight and hip circumference after 30 (weight: 4.8 ± 8.6 lbs; p<0.001; hip circumference: 10.8 ± 2.3 vs 10.5 ± 2.3, p=0.007) and after 60 days (weight: 9.1 ± 10.8 lbs; p<0.001; hip circumference: 10.6 ± 2.3 vs 10.3 ± 2.3, p=0.007) of dietary intervention. Additionally, was observed a significant reduction of total fat and %body fat after 30 (total fat: 23.8 ± 16.4 vs 20.4 ± 14.8 lbs; p=0.005, % body fat: 23.8 ± 10.5 vs 21.5 ± 8.5, p<0.001) and after 60 days (total fat: 23.8 ± 16.4 vs 19.9 ± 15.5, p<0.001; % body fat: 25.6 ± 10.5 vs 20.0 ± 8.5, p<0.001) and a significant gain of body-fat free mass after 60 days (4.8 ± 6.8 lbs; p<0.001). When subgroup analyses were performed by sex, it was found that the relative loss of body fat was similar. Thus, there was no difference between lean mass gain between men and women. Conclusion: The low carbohydrate diet promoted body weight, total fat and % body fat reduction and fat-free mass gain, independently of sex, after 30 and 60 days, in trained Crossfit individuals.
Effect Of Ballet Dance On Knee Joints Muscle Strength Based On The Isokinetic Research

Rou Wen, Jingjing Xue, Yanjing Ren, Mi Zhang, Jing Li. Beijing Dance Academy, Beijing, China. 'China Institute of Sport Science, Beijing, China.

PURPOSE: Several researches have revealed that dance training increases muscle strength. By comparing the muscle strength of knee joints of ordinary college students with ballet dance students, the differences between the two groups were analyzed and the influence of dance on muscle strength was explained.

METHODS: 48 college students volunteered to participate in the study. Experimental group consisted of 24 ballet students (12 male, 21.5 ± 0.9 years; 12 female, 20.9 ± 0.8 years); control group consisted of 24 non-dance students (12 male, 21.6 ± 0.9 years; 12 female, 20.6 ± 0.8 years). German ISOMED2000 isokinetic test device was used to test the knee joint strength of all participants, with the concentric contraction test going for 2 rounds and following the eccentric contraction test, with the testing angular of 60°/s, 180°/s. The test variables include peak torque, relative peak torque and the peak torque ratio of flexion and extension.

RESULTS: The result showed that the female and male ballet students have significantly higher peak torque (N m) and relative peak torque (N m/Kg) at all angular of knee flexion and extension compared to the non-dance students. All peak torque of the flexion/extention is 60°/s and 180°/s: 81.805 ± 10.84 vs. 5.7 ± 2.13, nd = 0.52, t(22) < 0.01. All peak torque extension at 60°/s and 180°/s: 178.335 ± 25.88 vs. 124.2 ± 19.54 and 128.465 ± 14.96 vs. 92.505 ± 16.41; both p < 0.01. All relative peak torque flexion at 60°/s and 180°/s: 2.9 ± 0.3 vs. 1.7 ± 0.3 and 0.8 ± 0.1 vs. 0.6 ± 0.1; both p < 0.01. All relative peak torque extension at 60°/s and 180°/s: 2.34 ± 0.43 vs. 2.17 ± 0.38 and 2.04 ± 0.25 vs. 1.61 ± 0.28; both p < 0.01. However, there is no significant difference in peak torque ratio of flexion and extension between two groups (P > 0.05).

CONCLUSIONS: The results indicated that long-term ballet training can obviously improve the control strength and outbreak power of knee flexion and extension. Ballet training leads to a balanced effect impact on hamstring and quadriceps, which helps to avoid knee injuries and improve the dance movements.

Acknowledgement: This work was supported by Beijing philosophy and social science foundation research (Grants No.14 DWYB011).

Kyeongtak Song, Troy Blackburn, Erik A. Wikstrom, FACSM. Board #58 May 30 2:00 PM - 3:30 PM

Elongation During Initial Phase Of Explosive Power Exertion

Chihiro Edamatsu, Tomiko Odagaki, Kazuki Kusumoto. Kurashiki University of Science and the Arts, Kurashiki, Japan.

PURPOSE: The sharp rise of the ground reaction force due to high pre-activation of muscles upon drop jump (DJ) contributes to increases in the reactive strength index (RSI). In our previous studies, in a comparison between athletic long jumpers and general men, the long jumper showed a significant increase in Achilles tendon tissue elongation immediately after DJ contact due to high pre-activation of the gastrocnemius muscle. In this study, we aimed to clarify the influence of plyometric training on Achilles tendon tissue elongation dynamics immediately after DJ contact.

METHODS: Five men (age, 21.0 ± 0.7; height, 122.2 ± 2.6 cm; weight, 83.8 ± 3.9 kg) volunteered to participate in this study. The subjects were asked to undergo plyometric training (maximum hopping 10 reps × 3 sets, 3 times a week, 12 weeks).

RESULTS: The RSI increased significantly after training (1.89 ± 0.35) and after detraining (1.08 ± 0.63) compared to that before training (1.08 ± 0.48). The elongation of Achilles tendon tissue immediately after the grounding of DJ was significantly increased by training (+ 2.99 ± 2.36 mm), and the training effect disappeared after detraining (− 0.23 ± 2.50 mm). On the other hand, there was no significant effect on the maximum elongation of tendon tissue in the push-off phase. In other words, the elongation of tendon tissue during the initial phase of explosive power exertion is more important than the maximum elongation of the tendon tissue.

CONCLUSIONS: Plyometric training increases tendon tissue elongation immediately after the DJ grounding and increases the RSI. These results suggest that the increase in tendon tissue elongation during the initial phase is one of the factors to increase explosive power exertion.

Chihiro Edamatsu, Tomiko Odagaki, Kazuki Kusumoto. Board #59 May 30 2:00 PM - 3:30 PM

Plyometric Training Increases Achilles Tendon Tissue Elongation Elasticity Immediately after Drop Jump Contact

Chihiro Edamatsu, Tomiko Odagaki, Kazuki Kusumoto. Kurashiki University of Science and the Arts, Kurashiki, Japan.

Purpose: To clarify the influence of plyometric training on Achilles tendon tissue elongation immediately after drop jump (DJ) contact.

Methods: Five men (1,89 ± 0.35) and after detraining (1,08 ± 0.63) compared to that before training (1,08 ± 0.48). The elongation of Achilles tendon tissue immediately after the grounding of DJ was significantly increased by training (+2,99 ± 2,36 mm), and the training effect disappeared after detraining (−0,23 ± 2,50 mm). On the other hand, there was no significant effect on the maximum elongation of tendon tissue in the push-off phase. In other words, the elongation of tendon tissue during the initial phase of explosive power exertion is more important than the maximum elongation of the tendon tissue.

Conclusions: Plyometric training increases tendon tissue elongation immediately after the DJ grounding and increases the RSI. These results suggest that the increase in tendon tissue elongation during the initial phase is one of the factors to increase explosive power exertion.
Regional Activation of Supraspinatus, Infraspinatus and Periscapular Musculature during Strengthening Exercises with Elastic Bands

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(No relevant relationships reported)

PURPOSE: Strengthening of the rotator cuff and periscapular muscles is crucial for appropriate neuromuscular control of the mobile glenohumeral and scapulothoracic joints. The aim of the current study was to quantify and compare the regional activation of supraspinatus (SUP), infraspinatus (INF) and some periscapular muscles during shoulder strengthening exercises with elastic bands.

METHODS: 23 right handed healthy volunteers (22.5 ± 2.7 years old) were recruited. Four fine wire electrodes were inserted into the anterior and posterior regions of SUP and the superior and middle regions of INF under ultrasound guidance. Four paired surface electrodes collected data from the upper, middle and lower trapezius and serratus anterior (UT, MT, LL, SERR respectively). Participants performed four resistance exercises (in Y, T, W and L postures) with elastic bands while maintaining good form and cadence. Kinematics were recorded synchronously by Vicon motion tracking system. Electromyography values were presented as % of maximal voluntary isometric contraction (MVIC) and compared across exercises using ANOVA.

RESULTS: Rotator cuff and periscapular muscles showed similar activation profiles throughout the Y, T, W and T exercises. The peak activation of SUP anterior occurred in 20% of L exercise cycle while for other regions it occurred in 0 - 6% of time cycle. Mean activations of all rotator cuff partitions were over 40% MVIC during four exercises, except middle INF during T exercise (28% MVIC). LT was activated >80% MVIC during all four exercises, with no significant differences across exercises while MT was significantly more active in T exercise. The activations of SERR and UT were significantly higher during Y exercise. CONCLUSIONS: YT WI exercises induced moderate to high activation in supraspinatus and infraspinatus partitions, and very high activation in lower trapezius. These exercises are appropriate for strengthening of some rotator cuff and periscapular muscles and can potentially be useful for rehabilitation of scapular dyskinesia and shoulder impingement. However, caution should be taken while prescribing Y exercise for these pathologic conditions as this exercise may induce high activation in UT. Providing additional strengthening exercises for SERR to this exercise package is recommended.

Bi-articular muscles play an important role to smooth movement in human. However, the biomechanics and physiological function of those muscles is unclear. Thus, this study investigates the function of rectus femoris as a famous bi-articular muscle in lower limbs.

PURPOSE: The purpose of this study is to unravel the compartment neuromuscular activation in rectus femoris during isometric knee extension and hip flexion in different knee angles.

METHODS: Subjects were eight healthy men. Knee extension with hip flexion were performed in isometric contraction. Knee angle was set up at 0, 60, 90 and 120 degree. Also, there were three contractions as follow: Maximum voluntary contraction (MVC), 8% MVC and 3% MVC. Muscle activation of rectus femoris was measured by using multi-channel surface electromyography, and calculated the average rectified value (ARV). We evaluated the ARV of rectus femoris divided into proximal, medium and distal compartment. We evaluated the ARV of rectus femoris divided into proximal, medium and distal compartment.

RESULTS: In the proximal region at 30 degrees knee angle, averaged ARV value in the MVC (0.113 mV) was significantly higher than those of other two contraction groups (8% MVC: 0.07 mV, p<0.05; 3% MVC: 0.03 mV, p<0.01 vs MVC). There was no significant differences in ARV's both in medium and distal compartiments.

CONCLUSIONS: Proximal region of rectus femoris has the role of knee extension and hip flexion in slightly flexed knee joint position. We conclude that the difference of knee angle affects the compartment neuromuscular activation in rectus femoris.

Effect of neuromuscular training on rate of force development and joint stability.

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(No relevant relationships reported)

INTRODUCTION

Shoulder pain is a common orthopedic ailment, with multiple potential sources of pain and dysfunction. A combination of treatments may be used. While treatment has generally shown to be effective, it does not resolve the syndrome for all patients.

PURPOSE To determine the effect of a standardized treatment protocol on the neuromechanics of the shoulder. It is hypothesized that rotator cuff activation will increase with both pain relief and physical therapy.

METHODS

Seven subjects, who were diagnosed with subacromial impingement, and seven healthy controls were recruited. At the first testing session, the subject was instrumented with six surface electromyography sensors and two fine-wire sensors. Subjects elevated their arm in the scapular plane, while kinematics and EMG were recorded synchronously by Vicon motion tracking system. Electromyography values were presented as % of maximal voluntary isometric contraction (MVIC) and compared across exercises using ANOVA.

RESULTS: Rotator cuff and periscapular muscles showed similar activation profiles throughout the Y, T, W and T exercises. The peak activation of SUP anterior occurred in 20% of L exercise cycle while for other regions it occurred in 0 - 6% of time cycle. Mean activations of all rotator cuff partitions were over 40% MVIC during four exercises, except middle INF during T exercise (28% MVIC). LT was activated >80% MVIC during all four exercises, with no significant differences across exercises while MT was significantly more active in T exercise. The activations of SERR and UT were significantly higher during Y exercise. CONCLUSIONS: YT WI exercises induced moderate to high activation in supraspinatus and infraspinatus partitions, and very high activation in lower trapezius. These exercises are appropriate for strengthening of some rotator cuff and periscapular muscles and can potentially be useful for rehabilitation of scapular dyskinesia and shoulder impingement. However, caution should be taken while prescribing Y exercise for these pathologic conditions as this exercise may induce high activation in UT. Providing additional strengthening exercises for SERR to this exercise package is recommended.

Bi-articular muscles play an important role to smooth movement in human. However, the biomechanics and physiological function of those muscles is unclear. Thus, this study investigates the function of rectus femoris as a famous bi-articular muscle in lower limbs.

PURPOSE: The purpose of this study is to unravel the compartment neuromuscular activation in rectus femoris during isometric knee extension and hip flexion in different knee angles.

METHODS: Subjects were eight healthy men. Knee extension with hip flexion were performed in isometric contraction. Knee angle was set up at 0, 60, 90 and 120 degree. Also, there were three contractions as follow: Maximum voluntary contraction (MVC), 8% MVC and 3% MVC. Muscle activation of rectus femoris was measured by using multi-channel surface electromyography, and calculated the average rectified value (ARV). We evaluated the ARV of rectus femoris divided into proximal, medium and distal compartment. We evaluated the ARV of rectus femoris divided into proximal, medium and distal compartment.

RESULTS: In the proximal region at 30 degrees knee angle, averaged ARV value in the MVC (0.113 mV) was significantly higher than those of other two contraction groups (8% MVC: 0.07 mV, p<0.05; 3% MVC: 0.03 mV, p<0.01 vs MVC). There was no significant differences in ARV's both in medium and distal compartiments.

CONCLUSIONS: Proximal region of rectus femoris has the role of knee extension and hip flexion in slightly flexed knee joint position. We conclude that the difference of knee angle affects the compartment neuromuscular activation in rectus femoris.
The gluteus maximus (Gmax) and medius (Gmed) have shown altered strength and activation in patients with patellofemoral pain (PFP) and have been addressed commonly in rehabilitation programs. However, the relationship between strength and a visual method of notifying muscle activation through ultrasound imaging has not been explored. PURPOSE: To determine relationships between muscle thickness (at rest and during contraction) and strength using hand-held dynamometry of the Gmax and Gmed in various positions (side-lying, bipedal stance, unipedal stance) before and after a 4 week impairment-based rehabilitation program. METHODS: 19 patients with PFP (23.7± 4.8yrs, 168.7± 6.8cm, 69.6± 15.1kg, 14F ) completed 12 sessions of supervised impairment-based rehabilitation focused on lower extremity range of motion, strength, functional movement, and core stability. Ultrasound imaging and activation in patients with patellofemoral pain (PFP) and have been addressed.

RESULTS: There were no significant relationships found between strength and muscle thickness at the pre-rehabilitation session. Following rehabilitation, both Gmax and Gmed exhibited significant relationships between strength and muscle thickness during side-lying positions. For Gmax, side-lying at rest, there was a moderate relationship (r=0.6, p<0.03) and during side-lying hip abduction (r=0.6, p<0.03). Gmed revealed similar relationships following rehabilitation with side-lying at rest (r=0.6, p<0.03) and during hip abduction (r=0.6, p<0.03). CONCLUSION: Muscle thickness, as captured with ultrasound imaging, increases as strength increases for both the Gmax and Gmed in individuals with PFP, while side-lying, and only following rehabilitation. The strongest relationship was found in the Gmed, which is supported by the positioning being the same for both thickness and strength measures. The concentric nature of the Gmed contraction during side-lying hip abduction could also be a major contributor to this relationship.

Exercise adherence and physical activity can be difficult to measure. Current methods often rely upon self-report surveys which are susceptible to error. Machine learning methods can be applied to biomechanical data to classify and identify activity. Each exercise has a unique “fingerprint” of biomechanical data in that there is a unique combination of motion in each joint. Inertial measurement units (IMU) can move biomechanical analysis from the lab to real world environments allowing for more ecologically valid measurements. PURPOSE: The purpose of this study is to develop a machine learning algorithm for classifying nine different upper extremity exercises, based upon biomechanics captured from an IMU-based device. METHODS: 0 participants (mean age = 21.96 yrs) were recruited. Participants performed one compound and eight isolation exercises with their right arm while wearing the device. Each exercise was performed ten times for a total of 80 trials. The device consists of a small, self-contained computer and four 3-axis IMUs. IMUs were placed on the hand, forearm, upper arm, and torso. Joint angles were calculated using relative rotations between pairs of IMUs. A modified Hampel filter and Savitzky-Golay filter were applied to remove outliers and noise. Random Forests were trained on 0% of the data and tested on the remaining 0%. RESULTS: The model performed well with an overall classification accuracy of 92.4%. Figure 1 shows the class confusion matrix where the numbers represent the proportion of true cases that were predicted. CONCLUSION: The results suggest upper extremity exercises can be classified using biomechanics data captured with a novel IMU-based device. These findings set the basis for more objective activity logs which can be used for measuring exercise adherence, physical therapy, and physical activity levels. Ultimately, the device may be used to create activity profiles for health screening and health status.
Improper posture including forward head, rounded shoulder and scapular dyskinesis has been linked to neck and shoulder pain. Treatment for forward head posture (FHP), rounded shoulder posture (RSP), and scapular dyskinesis has consisted of an exercise protocol. Kinesiophobia (KT) has recently emerged as a treatment method but there is a lack of research on the effectiveness, or whether exercise or KT is better than the other. **PURPOSE:** To compare a KT intervention to a strengthening and stretching program for correction of FHP, RSP, and scapular dyskinesis in a healthy, non-athletic, college age population. **METHODS:** Twenty healthy college-aged subjects with forward head, rounded shoulder posture and scapular dyskinesis completed the study. There were 10 subjects (T emales, 3 males, 20-30 yrs, ht-174 cm, wt-70-139 kg) in the exercise group and 10 subjects (T emales, 3 males, 20.0± 1.8 yr, ht-168± 11.9 cm, wt-70± 13.9 kg) in the KT group. Subjects were randomized into two intervention groups undergoing a four-week program. One group participated in a strengthening and stretching exercise protocol (EG) based on the current literature, while the other group had KT applied to the upper back and shoulders for a duration of five days with two days of no tape in a seven-day period. Pre-and post-test measurements included the craniovertebral angle (CVA) in degrees, forward shoulder angle (FSA) in degrees, and scapular dyskinesis as assessed using scapular dyskinesis scoring (0-3, maximum combined score = 8 for each scapula).

**RESULTS:** There was a significant time main effect for the scapular dyskinesis score (SDS) as both groups improved pre-to-post intervention (F=122.95, P<0.01; EG=11.94 vs 5.3±0.94, KT=4.10±0.59 vs 4.9±1.01). Time effect sizes were small to moderate for CVA (KT=13 to EG=5), RSA (EG=13 to KT=7) and SDS (EG=4 to KT=5) in both groups. Group effect sizes were small for CVA (0.24), RSA (0.25) and SDS (0.38). Minimal-detectable-change-scores were achieved for the CVA (EG=3.6, KT=8) and SDS (EG=8, KT=8) for both groups, indicating clinical improvement. No other results were significant. **CONCLUSIONS:** Both groups improved pre-to-post intervention for the three measurements, even though only SDS was significant. Thus, either treatment could be used.

**D-60**

**Effects Of An Exercise And Kinesiophobia Intervention On Forward Head/Rounded Shoulder And Scapular Dyskinesis**

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(No relevant relationships reported)

**PURPOSE:** To investigate the role of attentional focus on force output by assessing 1) force output during maximal voluntary elbow flexion contractions, 2) corticospinal excitability and 3) motor unit activation patterns.

**METHODS:** A group of 70 resistance-trained males completed two experimental sessions. Each session consisted of 12 maximum voluntary contractions (MVC) with 18s rest of recovery between MVC. Participants were given counter-balanced external and internal attentional focus conditions prior to each MVC to direct attention. Force output and electromyography (EMG) of the biceps brachii, brachioradialis were recorded for both sessions. Transcranial magnetic stimulation, transmastoid electrical stimulation, and brachial plexus electrical stimulation were used to produce motor evoked potentials (MEPs), cervicalmedullary motor evoked potentials (CMEPs) and maximal M-waves (Mmax) in the biceps brachii during each MVC in one of the two sessions. All MEPs and CMEPs were normalized to Mmax.

**RESULTS:** Forces produced during the stimulation sessions were not significantly different between external and internal focus conditions (P = 0.20). However, forces produced during the non-stimulation session were 19% higher with an external cue compared to internal cues (P < 0.05). As well, forces produced with external cues were 13.2% greater during the non-stimulation session compared to the stimulation session. (p<0.05). EMG activity was not found to be significantly different between attention focus cues (p=0.1).

**CONCLUSIONS:** The usage of stimulation technique likely distracted participants from the attentional focus cues provided during the stimulation session. Therefore, we were unable to successfully assess changes in corticospinal excitability between focus cues. However, we were still able to show that external cues direct greater force production of the elbow flexors compared to internal cues.
influence of PA intensity and body composition on CRF appear to differ by sex, a consideration for future PA interventions in this population. Supported in part by NIH grant DE11948.

1917 Board #73 May 30 3:30 PM - 5:00 PM Effects of Exergaming on Motor Skill Competence, Perceived Competence, and Physical Activity in Preschool Children

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No relevant relationships reported

PURPOSE: Few school settings offer structured physical activity (PA) opportunities for preschool children, with little study conducted examining exergaming’s effectiveness on health outcomes in this age group. This study’s purpose, therefore, was to examine a school-based exergaming intervention’s effect on preschool children’s perceived competence, motor skill competence and PA versus usual care (recess), as well as examine gender differences for these outcomes.

METHODS: Sixty-five preschoolers (33 girls; age: 4.4± 0.6 yrs; BMI percentile = 59.0± 32.04) were recruited from 2 underserved urban elementary schools in a Midwestern U.S. state and then assigned to 1 of 2 conditions, with school as experimental unit: (1) usual care recess group (66 girls, 50 girls ± 32.04 min) and (2) exergaming intervention group (66 girls, 50 girls ± 32.04 min). School-based exergaming/week. All children underwent identical perceived competence, motor skill competence and moderate-to-vigorous PA assessments at baseline and at the end of the 8th week. A multivariate analysis of variance with repeated measures was employed to examine preschool children’s changes in perceived competence, motor skill competence and MVPA over time.

RESULTS: A significant Group by Time effect was observed for MVPA (F(1, 52) = 26.8, p < 0.01). There were no significant changes in perceived competence, motor skill competence or changes in MVPA across gender but boys showed a higher level of in-school MVPA (3.1 min/h vs 2.3 min/h, p < 0.01) and of in-school TPA compared to out-of-school MVPA (17.3 min/h vs 15.1 min/h, p < 0.01). There was no difference in out-of-school MVPA and TPA across gender but boys showed a higher level of in-school MVPA (3.1 min/h vs 2.3 min/h, p < 0.01) and TPA (18 min/h vs 16 min/h, p < 0.01) compared to girls.

CONCLUSION: Chinese elementary school children spent more time engaging in in-school PA compared to out-of-school PA with boys showing a higher level of in-school PA compared to their counterparts girls. Findings suggest that PA promotion strategies should focus on developing out of school, community-based programs and that maximizing school-based PA among young children.

1918 Board #74 May 30 3:30 PM - 5:00 PM The Effect of Extracurricular Coordinated Physical Education on the Development of Basic Motor Skills of Children aged 7-9 Years Old

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No relevant relationships reported

PURPOSE: The purpose of this study was to analyze the effect of the extracurricular physical education program through a 12-week-coordination on the development of basic motor movements for children of 7-9 yrs. ars.

METHODS: A sample of 120 children of the elementary school period, 62 of whom were in the experimental group, 62 of whom were in the control group, were recruited from 3 elementary schools in Shanghai, China. PA was measured in 5 consecutive school days by accelerometers. Minutes per hour (min/h) of moderate-to-vigorous PA (MVPA) and total PA (TPA) were calculated using established cut points. Children’s in-school and out-of-school MVPA and TPA were compared using paired t test. Gender differences in MVPA and TPA across the two study settings were also examined using independent t test.

RESULTS: Students (boys: 66 , mean age: 6.3 years, height:139.8± 6.1 cm, body mass index: 17.8± 2.9 kg/m2) provided valid accelerometer data (defined as ≥ 2 days, ≥10 h/day) and were included in the study. Results showed a higher level of in-school MVPA compared to out-of-school MVPA (3.1 min/h vs 2.3 min/h, p < 0.01) and of in-school TPA compared to out-of-school TPA (17.3 min/h vs 15.1 min/h, p < 0.01). There were no difference in out-of-school MVPA and TPA across gender but boys showed a higher level of in-school MVPA (3.1 min/h vs 2.3 min/h, p < 0.01) and TPA (18 min/h vs 16 min/h, p < 0.01) compared to girls.

CONCLUSION: Chinese elementary school children spent more time engaging in in-school PA compared to out-of-school PA with boys showing a higher level of in-school PA compared to their counterparts girls. Findings suggest that PA promotion strategies should focus on developing out of school, community-based programs and that maximizing school-based PA among young children.

1919 Board #75 May 30 3:30 PM - 5:00 PM Comparisons Of In-school And Out-of-school Physical Activity Among Chinese Elementary School Children

Zheng Zhu, Chen Sun, Sheng Zhao, Zhen-Bo Cao. Shanghai University of Sport, Shanghai, China.

No relevant relationships reported

PURPOSE: Relatively little is known regarding children’s physical activity (PA) during school and outside of school. Therefore, the objective of this study was to compare in-school and out-of-school PA among Chinese elementary school children.

METHODS: A cross-sectional study was conducted among 36 (4th grade) children recruited from 3 elementary schools in Shanghai, China. PA was measured in 5 consecutive school days by accelerometers. Minutes per hour (min/h) of moderate-to-vigorous PA (MVPA) and total PA (TPA) were calculated using established cut points. Children’s in-school and out-of-school MVPA and TPA were compared using paired t test. Gender differences in MVPA and TPA across the two study settings were also examined using independent t test.

RESULTS: A significant Group by Time effect was observed for MVPA (F(1, 52) = 26.8, p < 0.01). There were no significant changes in perceived competence, motor skill competence or changes in MVPA across gender but boys showed a higher level of in-school MVPA (3.1 min/h vs 2.3 min/h, p < 0.01) and TPA (18 min/h vs 16 min/h, p < 0.01) compared to girls.

CONCLUSION: Chinese elementary school children spent more time engaging in in-school PA compared to out-of-school PA with boys showing a higher level of in-school PA compared to their counterparts girls. Findings suggest that PA promotion strategies should focus on developing out of school, community-based programs and that maximizing school-based PA among young children.

1920 Board #76 May 30 3:30 PM - 5:00 PM Predictors of Return to a Childhood Healthy Eating and Active Living Obesity Clinic

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No relevant relationships reported

PURPOSE: To identify predictors of program retention among children enrolled in a multifacitorial obesity treatment clinic designed to support behavior change in physical activity and healthy eating to combat unhealthy weight levels.

METHODS: Children age 2-19yrs old (n = 232 attended a baseline visit at a childhood healthy eating and active living (CHEAL) clinic. Parents completed a behavioral survey and height, weight, blood cholesterol and blood glucose were objectively measured. Weight status was reflected as the Percent Over the 50th Percentile for age and sex based on CDC reference values (BMI). Survey items included questions about prenatal and infant history, family medical history, and eating and activity behaviors as well as desire to make changes and discuss nutrition-behaviors with a dietician. All survey and objective measures were first evaluated with univariate analysis (Chi-Square and t-test) to identify differences between Returners and Non-Returners. Variables identified as having a significant relationship with returning for a second clinic visit were then entered into logistic regression models using forward selection. Four different models were constructed, with Model 4 containing all variables that were significant in univariate analyses.

RESULTS: Significant variables in univariate analyses included BMI50, sex, age, baseline cholesterol, sugar sweetened beverage (SSB) consumption, willingness to meet with a dietician, and the mother gaining more than 5 pounds during pregnancy. In logistic regression, children who consumed SSB once per week were more likely to return for a second clinic visit than those consuming SSB every day (OR = 5.6 (95% CI: 1.9 –10.5) ) and older children were less likely to return than younger children (OR = 0.9 (95% CI: 0.8 –0.9)).

CONCLUSIONS: The predictors identified support theories associated with the importance of readiness for change (SSB consumption, willingness to meet with a dietician) and suggest that the associations between children are young may improve retention rates for clinic-based interventions targeting healthy weight or energy balance behaviors.
INTRODUCTION: Evidence for physical activity (PA) compensation (e.g., high PA leads low PA in another part of the day) and synergy (e.g., building on times of high PA with additional high PA) in school-aged youth has been reported, but has not been studied in preschoolers. PURPOSE: To determine if preschoolers exhibit evidence of compensation or synergy in indoor and outdoor PA during child care. METHODS: Children (N=6-34) in three preschools wore an accelerometer on their right hip for two school days. PA intensity was determined using Pate cutpoints (counts/16sec). A proximity tagging beacon was placed in each classroom, and children’s accelerometers acted as receivers. Lack of communication between beacons and receivers indicated that children were outdoors. Outdoor and indoor time (min/hr) in light, moderate, vigorous, and total PA was determined. Paired t-tests were used to identify if time in each intensity (for indoor/outdoor time) significantly differed between days (p<0.05). Difference in time in each intensity between days was calculated and Pearson correlations were performed to compare between-day changes in outdoor and indoor light, moderate, vigorous, and total PA (e.g., correlation between change in outdoor total PA vs. change in indoor total PA). Positive associations support synergy, while inverse associations support compensation. RESULTS: No differences in time in each intensity between days were found. Change in outdoor light (r=0.21, p=0.6), moderate (r=0.17 p<0.02), and total (r=0.14 p=0.19) PA were not significantly related to change in indoor light, moderate, and total PA, respectively. Change in outdoor vigorous PA was positively related to change in indoor vigorous PA (r=0.12, p<0.07). For total PA, children exhibited evidence of compensation and 4% exhibited evidence of synergy. For vigorous PA, 5% of children exhibited evidence of compensation, and 8% exhibited evidence of synergy. CONCLUSION: Results suggest that vigorous intensity exercise may be more synergistic in nature. The weak-to-moderate, negative correlations among light, moderate and total PA warrant further research of high PA with additional high PA) in school-aged youth has been reported, but has not been studied in preschoolers.

**Cardiovascular Risk Factors in Obese Children, while HIIT with Greater Improvement**

Evidence for cardiovascular risk factors in obese children, while HIIT with greater improvement than MICT did. The main difference between HIIT and MICT is that HIIT is more effective for PA peak (MD: 3.36 ml/kg/min, 95% CI 1.01 to 0.64; p=0.001). CONCLUSIONS: Our meta-analysis of randomized controlled trials indicates that both HIIT and MICT can significantly reduce cardiovascular risk factors in obese children, while HIIT with greater improvement observed in cardiopulmonary fitness.

**The Effectiveness Of Active Video Games And SPARK PE On Children's In-school Physical Activity**

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**Purpose:** Active video games (AVGs) is a technology tool that allows participants to engage in physical activity (PA) while playing video games. Research has shown that AVGs may serve as a “gateway” to increase individuals’ PA. A physical education (PE) curriculum, Sport, Play, And Recreation for Kids (SPARK), is also designed to promote students’ fitness and PA. The purpose of the study is to compare the effects of the two interventions (AVGs vs. SPARK PE) in increasing participants’ in-school moderate to vigorous PA (MVPA).

**METHODS:** Both third (n=293) for boys, n=312 for girls, mean age ± SD = 9 ± 0.64 (n=34), for boys, n=325 for girls, mean age ± SD = 10 ± 0.74 (n=34). Students in the SPARK PE group were taught by a student teacher who is familiar with SPARK K-6 curriculum. All participants were pre- and post-tested on their in-school PA for three days prior to and after the intervention using ActiGraph GT3X+. Everson’s cut points were applied to generate the percentage of time engaged in MVPA. A two-way mixed ANOVA was conducted to examine the effects of interventions (between-subjects) and time (within-subjects) on participants’ in-school MVPA percentage.

**RESULTS:** There was no significant main effect of time (F(1, 8) = 2, p > 0.05 partial η2 = 0.01) on participants’ in-school MVPA percentage. There was, however, a significant main effect of interventions (F(1, 8) = 23.5, p < 0.001, partial η2 = 0.27) on students’ in-school MVPA percentage, with SPARK PE group (mean = 3.9) had higher percentage than did the Kinect AVG group (mean = 2.7). In addition, there was no significant interaction between time and intervention groups (F(1, 8) = 1.6, p > 0.05 partial η2 = 0.03).

**CONCLUSIONS:** Neither Kinect AVG nor SPARK PE changed participants’ in-school MVPA percentage. The effect of PA interventions on children’s in-school MVPA need to be explored in future studies.

**The Effectiveness Of High-intensity Interval Training Versus Moderate-intensity Continuous Training On Cardiometabolic Risk Factors In Childhood Obesity: A Meta-analysis**

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**Purpose:** Evidence for PA compensation at these intensities; however, results should be further examined in future studies using a larger sample size. **Funding:** ACSM Foundation, MWACSM, NASPEM, SHAPE.

**The Effectiveness Of Active Video Games And SPARK PE On Children's In-school Physical Activity**

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**Purpose:** To identify significant predictors and assess the acceptability of shared physical activity (PA) in young children and their parents.

**Methods:** Twenty-eight parent-child dyads (mean±SD: age, parents: 38±6 years; 61±1.7 children) completed sessions in a fitness center that included five different shared PAs (brisk walking, dancing, tag games, body-weight exercises, and jumping games) and were instructed to try to complete at least one PA per day in the following week at home. One week later, parents reported their dyad’s participation in the shared PAs. Parents reported demographic characteristics, family chaos, parent PA self-efficacy, parental PA self-efficacy for their child, and average min/week of shared PA. A forward stepwise regression analysis was used to determine the optimal model to predict the total number of minutes parent-child dyads spent completing each PA together at home. McNemar’s test was used to determine differences between perceived acceptability and completion of the five PAs as a dyad during shared time.

**Results:** Lower family chaos (B=−0.9, p=0.02), higher parent body mass index (BMI) (B=−0.3, p=0.003), and higher annual household income (B=−0.2, p=0.023) significantly predicted minutes of shared PA at home. The proportion of parents who perceived brisk walking as an acceptable PA was not different (p=0.125) than those who briskly walked with their child. The proportion of parents who perceived jumping games, body-weight exercises, dancing, and tag games as acceptable PAs was greater than those who completed these PAs with their child (all, p<0.05).

**Conclusions:** Shared PA participation may be higher when participants have lower family chaos, higher parental BMI, and higher annual household income. Brisk walking could be considered in future family-based PA programs since it was perceived as acceptable and was completed in the home environment, whereas the other shared PAs were perceived as acceptable but not completed at home.
1925 Board #81 May 30 3:30 PM - 5:00 PM
The Effects of Playground Zoning on Physical Activity During Recess in Elementary-Aged Children.
Jillian Barnas, MS, Stephen Ball, PhD. University of Missouri, Columbia, MO. (Sponsor: Jill Kanaley, PhD, FACSM)
(No relevant relationships reported)

While many factors contribute to the development of obesity, a sedentary lifestyle plays a significant role in this epidemic. Epidemiological data indicates that 50% of children aged 6 11 years old and approximately 9% of adolescents aged 12-18 years old are not meeting the recommended health guideline of 60 min of moderate-to-vigorous physical activity (MVPA) per day. Therefore, the most effective interventions for combating inactivity and childhood obesity should target children before inactivity develops in their adolescent years. Due to the increasing youth obesity rates, schools have been identified as ideal environments to promote physical activity (PA). PURPOSE: The purpose of this study was to compare changes in physical activity in youth, measured by accelerometry, during recess with a playground zoning intervention. METHODS: The sample included 453 third-, fourth- and fifth-grade boys and girls from two elementary institutions. PA was observed during recess using systematic observation of play and leisure activity in youth (SOPLAY) and measured using Actigraph GT3X accelerometers on a subset of students (n = 455). Baseline data were collected for one week prior to playground zoning. Afterwards, the playgrounds were zoned into six various activities for two weeks and PA data was observed and measured. RESULTS: A repeated measures ANOVA detected a significant main effect on the zoning and decreased time spent in sedentary activity (p = 0.013) and moderate activity (p = 0.027). A significant cross-over interaction was detected with zoning and an increase in time spent in vigorous activity (p = 0.017 and MVPA (p = 0.006) for third graders, whereas fifth graders significantly decreased the time spent in MVPA (p < 0.001). Furthermore, third grade boys accumulated 204 more steps on the zoned playground compared to baseline measurements (p = 0.001). A McNemar test revealed a 5% increase in observational PA on zoned playgrounds (p < 0.001). CONCLUSION: Zoned playgrounds are an applicable, manageable, and effective program that can help improve PA during recess for young children. However, a different intervention may be needed to improve PA in older children.

1926 Board #82 May 30 3:30 PM - 5:00 PM
Influence of Parents’ Physical Activity on Children’s Physical Activity And Cardiopulmonary Endurance
Shousheng Xu, Yan Wang, Yu Jing, Zhengheng Wang, FACSM, Juan Wang. Beijing Sport University, Beijing, China. (Sponsor: Zhengheng Wang, FACSM)
(No relevant relationships reported)

It is reported that parents have important influences on the children’s physical activity (PA) and health fitness, but such research has hardly been found in China nowadays. PURPOSE: To investigate PA level, health fitness and economic status of the children of 7-9 yrs and their parents; to assess the influence of parents’ PA level, economic status on the subject families,and the other main contents of the study made investigation of the economics and educational status on the subject families,and the other main contents including medical history, family history, PA and sports. It was obtained the PA data of the children by the revised PAQ-A,and the parents’ PA level were measured by accelerometer (ActiGraph GT3X);Health fitness examination adopted the national standard for pupil’s fitness measurements. RESULTS: 384 families completed the examination totally. According to daily average time of MVPA, whether one person or two of the couple, less than 30 min was regarded as insufficient family (IPAF), and more than 30 min was PA sufficient family(IPAF). (1)The data proved 20 IPAF and 16 PAF in the study. (2) There were different in the children’s scores between SPA(3.02±0.53)and insufficient one(2.61 ± 0.5) (P = 0.005 and the BMI of the two groups (1.5±1.7 and 1.7 ± 3.8 showed great difference(P = 0.01)). (3)The time of 6min huttle-run between the two children groups were different (119.35±29.42 vs 127.56±21.14s, P<0.05). (4) The sedentary time everyday of the husband and wife in a family were moderately correlated( r = 0.36 P < 0.023),and the light PA time displayed low positive correlation( r = 0.35 P < 0.06), while the correlation was not found between the time of their moderate and more intensity PA( r = 0.1 P < 0.09). CONCLUSIONS: (1) The findings indicated that the higher PA level the parent had, the higher PA level their children did;and the children’s cardiopulmonary endurance are higher similarly, whereas with the lower obesity extent. (2) The PA level of the husband and wife were interdependent and interactive. Supported by Central Universities and Colleges Basic Scientific Research Funds Special Funding (2016ZKX016).

1927 Board #83 May 30 3:30 PM - 5:00 PM
Preschool Children’s Cognition is Associated With Motor Skill Competence and Cardiovascular Fitness
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(No relevant relationships reported)

PURPOSE: While the early years are a critical window for the development of a healthy lifestyle, it is the period of growth for which we know the least about evidence linking physical activity with health outcomes in this population. This cross-sectional study examined the associations among physical activity (PA), motor skill competence (MSC), perceived physical competence (PPC), cardiovascular fitness (CF), and cognition in preschool children. METHODS: Sixty-five preschool children (33 girls; 27 White, 21 Black, 10 Hispanic; M age; Xage = 0.6 ± 0.6; Mean age = 0.5 ± 0.6) were recruited from two local elementary schools in Minneapolis, Minnesota. Children’s 3 days PA during school time included moderate-to-vigorous PA (MVPA) and steps were assessed via Actigraph Link; MSC was measured via the Test of Gross Motor Development-Second Edition; PPC was assessed via the Pictorial Scale of Perceived Competence and Social Acceptance; CF was assessed via a modified YMCA 3-Minute Step Test; and cognition was assessed via the computer-administered NIH Toolbox. Multiple linear regression was performed to determine the associations among outcome measures.

RESULTS: Preschool children’s MVPA was not significantly related to MSC (r = 0.18, p > 0.05), PPC (r = 0.121, p > 0.05), CF (r = -0.14, p > 0.05), cognition (r = -0.09, p > 0.05), but step counts were significantly positively related to MSC (r = 0.28, p < 0.05), and preschool children’s MSC was a significant predictor of step counts (F (4, 62) = 0.8, p < 0.01). Therefore, PA levels below 0.35 after age, gender, and BMI were adjusted. In addition, PPC was significantly positively correlated with MSC (r = 0.36 p < 0.01), and was a significant predictor of MSC (F (4, 62) = 2.6 b = 0.26, p = 0.04 R² = 0.15) Preschool children’s cognition was significantly positively correlated with MSC (r = 0.26 p < 0.01) and CF (r = 0.32, p < 0.01), respectively, but only CF seemed to be a significant predictor of cognition (F (2, 64) = 0.35 t = 2.3, p = 0.01). R² = 0.14 . CONCLUSIONS: The findings support the need for effective strategies that simultaneously promote motor skill competence, cardiovascular fitness, cognition, and physical activity behaviors in early childhood. Future research with larger and more diverse samples is warranted.

1928 Board #84 May 30 3:30 PM - 5:00 PM
Physical Literacy Competency Among Elementary and Middle School Children
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(No relevant relationships reported)

Physical literacy addresses the ability, confidence and desire needed to optimize physical activity participation. Ability to perform, or competency in, fundamental motor skills is an important component of physical literacy. PURPOSE: To assess physical literacy competency among young children and to compare competency between sex and age groups in children. METHODS: 288 children (134 males, 154 females; age 9±2 years; height 132±36 cm; mass 41±14 kg) from 6 schools volunteered to participate. Participants completed tasks in a randomized order to assess five domains of physical literacy competency: locomotor, running, balance, upper extremity (UE) and lower extremity (LE) object control. Trained raters evaluated competency using a standardized, valid and reliable assessment (PLAYfun; Canadian Sport for Life). Participants were divided into age groups (Elementary: grades K-4; Middle: grades 5-8). Competency on all tasks was measured using a 0-100 continuous scale. Total average score and domain average scores were compared between sexes and age groups using a multivariate analysis of variance (α<0.05). RESULTS: There were no significant interactions between sexes and age groups (p>0.05). Regardless of age, males demonstrated greater competency than females for overall score (mean±SE points: males=7.4±1.0, females=6.1±1.0, p=0.01). Physical activity level (PAL) was a significant predictor of MSC (β=0.37, p<0.01), and was a significant predictor of MSC (β=0.24, p<0.01) after age, gender, and BMI were adjusted. In addition, PAL was significantly positively correlated with MSC (r = 0.36 p<0.01), and was a significant predictor of MSC (F (2, 62) = 2.6 b = 0.26, p = 0.04 R² = 0.15) Preschool children’s cognition was significantly positively correlated with MSC (r = 0.26 p<0.01) and CF (r = 0.32, p < 0.01), respectively, but only CF seemed to be a significant predictor of cognition (F (2, 64) = 0.35 t = 2.3, p = 0.01). R² = 0.14 . CONCLUSIONS: The findings support the need for effective strategies that simultaneously promote motor skill competence, cardiovascular fitness, cognition, and physical activity behaviors in early childhood. Future research with larger and more diverse samples is warranted.

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tasks involving object control. Similarly, over 20% of children in middle school lack competency in object control tasks. These areas need to be addressed in order to optimize long-term physical activity.

**1929**
**Board #85**
**May 30 3:30 PM - 5:00 PM**
**Classroom-based Strategies to Reduce Disparities in Physical Activity Among Children with Asthma**

Tiwalouluwa Ajibewa, Toby Lewis, Lexie R. Beemer, Lauren Allport, Shreya Bahl, Emma Weston, Maysa Damen, Ben Ransier, Darin Stockdill, U. Sean Vance, Richard Dopp, Rebecca E. Hasson, FACSM. University of Michigan, Ann Arbor, MI. (Sponsor: Rebecca Hasson, FACSM)

**No relevant relationships reported**

**PURPOSE:** Children with asthma often experience physical activity (PA) induced symptoms 8 10 minutes following the start of exercise, with symptoms peaking 8 10 minutes post-activity. Classroom PA breaks provide shorter bouts of PA (45 inutes), and may represent a novel strategy to promote PA participation in this clinical population. Using a classroom-based PA intervention, we tested the feasibility of 8 4 minute PA breaks to promote PA participation in children with asthma. **METHODS:** Nine 3rd grade classrooms at an elementary school in Detroit, MI. (94% Hispanic; 8% on free/reduced lunch; 31% prevalence of asthma and asthma-like symptoms) participated in the 20-week intervention. Asthma status was self-reported via the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire in conjunction with nurse documentation. PA participation, exercise intensity (sedentary (SED), low-intensity physical activity (LPA), moderate-to-vigorous intensity physical activity (MVPA)), and asthmatic symptom occurrence were assessed via direct observation. **RESULTS:** All students accumulated approximately 19 otal minutes (60.84) of PA breaks x 80.8 s) during PA breaks. Throughout the intervention, a greater percentage of children with asthma participated in MVPA during the PA breaks compared to children without asthma (asthma 3.9 1.5% vs. non-asthma 6.1 1.3% p<0.001). In contrast, a greater percentage of students without asthma participated in LPA during PA breaks (non-asthma 30.2 1.1% vs. asthma 25.8 1.2% p<0.001). There were no differences in the percentage of students who were SED during PA breaks (asthma 21.3 1.7% vs. non-asthma 23.7 1.9% p=0.155). Out of 298 observations, six instances of asthmatic symptoms (coughing) were observed post PA break. **CONCLUSIONS:** Classroom-based interventions that incorporate short bouts of PA, represent safe exercises for children with asthma. Given the higher participation in MVPA among children with asthma, classroom interventions may be effective in reducing PA disparities in school settings.

**1930**
**Board #86**
**May 30 3:30 PM - 5:00 PM**
**Wearable Activity Monitors as Part of a Childhood Obesity Treatment Program**

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**No relevant relationships reported**

**PURPOSE:** It is well known that childhood obesity has become a common issue in the United States (1), and that obesity contributes to a multitude of chronic diseases and negative health conditions (2). One of the biggest challenges in the treatment and prevention of childhood obesity is that the goal of these programs is primarily to modify behaviors that occur outside of the program space. The purpose of this study was to summarize the findings from a 6-month program that used wearable activity monitors (WAM) as part of a clinical obesity treatment program for fifteen children in Arizona (USA) between December 2018 – November 2017 **METHODS:** Obese children were referred to participate in this program by their pediatrician. Participants were provided a WAM that was used to monitor their physical activity (PA) levels, heart rate, and sleep habits. For the first week, participants were instructed not to change their behaviors so that baseline PA data could be collected. Subsequently, appropriate step and heart rate zone goals were set and progressively increased each week that a participant met their previous goal. **RESULTS:** Adherence to wearing the WAM was high, with only about 13% of activity data and 3% of sleep data missing throughout the entire program. Three children dropped out of the study before the program was completed. For the children who completed the program, the greatest improvements were noted for step count, and healthy sleep habits were found to be positively correlated with PA. In baseline data collection, the children walked on average 8,900 steps per day. In the final week, the children recorded 9,784 daily steps on average, representing approximately a 10% increase in the average number of steps taken. **CONCLUSIONS:** Overall, childhood obesity treatment programs focus heavily on modifying behaviors that occur outside of the clinic setting. A WAM appears to be a feasible approach to continuously monitor and increase the PA of obese children. Including WAM and progressive goal setting in a clinical obesity treatment program for children may be an effective method to increase PA levels outside of the clinical setting. Further exploration of the link between healthy sleep habits and PA could yield additional findings useful to childhood obesity treatment and prevention.

**1931**
**Board #87**
**May 30 3:30 PM - 5:00 PM**
**Association of Sports Participation with Intake of Fast Food for Family Meals Among Rural Children**


(No relevant relationships reported)

After-school sports participation is common among children, and the busy lives of families could lead to challenges to prepare healthful family meals. This often results in families seeking the convenience of fast food for their evening meal. However, there is a scarcity of research, particularly among families in rural areas, examining whether children’s sports participation is associated with families’ intake of fast food as their evening family meal. **PURPOSE:** To examine associations between sports participation and fast food intake of rural children. **METHODS:** Baseline data from the childhood obesity prevention, randomized controlled trial, NU-HOME, were analyzed. Children (n=6; age=6.9±0.4; 13; female; 6% normal weight) and their parents reported on sociodemographics, child’s sports participation (activities in the last year and frequency after school and in evenings) and family’s intake of fast food as the evening meal. Logistic regression analyses were performed. **RESULTS:** Mean sports participation in the past year was z=2.36 (2.71) days/week, with children reporting engaging in after-school and evening activities on 2.19±1.6 and 2.6±2.21 days, respectively, over the past week. Of their evening family meals in the past week, parents reported that 1.2±1.01 meals were considered fast food. Although sports participation in the past year was correlated with socioeconomic status, there was no statistically significant association between sports participation and fast food as evening family meal (p<0.05). **CONCLUSION:** Although sports participation was not associated with fast food intake as evening family meal in this study, future research should explore this relationship in other populations, particularly in larger studies. Furthermore, the possibility of lower availability of fast food options in rural areas compared to more urban settings could be an important caveat.

**1932**
**Board #88**
**May 30 3:30 PM - 5:00 PM**
**The Association Between Sex and Directly Observed Physical Activity in Preschool-Age Children**

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(No relevant relationships reported)

Sex disparities in physical activity (PA) are evident in preschool-age children (2.9 years old). Preschool-age boys have been reported to participate in more PA during free play. However, it is unknown if this disparity is evident when participating in a structured PA intervention. **PURPOSE:** To examine the association between sex and directly observed PA levels in preschool-age children while participating in a PA intervention. **METHODS:** This study utilized data from the Short bouts of Exercise for Preschoolers (STEP) study. STEP was a 6 month cluster randomized controlled study that examined the effects of short bouts of structured PA implemented within the classroom setting as part of designated gross motor playtime in ten preschool centers. STEP consisted of structured PA during the first 10 minutes of gross motor playtime followed by 20 minutes of free playtime, PA levels during the 10-minute intervention session were measured using a modified Observational System for Recording Physical Activity in Children-Preschool Version. PA intensity was classified as sedentary, light, or moderate-to-vigorous (MVPA). This secondary analysis focused on the baseline and 3-month data of participants randomized to the intervention group (preschool centers, n = 5 participants, n = 5 age = 3.9 0.8 years). Spearman correlations were used to examine the association between sex and PA intensity during the intervention. Repeated measures ANOVAs were used to examine the effect of sex on PA intensity. **Results:** Participants spent similar percent of intervals in MVPA at baseline (boys, 4.7 3.8 and 3-months (boys, 4.6 3.9 and girls, 5.4 3.7) There were no significant associations between sex and directly observed MVPA at baseline (r=0.035 r=0.37 and 3-months (r=0.039 r=0.8). Similarly, there were no significant effects of sex on any PA intensity (all P > 0.80) during the intervention. **Conclusion:** In this sample, sex was not associated with or impacted the number of intervals that preschool-age children spent in MVPA during the structured PA intervention. Future studies are needed to determine if these trends remain the same in a larger sample size.  

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Abstracts were prepared by the authors and printed as submitted.
Prior research demonstrates that elevated acute (1-week) relative to chronic (3-4 weeks) training load (TL) ratios are associated with increased injury risk. However, there is no existing research examining this relationship in youth female soccer athletes, who are at high risk for certain injuries during sport, such as anterior cruciate ligament injury. PURPOSE: To investigate the association between acute-to-chronic TL (A:C) ratio measures with time-loss injury in elite-youth female soccer athletes. METHODS: Forty-three elite-youth female soccer athletes participated in the study. Daily measures of training load, measured by self-reported (0-10 scale) rating of perceived exertion (RPE) multiplied by training duration (minutes), were recorded within 30-minutes of practices and games from pre-season (August 2017) until the end of the fall competitive season (December 2017) using a customized phone app. Following completion of the competitive season, the athletes completed a survey to determine their history of experiencing a time-loss injury during the season. A:C ratios were calculated at week-9 relative to weeks 3 through 8 a as this was the most intensive TL period of the season. Binary logistic regression examined the association between A:C ratio and time-loss injury status. Receiver operator curve (ROC) analyses was performed to select a A:C TL cutpoint, followed by computed of sensitivity, specificity and area under the curve (AUC). Odds ratios (OR) were calculated and compared between those with and without time-loss injury. RESULTS: Nineteen athletes reported to miss ≥1 day of practice or game due to injury. Logistic regression demonstrated greater A:C ratio was associated with increased risk of time-loss injury (OR = 12.6, CI = 1.5, 102.7, Wald=39.0, p<0.001). ROC curve analysis identified an A:C ratio cutpoint of 1.62 to have optimal screening properties: sensitivity=73.3%, specificity=87.5%, AUC=0.76. The OR for an A:C ratio of 1.8 or higher compared to less than 1.8 was 1.83 (95% CI: 3.10, 1.017). CONCLUSIONS: Elevated A:C ratios (>1.8) are associated with increased risk of suffering time-loss injury in elite-adolescent female soccer athletes. Monitoring and managing A:C TL may be an important injury prevention strategy in this population.
PURPOSE: To determine physical education (PE) enrollment trends of youth with obesity in primary and secondary schools in a large Midwestern metropolitan area.

METHODS: Data from 7 months of clinical visits to a pediatric weight management program were extracted from electronic medical records. Entries were refined to include only school-aged children, ages 6-18 yrs old. Multiple encounters per subject were included if the encounters occurred during separate school years. Information regarding frequency (ncy; days per week) and duration (length of school year) of PE class was used to determine what percent of total school days a subject was enrolled in PE. Data were analyzed to determine trends in PE enrollment by age, gender, race, ethnicity and socioeconomic status.

RESULTS: Data were obtained for 2,131 patient encounters (354 females, 206 males). Of these, 31.5% of patients were not enrolled in PE during the school year of the encounter. The most common frequency nicies of PE enrollment overall were 20% (29.4%) and 40% (16.3%) of total school days. There was no significant difference in PE enrollment between the age groups of 6 11 years and 12-18 years (20% vs. 19%; p=0.001). Subjects ages 14-18 yrs old were enrolled in PE a lower percentage of school days (15%, p<0.0001). Of students ages 14-18 yrs, males were enrolled in PE significantly more than females (21.2% vs. 16.7%, p=0.002). Subjects with government-funded health insurance were enrolled in PE more than students with private health insurance (25.2% vs. 22.0%, p<0.0001). Subjects between race and ethnicity were not significant. CONCLUSION: PE enrollment in this population falls below previously reported national averages for elementary and middle school students and slightly above average for high school students. The majority of school-aged youth with obesity in this metropolitan area do not acquire enough physical activity through PE to meet recommended daily physical activity guidelines.

1938 Board #94 May 30 3:30 PM - 5:00 PM BMI, Body Composition and Race are Associated with Decreased Bicycling Ability in Youth with Obesity.

Christopher Kist, Amanda Gier, Phil Khoury, Shelley Kirk, Robert Siegel. Cincinnati Children’s, Cincinnati, OH.

(No relevant relationships reported)

PURPOSE: To evaluate which factors may decrease the ability to ride a bike in youth with obesity.

METHODS: Data from 7 months of clinical visits to a pediatric weight management program were extracted from electronic medical records. Demographics and anthropometric measures, along with patient response to the question, “Are you able to ride a bike?” were analyzed to determine which factors limit a patient’s ability to ride a bike. Levels of continuous variables for riders vs non-riders were compared using Wilcoxon rank sums tests. Fisher’s Exact tests were used to compare proportions.

RESULTS: Results were obtained for 2,131 patient encounters (354 females, 206 males). Of these, 31.5% of patients were not enrolled in PE during the school year of the encounter. The most common frequency nicies of PE enrollment overall were 20% (29.4%) and 40% (16.3%) of total school days. There was no significant difference in PE enrollment between the age groups of 6-11 years and 12-18 years (20% vs. 19%; p=0.001). Subjects ages 14-18 yrs old were enrolled in PE a lower percentage of school days (15%, p<0.0001). Of students ages 14-18 yrs, males were enrolled in PE significantly more than females (21.2% vs. 16.7%, p=0.002). Subjects with government-funded health insurance were enrolled in PE more than students with private health insurance (25.2% vs. 22.0%, p<0.0001). Subjects between race and ethnicity were not significant. CONCLUSION: PE enrollment in this population falls below previously reported national averages for elementary and middle school students and slightly above average for high school students. The majority of school-aged youth with obesity in this metropolitan area do not acquire enough physical activity through PE to meet recommended daily physical activity guidelines.

1939 Board #95 May 30 3:30 PM - 5:00 PM Game-Play Characteristics by Field Size in Girls’ Youth Lacrosse

Patricia M. Kelshaw1, Matthew Johnson2, Lisa H. Hepburn3, Andrew E. Lincoln1, Reginald E. Dunn1, Shane V. Caswell1.

1939 Board #95 May 30 3:30 PM - 5:00 PM Game-Play Characteristics by Field Size in Girls’ Youth Lacrosse

Patricia M. Kelshaw1, Matthew Johnson2, Lisa H. Hepburn3, Andrew E. Lincoln1, Reginald E. Dunn1, Shane V. Caswell1.


(No relevant relationships reported)

To facilitate player development, the Lacrosse Athlete Development Model (LADM) recommends using small-sided games (SG) and fewer players on the field. Yet, no studies have evaluated if SG change game-play in girls’ youth lacrosse (GYL).

PURPOSE: To describe game-play characteristics during SG and full-field games (FG).

METHODS: Athletes (N=2082) 0.3e ars, 132.3±3.6 m, 31.4±1.7 kg) participated on either a small-sided (SG, n=13) or a full-field (FG, n=15) 10U level team within a single GYL league in Virginia. Both SG and FG teams participated in 6 games during the season. All games were filmed using a digital camera affixed to a camera lift system. Game-play characteristics were measured by reviewing game video and coding the frequency of observed activities (e.g. successful passes, changes of possession, intercepted passes, shots on goal, and loose balls). Descriptive statistics (Frequency, Mean) for game-play characteristics were calculated.

RESULTS: A total of 135attle-exposures (AE) occurred across 12 games (SG=8, FG=9). Total characteristics for the season were: unsuccessful passes (SG=28, FG=35), successful passes (SG=110, FG=110) , shots on goal (SG=18, FG=19), goal saves (SG=4, FG=5), changes of possession (SG=333, FG=23), loose balls (SG=15, FG=5), and intercepted passes (SG=17, FG=10). Average characteristics per game were: unsuccessful passes (SG=9, FG=8), successful passes (SG=8, FG=18), shots on goal (SG=30, FG=31), goal saves (SG=3), changes of possession (SG=28, FG=28), loose balls (SG=104), and intercepted passes (SG=17, FG=10). Further, the FG team had a larger proportion of successful passes (23%) than the SG team (11%). However, the SG team had a larger proportion of successful shots on goal (8%) than the FG team (6%).

CONCLUSION: A greater proportion of successful passes were observed in FG than SG with comparable attempts and slightly fewer intercepted passes per game. Further, SG was observed to have a greater proportion of successful shots on goal despite FG having slightly more attempted shots on goal and more goalie saves. Additional research is needed to better understand how all aspects of LADM guidelines affect player development and skill acquisition in GYL.
Girls with intellectual disabilities (ID) exhibit poor fitness and low physical activity (PA) levels, and are considered a vulnerable, at-risk population. Girls with ID have limited access to many PA opportunities, but dance is accessible, widely available, and perceived as enjoyable. **Purpose:** To evaluate the feasibility and preliminary efficacy of a 12-week dance intervention to promote engagement in moderate to vigorous PA (MVPA) and increase cardiorespiratory (CR) fitness among girls with ID ages 16-21. **Methods:** The intervention was implemented in 3 urban communities and included two 75-minute weekly dance sessions. Dance styles included hip hop, jazz, and modern; the choreography and session structure were designed to promote MVPA. Continuous heart rate (HR) monitoring (Polar®) was used for motivation and to record time spent below/in above each girl's target HR (THR) zone (60-80% HRmax). Pre- and post-test CR fitness was measured by the 6-minute walk test (6M WT). Survey items assessed enjoyment and satisfaction. **Results:** 14 adolescent girls (17 ± 1.5 y) with ID completed the intervention. Attendance was high; girls attended an average of 0.96 ± 0.41 session completions (range: 0.75 - 1.0) in 75-minute sessions. Overall, girls spent 52% ± 23% of each session engaged in MVPA; definitions included movements in or above their depth walked on the 6MWT baseline to post-test (n=14); however, this difference was not significant (p=0.17). Post-intervention surveys indicated that girls “liked” the dance program (14 of 17), perceived improved fitness (15 of 17), and wished to continue dancing (16 of 17). Most girls reported a preference for a girls-only dance program and a program geared exclusively for those with ID. **Conclusion:** Participation in a dance program was associated with improved PA in girls with ID. Girls expressed their enjoyment of the program and wanted to continue beyond the 12-week program. More frequent training is likely needed to increase CR fitness.
Both the decline in moderate to vigorous physical activity intensities (MVPA) and the increase in sedentary behavior (SB) have different deleterious effects on the health of adolescents. PURPOSE: Verify a 10-week intervention using exergames with adolescents was able to promote levels of physical activity from moderate to vigorous intensities (MVPA) and compare the time in MVPA between the group with adolescents who did not meet the combination recommendations.

METHODS: Twenty adolescents (11 boys and nine girls) with an average age of 11.7 ± 0.9 years participated in an intervention with 10 sessions of exergames on the school, twice a week for about 0 to 0.6 minutes. XBOX 360 equipment was used with Kinect and the pair of adolescents practiced the games using an ActiGraph accelerometer. The analyses included the total time and time of involvement in MVPA at each session. Descriptive statistics analyzes and the independent student T test were used. The level of significance was 5%.

RESULTS: Of the 20 adolescents, three participated in all the sessions (10), six participated in nine sessions and seven participated in eight sessions, representing 80% of effective participation in the intervention. Only 20% of the students participated in only four to six sessions per week. Approximately half the time of each session was spent with MVPA (20.8% in vs. 23.8% in), in favor of the group with the largest participation in sessions with active video games. This same group presented up to the ninth session with longer mean time in MVMA compared to the group that participated in fewer sessions.

CONCLUSION: It was possible to observe that a 10-week intervention using exergames with adolescents was able to promote levels of physical activity of moderate to vigorous intensities (MVPA), mainly in the group that have more participation in sessions.

PURPOSE: To explore the effect of high-intensity interval training and low-intensity training on weight loss in obese children and adolescents.

METHODS: We evaluated 36 adolescents as part of a cohort study that started in 2005 in São Paulo city. In this study we analyzed 2,012 sex adolescents that were followed in 200220092013, 2 015 ± 0.2017 2 2005a dolescents were from 13 ± 0.16 years of age. We assessed the habitual physical activity practice by International Physical Activity Questionnaire (IPAQ-short-8 version) considering active (AT) the adolescents that accumulated at least 300 minutes per week of moderate-vigorous PA and inactive (INA) if less than 300 min/week were reported. Body weight (kg) and height (m) were self-reported by questionnaires. BMI was calculated and the respective criteria for overweight classification were considered for Brazilian adolescents.

RESULTS: In general, the prevalence of physical inactivity in 2005 was 6.8%, with significant increase to 53.2% (2009); 56.7% (2013); 59.2% (2015) and 60.2% (2017), with 0.9% annual increase. Higher variation was observed in girls than boys (1.32% x 0.9% per year). The overweight prevalence followed similar trend: 2005 16%; 21.2% (2009); 28%; 22.5% (2013); 27% (2015) and 28% (2017) with 1.2% increase per year (p<0.5). Girls presented significantly and higher percentage change than boys (1.8 ± 1.1 ± 1.5% per year).

CONCLUSIONS: Data showed progressive trend of high physical inactivity and body fat increase, leading to an incidence of obesity in the next 10 years around 7.0% of all adolescents living in Sao Paulo State 32% of physically inactive behavior. These data suggests an early development of cardiovascular disease, with higher impact in girls than boys. Also data strongly suggest to effectiveness of public health policies towards the physical inactivity prevention and the excess of body mass among adolescents are related to unhealthy behaviors of eating, drinking and PA.
LI T is better for whole body weight loss, but HI I T is better for body fat reduction. For

**CONCLUSIONS**

HI I T is more effective for obese children/adolescents than LI T.

Body image is an important marker of health and well-being among young people. Instruments to assess body image use contour images that participants use to describe their body image self-perception. These images must be culturally sensitive and adequate for different age groups. Although the Contour Drawing Rating Scale (CDRS) has been validated among adolescents in Spain, no previous studies have compared the body image CDRS with anthropometric measures among Chilean adolescents.

**PURPOSE**

To assess body image using the CDRS among Chilean adolescents, and compare with anthropometric measures including body mass index (BMI) and waist circumference (WC).

**METHODS**

A group of 156 Chilean adolescents (87 males, 69 females) aged 13-14 years old participated in the study. They completed the body image CDRS consisting of 9 images from which they selected the one representing their body image self-perception. Values for selected images ranged from 1 (underweight) to 9 (obese). Subsequently, body weight was measured with a Tanita-HD313® scale, height with a SECA-206® stadiometer, and waist circumference with a Lufkin W606P M® tape, while participants were barefoot, and wore short-sleeve t-shirts and shorts. BMI was then calculated (kg/m²). To determine sex differences, Chi-Square and t-test were used, and correlation analyses were performed to detect association between variables.

**RESULTS**

Body image CDRS values ranged from 2 to 9 in males, and 1 to 9 in females (Z=2.03, p<0.001). Mean (standard deviation) BMI in males and females was 21.3±3.5 kg/m² and 22.3±3.3 kg/m², respectively (Z=2.18, p<0.03). Mean (standard deviation) waist circumference in males and females was 75.9±9.1 cm and 74.1±8.3 cm, respectively (Z=1.52, p<0.05). Spearman correlation coefficients showed a moderate but significant association between the CDRS score and BMI (males, rho = 0.8, females, rho = 0.8, both p<0.01) and waist circumference (males, rho = 0.6, females, rho = 0.6, both p<0.01 for both).

**CONCLUSIONS**

The significant correlation between anthropometric measures and the CDRS in our group of Chilean adolescent males and females suggest that body image self-perception closely represent objective measures of body image assessment; thus, providing an adequate body image assessment tool in this population.
viewed (p=0.012) or computer used (p=0.010). However, Heavy TV viewers had a higher risk of being overweight/obese regardless of PA level. The associations of TV viewing and computer use were similar with BMI categories and WHtR tertiles.

CONCLUSIONS: Heavy TV viewing and computer use are associated with higher BMI and central adiposity in preadolescents. Heavy TV viewing seems to increase the risk for overweightness and central adiposity, regardless of PA level. Strategies to reduce high sedentary screen times could potentially help in preventing overweightness and adiposity among children and adolescents.

The current physical activity (PA) guidelines for children and adolescents recommend accumulating 60 minutes of moderate-to-vigorous intensity physical activity (MVPA), 7a ya per week. Although the time and intensity components of the PA guidelines have been rigorously studied, the days per week (frequencyp) component is less researched. PURPOSE: To examine the influence of frequency of meeting the MVPA guidelines on cardiometabolic risk in children and adolescents. METHODS: Accelerometer data from children and adolescents (age 6 12 yrs) with at least 4 valid days, 10 hours of wear time, and an average of ≥60 minutes per day of MVPA participating in the National Health and Nutrition Examination Survey 2003-2006 was used. The Evenson cut points for MVPA were applied. The proportion of valid days meeting the ≥60 minutes of MVPA guidelines (DMG) were calculated and used to assign subjects to quartiles. General linear modeling was used to compare associations of quartiles to individual cardiometabolic risk factors. Covariates included age, sedentary time, MVPA, sex, race/ethnicity, asthma, physical disability, academic achievement, money in the house, and poverty-income ratio.

RESULTS: DMG by quartile are as follows: Quartile 1 (n=158; DMG=43.6%; 95% CI 38.5-48.7%; p<0.01), Quartile 2 (n=171; DMG=39.3%; 95% CI 33.9-44.7%; p<0.05), Quartile 3 (n=155; DMG=39.7%; 95% CI 34.3-45.1%; p=0.05), and Quartile 4 (n=146; DMG=41.0%; 95% CI 35.6-46.4%; p<0.05). There were no other differences between quartiles for BMI percentile, waist circumference, waist-to-height ratio, systolic blood pressure, cholesterol, triglycerides, glucose, or insulin. CONCLUSION: This cross-sectional analysis found no association between proportion of DMG and cardiometabolic risk factors in children and adolescents. Achieving an overall weekly average of ≥60 minutes per day of MVPA appears to be sufficient for cardiometabolic health regardless of meeting the frequency component of the PA guidelines. Future studies are needed to understand optimal weekly patterns and volume of PA as well as their associations with health outcomes in youth.
of doctors performed it after 5 ye ars old and it was striking that in 2% of them do it annually, despite being the whole population healthy children. CONCLUSIONS: Facing this result, we believe it is necessary to unify the medical criteria to request studies in relation to the needs of patients

1955 Board #111 May 30 3:30 PM - 5:00 PM Contribution Of In-school And Out-of-school Physical Activity Towards Meeting The Daily Recommendations. Neal C. Phifer, Dale D. Brown, FACSIM, Susann Marcum, Emily Jones, Skip M. Williams, Dan Phelps. Illinois State University, Normal, IL. (Sponsor: David Q. Thomas, FACSIM)

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(Please report any relationships)

PURPOSE: The purpose of the study was to examine in-school and out-of-school activity in children as related to achieving daily activity recommendations for moderate-to-vigorous physical activity (MVPA) and steps. METHODS: Activity patterns of 346, 10-12 year old fifth-grade students in three Midwestern elementary schools were assessed during a two week period, one week during school hours only and the other week for continuous 24-hour periods. Data were collected using wrist worn activity trackers (Polar Active). Teachers distributed the devices at the start of each school day and collected at the end of each school day for the first week and provided to the students for the next week for continuous monitoring. Monitors measured MVPA, steps, and calories expended per day. Demographic and anthropometric data were also recorded (age, height, weight). All data were uploaded to the monitor’s manufacturer website and then collected by the researchers. A prior study was used to determine that four days of monitoring could accurately estimate physical activity. A final sample of 186 (N=186) students who attained a 500 step minimum for the same four consecutive school days between both weeks (M-R or T-F), were identified. These data were used to determine averages for steps, minutes of daily activity, and calories expended. RESULTS: Results indicate students attained an average of 1518±81 steps/day. In-school activity and out-of-school activity accounted for an average of 56.9 ± 21.6% of total steps and 30.7 ± 15.0% of total minutes respectively. Activity minutes averaged 34 ± 23.4 minutes/day. In-school and out-of-school activity accounted for an average of 33.8 ± 20.4 minutes (3.3% of total), and 3.8 minutes (0.8% of total) respectively. Calorics expended averaged 2046 ± 69 Kcal/day. In-school and out-of-school activity accounted for an average of 16.5 ± 15 Kcal (82% of total), and 8956.59 (58.47% of total) Kcal (23.8% of total) respectively. CONCLUSIONS: These results indicate that out of school activities account for most of daily steps taken and activity minutes in the fifth grades students studied during an average school day. A similar distribution of caloric expenditure was not observed between in school and out of school monitoring.

1956 Board #112 May 30 3:30 PM - 5:00 PM The Effect of Increased Extracurricular Physical Activity on the Mathematics Achievements of Children aged 7-9 Years Old

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(Please report any relationships)

PURPOSE: The purpose of this study was to assess the impact of an increased extracurricular physical activity on mathematics academic performance for children aged 7-9 ye ars old. METHODS: A sample of 120 children aged 7 ± 0.5 years participated in the MQ101 Program. The experimental samples were randomly divided into the experimental group (8 children) and the control group (8 children). The experimental group involved in the extracurricular exercise with games as the main activity content, intervention. The activity lasted for 12 weeks, twice a week for 8 min, 4 times each week, exercise intensity: MVPA (= (220-age) 0.7 (≥ 0.75)); the control group did not participate in any intervention project. The body shape, physical fitness, and mathematics testing scores of the subjects were tested before and after the experiment. The main finding is the change in numerical scores, measured by a standardized mathematical test of 10 minutes. The secondary outcome is a change in body shape and physical fitness. RESULTS: The results showed that the experimental group was better than the control group in the problem solving (t=2.8, p<0.01), calculation speed (t=3.39, p<0.01), and accuracy rate (t=2.21, p<0.05). The math scores of the experimental group were significantly higher than the control group (t=4.14, p<0.01). In addition, the changes in physical fitness of the experimental group were significantly better than the control group (t=2.34, p<0.01), however, the difference in body shape index was not statistically significant (t=1.91, p=0.05).

1957 Board #113 May 30 3:30 PM - 5:00 PM Influence Of Menarche On Perception, Dimension And Body Image Of Active And Insufficiently Active Girls

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Menarche causes body changes such as increased body fat and classic changes occur in secondary sexual characteristics. In this way due to body changes, the body perception also needs to be adjusted. The regular practice of physical activity has been considered a key element to improve the perception of size and body image in different populations, however, to our knowledge, the association between menarche and the level of physical activity in perception of the dimension and of the body image still unexplored. PURPOSE: Verify the influence of menarche in the perception of the body in a group of active and inactive girls. METHODS: After the approval of the São Judas Tadeu University Research Ethics Committee, thirty-eight girls were distributed into two groups active and insufficiently active subjects and analyzed semianually by 2, 5 years by identification before and after menarche. Anthropometric parameters (height, body weight and body mass index), perceptions of body size (using the Image Marking Procedure) and body image (silhouettes scale) were used as evaluation parameters. RESULTS: After menarche, all the girls in both groups presented alteration (p<0.05) only in the anthropometric parameters and the body perception index of the hip after the menarche. No significant differences were identified (p>0.05) between groups. CONCLUSION: menarche induced anthropometric alterations and perception of the hip dimension, but without promoting changes in the general perception of the body, as well as in the indication of the silhouettes and in the corporal satisfaction regardless of the level of activity physical.

1958 Board #114 May 30 3:30 PM - 5:00 PM Habitual Physical Activity And Academic Achievements Among Undergraduate Adult Students

Daniel S. Moran, FACSIM, Julianna Asnier, Tamam Younis, Oxana Rubinstein. Ariel University, Ariel, Israel.

(No relevant relationships reported)

Physical activity is associated with many physical and mental health benefits. The activity promotes mood, reduces stress and anxiety and as shown previously increases academic performance with higher grades among youth and young undergraduate students. PURPOSE: To examine the relationship between physical activity habits and academic achievement among undergraduate adult male and female students. METHODS: Two hundred and thirty two male students (34.5 ± 10.2 yrs) and seventy two female students (38.2 ± 7yrs) s from the Faculty of Health Sciences at Ariel University volunteered to participate in this study. The cross-sectional study was conducted using a q quantitative method and data was collected by a closed questionnaires, which included questions about physical activity in view of intensity, type of activity, time duration and frequency. RESULTS: A significant positive correlation (r=0.03) was found between physical activity habits and higher grades among the male students. For the younger male students and the adult male students - the higher the physical activity time duration and frequency the higher the grades were. No correlation between adult female students’ physical activity and academic grades were found (p>0.05) . CONCLUSIONS: Older male students’ academic grades were correlated to their physical activity habits. The awareness of the importance of physical activity habits among undergraduate male students is not limited to the younger age students but is also true for all age groups.

1959 Board #115 May 30 3:30 PM - 5:00 PM Assessing Hispanic College Students Knowledge Related to Metabolic Syndrome Conditions

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(No relevant relationships reported)

PURPOSE: To investigate Hispanic college students’ awareness and knowledge related to metabolic syndrome (MetS) conditions. METHODS: Hundred and thirty-nine Hispanic college students (aged 22.43 ± 4.07) volunteered to participate in the study. Each participant read and signed the consent form prior to any data collection to take place. Demographic data including age,
race, gender, and major were collected. Participants then answered recall questions and completed MetS knowledge questionnaires (Yahia et al., 2018; Becker et al., 2008). The questionnaires were designed to assess MetS knowledge and awareness and have seven categories: diabetes, adiposity, hypertension, high serum cholesterol, arteriosclerosis, stroke, and myocardial infarction. Students’ responses were scored and interpreted as poor knowledge (≤50% correct), fair knowledge (51–80% correct), and good knowledge (≥80%).

RESULTS: The results showed that majority of the students had fair level of knowledge (77.5% correct) related to MetS conditions. The participants were more knowledgeable on stroke and adiposity, and least knowledgeable on cholesterol, myocardial infarction, and diabetes components. There was no significant difference between genders for the level of knowledge for adiposity, cholesterol, myocardial infarction, and diabetes component of the MetS questionnaire. However, there was a significant difference in knowledge level for stroke component between genders (p<0.01). Males had more knowledge on stroke component than females.

CONCLUSIONS: Majority of Hispanic college students have fair level of knowledge about MetS and MetS related conditions. Findings suggest that students MetS related knowledge and awareness can be improved. MetS is highly prevalent among Hispanic population. Therefore, increasing Hispanic students’ awareness and knowledge related to MetS is essential to improve students’ overall health. Previous studies identified colleges and universities as potential settings for health prevention and early intervention. Future studies should investigate the effects of various intervention methods on Hispanic students’ MetS related knowledge and long-term health conditions.

1960 Board #116 May 30 3:30 PM - 5:00 PM Comparison of School Meal Patterns in High School Athletes and Non-Athletes
Alison M. Redd, Jeanette M. Garcia. UCF, Orlando, FL.
(No relevant relationships reported)

PURPOSE: To compare differences in school meal patterns and total (both interscholastic organized sports and leisure time) physical activity among high school athletes and non-athletes. METHODS: A total of 308 high school students (16.04 ± 1.35 yrs old, 55% female, 53% Caucasian) completed a series of questionnaires regarding their consumption of meals provided at school (both breakfast and lunch), participation in their school’s free/reduced price meal program, and reasons for not consuming school meals. Additionally, questions regarding weekly duration and frequency of organized interscholastic sports and leisure-time physical activity were included. Due to skewed distribution, both non-parametric and parametric analyses were conducted to compare differences among male and female athletes and non-athletes. All analyses were conducted in SAS software version 9.4 with a significance level set at α < 0.05 software.

RESULTS: Out of the 308 respondents, 5% of the sample (n=18.5% female) participated in interscholastic sports, and 44% (n=136; 65% female) were classified as non-athletes. Student athletes participated in more overall weekly physical activity (p=0.00) compared to non-athletes. No differences existed between athletes and non-athletes regarding their consumption of either school breakfast (2.8% athletes vs. 18% non-athletes, p=0.02) or lunch (3.5% athletes vs. 6.0% non-athletes, p=0.23). Additionally, there were no differences between males (28%) and non-athletes (35%) regarding participation in the school free/reduced meal program (p=0.03). Qualitative feedback provided for avoiding consumption of school meals included students arriving to school without enough time to purchase breakfast before class, eating breakfast or lunch, and having school meals not offering satisfactorily. Lack of sleep among college students is currently a massive epidemic affecting millions. Sleep duration and quality is an important determinant of overall health, and is related to health behaviors (physical activity (PA) & diet) and outcomes (mental health). But little is known about these relationships among college students.

Purpose: Examine how PA, depression, body mass index (BMI), fruit and vegetable consumption (FVC), and academic performance differed based on sleep quality and duration. Methods: Students completed an online survey, self-reporting their sex, height, weight, grade-point average (GPA), PA levels, FVC, and also responded to sleep questions regarding mental health and sleep. Participants were grouped into those who reported sleep <4 or ≥4 nights of restful sleep/week. Paired samples t-tests examined differences in the aforementioned PA, FVC, BMI, and GPA between groups. Chi-square tests for independence examined differences in mental health (depression and stress) based between groups. Results: 38% of respondents participated to the sleep question, the majority of whom were women (52%) and non-Hispanic white (76.1%). For all participants, those who reported better sleep reported significantly higher moderate PA (p=0.08), vigorous PA (p=0.001), weekly MET-min (p=0.001), and GPA (p=0.001), whereas BMI (p=0.627) and FVC (p=0.107) did not differ between groups. When split by sex, the same results were revealed for women, but among men the only significant differences were in GPA (p=0.042) and vigorous PA (p=0.019). Those who reported better sleep also reported significantly less symptoms of depression regardless of sex (p=0.001). Conclusion: A positive relationship between sleep and PA was found for women. In men, only vigorous PA was found to have a positive relationship with sleep. Though, a positive relationship between sleep and academic performance was evident for both sexes. In addition, better sleep was associated with better mental health regardless of sex. In summary, findings highlight the importance of more education on the importance of the relationship between sleep and better academic performance and mental health. Further research is required to examine the relationship, in particular directionality, between the amount PA and the duration of sleep in college students.
with a subset of 10 (6 female, age 18 2 years, 9% Caucasian) students who were enrolled in a larger study (n=135) investigating learning and behavioral outcomes from participation in a health and fitness course. Interviews were audio-recorded and transcribed verbatim. Thematic analysis was used to identify predominant themes.

RESULTS: Interviewees described their experiences and learning outcomes from the course. In regards to PA attitudes and practices, three themes emerged: (1) Self-Consciousness. Participants reported feeling embarrassed and awkward in the fitness facility; (2) family and friends. The majority of interviewees reported exercising with friends as a strategy to improve motivation. Additionally, many identified family members as either having a positive or negative influence on PA behaviors. (3) Motivational Factors. The primary factors participants cited as influencing PA motivation were health, and maintenance of body weight. CONCLUSIONS: Results show that several factors influence college students’ motivation, attitudes, and adherence to PA participation. It is recommended that health educators consider implementing practices to ensure that physical activity courses meet the specific needs of college students. This study was funded by a Fitchburg State University Special Projects Grant.

1964

**Board #120**

**May 30 3:30 PM - 5:00 PM**

**Effects Of A 13-week Yoga Class On College Aged Student’s Flexibility, Body Image, And Mood**

Suet Hon. *The Chinese University of Hong Kong, Hong Kong, Hong Kong*  
Sponsor: Professor Stanley Hui S.C., FACSJM  
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(No relevant relationships reported)

**RESULTS:** The findings suggest that parents’ physical activity behavior is directly associated with their children’s BMI, PA, and FMS—setting the stage for the development of experimental trials seeking to promote improvements in preschool children’s FMS and overall health. Future research with larger and more diverse samples investigating the influence of parents’ PA intensity (i.e., light, moderate, and vigorous) on preschool children’s other health outcomes is warranted.

**1966**

**Board #122**

**May 30 3:30 PM - 5:00 PM**

**Effects Of A Peer-led Aerobic Training Program On Physical Activity Behavior Of Urban College Students**

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(No relevant relationships reported)

**PEOPLE:** Peer-based education is commonly used on college campuses to provide health information. Using it to introduce physical activity to ethnically-diverse sedentary students attending an urban commuter college has not been explored. We examined the impact of a 10-week peer-based aerobic-exercise (AE) training program on urban college students’ leisure physical activity behavior. **METHODS:** Inactive students (N = 23, mean age: 21 ± 2.3 years) participated in a 10-week training program consisting of approximately 3 weekly AE sessions. Once-per-week sessions led by a peer-student trainer included a short lecture on exercise’s health benefits followed by 30 mins of AE (5.5 ± 6.0 HRR). Participants were instructed to complete 2 other AE sessions independently per week and completed weekly online journals to assess adherence. Pre- and post-training evaluations of AE behavior patterns (International Physical Activity Questionnaire [IPAQ]) were conducted in the weeks prior to and following the exercise program and one month (30-IPAQ) and 90 days (9-IPAQ) after the conclusion of training. Descriptive statistics describing program participation and adherence are presented. Paired-samples t-tests were conducted comparing pre- and post-training cardiovascular fitness. **RESULTS:** Each week 18 ± 1.6 times participants attended a peer-led session, training at THR of 13 ± 2.88 bpm participants completed 1.26 sessions on average, with the expected 10. Two participants completed 9-IPAQ data demonstrated that 25% of participants engaged in leisure physical activity at a mean of 161.2 MET-min-wk-1. One month following the training period 0% of participants engaged in leisure physical activity at a mean of 103.3 MET-wk-1. **CONCLUSION:** Participation in a peer-led aerobic training program may serve as a gateway to adopting a low level of leisure physical activity by urban college students.

**1967**

**Board #123**

**May 30 3:30 PM - 5:00 PM**

**Association of Sleep Quality and Physical Activity Among Chinese College Students**

Xiayu Zhai, Qian Gu, Mei Ye, Tao Huang, Kun Wang, Xiang Fan. *Shanghai Jiao Tong University, Shanghai, China.*  
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(No relevant relationships reported)

**RESULTS:** The findings suggest that the sleep quality (SQ) in Chinese youth is in a worrying situation. Meanwhile, SQ is associated with lifestyle factors, such as physical activity (PA). Therefore, this study will particularly focus on the association between PA level and SQ in Chinese college students, a special youth group who are under academic pressure.

**Sleep plays a critical role in the growth of youth. However, increasing studies suggest that the sleep quality (SQ) in Chinese youth is in a worrying situation. Meanwhile, SQ is associated with lifestyle factors, such as physical activity (PA). Therefore, this study will particularly focus on the association between PA level and SQ in Chinese college students, a special youth group who are under academic pressure.**

**CONCLUSION:** The present study is aimed to determine the correlation between SQ and PA level in Chinese college students.

METHODS: In 2017B305 college students (male: 61.1%; female: 38.9%) aged 17-24 years old were randomly sampled from Shanghai Jiao Tong University, China. SQ, PA level, academic pressure and lifestyle of students were collected via a questionnaire. SQ and PA level were evaluated by Pittsburgh Sleep Index (PSI) and International Physical Activity Questionnaire (IPAQ), respectively. SQ dichotomizes two: good SQ (PSI score ≤5) and poor SQ (PSI score >5). PA was also divided into two levels: sufficient PA and insufficient PA according to World Health Organization moderate-to-vigorous physical activity (MVPA) recommendations.

**RESULTS:** The average MVPA time was 4.8 ± 3 min/day (males: 5 ± 3 min/day; females: 38 ± 32 min/day). About 22% of participants met MVPA recommendations (males: 5.5%; females: 20.5%). Average SQ score was 3.8 ± 1.6 (males: 3.8 ± 1.6; females: 3.8 ± 1.6). About 8% of poor SQ had poor SQ (males: 87.9%; females: 91.8%). Males with sufficient PA had better SQ (7.41 ± 1.87) than those with insufficient PA (7.74 ± 1.85; P <0.05). So no significant correlation was found in females. The linear regression results showed that insufficient PA was
associated with higher SQ score (B=0.29, P<0.01) among males. Other health-related factors such as dietary habits and academic pressure also showed significant correlation with SQ. However, regarding the females, no significant correlation between PA and SQ was observed. Furthermore, after adjustment for the demographic variables and health-related factors, the results of binary logistic regression showed that males with insufficient PA had higher odds of poor SQ (OR=1.44, 95%CI=1.12-1.86, P<0.01) compared with the others.

CONCLUSION: Better SQ was related to higher PA level in male college students.

1968 Board #124  May 30 3:30 PM - 5:00 PM

**Associations Between Physical Activity, Diet, And Substance Use With Academic Performance**

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Email: pjm9@psu.edu

**No relevant relationships reported**

Physical inactivity, poor diet, and alcohol/substance abuse are common health behaviors among college students. However, little is known about the relationship between these health behaviors and academic performance. **Purpose:** To examine differences in grade point average (GPA) based on physical activity (PA) levels, fruit and vegetable consumption (FVC), and use of alcohol and substances. **Methods:** Students completed an online survey self-reporting demographics (age, sex, race/ ethnicity), PA (min/week of moderate and vigorous PA, FVC (servings/day), use of alcohol and substances (yes/no), as well as GPA. Independent samples t-tests were used to examine differences in GPA between those who did not meet PA and FVC recommendations, and those who did not use alcohol and substances. **Results:** Data was collected from 339 pa participants (women, 213, non-Hispanic white, 7, 2%). For all participants, GPs differed significantly between those who did (3.40±0.40) and did not (3.36±0.46) meet FVC recommendations (p<0.01), and those who did not (3.34±0.46) and did (3.36±0.48) accumulate 500 weekly MET-min (p=0.034), and those who did (3.3±0.4) and did not (3.3±0.4) meet FVC recommendations (p=0.001). GPA also differed significantly between tobacco users (3.26±.41) and non-users (3.40±0.40, p<0.001), as well as cigarette users (3.30±0.40) and non-users (3.4±0.4, p<0.001), but not based on alcohol use, for all participants. **Conclusion:** Findings indicate that those with unhealthy lifestyles are less physically active and display unhealthy eating habits, tend to have poor academic performance. This provides insight to students and campus health professionals regarding how their health behaviors may be affecting their GPA.

1969 Board #125  May 30 3:30 PM - 5:00 PM

**Pilates Connect: A Program To Support The Transition Of Student-athletes To Lifetime Activity**

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**No relevant relationships reported**

Student-athletes face challenges maintaining physical activity when they transition beyond college athletics, including loss of team support, few specific goals and strong athletic identities with weaker exercise identities (Fuller, 2014). Reifsteck, Gill, & Labban, 2016). Resources that prepare final-year student-athletes for meaningful lifetime physical activity support physical and psychological wellness. **PURPOSE:** To implement the PILATES Connect program for final-year student-athletes and evaluate their experiences and program support in the transition to lifetime physical activity. **METHODS:** Twelve final-year student-athletes participated in PILATES Connect, once each week for six weeks. The sessions included 30m inutes of Pilates training, 15 minutes of reflection and discussion, and 10 minutes of evaluation. Measures included attendance, session and program evaluations, and focus groups. **RESULTS:** Final-year student-athletes strongly adhered to the program, with an overall attendance rate of 94.4%. In session evaluations (1=not at all true, 7=very true), participants agreed that they were pretty good at Pilates (M=6.8), did the activity because they wanted to (M=6.8), and felt like they could trust the other participants (M=6.4). Participants agreed that PILATES Connect supported their confidence in the transition to lifetime activity (M=6), greater control over activity choices (M=5), and connection to other participants (M=6). They would recommend PILATES Connect to other student-athletes (M=6) and consider participating in Pilates or other group exercise in the future (M=6.8). Focus group responses highlighted increased confidence through progression in a new form of activity and recognition of different options for activity after graduation. Student-athletes enjoyed discussing the transition with peers and felt less alone. They recommended more sessions and promoting the program through word of mouth and feedback from past participants. **CONCLUSION:** The six-week PILATES Connect program was feasible, as evidenced by strong adherence rates and positive feedback from participants. Final-year student-athletes agreed that the program supported their competence, autonomy, and relatedness in physical activity as they approached the transition to alumni.

1970 Board #126  May 30 3:30 PM - 5:00 PM

**Gunter Submission**

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**No relevant relationships reported**

**PURPOSE:** To learn if different physical activity (PA) promotion approaches for boys compared to girls are needed in rural elementary school settings, we evaluated sex differences in total physical activity (TPA) and moderate-to-vigorous physical activity (MVPA) among 1st - 5th graders attending six rural schools in Oregon. **METHODS:** We assessed the PA levels of 173 students (86 girls and 87 boys) over four consecutive school days using Walk3R. The MVPA pedometres in fall 2015D evies were worn above the right hip for the duration of the school day (8 hours) and programmed to measure PA time at any intensity (i.e. no minimum requirement for step rates/min). Time spent in MVPA was evaluated using a pre-specified step rate (≥ 120 steps/min). Teachers distributed and collected devices daily, recorded wear time, and reported daily classroom schedules (e.g. times for recess, lunch, etc.). At the end of the school year students were run in R.

**RESULTS:** Analyses were done on data from boys and girls. There were significant sex and grade-level differences in the volume of TPA and MVPA accrued throughout the school day (p<0.001). Boys accrued more TPA and MVPA than girls, and younger children accrued more TPA and MVPA than older children (p<0.001). There was a significant grade by sex interaction. Specifically, for both MVPA and TPA, girls in 2nd and 4th grade had higher levels of PA compared with other grades, with the exception of 5th grade. **CONCLUSIONS:** Physical activity levels at school declined for all students from 1st through 4th grade. Girls in 2nd and 4th grade exhibited lower TPA and MVPA levels than boys. Preliminary findings suggest different approaches to increase PA among elementary school girls may be warranted. More data are needed to learn where to target these approaches.

Supported in part by USDA NIFA, Grant 801-1-BO 30-020.

1971 Board #127  May 30 3:30 PM - 5:00 PM

**Effect Of 10-week Flag Football Intervention On Physical Activity Of Overweight And Obesity Children**

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**No relevant relationships reported**

**PURPOSE:** To investigate the effect of 10-week flag football exercise and regular physical education class on daily physical activity (PA) levels in elementary school students. **METHODS:** A total of 1739 students (835 girls and 901 boys) over four consecutive school days using Actigraph GT3X + (wore on right hip) for seven consecutive days. The cut-points established by Evenson et al. were used to convert Actigraph counts data into PA in minutes in different intensity levels (sedentary: 0-229 counts/15s epochs, light 230-691 counts/15 epochs, moderate-to-vigorous: ≥75 counts/15 epochs). Differences in PA between intervention and control groups before and after the 10-week intervention period were compared by a series of mixed model repeated measures ANOVAs. Data were expressed as mean ± standard deviation; Significant level was set at 0.05. **RESULTS:** The intervention group spent more sedentary time than the control group after the 10-week intervention (Table 1). **CONCLUSIONS:** Flag football exercise could help reduce overweight and obesity elementary school students’ sedentary time. Meanwhile, it was noticed that daily MVPA levels of most of these students were significantly below 60 min/d. This study was supported by National Social Science Fund of China (No. 1B TY09).
Table 1 Group differences in weekday PA levels (min/d)

<table>
<thead>
<tr>
<th>PA</th>
<th>Intervention (n=24)</th>
<th>Control (n=28)</th>
<th>F</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST</td>
<td>Pre 9.9 ± 2.4</td>
<td>9.6 ± 3.1</td>
<td>1.8</td>
<td>0.04</td>
<td>0.19</td>
</tr>
<tr>
<td>Post</td>
<td>10.5 ± 2.1</td>
<td>10.6 ± 2.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>LPA</td>
<td>Pre 28.9</td>
<td>27.8</td>
<td>0.2</td>
<td>0.07</td>
<td>0.37</td>
</tr>
<tr>
<td>Post</td>
<td>27.5 ± 3.5</td>
<td>27.5 ± 3.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MPA</td>
<td>Pre 30.4 ± 9.5</td>
<td>29.6 ± 9.5</td>
<td>0.8</td>
<td>0.07</td>
<td>0.36</td>
</tr>
<tr>
<td>Post</td>
<td>27.8 ± 9.5</td>
<td>27.8 ± 9.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>VPA</td>
<td>Pre 32.5 ± 13.5</td>
<td>31.5 ± 12.0</td>
<td>1.35</td>
<td>0.07</td>
<td>0.25</td>
</tr>
<tr>
<td>Post</td>
<td>31.5 ± 12.0</td>
<td>31.5 ± 12.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

1972 Board #128 May 30 3:30 PM - 5:00 PM

The Effect Of Extracurricular Physical Activities In The Development Of Coordination Of Children Aged 7 To 9 Yearsold

Yunai Chen, Ming Yang, Jingdong Chang. Southwest University, Chongqing, China. The Branch of the Collaborative Innovation Center of Assessment toward Basic Education Quality at Southwest University, Chongqing, China. Email: yunai.chen@swu.edu.cn

Purpose: The purpose of this study was to assess the effects of extracurricular physical activities on the physical coordination in children aged 7-9 years.

Methods: A total of 120 children aged 7-9 years were enrolled for a 12-week experimental intervention study. The sample was divided into an experimental group (60 children) and control group (60 children) by random number method. The experimental group participated in extracurricular intervention courses twice a week for 1 hour. The content of the course was mainly game, medium exercise intensity. The control group did not participate in the extracurricular exercise. The “Chinese Children Coordination Test” (CCCT) developed by the project team was used to conduct the coordination test before and after the experiment. The raw data was standardized and compared according to age and gender.

Results: After 12 weeks of extracurricular intervention, the results showed that the scores of the experimental group in the transfer coordination (t=2.8; p<.05) and the coordination transfer (t=2.5; p<.05) were significantly higher than the control group. The experimental group was significantly higher than the control group (t=2.90; p<.05) in locomotor skills (intervention: M=27.8 vs. control: M=20.1; t=8.31; p<.05). The density of VPA (intervention: M=13.0 vs. control: M=10.6; t=2.0; p<.05) in the experimental group was significantly higher than the control group over time.

Conclusion: The effects of extracurricular physical activities on the physical coordination in children aged 7-9 years were significantly higher than the control group. The experimental group had higher coordination ability compared to the control group. The results showed that extracurricular physical activities could significantly improve the coordination ability of children, and the density of VPA was higher in the experimental group compared to the control group.

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Effects of Eight-week Fundamental Motor Skills Intervention on Children's Physical and Cognitive Health Outcomes

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Purpose: This study aimed to examine the effects of a fundamental motor skills (FMS) intervention program on physical and cognitive health outcomes among elementary children.

Methods: Participants were 31 K-2 students (16 girls, 15 boys) from three public elementary schools in the southwestern U.S. They were randomly assigned to either the intervention (1 school, n=20) or the control group (2 schools, n=11). During two separate 8-week periods in 2013 and 2014, children in the intervention group (15 girls, 15 boys) joined the FMS intervention for three times per week (6

Globaly, 83% of school-aged children do not engage in the recommended 6 minutes of daily moderate-to-vigorous physical activity (MVPA; Hallal et al., 2012). Motor skill competence is fundamental to a child’s physical activity and cognitive development (Stodden et al., 2008), and thus may explain the lack of MVPA engagement among children.

Purpose: This study aimed to examine the effects of a fundamental motor skills (FMS) intervention program on physical and cognitive health outcomes among elementary children.

Methods: Participants were 31 K-2 students (16 girls, 15 boys) from three public elementary schools in the southwestern U.S. They were randomly assigned to either the intervention (1 school, n=20) or the control group (2 schools, n=11). During two separate 8-week periods in 2013 and 2014, children in the intervention group (15 girls, 15 boys) joined the FMS intervention for three times per week (6

1974 Board #130 May 30 3:30 PM - 5:00 PM

Evaluation Of A Physical Activity Level And Physical Fitness In Obese Children: Health Educational Program For Children (hepchild)

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Purpose: This study aimed to evaluate the effectiveness of the Health Educational Program for Children (HEPchild) being 24% of camp and 26% follow-up on the physical activity level (PAL) and physical fitness (PF) in obesity children. METHODS: Hepchild was designed for obese children and developed in two phases: The Phase 1 consisted of Pre assessments and five-day camp (CAMP); and Phase 2 corresponded to the 3 months follow-up. Twelve children attended to CAMP as well as PAL and PF tests RESULTS: After 12 weeks, 2% of children became more active (> 1800 METs per week). In contrast the amount of sedentary children (<3000 METs per week) decreased by 15% and the insufficiently active (<600 METs per week) increased by 15%. No child was classified as active (>3000 METs per week) in any time. The PAL leisure time during the week and during the weekend increased 26.06% and 14.1%, respectively, when comparing pre CAMP to the end of 12 weeks follow-up. SB during the week and the weekend showed a significant mean reduction of 177.14 and 41.43 minutes respectively. A significant improvement was observed in the subjects’ sit and reach flexibility, upper limb strength, and lower limb strength.

Conclusions: The effects of eight-week eight-week Hepchild contributed to increase PAL and reduction of sedentary behavior and improve physical fitness in obesity children.
week. Of the pupils who recalled being in a PAL (3%), >9% wanted teachers to continue teaching PAL. Delivering the training cost $901 (€45 staff time, €450 equipment). Change in step count for exercise (EX) and sedentary time (SED) was -1,301±1,398 (+1.1±1.3) minutes at control & intervention schools, respectively. **CONCLUSION** As most PAL evaluations focus on primary schools, this study makes a valuable contribution to the literature. Delivering PAL training to teachers was feasible, and delivering & participating in PAL was acceptable for teachers & students. However, low acceptability of PAL training & no evidence of effectiveness. **CONCLUSION**: Change in student physical activity (PA) was significant, but the range was small (exercise (EX) and sedentary behavior (SED) were 3% and -1.3% respectively). The difference in PA between control and intervention schools was not significant. **CONCLUSION**: The implementation of PAL training in schools was feasible and effective, but the impact was limited. Further research is needed to evaluate the long-term effects of PAL training on student PA levels.
Kidney (KTR) and liver (LTR) transplanted recipients suffer from a reduced exercise capacity ($V_{O2peak}$) and performance. Several studies pointed out the skeletal muscle dysfunctions and atrophy seem to be a major problem in these recipients. Indeed, skeletal muscle dysfunctions and atrophy appear to be a common scenario in the post-transplant period (Kempeners et al., 1999; Kallwitz, 2011).

**PURPOSE:** The aim of the present study is to determine if endurance training (ET) involving a small muscle mass, e.g. single leg cycling (SLC), might be effective in the development of higher $V_{O2peak}$ and WR than ET with large muscle masses, e.g. double leg cycling (DLC), in KTR and LTR.

**METHODS:** 9 sedentary patients were enrolled (KTR=6; LTR=3) and divided into double leg cycling (DLC), in KTR and LTR. These preliminary results suggest that SLC training elicited a similar increase significantly ($p: 0.025$) the $V_{O2peak}$ in the SLC and DLC groups completed 20±2.5 and 23±1.4 ET sessions, respectively. SLC and DLC groups trained both legs at the same time and the SLC group performed the first half of the ET regimen due to a technical problem. Electronic braking ergometer. Pulmonary gas exchange was measured using breath-by-breath analyses. All subjects were asked to attend 24 T sessions: the DLC group trained both leg at the same time and the DLC group performed the first half of the session with moderate- to vigorous-intensity (3.0-7.0 METs), and moderate-to-vigorous-intensity (3.0-7.0 METs).

**RESULTS:** In the accelerometer data, time spent in light-intensity physical activity was not significantly correlated with contents of IntramAT and SAT. Stepwise regression analysis was performed, with IntramAT content as a dependent variable. These results were based on the recall from their mothers, the agreement between the two recalls is particularly noteworthy. The current sample is consistent with previous work which found a significant correlation of $r=0.32$ between mothers’ and daughters’ ages at menarche.

**CONCLUSIONS:** These results suggest that moderate- to vigorous-intensity physical activity time was related to IntramAT content only, skeletal muscle size and moderate- to vigorous-intensity physical activity time as independent variables. As a result, skeletal muscle CSA/body weight and moderate- to vigorous-intensity physical activity time were independent variables ($R^2=0.5$).

Physical inactivity decreases of skeletal muscle mass and increases content of the adipose tissue in humans. However, it is not well known that the relationships between daily physical activity and various types of adipose tissues such as intramuscular adipose tissue (IntramAT), intermuscular adipose tissue (IntermAT) or subcutaneous adipose tissue (SAT). **PURPOSE:** To investigate relationship between daily physical activity and contents of IntramAT, intermuscular adipose tissue (IntermAT) or subcutaneous adipose tissue (SAT).

Methods: Twenty healthy young men ($28±4$ yrs) participated in this study. Axial images of the mid-thigh were taken using magnetic resonance imaging. The cross-sectional area (CSA) of IntramAT, IntermAT, SAT and skeletal muscle were measured. Daytime physical activity time was measured using an accelerometer on 14 consecutive days and summarized the activity time of two intensities; light-intensity (1.1-2.9 METs), and moderate-to-vigorous-intensity (3.0-7.0 METs).

**RESULTS:** In the accelerometer data, time spent in light-intensity physical activity was $8.4\text{ min}/	ext{day}$ and time spent in moderate-to-vigorous-intensity physical activity was $30.5\text{ min}/	ext{day}$. Light-intensity physical activity time was not significantly correlated with contents of all adipose tissues in the thigh. The moderate-to-vigorous-intensity physical activity time was correlated with IntramAT content ($r=0.70-0.81$, $p<0.001$). On the other hand, moderate-to-vigorous-intensity physical activity time was not significantly correlated with contents of IntermAT and SAT. Stepwise regression analysis was performed, with IntramAT content as a dependent variable and age, body mass index, SAT CSA/body weight, skeletal muscle CSA/body weight, light-intensity physical activity time, moderate- to vigorous-intensity physical activity time as independent variables. As a result, skeletal muscle CSA/body weight and moderate- to vigorous-intensity physical activity time were independent variables ($R^2=0.5$).

**CONCLUSIONS:** These results suggest that moderate- to vigorous-intensity physical activity time was related to IntramAT content only, skeletal muscle size and moderate- to vigorous-intensity physical activity time could be a major determinant of IntramAT content in young men.

**Schools play an important role in shaping the dietary and physical activity behaviors of children, and teachers are increasingly called to deliver health-related information in the school setting. No study has examined the association between body mass index (BMI) and health perceptions in preschool teachers in elementary education programs.**

**PURPOSE:** To determine the association between perceptions of physical activity, healthy weight, and healthy eating in a sample of preschool teachers in elementary education programs.
education programs. METHODS: Participants included 34 pre-service teachers enrolled in elementary education programs in the state of Florida. Individuals ranged in age from 18 to over 60, with 9% of the participants in the age range of 18 to 29. Females accounted for 9% of the participants. All participants provided self-report height and weight information and responded to statements regarding perceptions of physical activity, healthy weight, and healthy eating. Participants also provided the number of days per week they engaged in at least 30 minutes of moderate to vigorous physical activity. RESULTS: Bivariate correlations showed lower BMI was associated with the perceptions of a more physically active lifestyle (r = −0.25, p < 0.01), healthier weight (r = −0.6, p < 0.01), and healthier eating choices (r = −0.26, p < 0.01). In terms of exercise, higher BMI was associated with fewer days per week at least 30 minutes of moderate to vigorous physical activity (r = 0.16, p < 0.01). CONCLUSION: The current findings indicate that BMI is associated with perceptions of health in preservice teachers in elementary education programs. Since these correlations are replicable, such findings encourage researchers to examine the ways in which health promotion programs should be delivered to preservice teachers to improve their health and enhance their ability to promote healthy eating and physical activity to their future students.

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Board #141 May 30 3:30 PM - 5:00 PM
What is the Effectiveness of HIIT Body Work on Energy Expenditure in Active Male Adults
Alexandre F. Machado1, Roberta L. Rica1, Fábio L. Ceschin1, Victor M. Reis2, Aquiles Y. Silva1, Danilo S. Bocalini3, Aylton F. Junior1, 1University São Judas Tadeu, São Paulo, Brazil. 2Research Center in Sports Sciences, Vila Real, Portugal. 3University Mayor, Santiago, Chile. 4University Federal of Espirito Santo, Vitória, Brazil. Email: xd.machado@gmail.com

INTRODUCTION: The High Intensity Interval Training (HIIT) has been identified as an important strategy in fitness by improving the cardiometabolic function in adults. However, different models of HIIT performed with body weight, known as High Intensity Intermittent Work (HIOW) in blocks with maximum intensity, still lack information namely the energy demand imposed in training. PURPOSE: Assessment the energy expenditure in a single session of HIW in healthy male adults.

METHODS: 12 male adults (33.3 ± 12 years old) performed an all-out protocol with 30 seconds effort x 30 seconds recovery, amounting 20 minutes in the total session. The session exercises were Jumping Jack (JJ), Burpee (BP), Mountain climber (MC) and Squat (SQ). Power efficiency was calculated for each set. The energy expenditure was determined by indirect calorimetry with K5, gas analyser throughout the entire session. Heart rate was also measured as well as the rating of perceived exertion (0-10 Borg scale). Repeated measures ANOVA, followed by Tukey (0.05, post hoc test), were performed to compare the differences between exercises. All analysis were performed using SPSS software.

RESULTS: The session mean VO2 was 3.81 ± 0.21 mL kg·min−1; total energy expenditure was 2.9 ± 2.7 kcal; mean heart rate was 16 ± 9 bpm and mean RPE was 15 ± 6. The mean and standard deviation for the blocks of the different exercises are described in the table below, values followed by the same letter do not differ significantly from each other. Table – Mean VO2 and energy expenditure per exercise and minute of exercise.

Note: a and b = significantly different from every other exercise (p<0.05); c = significantly different from JJ and BP (p<0.05). CONCLUSION: The burpee exercise is the most demanding exercise in terms of aerobic energy expenditure. Contrarily, the jumping jack exercise was the least demanding. Aerobic energy expenditure seems consistent with the use of this type of workout to promote weight loss and/or fat loss.

1986

Board #142 May 30 3:30 PM - 5:00 PM
Mechanical Efficiency After High Intensity Interval Training In HIV+ Hispanic Women
Farah A. Ramirez-Marrero, FACSM1, Marcos A. Arnal-birriel1, Jorge L. Santana-Bagur2, Valerie Wojna1, Walter Frontera, FACSM3, 1University of Puerto Rico, Rio Piedras, San Juan, Puerto Rico. 2University of Massachusetts, Amherst, MA. 3University of Puerto Rico, Medical Sciences, San Juan, Puerto Rico. Email: farah.ramirezr1@uapr.edu

High intensity interval training (HIIT) is known to improve cardiorespiratory fitness (VO2peak) and exercise capacity in healthy and living with chronic disease adults. Mechanical efficiency (energy demand at a given workload) also helps improve exercise capacity; however, few studies have evaluated mechanical efficiency resulting from HIIT, and none with HIV+ adults. PURPOSE: To compare mechanical efficiency in HIV+ and HIV- women after a low volume HIIT intervention. METHODS: A group of 20 HIV+ and 11 HIV- Hispanic women completed a graded exercise test (GXT) on a bicycle ergometer with increments of 2W until volitional fatigue, during which measures of VO2 and HR were obtained. GXT were conducted before and after a low volume-HIIT intervention (1:1 intervals) 3 days/wk for 6 wk (2 wks, 16 min total) at 80% and 4 wk (20 min total) at 90% of HR reserve. Percent VO2peak and %HRpeak were determined at 25%, 50 and 100% T-tests and Wilcoxon Rank Sum tests were used to detect pre to post-test differences within each group.

RESULTS: Compared with HIV+, HIV+ had lower VO2 at 100W workload during pre-test (2.0L, 18 ± 13 kg·m−1, P = 0.01), and also at 75% and 100W during post-test (1.6L ± 18 ± 13 kg·m−1, P = 0.01; respectively). Reduced metabolic demand (%VO2peak) was observed at 25W in HIV- (15 ± 3.9 mL·kg−1·min−1, P = 0.01), at 75% in both HIV+ and HIV- groups (0.8 ± 0.6 mL·kg−1·min−1, 10.8 ± 3.6 mL·kg−1·min−1, P = 0.04 and P = 0.04 respectively), and at 90% in HIV+. %HRpeak was lower at near maximal workouts in HIV+ compared with HIV-, both groups increased their mechanical efficiency at various submaximal worksloads; thus, improving exercise capacity with HIIT. Supported by NIH/NID121MD001830, R21MH119524, U54MD007587-04, and R25MD007607.

Abstracts were prepared by the authors and printed as submitted.
and post-intervention measurements included a submaximal cycling test at 6W for women and 10W for men. Participants rated their perceived breathlessness (RBP, 0-10 Borg scale) as well as unpleasantness, depression, anxiety, frustration, anger, and fear associated with their breathlessness (visual analog scales, 0-10 cm) at the end of the test. Paired t-tests were used to analyze difference between pre- and post-intervention. RESULTS: Significant decreases were achieved in body weight by 9 ± 4 kg (\( \text{P}<0.01 \)), BMI by 3 ± 1 kg/m², and body fat by \( \text{P}<0.05 \). RBP dropped by 1.5 ± 1.8 (\( \text{P}<0.05 \)). Significant decreases in ratings of unpleasantness (-2.3 ± 2.2), anxiety (-1.2 ± 1.8), frustration (-0.8 ± 1.9), and fear (-0.4 ± 1.0) were observed, while ratings of depression and anger were unchanged. CONCLUSIONS: Moderate weight loss alleviated not only dyspnea on exertion, but also the unpleasantness and negative emotional response related to the dyspnea. Supported by NIH Grant R01 HL08463 and King Charitable Foundation Trust.

1988 Board #144 May 30 3:30 PM - 5:00 PM
Prior Baby Jumper Use Is Correlated With Children’s Parent-Reported Physical Activity Level
Toyn Ajsa, Poonam Mankat. Texas A&M University - Corpus Christi, Corpus Christi, TX.
Email: toyn.ajsafe@tamucc.edu
(No relevant relationships reported)

PURPOSE: Baby jumpers are ubiquitously found in the infant environment. Anecdotally, while some parents link them to enhanced motor development, others link them with delayed walking onset. Baby jumper use involves successive vertical push-offs (rebounds) against the floor with the feet. The resulting raising and lowering of the body's center of mass is consistent with movements that require leg stiffness regulation. Leg stiffness has been shown to be positively related to maximum sprint velocity in adults and adolescents. Yet, no studies (to our knowledge) have investigated relationships between prior baby jumper use and current locomotor and physical activity (PA) behaviors in young typically developing children. This pilot study investigated these relationships.

METHODS: Parents of \( \text{n} = 3 \) children (age: \( \text{m} = 2.3 \) years; height: \( \text{m} = 2.8 \) m; mass: \( 12 \pm 5 \) kg) completed a 24 item survey administered through Qualtrics software. Questions included prior use of a baby jumper, age at walking onset, current fundamental locomotor behavior and PA level. Questions on the degree of a behavior level were on a 5 point Likert scale. Surveys were excluded, if a parent indicated that the child was born preterm or diagnosed with an intellectual or developmental disability. Bivariate correlations were used to evaluate the directionality of relationships between prior baby jumper use and locomotor and PA behaviors. A Mann-Whitney U test was used to compare age at walking onset between children who used and did not use a baby jumper.

RESULTS: Of the sample, \( \text{n} = 3 \) previously used a baby jumper. The proportions of the sample that were underweight, healthy weight, overweight, and obese, were \( 14\% \), \( 51\% \), \( 17\% \), and \( 17\% \) respectively. Prior use of a baby jumper was moderately positively correlated with children’s parent-reported PA level (\( \text{U} = 231.0, \text{P}<0.01 \)). There was no significant difference in age at walking onset between the groups (\( \text{U} = 231.0, \text{P}=0.09 \)). There was no significant difference in age at walking onset between the groups (\( \text{U} = 231.0, \text{P}=0.09 \)).

CONCLUSIONS: Prior baby jumper use may be linked with running performance and PA level and may promote physical activity in young children. These relationships should be further investigated and modeled using objective measures of locomotor and PA behaviors. Prior baby jumper use did not delay walking onset in the sample.

1989 Board #145 May 30 3:30 PM - 5:00 PM
Overall Mortality, Survival, And Causes Of Death In Former US Olympians
Juliana Antero1, Hirofumi Tanaka2, Quentin D. Larochelambert, Maja Pohar-Perme3, Jean-François Toussaint1. The French National Sports Institute (INSEP), Paris, France. 1The University of Texas at Austin, Austin, TX. 2The University of Ljubljana, Ljubljana, Slovenia. Email: juliana.antero@insep.fr
(No relevant relationships reported)

United States (US) send a greatest number of athletes to Olympic Games but their longevity and specific causes of deaths have not been examined.

PURPOSE: To quantify US Olympic athletes’ longevity and to determine the impact of specific causes of deaths (CoD) on Olympians life duration in relation to the general population.

METHODS: Female (n = 2,301) and male (n = 33) US athletes who have participated at least once in the summer or winter Olympic Games between 1924 and 2012 were followed up to 2016. Their life status and CoD were certified by the National Death Index. The years-saved method was applied to quantify longevity gains/losses in former US Olympians in comparison to the general population.

RESULTS: Former US Olympians lived on average \( 5 \) years longer than their referents in the general population, based on the 2,300 male athletes observed out of \( 24 \) former athletes. The burden of each CoD was distributed according to

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1990 Board #146 May 30 3:30 PM - 5:00 PM
Elevated Serum Uric Acid And Heart Failure In U.S. Adults: 2007-2016 NHANES
Michelle L. Stone, Michael R. Richardson, Larry Guevara, Bethany G. Rand, James R. Churilla, FACS.M. University of North Florida, Jacksonville, FL. (Sponsor: Dr. James Churilla, FACS.M)
(No relevant relationships reported)

There is limited evidence examining the relationship between elevated serum uric acid (UA) concentration and heart failure (HF) in U.S. adults. PURPOSE: To examine the associations between elevated UA and HF using a nationally representative sample of U.S. adults.

METHODS: The final sample with complete data for this analysis (N=17,412) included men and women aged ≥40 years who participated in the 2007-2018 National Health and Nutrition Examination Survey. Self-reported diagnosis of HF was assessed via interview. Elevated UA was defined as <6.0 mg/dL for women and ≥7.2 mg/dL for men. Multivariable gender-stratified logistic regression was utilized to examine the odds of HF. RESULTS: The estimated prevalence of HF was 3.5% and 3.3% among men and women, respectively. Age adjusted analysis revealed significantly increased odds of HF in men (odds ratio [OR], 2.78; 95% confidence interval [CI] 2.09-3.71, \( P<0.01 \)) and women (OR, 3.25; CI 2.57-4.01, \( P<0.01 \)) with elevated UA. Significance remained following adjustment for education, income, race, body mass index, alcohol consumption, hypertension, diabetes, physical activity, and creatinine in men (OR, 1.9; CI 1.04-2.3, \( P=0.03 \)) and women (OR, 2.03; CI 1.33-3.08, \( P=0.01 \)).

CONCLUSIONS: In a representative sample of U.S. adults, having an elevated UA concentration was associated with significantly increased odds of HF when compared to adults with normal UA.

1991 Board #147 May 30 3:30 PM - 5:00 PM
Modernization of a Developing Country: Effect on Body Mass Index
Cynthia Villalobos1, William E. Herrin1, J. Mark Van Ness1, Norah Madaya2, Margaret E. Ciccollela1, Courtney D. Jensen1. 1University of the Pacific, Stockton, CA. 2Uganda Bureau of Statistics, Kampala, Uganda. (No relevant relationships reported)

Modernization provides technology and resources that commonly displace physical activity (PA) from the daily routine; in time, body mass index (BMI) trends upward.
Given the host of deleterious consequences precipitated by poor body composition, it may be helpful to isolate specific factors that predict the largest elevations in BMI. Uganda is an appropriate location to evaluate this. Over the past two years, both overweight (n=1,485) and obese (n=46) subjects owned a bicycle (68.6%) or a motorcycle (31.4%) as transport. Of these, more subjects owned a bicycle (68.6%) than a motorcycle (31.4%). The relationship between ferritin and BMI is significant (p<0.001). Additionally, ownership of a car (β=0.421; p<0.016) and a mobile phone (β=0.625; p<0.001) predicted increases in BMI, while ownership of a bicycle (β=0.330; p<0.001) and a land-line phone (β=-0.657; p<0.034) predicted decreases in BMI. Logistic regression (pseudo R2=0.21; p<0.001) found the odds of being overweight (-0.330; p<0.001) and a land-line phone (β=-0.657; p<0.034) predicted decreases in BMI. Logistic regression (pseudo R2=0.21; p<0.001) found the odds of being overweight or obese increased when a household had a refrigerator (β=0.483; p<0.004), electricity (β=0.400; p<0.001) and television (β=0.961; p<0.001). Additionally, ownership of a car (β=0.421; p<0.016) and a mobile phone (β=0.625; p<0.001) predicted increases in BMI, while ownership of a bicycle (β=0.330; p<0.001) and a land-line phone (β=-0.657; p<0.034) predicted decreases in BMI. Logistic regression (pseudo R2=0.21; p<0.001) found the odds of being overweight or obese increased when a household had a refrigerator (β=0.483; p<0.004), electricity (β=0.400; p<0.001) and television (β=0.961; p<0.001). Additionally, ownership of a car (β=0.421; p<0.016) and a mobile phone (β=0.625; p<0.001) predicted increases in BMI, while ownership of a bicycle (β=0.330; p<0.001) and a land-line phone (β=-0.657; p<0.034) predicted decreases in BMI.

PURPOSE: To determine the influence of cross-country training on markers of inflammation and iron storage and to interpret potential mechanisms underlying these relationships.

METHODS: Twelve NCAA division I cross-country athletes, aged 18 ± 2 yrs, were followed for two years. Blood was collected at the beginning of the season and analyzed by complete blood count (CBC) and ferritin levels were assessed by enzymatic spectrophotometry. Cytokines IL-1β, IL-2, IL-4, IL-5, IL-6, IL-10, TNF-α and IFN-γ were measured with the Lumix® MAGPIX® system. Dependent samples t-test was used to compare ferritin cytokines and CBC mean difference between the first and second year measurements. Pearson correlations were conducted to assess associations between ferritin and immune cell concentrations. IBM® SPSS Statistics 22 software was used to analyze the data.

RESULTS: TNF-α levels increased from the 1st to the 2nd year (β ± 1.17 vs. 121.41 ± 11.93 pg/dL, p<0.006). Platelets (253.63 ± 12.28 vs 267 ± 13.43 K/μL, p=0.045) and Monocytes (8.58 ± 1.90 vs 10.61 ± 2.70 K/μL, p=0.003) also significantly increased from the 1st to the 2nd year. Ferritin levels were positively correlated with TNF-α both years (r=0.716, p=0.009, r=0.84, p=0.008).

CONCLUSIONS: One year of cross-country training seems to influence increases in pro-inflammatory cytokines and immune cell concentrations in NCAA Division I Athletes. Although there were no significant changes in ferritin levels over the years of study, ferritin increases were linked to increases in pro-inflammatory cytokine TNF-α.

Conclusion

The scientific literature has shown increased data on the FitBit ambulatory self-monitoring device but little is known about its effects on sedentary adult men.

PURPOSE: The purpose of this pilot study was to evaluate the impact of FitBit HR2 (G1) and FitBit HR2 with kinesiology - Dietitian counseling (G2) on the number of steps taken per day. METHODS: 12 sedentary men aged between 18-35 yrs were asked to wear a Fitbit watch for 6 days. Six men using FitBit (mean±SE 2.3 years old, BMI 28 ± 3.5 kg/m²) were compared to 6 men using Fitbit while also receiving kinesiology - Dietitian counseling (mean±SE 3 yrs as old, BMI 28 ± 3.5 kg/m²) as their respective ecological environments. The participants in G1 received a 4-minute individual counseling sessions. RESULTS: Both groups appear to have significantly increased the number of steps they take per day during the study. Participants in G1 took 893 ± 103 steps on average at week 1 and 923 ± 239 steps at week 1 (p 0.001). Participants in G2 took 302 ± 138 steps on average at week 1 and 329 ± 138 steps at week 1 (p 0.001). While G2 mean steps difference (week 7-week 1) is greater than that of G1, it is too early to suggest that counseling sessions combine with FitBit had an increased value. CONCLUSION: It appears that using a self-monitoring ambulatory device
by itself is likely to help sedentary men to increase the step per day number. Future research should involve more sedentary men and women of all ages to help conclude the impact of either FitBit alone and FitBit and counseling.

1996 Board #152 May 30 3:30 PM - 5:00 PM HEART RATE CHARACTERISTICS FOR MALE CHINESE COLLEGE STUDENTS OF DIFFERENT PA-LEVEL DURING 3000 METERS RUNNING Jingmin Liu1, Jian Guan1. Division of Sport Science and Physical Education, Tsinghua University, Beijing, China. 1Tsinghua Affiliated Middle School of Chiang Tai Road, Beijing, China. Email: ljms_th@tsinghua.edu.cn (No relevant relationships reported)

PURPOSE: To explore the heart rate load variation for male Chinese college students of different physical activity level during 3000 meters running, providing a reference for training load monitoring and security.

METHODS: Real-time heart rate of Chinese undergraduate students in Tsinghua University were tested with Team 2 Polar tester during 3000-meter-run test. The physical activity was investigated by an international questionnaire. All subjects were grouped three by PA levels. Data calculated by SPSS 20.0.

RESULTS: 1. There were significant difference in heart rate among students with different levels of physical activity during 3000-meter-run. The mean of maximum heart rate in group with lower PA level was the highest 202.4 ± 9.6 while that of the group with good PA level was the lowest 179.8 ± 9.2. 2. The heart rate has relation to the time during 3000-meter-run. The average speed of first three laps has a significant linear relationship to the average heart rate (R=0.875). The heart rate reached a plateau in the last four laps. The heart rate of all reached the maximum in the end of test. 3. The maximum heart rate of 20% individual students reached or exceeded the summits value of maximum heart rate (220-age), and continued for a several minutes within a relatively dangerous range.

CONCLUSIONS: Mean of maximum and average heart rate of Chinese male college students with good PA level group was lower than that of poor PA level group in 3000-meter-run test. There is a high risk factor for poor PA level Chinese male students when running continuously in the maximum heart rate level. Study was supported by The Chinese General Administration of sports (2018 07).

1998 Board #154 May 30 3:30 PM - 5:00 PM THE DOWNFALL OF SITTING: THE RELATIONSHIP BETWEEN SEDENTARY TIME AND BLOOD PRESSURE Megan L. Conner, Grace Shin, Jamie C. Clark. University of Central Oklahoma, Edmond, OK. (No relevant relationships reported)

One third of the population is affected by hypertension, and previous research has shown that sitting for extended amounts of time can be detrimental to a person’s health. PURPOSE: The purpose of this study was to evaluate the correlation between self-reported sitting time and blood pressure. It was hypothesized that sedentary time was significantly related to blood pressure. METHODS: The study included faculty or staff that were ambulatory and full-time equivalent. The participants were given a self-reported physical activity questionnaire (The International Physical Activity Questionnaire [IPAQ]) to determine sedentary time. Resting blood pressure (systolic and diastolic) was assessed using a sphygmomanometer, and sitting quietly in a chair for 5 minutes. Data was analyzed with a bivariate correlation test. RESULTS: There was a significant, positive, moderate relationship between sedentary time and systolic blood pressure (r = 0.10, r = .705, p = .01) and a significant, positive, strong relationship between sedentary time and diastolic blood pressure (r = 0.11, r = .702, p = .001). CONCLUSION: Self-reported sedentary time was positively related to blood pressure. In other words, the greater the individual’s sitting time, the higher the systolic and diastolic blood pressure was found to be. Engaging in physical activity and reducing sedentary time may decrease the likelihood of developing hypertension. Future research should focus on the effects of programming to decrease sedentary time on measures of health.

1999 Board #155 May 30 3:30 PM - 5:00 PM SELF-REPORTED SEDENTARY BEHAVIOR IS ASSOCIATED WITH TOTAL, VISCERAL, AND SEGMENTAL BODY FAT IN ADULTS Megan C. Nelson, Christopher Alfiero, Rachel Midence, Chantal A. Vella, FACSM. University of Idaho, Moscow, ID. Email: megann@uidaho.edu (No relevant relationships reported)

Regional body fat deposition, particularly visceral fat, may be an important mechanistic link between sedentary behavior and cardiometabolic disease risk with advancing age. PURPOSE: To examine the associations of sedentary behavior and screen time with total, visceral, and segmental body fat in middle to older aged adults. METHODS: 658 adults (mean±SD: age 53.5± 11.2 y; body fat 30.5± 10.6% ; men 38% ; self-reported sedentary behavior and moderate-to-vigorous physical activity (MVPA) using the Sedentary Behavior Questionnaire and International Physical Activity Questionnaire, respectively. Leisure screen time was defined as television viewing, video games and computer games. Total, visceral, and segmental body fat was estimated with the InBody® body electrical impedance analyzer. Waist circumference was measured at the top of the iliac crest. Multiple regression assessed the association of sedentary behavior and screen time with total and regional fat distribution, controlling for age, sex and MVPA. RESULTS: Average sedentary time was 2.3 ± 1 h·d⁻¹. d² reported as screen time. Sedentary time was associated with total fat mass (R²=0.19, p=0.33, p=0.02), visceral fat (R²=0.20, p=0.31, p=0.03), trunk fat (R²=0.17, p=0.36, p=0.01), waist circumference (R²=0.23, p=0.39, p=0.01) and leg fat (R²=0.24, p=0.30, p=0.03) independent of age and sex. When MVPA was added to the model total fat mass (R²=0.20, p=0.30, p=0.04), trunk fat (R²=0.17, p=0.34, p=0.03) and waist circumference (R²=0.25, p=0.36, p=0.01) remained significant. Screen time was associated with trunk fat (R²=0.13, p=0.30, p=0.04) and waist circumference (R²=0.23, p=0.38, p=0.01) dependent.
Cardiovascular disease (CVD) is the leading cause of mortality and is associated with modifiable lifestyle factors, such as physical activity (PA). Research has examined CVD knowledge (CVDK) and PA level in undergraduate students; however, no research has examined the relationship between CVDK and PA in this group. PURPOSE: To examine differences in CVDK and PA across sex and major (health (BH) or non-health (NHB) based) and potential associations between CVDK and PA. METHODS: Students (N=24) completed an online survey including the 30-item Heart Disease Knowledge Questionnaire and 7 items International Physical Activity Questionnaire. RESULTS: Differences across sex and major were significant for both CVDK and PA. CONCLUSIONS: Differences across sex and major exist for both CVDK and PA.

**2002 Board #158 May 30 3:30 PM - 5:00 PM Physical Activity and Health Habits Among Emergency Medical Technician Students Kristi L. Storti, Hayden D. Gerhart, Amy B. Fiorentini, Robert E. Alman, Louis Pesci, Madeline P. Bayles, FACSM. Indiana University of Pennsylvania, Indiana, PA. Email: kslorti@iup.edu (No relevant relationships reported)

Of the recognized emergency medical service professionals, the least is known about EMTs and EMT students. One known study suggests that EMT-B students have some level of predisposition to conditions such as high blood pressure, low exercise tolerance, obesity, and poor health-habit decision-making with regard to tobacco and alcohol use. PURPOSE: To determine the prevalence of health risk, physical activity and sedentary behaviors among students enrolled in an Emergency Medical Technician Certification Program. METHODS: Sixty EMT students (mean age 24 ± 8.3 years, 6% female, 6% Caucasian) completed risk behavior surveys including physical activity, health status, smoking, and alcohol use modeled after the Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance System (BRFSS) and a Modified Activity Questionnaire (MAQ) to assess leisure-time physical activity and sedentary behavior. RESULTS: The median (25th, 75th percentile) METmin/week of self-reported physical activity from the MAQ for all participants was 5468 (1086, 12809) and by gender  2 (3101, males and 2 (31510) females. When categorized as meeting or not meeting the current US Physical Activity Guidelines, 56.7% met or exceeded the ≥ 500 METmin/week guideline. Median BMI for all participants was 22.930 ± 1.1 kg/m² with approximately 28% of the population considered overweight and 2% obese. Among reported health conditions, 4% rated their general health as very good or excellent; 20.0% percent reported being diagnosed with asthma and 10% reported being diagnosed with a depressive disorder. With regard to smoking and alcohol, 11% reported currently smoking, 15% reported current use of chewing tobacco or snuff and 43.3% reported ever vaping or using an e-cigarette. Additionally, participants reported a mean (standard deviation) of 6 ± 4 days per month of drinking at least one drink of alcohol and drinking 2 ± 2 drinks when they drank. CONCLUSION: Among EMT students, over half are meeting the current US Physical Activity Guidelines. Prevalence of overweight/obesity, smokeless tobacco use, and reported depression may put this population at risk for comorbid conditions as they transition from student to professional EMT. **

**2003 Board #159 May 30 3:30 PM - 5:00 PM Accelerometer-determined Sedentary Time And Physical Activity Across Standard Occupational Categories in CARDIA

Tyler D. Quinn1, Kelley Pettee Gabriel, FACSM2, Juned Siddique3, David Aaby3, Kara Whitaker4, Abbi Lane-Cordova5, Steve Sidney6, Barbara Sternfield6, Bethany Barone Gibbs6. 1University of Pittsburgh, Pittsburgh, PA. 2UT Austin, Austin, TX. 3Northwestern University, Chicago, IL. 4University of Iowa, Iowa City, IA. 5University of South Carolina, Columbia, SC. 6Kaiser Permanente, Oakland, CA. (Sponsor: Kelley Pettee Gabriel, FACSM) Email: tyler Quinn@kaiserpermanente.com (No relevant relationships reported)

PURPOSE: High accumulated sedentary time with inadequate physical activity is a common behavioral profile in the United States. Examining differences in activity patterns across occupational categories can distinguish target populations for intervention. METHODS: This cross-sectional analysis of Year 20 CARDIA data (2005-6) included participants who had valid accelerometer data (24 days with ≥ 10 hours), reported job and job duties, and were not currently a student (n=2000). Uniaxial accelerometer data (Actigraph T6w), including leisure and occupational time, were expressed in 6 second epochs and summarized as: average counts per minute (CPM) and time spent (hours/day) in total sedentary behavior (SED), light physical activity (LPA), and moderate-to-vigorous physical activity (MVPA) using Freedson cutoffs. Self-reported job and job duties were categorized into the 23 major groups of 2010 Standard Occupational Classification (SOC) using OccuRec v2.7 followed by adjudication by a trained researcher. Military and forestry categories were excluded because <5 participants reported jobs in those categories. Omnibus group differences were analyzed using ANCOVA adjusted for sex, race, age, education, wear time, center, and BMI. RESULTS: Table 1 shows the least and most favorable three SOC groups in each activity category with mean (standard error) reported. P-values represent overall group of occupation in each category with mean (standard error) reported.
differences across occupational categories. Building/grounds maintenance had the highest CPM while office and admin support had the lowest. Architecture/engineering had the highest change while food preparation had the lowest. Food preparation had the most LPA and legal had the least. Construction had the highest MVPA while healthcare support had the lowest.

Table 1 – Occupational Categories with the Least and Most Favorable CPM, MPA, LPA, and MVPA

<table>
<thead>
<tr>
<th>Least favorable 3 categories</th>
<th>mean (SE)</th>
<th>Most favorable 3 categories</th>
<th>mean (SE)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office and Administrative</td>
<td>36.2(3.7)</td>
<td>Construction and Extraction</td>
<td>43.0(3.7)</td>
<td>0.001</td>
</tr>
<tr>
<td>Support</td>
<td>36.2(3.7)</td>
<td>Construction and Extraction</td>
<td>43.0(3.7)</td>
<td>0.001</td>
</tr>
<tr>
<td>Healthcare Support</td>
<td>36.2(3.7)</td>
<td>Construction and Extraction</td>
<td>43.0(3.7)</td>
<td>0.001</td>
</tr>
<tr>
<td>Architecture/Engineering</td>
<td>35.6(5.0)</td>
<td>Construction and Extraction</td>
<td>39.6(5.0)</td>
<td>0.001</td>
</tr>
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<td></td>
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</tr>
<tr>
<td>Office and Administrative</td>
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<td>Construction and Extraction</td>
<td>3.0(0.1)</td>
<td>0.01</td>
</tr>
<tr>
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<td>3.0(0.1)</td>
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</tr>
<tr>
<td>Healthcare Support</td>
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<td>Construction and Extraction</td>
<td>3.0(0.1)</td>
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</tr>
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<td>LPA</td>
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<tr>
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<td>Construction and Extraction</td>
<td>4.7(0.1)</td>
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</tr>
<tr>
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<td>4.7(0.1)</td>
<td>0.01</td>
</tr>
<tr>
<td>Community and Social Service</td>
<td>3.9(0.1)</td>
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<td>4.7(0.1)</td>
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<tr>
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<td>Construction and Extraction</td>
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<td>0.049</td>
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<tr>
<td>Healthcare Support</td>
<td>0.5(0.0)</td>
<td>Construction and Extraction</td>
<td>0.7(0.0)</td>
<td>0.049</td>
</tr>
</tbody>
</table>

CONCLUSION
Activity patterns have large variation across occupational categories, justifying occupation as an important determinant of activity and the workplace as a potential intervention setting.

2004 Board #160 May 30 3:30 PM - 5:00 PM
Association Between Cardiorespiratory Fitness And Continuous cardiometabolic Syndrome Risk Score In Korean Men
Hyon Jeong Kim1, Min Jeong Cho1, Eun sun Yoon1, Yoon-Ho Choi2, Sae Young Jae1.1University of Seoul, Seoul, Korea, Republic of.2Samsung Medical Center, Seoul, Korea, Republic of. Email: hjjeong30@naver.com

PURPOSE: We examined the hypothesis that cardiorespiratory fitness (CRF), defined as maximal oxygen uptake, predicts the risk of incident cardiometabolic syndrome (CMS) defined as having ≥3 risk factors and is prospectively associated with continuous CMS risk score in healthy men. METHODS: Participants were 2,410 men, aged 42-61, who participated in the Korean Health Examination Survey cohort study from 2004-2005. They were directly measured by peak oxygen uptake (VO2peak) and divided into quartiles. We tested the hypothesis that higher VO2peak would be associated with a lower risk of incident CMS in men. RESULTS: In a median follow-up of 7.3 years, a history of CMS was associated with an increased or decreased risk of SCD in men without a history of cardiovascular disease (HR 1.3, 95% CI 1.07-1.6) and without (n=1,570) a history of cardiovascular disease at baseline. RESULTS: In a median follow-up of 7.3 years, a history of CMS was associated with an increased or decreased risk of SCD in men without a history of cardiovascular disease (HR 1.3, 95% CI 1.07-1.6) and without (n=1,570) a history of cardiovascular disease at baseline. RESULTS: In a median follow-up of 7.3 years, a history of CMS was associated with an increased or decreased risk of SCD in men without a history of cardiovascular disease (HR 1.3, 95% CI 1.07-1.6) and without (n=1,570) a history of cardiovascular disease at baseline.

2005 Board #161 May 30 3:30 PM - 5:00 PM
Differential Impacts Of Exercise Systolic Blood Pressure Response On The Risk Of Sudden Cardiac Death In Men With And Without A History Of Cardiovascular Disease
Sae Yong Jae1, Jari Laukkonen2, Barry Franklin, FACSM1, Bo Fernhall, FACSM.1University of Seoul, Seoul, Korea, Republic of.2University of Eastern Finland, Kuopio, Finland.1William Beaumont Hospital, Royal Oak, MI.2University of Illinois at Chicago, Chicago, IL. Email: sjya@uos.ac.kr

PURPOSE: Although exercise systolic blood pressure (ESBP) response has been associated with risk of cardiovascular disease in men with and without known or suspected coronary heart disease, it remains unclear whether ESBP is associated with a decrease in the risk of sudden cardiac death (SCD). We hypothesized that higher VO2peak would be associated with a lower risk of incident CMS in men. METHODS: Participants were 2,410 men, aged 42-61, who participated in the Korean Health Examination Survey cohort study. The independent association between VO2peak and CMS was assessed with Cox regression models. RESULTS: In a median follow-up of 7.3 years, a history of CMS was associated with an increased or decreased risk of SCD in men without a history of cardiovascular disease (HR 1.3, 95% CI 1.07-1.6) and without (n=1,570) a history of cardiovascular disease at baseline.

2006 Board #162 May 30 3:30 PM - 5:00 PM
Moderators Of The Relationship Between Worksite Walkability And Physical Activity
Jane C. Hurley, Mike Todd, Christine B. Phillips, Hannah Hook, Steven P. Hooker, FACSM, Panum Ohri-Vacaspati, Marc A. Adams. Arizona State University, Phoenix, AZ. (Sponsor: Steven Hooker, FACSM). Email: jchurley@asu.edu

PURPOSE: This study examined traditional and novel moderators (i.e., age, sex, race, income, # of children < 18 yr s) in associations of physical activity (PA) with the relationship between worksite neighborhood walkability (WNW) and PA. METHODS: Participants (n = 52, m age 47 yr s, 55% female, 9% White) were employed (not at home) during the baseline phase of a larger trial. Measures included self-reported PA (total min/week, min/week of transport inside (TPAin) and outside (TPAout) the home neighborhood). RESULTS: WNW was associated with TPAout (p = .04), not different from zero for those with at least 1 child. For White participants, the conditional effect of WNW on TPAout was negative (p = .03). CONCLUSION: The independent effect of WNW on PA was negative (p = .01), not different from zero for non-Whites. No other moderators (age, income, car ownership ratio) had significant associations with PA. Conclusions: Participation in PA may be different across income levels. Women, White participants, those with at least 1 child, and non-Whites tend to be less physically active when WNW is low.

2007 Board #163 May 30 3:30 PM - 5:00 PM
Association of Leisure Time Physical Activity and Back Pain in Brazilian adults
Italo R. Lemes1, Rômulo A. Fernandes1, Bruna C. Turi-Lynch2, Jamie S. Codogno1, Henrique B. Monteiro1, 1São Paulo State University, Presidente Prudente, Brazil. 2Faculty of Dracena, Dracena, Brazil. 3São Paulo State University, Bauru, Brazil. Email: itolemes@hotmail.com

PURPOSE: This study examined traditional and novel moderators (i.e., age, sex, race, income, # of children < 18 yr s) in associations of physical activity (PA) with the relationship between worksite neighborhood walkability (WNW) and PA. METHODS: Participants (n = 52, m age 47 yr s, 55% female, 9% White) were employed (not at home) during the baseline phase of a larger trial. Measures included self-reported PA (total min/week, min/week of transport inside (TPAin) and outside (TPAout) the home neighborhood). RESULTS: WNW was associated with TPAout (p = .04), not different from zero for those with at least 1 child. For White participants, the conditional effect of WNW on TPAout was negative (p = .03). CONCLUSION: The independent effect of WNW on PA was negative (p = .01), not different from zero for non-Whites. No other moderators (age, income, car ownership ratio) had significant associations with PA.

Leisure time physical activity (PA) may reduce the risk of back pain. A recent meta-analysis found that moderate to high PA during leisure time promotes low back pain by up to 16%. However, there is no study investigating this association in a developing country like Brazil (the biggest nation in Latin America).

PURPOSE: To investigate the association of leisure time PA and back pain in adults from the Brazilian National Health System (NHIS). METHODS: Data were obtained from 5,000 (4,000 women) enrolled in the Brazilian NHIS in 2016. Participants were 45 years of age or older, registered for at least 4 years, and followed up in the Kuopio Ischemic Heart Disease cohort study. Excessive ESBP was defined by a maximal SBP 20-29mmHg during progressive bike exercise testing to volitional fatigue. Participants were stratified by sex (n=884) and with (n=1,570) a history of cardiovascular disease at baseline. RESULTS: In a median follow-up of 7.3 years, a history of CMS was associated with an increased or decreased risk of SCD in men without a history of cardiovascular disease (HR 1.3, 95% CI 1.07-1.6) and without (n=1,570) a history of cardiovascular disease at baseline.
Body mass index (BMI) is a worldwide used method for obesity identification. It is calculated using the Quetelet formula: \( \text{BMI} = \frac{\text{weight in kg}}{\text{height in m}^2} \). BMI is an anthropometric scale (Welmy-RI W200). Both m-BMI and r-BMI were calculated for each individual. When the 29.0 kg/m² cut-off point was used in the r-BMI, we found a much higher sensitivity (88.2%) with very high agreement between r-BMI as compared to m-BMI in the total sample and among men. The accuracy of r-BMI to identify obesity among women was lower as compared to m-BMI. The presence of back pain may benefit from a regular exercise routine being incorporated into their ‘training.’ These findings may have a public health impact given the large number of sedentary Americans with high amounts of screen time.

The age-related life utility in aged population has been widely reported in literature including muscular functioning and self-reported health state. The EQ-D-5L questionnaire is widely used at population level and comprises five dimensions including mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Grip strength and walking ability are known to be associated with health condition. Binary logistic regression was used to estimate values of odds ratios (ORs) and 95% confidence intervals (95% CIs). Reference group was the bottomtertile. Health status, sociodemographic and behavioural covariates were potential confounders.

**RESULTS:** In overall sample, mean age was 80 ± 30 yr, 214 (36%) were physically active, 183 (33.9%) were moderately active and 126 (22%) were insufficiently active. Back pain was present in 344 (61.8%) adults. In the adjusted model, physically active participants were less likely to have back pain when compared to insufficiently active group (OR: 0.59; 95%CI = 0.36 to 0.95).

**CONCLUSION:** In this sample, leisure time PA was inversely associated with the presence of back pain.

Supported by São Paulo Research Foundation (FAPESP) Grant 2015/17777-3 and 2016/1110-96.
The biological mechanisms underlying the beneficial effects of regular physical activity (PA) on prevention of chronic diseases are not fully understood. It is currently suggested that N-linked enzymatic glycosylation, a post-translational modification modulating the biological function of several proteins, may contribute to disease development. Nevertheless, the influence of PA on N-glycans in humans has never been explored. PURPOSE: To explore N-glycan profile in a sample of community-dwelling older women with different objectively assessed PA levels and metabolic risk status. METHODS: Components of the metabolic syndrome (MetS) and serum N-glycans analyzed using DSA-FACE technology were assessed in 109 older community-dwelling women (8 yr s). Ten peaks, each representing a unique N-glycan structure were detected. Adherence to PA guidelines was determined using accelerometry. Participants daily engaged in 30 minutes of MVPA were classified as meeting PA guidelines. RESULTS: Significant differences in N-glycan peaks were indicated when comparing women adhering to the PA guideline to those less active: when adjusted by MetS, a 12% (p = 0.006) and a 13% (p = 0.005) lower level of NA3 (peak  #) and NA4 (peak 10), respectively, were evident among the physically active women compared to those less active. In contrast to findings based on the MVPA threshold, no differences in N-glycan peaks were observed between PA groups when based on the lower intensity threshold, which may indicate that the influence on N-glycan levels by PA is intensity-sensitive. CONCLUSIONS: Adherence to PA guidelines is related to a favorable N-glycan profile, regardless of metabolic risk status. This proposed effect on N-glycans only occurs above the moderate PA-intensity threshold. Our findings support the promotion of a physically active lifestyle as a supporting non-pharmacological public health approach.

D-62 Free Communication/Poster - Protein Metabolism
Thursday, May 30, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

Protein ingestion and cooling are strategies employed by athletes to improve post-exercise recovery and, as such, to facilitate muscle reconditioning following exercise. However, whether post-exercise cooling affects postprandial protein handling and subsequent muscle protein synthesis rates during recovery from exercise has not been studied.

Purpose: This study assessed the impact of post-exercise cooling on acute postprandial (hourly) and prolonged (daily) myofibrillar protein synthesis rates during recovery from resistance-type exercise over a 2-week period.

Methods: Twelve healthy, male adults (age: 21±1 y) performed a single session of resistance training followed by water immersion for 30 minutes of recovery. Water immersion was performed with loads of either 20°c or 30°c. Blood and muscle biopsies were collected over 2 weeks to assess the effects of post-exercise cooling with intake of myofibrillar protein synthesis rates during more prolonged resistance-type exercise training.

Results: Incorporation of dietary protein-derived L-[1-13C]-phenylalanine into myofibrillar protein was significantly lower in CWI compared to CON (0.016±0.002 vs 0.021±0.002 MIE; P=0.016). Post-exercise myofibrillar protein synthesis rates were lower in CWI compared to CON based upon L-[[1-13C]-leucine ingestion (0.03 vs 0.02: 0.05%·h^-1), respectively; P=0.042 and L-[[ring-H]-13C]-phenylalanine (0.02: 0.03 vs 0.00%·h^-1 respectively; P=0.025). Daily myofibrillar protein synthesis rates assessed over 2 weeks were significantly lower in CWI when compared to CON (1.6 0.05 vs 1.6 0.11%·d^-1, respectively; P=0.04).

Conclusion: Cold-water immersion during recovery from resistance-type exercise impairs myofibrillar protein synthesis rates.
a paucity of research supporting any benefits. **PURPOSE:** To compare the satiating effect of two protein diets on resistance-trained individuals in short-term energy deficit.

**METHODS:** Forty-eight university ethically cleared, 18-25-year-old, resistance-trained participants (age: 24.2 ± 2 years; height: 1.72 ± 0.03 m; body-mass: 66.5 ± 13.4 kg; body-fat: 13.8 ± 1.8%) were randomly assigned to a moderate (PRO LOW: 1.8 g· kg⁻¹· d⁻¹) or high protein (PRO HIGH: 2.9 g· kg⁻¹· d⁻¹) matched calorie-deficit diet for 7 days in a cross-over design, including 4 week wash-out. Venous samples were collected (time-points T0, T60, 120min) for assessment of ghrelin and protein YY concentrations to a fixed-protein (0.7 g· kg⁻¹) meal, along with perceived satiety ratings, following each diet.

**RESULTS:** Following PRO LOW, mean ghrelin concentration (pg· ml⁻¹) significantly reduced post-meal (T0: 972.8 ± 130.4, T60: 659.7 ± 86.4, T120: 613.6 ± 114.3; p ≤ 0.003 compared to T0). Similar observations were reported for PRO HIGH (T0: 1088.2 ± 158.8, T60: 786.6 ± 117.3, T120: 850.6 ± 147.7; p ≤ 0.01). However, T120 responses differed between conditions, and further confirmed when data were normalised for relative change (PRO LOW: -0.06 ± 0.05; PRO HIGH: -0.26 ± 0.06; p ≤ 0.01). **CONCLUSIONS:** These results suggest that nutrient intake before RE may have no substantial MHE.

Supported by Grant-in-Aid for Scientific Research from the Japanese Ministry of Education, Culture, Sports, Science, and Technology (Grants 26707029 and 1K0364).
Adequate Protein Intake and Maximal Deadlift Strength

**Adequate protein intake could serve as a strategy to eat more protein rather than playing a relative protein intake. Therefore, the association between protein intake and deadlift with higher deadlift 1RM. However, its importance decreased when were adjusted for body mass, height, and sex, it remained significant. However, the differences were no longer significant when the model was also adjusted for relative protein intake. As the model was expressed as absolute (g) and relative (g/kg body mass). Adequate protein intake per meal was assessed with 24 h dietary recalls. The reported protein intake was expressed as absolute (g) and relative (g/kg body mass). Adequate protein intake per meal was deemed as ≥20 g and ≥0.3 g/kg. Next, we calculated the number of meals that achieved these thresholds and were grouped as ≤1, 2, 3, ≥4 meals for each criterion. Then, 1RM was compared between groups with and without adjustment for covariates (age [years], lean body mass [kg, bioelectrical impedance], height [cm], sex, relative protein intake [g/kg/d]) for each criterion.**

**RESULTS:** For ≥20 g criterion, the ≥2 meals group showed significantly higher 1RM than ≤1 group for the unadjusted model. When it was corrected for age, lean body mass, height, and sex, it remained significant. However, the differences were no longer significant when the model was also adjusted for relative protein intake. Therefore, the association between protein intake and deadlift 1RM could be mediated by total relative protein intake, and the number of meals with adequate protein intake could serve as a strategy to eat more protein rather than playing a “timing” role.

**METHODS:** To analyze the association between the number of meals with adequate protein intake and maximal deadlift strength in college athletes. We evaluated 28 (10% men) college athletes previous to a national contest. Maximal strength was assessed with one repetition maximum (1RM) on deadlift and was adjusted for body mass (kg lifted weight/kg body mass). The protein intake per meal was assessed with 24 h dietary recalls. The reported protein intake was expressed as absolute (g) and relative (g/kg body mass). Adequate protein intake per meal was deemed as ≥20 g and ≥0.3 g/kg. Next, we calculated the number of meals that achieved these thresholds and were grouped as ≤1, 2, 3, ≥4 meals for each criterion. Then, 1RM was compared between groups with and without adjustment for covariates (age [years], lean body mass [kg, bioelectrical impedance], height [cm], sex, relative protein intake [g/kg/d]) for each criterion.

**RESULTS:** For ≥20 g criterion, the ≥2 meals group showed significantly higher 1RM than ≤1 group for the unadjusted model. When it was corrected for age, lean body mass, height, and sex, it remained significant. However, the differences were no longer significant when the model was also adjusted for relative protein intake. Therefore, the association between protein intake and deadlift 1RM could be mediated by total relative protein intake, and the number of meals with adequate protein intake could serve as a strategy to eat more protein rather than playing a “timing” role.

**CONCLUSIONS:** The number of meals with adequate protein intake is associated with higher deadlift 1RM. However, its importance decreased when were adjusted for relative protein intake. Therefore, the association between protein intake and deadlift 1RM could be mediated by total relative protein intake, and the number of meals with adequate protein intake could serve as a strategy to eat more protein rather than playing a “timing” role.

**Table. Comparison of maximal deadlift strength by number of meals with adequate protein intake.**

<table>
<thead>
<tr>
<th>Number of meals with adequate protein intake</th>
<th>1 RM (kg)</th>
<th>2 RM (kg)</th>
<th>p</th>
<th>R²</th>
<th>R²§</th>
<th>R²#</th>
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<tbody>
<tr>
<td>≤1</td>
<td>1.35 ± 0.05</td>
<td>1.5 ± 0.08</td>
<td>1.5 ± 0.02</td>
<td>1.6 ± 0.08</td>
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<td>0.02 0.02</td>
</tr>
<tr>
<td>n</td>
<td>3</td>
<td>3</td>
<td>9 34</td>
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<tr>
<td>20 g/meal</td>
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<tr>
<td>≥2</td>
<td>1.36 ± 0.04</td>
<td>1.5 ± 0.06</td>
<td>1.5 ± 0.08</td>
<td>1.6 ± 0.09</td>
<td>0.020</td>
<td>0.04 0.204</td>
</tr>
<tr>
<td>≥3</td>
<td>1.4 ± 0.06</td>
<td>1.5 ± 0.06</td>
<td>1.5 ± 0.08</td>
<td>1.6 ± 0.108</td>
<td>0.6</td>
<td>0.008 0.218</td>
</tr>
<tr>
<td>≥4</td>
<td>1.34 ± 0.05</td>
<td>1.5 ± 0.08</td>
<td>1.5 ± 0.08</td>
<td>1.6 ± 0.02</td>
<td>0.001</td>
<td>0.06 0.06</td>
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<tr>
<td>0.3 g/meal</td>
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<td></td>
<td></td>
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<tr>
<td>≥2</td>
<td>1.4 ± 0.06</td>
<td>1.5 ± 0.08</td>
<td>1.5 ± 0.08</td>
<td>1.6 ± 0.09</td>
<td>0.032</td>
<td>0.036 0.18</td>
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<tr>
<td>≥3</td>
<td>1.5 ± 0.04</td>
<td>1.6 ± 0.04</td>
<td>1.5 ± 0.04</td>
<td>1.7 ± 0.106</td>
<td>0.81</td>
<td>0.007 0.211</td>
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</tbody>
</table>

Data expressed as mean ± standard error. Different letters denote significant differences between groups (p < 0.05). 1RM: One repetition maximum (kg of weight lifted/kg body mass). *: Symbol for absolute protein intake. #: Symbol for relative protein intake. \( R² \): For ≥20 g criterion, the ≥4 meals group showed significantly higher 1RM compared to vegetarians (23.8 ± 2.9 kg), t(2.046) p < 0.05, and no difference in protein intake between groups (t(38) p = 0.76). Results showed no correlation between protein intake (≥0.3 g/kg) and grip strength (2.8 ± 1.4 kg) while controlling for diet type (t(30) = 113.53, p = 0.30). It is noteworthy that mean grip strength in the sample was significantly below the reference value for North American females (31 kg). CONCLUSION This study provides evidence that there was no significant association between protein intake and grip strength in inactive female vegetarians; yet, the grip strength for this population fell significantly below region/gender-specific reference ranges.

**Correlation Between Dietary Protein Intake And Grip Strength In Inactive Vegetarian And Vegan Females**

More than 5% of U.S. adults are < 18 years old identify as vegetarian or vegan. While health benefits, including reduced risk for cardiometabolic diseases are promoted, concern remains over the potential of lower protein intake, which can lead to reduced muscle mass and strength.

**PURPOSE:** To examine the relationship between dietary protein and grip strength in inactive vegetarian and vegan female adults.

**METHODS:** Thirty-three self-reported inactive (<10m in exercise/wk) female vegetarians and vegans (31±6 n = 23 vegan) of at least 1 year were recruited for this study. A 24h dietary recall was administered by a trained researcher and protein intake calculated using Food Processor software. Dominant handgrip strength was measured 3 times using a handheld dynamometer, and greatest score recorded. As a priori α of 0.05 was used and partial Pearson Product Moment correlation was determined between protein intake and grip strength when controlling for diet type (vegetarian vs. vegan). Independent samples t-tests were conducted to compare protein intake and grip strength in protein intake and grip strength in inactive vegetarians vs. vegans.

**RESULTS:** Results showed significantly greater grip strength in vegans (26.7±4.7 kg) as compared to vegetarians (23.8 ± 2.9 kg), t(2.046) p < 0.05, and no difference in protein intake between groups (t(38) = 0.76). Results showed no correlation between protein intake (≥0.3 g/kg) and grip strength (2.8 ± 1.4 kg) while controlling for diet type (t(30) = 113.53, p = 0.30). It is noteworthy that mean grip strength in the sample was significantly below the reference value for North American females (31 kg). CONCLUSION This study provides evidence that there was no significant association between protein intake and grip strength in inactive female vegetarians; yet, the grip strength for this population fell significantly below region/gender-specific reference ranges.

**Anterior cruciate ligament (ACL) rupture rupture results in significant quadriceps weakness, which will then cause abnormal gait and knee instability. Eccentric training (ET) can produce larger effects on muscle strength than concentric training, which may be further augmented by protein supplement.**

**Purpose** To examine the effects of combining whey protein supplement with preoperative isokinetic ET on quadriceps strength in patients with ACL Rupture.

**Methods** Thirty-seven male subjects aged 18-40 years with ACL rupture were randomly assigned to isokinetic ET (IET; N = 19 group or isokinetic ET with whey protein isolate (IET+WP; N = 18 group. Both groups received preoperative isokinetic ET for six weeks, containing 3-4 sets per day with 10 repetitions for each set, twice a week. Subjects in IET+WP consumed whey protein isolate 22 g per day. Cross-Sectional Area (CSA) of quadriceps was scanned by MRI, and strength and knee function were measured before and after the trials. Results After intervention, CSA of the involved quadriceps increased by 3.7% (NS) in IET and 7.6% (P = 0.012) in IET+WP. The ratio of side-to-side increased by 3.9% (NS) in IET and 4.8% (P = 0.002) in IET+WP. The peak torque of quadriceps during eccentric contraction at 60°/s concentric contraction at 0, 180° and 300 degrees/second was increased by 28.4% (P = 0.001), 3.8% (P = 0.001), 3.8% (P = 0.001) and 23.5% (P = 0.003) in IET, and increased by 48.3% (P = 0.001), 3.3% (P = 0.001), 3.1% (P = 0.002) and 36.7% (P = 0.001) in IET+WP, respectively, with no differences between the two groups. Lysholm and IKDC2000 knee function score in IET+WP increased by 24% (P = 0.001) and 12.9% (P = 0.001). Conclusions Combining whey protein supplement with ET tends to be more effective on improving CSA of quadriceps, knee function and quadriceps strength when compared to ET alone after ACL rupture, even though the results did not reach statistical differences. References [1]. Douglas, J., et al., 2017. [2]. Cermak, N.M., et al., 2012. Supported by The National Key Research and Development Program (No.2018FD08003)
The Effect of Protein Supplementation on Recovery From Exercise-Induced Muscle Damage
Brooke E. Starkoff, Elizabeth Lenz, Craig O. Mattern, Danny Too, FACSM, Heidi K. Byrne.
Valparaiso University, Valparaiso, IN. The College at Brockport, State University of New York, Brockport, NY. (Sponsor: Danny Too, FACSM)
Email: brooke.starkoff@valpo.edu

CONCLUSIONS: This data suggests that a CHO-P supplementation does not elicit greater recovery from EIMD when compared to a CHO supplement alone.

Effect of Soy Milk Ingestion On Running Anaerobic Sprint Test (RAST) Performance
Govindasamy Balasekaran, FACSM, Pan Shi Yu. Nanyang Technological University, Singapore, Singapore.
Email: govindasamy.bj@nie.edu.sg

PURPOSE: To investigate the effects of soy milk ingestion on anaerobic performance during the RAST. METHODS: 10 males (age: 23.2 ± 1.23 years, height: 181 ± 8 cm, weight: 79.0 ± 7.4 kg) participated in the study. They performed two RASTs with a soy milk intervention (80 mL of soy milk + 4g of stevia sweetener) and a placebo control (80 mL of water + 4g of stevia sweetener). RESULTS: The significant decrease in FI and earlier peak lactate levels during the intervention in RAST significantly lowered the FI, but had no significance in any of the variables investigated. The significant decrease in FI and earlier peak lactate levels post-exercise may indicate the possibility of soy milk reducing fatigue. Future studies are required to examine the ergogenic effects of soy milk.

Association of Protein Intake at Three Meals With Muscle Mass in Healthy Young Subjects
Jun Yasuda, Mai Asako, Takuma Arimitsu, Satoshi Fujita. Ritsumeikan University, Shiga, Japan.

PURPOSE: In addition to importance of total daily protein intake for regulation of muscle mass, protein intake over 0.24g/ body weight (BW) from each meal may be necessary to maximize postprandial muscle protein synthesis in young population. Therefore, we hypothesized that if individuals do not achieve protein intake over 0.24g/ BW at least one of three meals (breakfast, lunch, and dinner), muscle mass can be decreased. This cross-sectional study examined the association of protein intake at three meals with muscle mass among healthy young subjects. METHODS: We collected 3-day dietary records to evaluate dietary intake. We calculated total fat free mass (FFM) and appendicular (AppFFM) with dual-energy X-ray absorptiometry, and TotalFFM% and AppFFM% were also calculated as FFM relative to BW. The 26 subjects were categorized into two groups: AP group, achieving over 0.24g/ BW of protein intake at all three meals; or NP group, not achieving 0.24g/ BW of protein intake at least one meal. RESULTS: There was no linear association between total protein intake above the recommended dietary allowance (RDA) and both TotalFFM% and AppFFM%. Consequently, we examined the association of protein intake at three main meals with muscle mass in subjects consuming total daily protein intake above the RDA. Regardless of potential confounders (e.g., sex, physical activity, and energy intake), we demonstrated that TotalFFM% (β: 0.5s; r: 0.8s, p < 0.008) and AppFFM% (β: 0.3s; r: 0.2s, p > 0.08) in AP group was greater than in NP group consuming total protein intake above the RDA. CONCLUSION: This finding suggests that even if individuals achieve total protein intake above the RDA, not achieving protein intake over 0.24g/ BW at least one meal may lead to decreased muscle mass in young population. This work was supported by the Japanese Council for Science, Technology and Innovation (SIP: Project ID 180105) and the grant “Technologies for creating next-generation agriculture, forestry and fisheries” (funding agency: Bio-oriented Technology Research Advancement Institution, NARO).

Association of Dietary Protein Intake, Physical Activity, and Muscle Quality in Young Adults
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(No relevant relationships reported)
Cyclic fluctuations in ovarian hormone (estrogen and progesterone) levels that play an important role in reproductive function are a unique characteristic of adult women. However, these changes in ovarian hormone levels affect physical and mental condition. Previous studies have reported that levels of branched-chain amino acids (BCAA) and aromatic amino acids (AAA) in the blood are related to fatigue. PURPOSE: This study investigated the effects of the menstrual cycle on the concentration of BCAA and AAA during endurance exercise and the recovery period in female athletes. METHODS: Seven eumenorrheic female athletes (lacrosse players; age, 21.7 ± 0.9 yr; height, 158.3 cm; weight, 73.7 ± 4.8 kg), who usually exercised 4 h/day, 7 days/week, were recruited. Subjects performed endurance exercise on a cycle ergometer for 60 min at 80% of their VO2peak, measured in a preliminary trial, during the follicular phase (FP) and luteal phase (LP) of their menstrual cycles. After exercising, subjects rested in a chair for 40 min and in their post-exercise recovery was observed. Blood samples were taken: pre-exercise (0 min); 30 min after the start of exercise (30 min); 0 min in the start of exercise (30 min); immediately post-exercise (0 min in); 30 min post-exercise (0 min in); and 0 min in post-exercise (120 min). Levels of estradiol, progesterone, BCAA (valine, leucine, isoleucine), and AAA (tyrosine, phenylalanine) in the blood were assessed. The Fischer ratio (BCAA/AAA) was calculated using the following formula: BCAA/AAA = (valine + leucine + isoleucine)/ (tyrosine + phenylalanine). RESULTS: Estradiol and progesterone levels were significantly lower in the LP than in the FP (estradiol: 40.2 ± 15.4 pg/mL vs. 10.8 ± 0.1 ng/mL, p < 0.01; progesterone: 0.5 ± 0.1 ng/mL vs. 11.3 ± 0.0 ng/mL, p < 0.05). The Fischer ratio significantly decreased from exercise initiation to exercise conclusion during both phases (FP: 3.6 ± 0.4 min, 3.2 ± 0.3 (0 min in), p < 0.05; LP: 3.6 ± 0.4 min, 3.3 ± 0.6 (0 min in), p < 0.05). However, no significant differences were observed between the FP and LP. CONCLUSION: No differences in the levels of BCAA and AAA in the blood were observed between the FP and LP of the menstrual cycle pre-, during, or post-exercise.

**D-63**

**Free Communication/Poster - Cognition and Emotion**

**Thursday, May 30, 2019, 1:00 PM - 6:00 PM**

**Room: CC-Hall WA2**

**2026**

**Board #182**

**May 30 2:00 PM - 3:30 PM**

**Semantic Memory fMRI in Healthy Older Adults After Acute Exercise and Rest**

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(NO relevant relationships reported)

An extent literature suggests that regular participation in long-term exercise enhances cognitive function. However, less is known about the beneficial effects of acute exercise on semantic memory. PURPOSE: This study investigated brain activation during a semantic memory task after a single session of exercise in healthy older adults (ages 80 $ $ using functional magnetic resonance imaging (fMRI). METHODS: We used a within-subjects counterbalanced design where 22 participants (ages 80 $ $ underwent two experimental visits on separate days. During each visit, participants engaged in 30 minutes of rest or stationary cycling exercise immediately prior to performing recognition of Famous names and Non-Famous names during fMRI scanning. RESULTS: There were no significant differences in the Famous Name Task (FNT) response time (RT) or accuracy after exercise rest. Acute exercise was associated with significantly greater semantic memory activation (Famous > Non-Famous) in bilateral middle temporal gyrus, right cerebellum, and left fusiform gyrus. A post-hoc analysis showed significantly greater activation in the bilateral hippocampus after exercise compared to rest. CONCLUSIONS: Greater brain activation following a single session of exercise suggests that exercise may increase neural processes underlying semantic memory activation in healthy older adults. These effects were localized to the known semantic memory network, and thus do not appear to reflect a general or widespread increase in brain blood flow. Coupled with our prior exercise training effects on semantic memory-related activation, these data suggest the acute increase in neural activation after exercise may provide a stimulus for adaptation over repeated exercise sessions.

**2027**

**Board #183**

**May 30 2:00 PM - 3:30 PM**

**The Effects of Continuous and Interval Exercise on Cognitive Performance in Young Adults**

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(NO relevant relationships reported)

Exercise has been shown to increase cognitive performance. However, there are few studies that have compared exercise type to determine different effects. PURPOSE: The purpose of the present investigation was to compare changes in cognitive function after two different forms of work matched exercise. METHODS: The participants were 22 healthy college age males. Participants were randomly assigned an order of treatment consisting of work matched continuous (CONT) and interval exercise (INT) protocols. The continuous exercise treatment consisted of 20:24 min in of 8% VO2max on the cycle ergometer. The interval exercise treatment consisted of 4 c ycles of 2:00 min 8% VO2max and 1:00 min 9% VO2max on the cycle ergometer for a total of 18 minutes. Pre and post exercise blood samples were collected to quantify brain-derived neurotrophic factor (BDNF) and participants completed a battery of assessment on the CogState software platform. The cognitive function battery exam included tests of reaction skills, memory skills, psychomotor skills, visual attention, working memory, and spatial working memory. Additionally, blood pressure was continuous measured during the 2 hours post exercise using a non-invasive finger cuff system. RESULTS: Repeated measures ANOVA analysis did not reveal any differences in serum BDNF levels by time (F=0.237, p = 0.629; pre: 388.9± 196.4, post: 464.3± 222.4) or treatment (F=0.896, p = 0.349). However, in the interval exercise there was a significant increase (p=0.01) from baseline (baseline: 11.7±0.0 sec, post: 13.8±0.0 sec). There were significant correlations between systolic blood pressure during recovery for both CONT and INT and improvements in executive function (CONT: r=0.59, p< 0.01; INT: r=0.8, p< 0.01). CONCLUSION: It appears that both CONT and INT exercise promote some increases in cognitive function related to elevated recovery systolic blood pressure and independent of serum BDNF. Moreover, INT exercise may increase executive function more that aerobic exercise, though more investigation into this effect is warranted.
CONCLUSIONS: A 30-min acute moderate aerobic exercise could elicit inhibitory control for young adults. The studies manifested the potential physiological mechanism between central nervous system and autonomous nervous system which were reflected by HRV index.

2029 Board #185 May 30 2:00 PM - 3:30 PM Aerobic and Muscle Fitness Associations with Adolescent Cognitive Control

Tatsuya T. Shigeta¹, Angus A. Leahy², Jordan J. Smith, Narelle Earther,² David R. Lubans,³ Charles H. Hillman.¹ ¹Northeastern University, Boston, MA. ²University of Newcastle, Callaghan, New South Wales, Australia.

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Purpose: Physical activity supports greater cardiorespiratory fitness (CRF); a correlate of cognitive control. The relation of muscle fitness (MF) and cognitive control are less clear. The present study investigated the differential relationship of CRF and MF with cognitive control in older adolescents; a population subject to social and academic stressors.

Methods: Students (15 ± 1.3 yrs, N = 28122 females) from ten secondary schools completed tests of inhibition, working memory (WM), CRF (PACER), and MF (standing long jump, push-ups).

Results: Stepwise regression analyses accounted for demographic factors in step 1, and either CRF or MF in step 2. CRF predicted flanker response accuracy (RA) and reaction time (RT) in WM task only (β’s ≥ 0.14, p’s ≤ 0.05). In the 1-back WM task, CRF predicted greater RA, greater d’ and shorter non-target RT (β’s ≥ 0.15, p’s < 0.05). In the 2-back WM task, CRF predicted greater non-target RA and d’ (β’s ≥ 0.14, p’s ≤ 0.05). Comparatively, MF only predicted 2-back target accuracy (β = 0.14, p = 0.02). Follow-up 3-step regressions assessed significant outcomes from the 2-step models to account for the contrated fitness variable in step 2, and the fitness variable of interest in step 3. CRF remained a significant predictor for most cognitive outcomes (β’s ≥ 0.17, p’s ≤ 0.05). However, with MF entered in step 2, CRF marginally predicted incorrect flanker RA and 1-back non-target accuracy (β’s ≤ 0.16, p’s ≥ 0.06), and no longer predicted greater 2-back d’ (β = 0.11, p = 0.20). Comparatively, MF marginally predicted 2-back target accuracy with CRF accuracy (β = 0.12, p = 0.02).

Conclusion: MF was unrelated to cognitive performance, especially with CRF included in the model. CRF’s predictability of WM decreased with MF accounted for, particularly during conditions requiring greater WM demands. CRF was generally related to faster processing speed and greater RA during a task modulating inhibitory demands, suggesting that increased CRF may improve cognition via modulation of older adolescents’ inhibitory control. Such findings highlight physical activity’s value in aiding cognition underling older adolescents’ academic performance.

Project funded by the National Health and Medical Research Council (APP1122066).

2030 Board #186 May 30 2:00 PM - 3:30 PM Cortical Activation during Walking While Smartphone Texting: a Dual Task Based fNIRS Study

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BACKGROUND: Previous studies demonstrated that gait performance was decreased when walking while performing a cognitive task such as texting on a smartphone, which reflects a cognitive-motor dual-task interference. The neural bases of the interference are not well studied. This study examined the neural effect of smartphone texting only (T task), walking only (W task), and dual task of smartphone texting while walking (TW task) on the three tasks was monitored using a 38 channel fNIRS (NIRx Medical Technologies LLC, USA).

Walking was conducted on a treadmill with a speed of 2.0 km/hour. Texting task was performed with a typing APP on a smartphone. RESULTS: There was no significant difference in texting speed between T task and TW task (71.7 ± 10.4 vs. 71.0 ± 12.9 chars/min, P > 0.05). Texting enhanced hemodynamic response in frontopolar area (eg, Ch1: τ = 1.01 ± 0.10 vs. -0.12 ± 0.14, A = 0.0, P < 0.01; Ch1: τ = 0.15 ± 0.4 vs. 0.2 ± 0.14, A = 0.0, P < 0.01) and Broads area (eg, Ch5: τ = 0.3 ± 0.3 vs. 0, A = 0.3, P = 0.01). In addition, although texting effects were not seen in prefrontal cortex, cortical oxygenation during the three tasks was significantly different in these regions between T task and TW task. CONCLUSIONS: The findings indicated that walking on a low speed requires less cognitive resources from the prefrontal cortex, while the temporal lobe is involved. When walking while texting on a smartphone, the brain areas (e.g., superior parietal and temporo-parietal gyrus) involved in gait were activated, and areas in prefrontal cortex were also activated. Thus, more cognitive resources were allocated to smartphone texting during the dual task.

2031 Board #187 May 30 2:00 PM - 3:30 PM Can Repeated Bouts Of Exercise Improve Equally Post-exercise Inhibitory Control As Single Bout Of Exercise?

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PURPOSE: We previously demonstrated that post-exercise improvements of inhibitory control (IC) are associated with increase in exercise volume (Tsukamoto et al. Med Sci Sports Exerc. 2017). Previous studies reported that repeated bouts of moderate-intensity exercise (Repeated), which is performed with a short rest interval during exercise program, may be a useful strategy in improving metabolic function, potentially by enhancing lipid metabolism compared with volume-matched single bout of moderate-intensity exercise (Single) (Goto et al. J Appl Physiol. 2007). However, it remains unknown whether Repeated would be effective in improving post-exercise IC. In this study, we compared the effect of Repeated and Single on post-exercise IC.

METHODS: Fifty healthy men (age: 20.6 ± 0.4 yrs) performed Repeated and Single in randomized order. The Repeated was consisted of twice moderate-intensity cycling exercise (8% V̇O₂peak) for 20 min which was separated by a 20-min resting test, while the Single was performed for 0 min in without rest. To evaluate IC, The Stroop task was administered before exercise, immediately after exercise, and every 10 min during the 30-min post-exercise recovery period. At the same time points, blood was collected for glucose and lactate measurement, and psychological arousal level was assessed by the felt arousal scale. RESULTS: The exercise-induced increase in mean arterial pressure was significantly lower in Repeated than in Single (P < 0.01), but not heart rate and rates of perceived exertion. Physiological recovery did not differ significantly between the two conditions. Similarly, there were no significant differences for blood glucose and lactate immediately after exercise and post-exercise recovery between conditions. IC was significantly improved immediately after both Repeated and Single (P < 0.05), but it did not differ significantly between two conditions. CONCLUSION: The present findings suggest that Repeated can similarly elicit IC improvements as Single.

2032 Board #188 May 30 2:00 PM - 3:30 PM The Differential Relationships Between Physical Activity and Adiposity with Cognitive Function in Preadolescent Children.

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PURPOSE: To identify the effects of adiposity and a physical activity (PA) intervention on cognitive and neuroelectric indices of inhibitory control in preadolescent children. METHODS: Children were randomly assigned to either a 9 month afterschool physical activity (PA) or a wait-list control (CON) group. Children completed a task that manipulated inhibitory control at pre- and post-test while measures of task performance and the P3-event related potential (ERP) were assessed. Children were further grouped according to weight category. Children with obesity (3P; A; 3T; ON) completed testing. A sample of normal weight children (NW) were matched to the sample of children with obesity based on treatment assignment and demographic variables of age, sex, IQ, SES, and fat-free V.O2 max. Changes in adiposity measures included whole body percent fat (%Fat), subcutaneous abdominal adipose tissue (SAAT), and visceral adipose tissue (VAT). The influence of physical activity and adiposity on task performance and brain function was examined. RESULTS: Children in the PA group decreased %Fat from pre- to post-test (p=0.01), an effect not observed in the CON group. Children in the CON group gained SAAT and VAT from pre- to post-test (p<0.001), whereas children in the PA group did not. The PA group showed larger P3 amplitude from pre- to post-test (p=0.026); an effect not seen in the CON group. P3 amplitude did not differ between groups at pre-test for children with obesity; however, the PA group demonstrated larger P3 amplitude compared to the CON group at post-test (p=0.008). Children with obesity in the CON group had smaller P3 amplitude at post-test compared to pre-test (p=0.003), an effect not seen in NW children. Results suggest that physically inactive children with obesity Abstracts were prepared by the authors and printed as submitted.
have increased adiposity and smaller P3 amplitude over 70s onths. Furthermore, results suggest that a PA intervention may be particularly beneficial for children with obesity, as they showed increased P3 amplitude from pre- to post-test. CONCLUSION: PA is beneficial for brain function in pre-adolescent children, especially in those with obesity. Given that childhood obesity is a public health concern with an array of health complications, these results have important implications for the physical and cognitive health of children.

2033 Board #189 May 30 2:00 PM - 3:30 PM Association of School Day Segmented Physical Activity with Children’s Physical and Cognitive Health Xiangli Gu1, Tao Zhang2, Priscila M. Caçola1, Xiaoxia Zhang3, Jing Wang1. 1University of Texas at Arlington, Arlington, TX; 2University of North Texas, Denton, TX; 3University of Central Florida, Orlando, FL. Email: xiangli.gu@uta.edu (No relevant relationships reported)

Purpose: Around 32% of children are overweight or obese and do not meet the 60-minute moderate-to-vigorous physical activity recommendation (MVPA; SHAPE America, 2016). Given that physical activity is highly variable between children across the school day and during specific segments (CDC, 2013), it is unclear which segmented MVPA during school contributes the most physical and cognitive health benefits. This study aimed (1) to investigate associations between time spent in MVPA during recess, lunch, physical education (PE), and physical fitness components (BMI, cardiorespiratory and muscular fitness), as well as cognitive health, respectively; and (2) to test the indirect effect of segmented MVPA on cognitive health through physical fitness among 8-9 years old children.

Methods: Participants were 30 8-9 year old children (M = 8.78, SD = 0.97) recruited in the southwest region of the U.S. Time spent in MVPA during recess (RE_MVPA), lunch (LU_MVPA) and PE (PE_MVPA) segments were measured by accelerometers across five school days. The FITNESSGRAM® test battery was used to assess physical fitness components including PACER, curl-up, push up, and BMI. Children’s cognitive health was measured by also the 6-item PedsQL® Cognitive Functioning Scale (Varni et al., 2011).

Results: The time spent in MVPA during recess was positively associated with physical fitness (cardiorespiratory and muscular fitness: r = .27, p < .01) and had low, but positive correlation with cognitive function (p < .05). Both cardiorespiratory (r = .26, p < .01) and muscular fitness (r = -.12, p < .05) were significantly related to cognitive health. The structural equation modeling analyses suggested a significant indirect effect of time spent in MVPA during recess and PE on children’s cognitive function through physical fitness with sound goodness-of-fit indices: χ²/df = 109.46/58, CFI = .93, RMSEA = .051; (90% CI [.04, .07]).

Conclusion: The results suggest that school segmented MVPA in PE and recess provide children with opportunities to maintain appropriate levels of physical fitness and cognitive health. This study fills the research gap by identifying unstructured physical activity periods such as recess that can provide greater room to implement physical activity and health promotion strategies in school-age children.

2034 Board #190 May 30 2:00 PM - 3:30 PM Relationship Between Fitness and Active-Sedentary Behavior with Cognitive and Emotional Recognition in Elderly: Core Study Andrés Vivas, Paulo C. Freire, Juliana L. Sousa, Marcoz C. Silva, Henrique Bortolotti, Eduardo C. Costa, Hassan M. Elsangedy, Eduardo B. Fontes. Federal University of Rio Grande do Norte, Natal, Brazil. Email: andrevivs@gmail.com (No relevant relationships reported)

The decline in cognitive function and emotional regulation in aging have broad negative implications for independence, social competence and behavior that affect health. These impaired conditions can be exacerbated by increased sedentary behavior (SB) and lower levels of physical activity (PA) and fitness. However, it is not clear which of these have a higher relationship with cognitive function and emotional regulation in elderly.

PURPOSE: To investigate the relationship between cognitive function and emotional regulation with physical fitness, PA and SB in the elderly.

METHODS: This preliminary analysis of the Cardiovascular, Cognitive and Exercise Study in the Elderly (CORE) included 80 volunteers (# 3:3:4: arch, female: 39, male: 41) who performed a cognitive task (Wisconsin cards sorting test) and an emotional facial recognition task, physical fitness test (senior fitness test and handgrip strength), PA level (Minnesota Leisure-time Physical Activity Questionnaire) and sedentary behavior qua storniae (Longitudinal Aging Study Amsterdam). Bivariate correlations using Spearman’s rho were calculated with statistical significance set at 5%.

RESULTS: Significant relationship between cognitive performance with, leg strength (total correct response, p = .028; total errors, p = .028; and non-performative errors, p = .028), 6-min walking test (total correct response, p < .01; total errors, p < .01).

and non-performative errors, p = .030) and SB (performative errors (displaystyle \backslash \rho ) = .27). Also, the reaction time (RT) during the emotional facial recognition had a significant relationship with upper body strength (FT posterior p = .01; RT negative p = .033) and PA level (MET, hr/w) (RT negative p = .031). Also, a significant relationship between worse cognitive performance with handgrip strength (non-performative errors, p = .026) and SB (performative errors, p = .027).

CONCLUSIONS: These preliminary results suggest that physical fitness and SB are associated with cognitive performance. Also, PA level and upper body strength are associated with emotional performance. These findings suggest the importance between the balance of maintaining an active behavior and the inclusion of aerobic and resistance exercises to improve cognitive and emotional regulation in the elderly.

2035 Board #191 May 30 2:00 PM - 3:30 PM Cardiovascular Risk Moderates Aerobic Training Efficacy on Executive Function in Older Adults Lauren Marcotte, Cindy K. Barha, Robin Hsiung, Teresa Liu-Ambrose. University of British Columbia, Vancouver, BC, Canada. Email: lauren.marcotte@alumni.ubc.ca (No relevant relationships reported)

PURPOSE: To examine whether the Framingham Cardiovascular Risk Profile Score (FCRP) moderates the effect of a 6-month progressive aerobic training program (AT) on executive function in older adults with mild subcortical ischemic vascular cognitive impairment.

METHODS: This is a secondary analysis of a proof-of-concept randomized controlled trial in 7 older adults, who were randomized to either a 6 month, three-weekly, progressive AT program (AT), or usual care plus an education program (CON). At baseline and trial completion, three executive processes were measured: 1) response inhibition by Stroop Colour Word Test; 2) working memory by digits backward task, and 3) set shifting by the Trail Making Test (B-A). Baseline cardiovascular risk was calculated using the FCRP, and participants were classified as either low risk (<20% FCRP score; LCVR) or high risk (>20% FCRP score; HCVR). A complete case analysis (naïve) was conducted using an analysis of covariance (ANCOVA) to evaluate between-group differences in the three executive processes. Age, baseline Montreal Cognitive Assessment score, education, and baseline score for the outcome variable were entered as covariates in all models.

RESULTS: A significant interaction was found between FCRP and group (AT or CON) for the digit span backward (F(1,8) = 6.54, p = 0.03) and the Trail Making Test (F(1,5)=4.09, p<0.04). There was no significant interaction for the Stroop Colour Word Test (F(1,37)=2.16, p=0.16) and 3) set shifting by the Trail Making Test (B-A). Baseline cardiovascular risk was significantly related to upper body strength (RT positive r=-0.26; RT negative r=-0.33) and PA level (MET, hr/w) (RT negative r=-0.31). Also, a significant relationship between worse cognitive performance with handgrip strength (non-performative errors, p = 0.26) and SB (performative errors, p = 0.27).

CONCLUSIONS: These preliminary results suggest that physical fitness and SB are associated with cognitive performance. Also, PA level and upper body strength are associated with emotional performance. These findings suggest the importance between the balance of maintaining an active behavior and the inclusion of aerobic and resistance exercises to improve cognitive and emotional regulation in the elderly.

A Single Bout of Exercise Improves Accuracy in Video Gaming: a Pilot Study Bernat de las Heras, Orville Li, Lynden Rodrigues, Jean-Francois Nepveu, Marc Roig. McGill University, Montreal, QC, Canada.

Email: bernadelas@gmail.com (No relevant relationships reported)

There are 2.3 billion of video gamers worldwide and this number is expected to grow to more than 2.6 billion by 2021. Research has demonstrated negative associations between the number of hours spent in front of a screen and physical inactivity. Video gamers are thus a great risk of experiencing long-term health issues associated to excessive sedentarism. Cardiovascular exercise has been proven to be an effective intervention in reducing the risk of cardiometabolic clinical conditions as well as enhancing brain health and function. However, whether exercise has positive effects on video game performance is not known.

PURPOSE: To investigate the effects of a single bout of cardiovascular exercise on the performance of “League of Legends” (LoL), a video game played daily by more than 30 million players.

METHODS: 1416 49 year young (18 59) LoL gamers played an individual LoL task of 20 min preceded by either 15 min of a high-intensity interval exercise or rest. The two conditions were administered on two separate days in a counterbalanced fashion. Video game performance was assessed as the number of targets destroyed, as well as accuracy, defined as the ability to destroy a target with only one attack. Attacks that required more than one attempt to destroy a target
were counted as accuracy errors. RESULTS: Exercise improved the capacity of participants to successfully destroy targets, but differences between exercise (119.43 [4.23]) and rest (111.50 [3.98]) did not reach statistical significance (t-test; t=1.81; p=0.09). Exercise enhanced accuracy, with fewer errors after exercise than after rest (paired t-test; t=2.38; p<0.003). Self-reported sitting time was negatively associated with total score after the rest condition (r=-0.5; p<0.00). Neither other variable (cardio-respiratory fitness, BMI, cognitive level) was associated with game performance. CONCLUSION: Exercise performed before playing LoL improves video game performance increasing accuracy. The fact that players with less sitting time showed better performance reinforces the importance of reducing sedentary behaviors in this group. The implementation of exercise routines in video games may improve their general health and their gaming performance.

Supported by FRQS Junior 1 Salary Award (MR) and by the McGill Faculty of Medicine (OL).

2037 Board #193 May 30 2:00 PM - 3:30 PM
Association Between Cognitive Function And Handgrip Strength In Physical Education College Students
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PURPOSE: To analyze the association between cognitive function and handgrip strength in a sample of university students of Physical Culture in Bogotá, Colombia. METHODS: The cross-sectional study included a total sample of 104 voluntery university students of Physical Culture, 18 ±2.5 yrs old, from Bogotá, Colombia. The handgrip strength was determined by the digital dynamometer and the cognitive function was evaluated individually by trained personnel through the Paced Auditory Serial Addition Test (PASAT), to evaluate the speed and flexibility of the processing of auditory information, the sustained and divided attention, as well as the calculation capacity, a standardized audio was used in the speed of the stimulus, presenting the individual digits every 3 seconds (PASAT-3), adding each new digit to the previous one immediately. The shorter stimulus intervals were used in 2 seconds (PASAT-2), increasing the difficulty. The association between cognitive function and handgrip strength adjusted for weight, was performed using the linear logistic regression model in the statistical package SPSS v.25. RESULTS: The sample was middle-aged (Age= 19.2 ±2.9 yrs; N=362 en). The logistic regression model showed a strong association between hand grip strength adjusted to weight and cognitive function, through the stimulation of PASAT-2 (p = 0.0268 eta= 0.219), compared with PASAT-3 (p = 0.062; Beta = 0.184) where no significant difference was found, however a low tendency is identified. CONCLUSION: the results of this study show that hand grip strength is associated with a better cognitive response in speed and flexibility of processing in college students of Physical Culture of Bogotá, Colombia, for which it is suggested to promote the regular practice of exercise physical that stimulates muscle strength, in order to improve cognitive performance in college students.

2038 Board #194 May 30 2:00 PM - 3:30 PM
Exercise Intensity Influences Prefrontal Cortex Oxygenation During Cognitive Testing
Terence Moriarty, Kelsey Bourbeau, Bryanne Bellovary, Micah Zuhl. University of New Mexico, Albuquerque, NM. Email: moria1ta@umm.edu

Various types of exercise training, including high and low intensity aerobic exercise, along with mind-body exercise (e.g., yoga) have been implemented into treatment for those suffering from psychological disorders and traumatic brain injury. The prefrontal cortex (PFC), which houses key cognitive constructs is responsive to exercise, and is commonly measured in functional near infrared spectroscopy (fNIRS). The fNIRS evidence suggests that exercise mediates neural adaptation through increased blood flow and neurogenesis, which enhances neural activation leading to improved cognitive performance. However, the type and intensity of exercise that has the most robust impact on brain blood flow is currently unknown. PURPOSE: Therefore, the primary aim of the study is to compare PFC activation during cognitive tasks performed after low intensity, high intensity, and yoga exercise. We aim to determine if markers of cardiovascular and metabolic stress influence brain activity after each exercise bout.
METHODS: Eight subjects (4 male, 4 female), aged 35±5 years were completed a control, high intensity, low intensity, and yoga exercise trial followed by administration of a cognitive task (NIH Toolbox Fluid Cognition). Left and right PFC oxygenation were measured during the post-exercise cognitive assessment using fNIRS technology.
RESULTS: Oxygenation during the cognitive task was higher in the left PFC region after low intensity exercise compared to all other trials (control, high intensity, yoga). Regression model analysis showed that a 10% increase in %HMax up to 0% intensity predicts an increase in left PFC oxygenation by 2.11 umol.

was detected between PFC oxygenation and cognitive performance or the lactate response among participants in the current study, however a relationship between control levels of brain derived nitriteergic factor (BDNF) and blood oxygen speed was detected. CONCLUSIONS: Acute exercise below 9% aerobic intensity increased brain blood flow during a post-exercise cognitive task. Therefore, it may be beneficial for those who engage in any cognitive related activity to perform a brief bout of low intensity exercise prior to the task. This may include people who participate in academic-based testing, cognitive behavioral therapy, or motor training.

2039 Board #195 May 30 2:00 PM - 3:30 PM
Exploring The Relationships Between Personality And High-Intensity Exercise-affect In Men And Women
Shelby E. Dietz, Allyson G. Box, Annmarie Chiziewski, Steven J. Petruzello, FACSIM. University of Illinois Urbana-Champaign, Urbana, IL. (Sponsor: Steven J. Petruzello, FACSIM)

In general, men are more likely to meet physical activity guidelines in comparison to women, and tend to report exercising at higher-intensities. However, less is understood in regards to how men and women differ in feeling states (e.g., core affect) during a high-intensity exercise bout. PURPOSE: Determine whether sex differences exist in personality traits and high-intensity exercise-affect. METHODS: Male (M=66) and female (F=101) undergraduates (n=1670: 2 yrs, 24 ·body mass index (BMI), 5% female, 8% regular exercisers) completed several personality surveys along with a 1-minute high-intensity cardiac (HIC). Core affect (via Feeling Scale & Felt Arousal Scale) was assessed prior to, every 3-minutes during, and 20-minutes post (P20) condition. RESULTS: Multivariate ANOVAs revealed significant differences (P<.05) in the personality traits extraversion (F=4·M, M = 2.2, d = 0.59), neuroticism (F=2·M = 3.9, d = 0.67), openness (F=1·M = 1.8, d = 0.56), and intensity-tolerance (F=2·M = 2.3, d = 0.59). No sex differences (P>.05) were observed for exercise-affect prior to, during, and following the HIC. CONCLUSIONS: Although sex differences exist in various personality traits, these differences did not influence how one felt prior to, during, and following a HIC. These findings support the notion that men and women respond similarly to exercise stimuli. More research is needed to understand why women exercise less and at lower-intensities in comparison to men.

2040 Board #196 May 30 2:00 PM - 3:30 PM
Acute After-School Screen Time in Children Decreases Impulse Control: A Randomized Crossover Trial
Bruce W. Bailey, Mary Efrain, Chance McCutcheon, Hunter LaCouture, Harrison Marsh. Brigham Young University, Provo, UT. Email: bailee.bruce@byu.edu

PURPOSE: This study examined the effect of three hours of after school active play vs. sedentary screen time on executive function in children.
METHODS: This study used a crossover design with treatment conditions that were randomized and counter-balanced. There were two experimental conditions: three hours of active play compared to three hours of sedentary screen time. Participants included 32 boys and 28 girls aged 8 ±2.9 yrs. Physical activity patterns were measured using an actigraph accelerometer. Executive control was measured using the Stroop color and word test. RESULTS: The mean age and BMI were 8.0 ±1.8 yrs and 8.9 ±1.8. On the active day, children spent 28 ±9 minutes in MVPA after school compared to 3 ±3 minutes on the sedentary day (F = 253.1, P < 0.0001). There was no difference between days in the Stroop Task performance for word reading or color naming. However, there was a significant difference between conditions for the incongruent task, with children performing better on the active day (F = 19·G = 0.018). CONCLUSIONS: The results of this study demonstrate that active play after school improves executive function in children by increasing their ability to inhibit cognitive interference.

2041 Board #197 May 30 2:00 PM - 3:30 PM
Acute Exercise Alters Functional Connectivity During Cognitive Task
Soichi Ando1, Sota Saito1, Nobuaki Mizuguchi2, Mizuki Sudo1, Kazunori Ohkawara1, Atsushi Sano1. 1The University of Electro-Communications, Tokyo, Japan. 2Keio University. Tokyo, Japan. 3Meiji Yasuda Life Foundation of Health and Welfare, Tokyo, Japan. 4Tokyo Metropolitan University, Tokyo, Japan. Email: soichi.ando@uec.ac.jp

PURPOSE: There is a growing body of evidence to show that acute aerobic exercise improves cognitive performance. Nevertheless, it remains largely unknown how acute
exercise improves cognitive performance. The purpose of this study was to test if alteration in functional connectivity is involved in improving cognitive performance induced by acute exercise.

METHODS: Participants were 10 healthy right-handed young men (age: 21.6 ± 1.4 yr, peak oxygen uptake = 44 ± 8 ml/kg/min). Experiments were conducted in a randomized crossover design. In the Exercise condition, subjects cycled at 40% peak oxygen uptake for 30 minutes. In the Control condition, subjects rested for 30 minutes without exercise. For both conditions, a cognitive task (Go/No-Go task) before and after exercise (rest). We first analyzed regions specifically activated by exercise as region of interest. Then, we identified regions where functional connectivity was altered before and after exercise. We also identified regions where amount of alteration in functional connectivity was correlated with that of reaction time (RT).

RESULTS: RT was reduced in the Exercise condition (Pre: 30 ± 7 s, Post: 38 ± 6 s, p < 0.02), while it did not change in the Control condition (Pre: 46 ± 9 ms, Post: 47 ± 9 s, p > 0.82). We observed significant increases in activation in the opercular and triangular parts of the left inferior frontal gyrus (IFG) and anterior cingulate cortex (p < 0.01, uncorrected). We noted an increase in functional connectivity between the opercular part of the left IFG and the left putamen (Pre: 0.02 ± 0.11, Post: 0.12 ± 0.13, p = 0.08). Alteration in the functional connectivity between these regions was negatively correlated with the alteration in RT (r = -0.4 p = 0.06).

CONCLUSIONS: Alteration in functional connectivity may be associated with improvement of cognitive performance after acute exercise.

2042 Board #198
May 30 2:00 PM - 3:30 PM
The Effects Of Exercise Intensity On Auditory Processing Speed And Flexibility: A Randomized Crossover Study.
Ciera Bartholomew, Michael Larson, Hunter LaCouture, Kaylie Carbine, Chance McCutcheon, Harrison Marsh, Bruce W. Bailey, Jr. Brigham Young University, Provo, UT.
Email: cierabl12@gmail.com

PURPOSE: The purpose of this study was to determine how exercise, at a moderate and vigorous intensity, affects auditory processing speed and flexibility, and calculation ability. METHODS: One hundred and thirty-six men and women between the ages of 18-60 were recruited for this randomized crossover study. Participants were randomly assigned to each of the following exercise conditions: moderate (35% VO2 max), vigorous (80% VO2 max), and sedentary (no exercise). Each condition lasted 30 minutes and was separated by a 72-hour rest interval. After the exercise condition, a battery of cognitive tests were administered. The Paced Auditory Serial Addition Test (PASAT) was one of these tests and was used to measure the relationship between exercise intensity and auditory processing speed and flexibility. RESULTS: Eighty-one men (age=23.2, BMI=23.9 ± 3.2) and fifty-five women (age=20.9, BMI=22.4 ± 2.8) completed the study. There was no main effect of condition for the number of problems answered correctly (F = 1.249 p = 0.290), the number of problems attempted (F = 1.18 p = 0.229) and the percent of problems correctly answered (F = 1.08 p = 0.325). There was a main effect for gender for the number of problems answered correctly (F = 1.249 p = 0.290), the number of problems attempted (F = 1.18 p = 0.229) and the percent of problems correctly answered (F = 1.08 p = 0.325). We observed significant increases in activation in the opercular and triangular parts of the left inferior frontal gyrus (IFG) and anterior cingulate cortex (p < 0.01, uncorrected). We noted an increase in functional connectivity between the opercular part of the left IFG and the left putamen (Pre: 0.02 ± 0.11, Post: 0.12 ± 0.13, p = 0.08). Alteration in the functional connectivity between these regions was negatively correlated with the alteration in RT (r = -0.4 p = 0.06).

CONCLUSIONS: Alteration in functional connectivity may be associated with improvement of cognitive performance after acute exercise.

2043 Board #199
May 30 2:00 PM - 3:30 PM
The Effects Of Acute Aerobic Exercise On BDNF Levels And Cognition In Postmenopausal Women
Ryan Wiet, Kenneth Sparks, Dough Wajda, Jeremy Genovese, Emily Kullman. Cleveland State University, Cleveland, OH.

PURPOSE: The purpose of this study was to examine how menopausal status affects choice reaction time and peripheral BDNF levels after aerobic exercise. It was hypothesized that exercise would affect peripheral BDNF levels. The study was randomized, crossover design with pre and post exercise testing. RESULTS: Our data showed no significant differences in BDNF levels before and after exercise. CONCLUSIONS: Further investigation is required to clarify this relationship.

2044 Board #200
May 30 2:00 PM - 3:30 PM
Chronic Effect of Exercise on Working Memory in Children And Adolescents: A Meta-Analysis of Randomized Controlled Trials
Sonia Monterro-Bricich, 1saura M. Castillo-Hernández, Gerard A. Araya-Vargas. University of Costa Rica, San José, Costa Rica. (Sponsor: Ellen M. Evans, FACSM)
Email: soniamonterob@yahoo.es

INTRODUCTION: Working memory (WM), generally considered executive function, is gaining attention due to its role in contributing to children and adolescents’ academic achievement, especially verbal and qaitative reasoning, and sports-related tactical memory. Quantitative reviews regarding the effect of exercise interventions (EX) on this higher-level cognitive skill in these important cohorts are lacking.

PURPOSE: The aim of the study was to assess the chronic effect of EX on WM in children and adolescents and to evaluate potential moderators of this effect using a meta-analytic approach.

METHODS: A computerized literature search was conducted based on seven databases: SPORTDiscus, Google Scholar, PubMed, ScienceDirect, Dialnet Plus, SciElo, and MEDLINE. Studies needed to meet the following inclusion criteria: 1) a RCT design in children or adolescents, 2) EX with mode description, 3) published in English, Spanish, or Korean $ WM as dependent variable, and $ reported descriptive that permitted effect size (ES) calculation. The quality score was defined using a scale from 1 to 5. A random-effects model with a within-group design was used to calculate the ES. One-way analysis of variance of independent groups or Pearson’s correlation coefficients were used to examine moderators.

RESULTS: 807 articles published before Nov. 2016 were found, of which 10 studies met the inclusion criteria. The meta-analytic effect size (ES) of .85 was found (p<0.01; CI: 0.96 to 0.74) suggesting a positive high effect of the EX to enhance WM. Age (r=-.34; p<0.05), number of sessions (r=.42; p<0.05), interaction (P=0.041) between pre and postmenopausal women over time between pre and post timepoints, with premenopausal women trending towards an increase in BDNF, and postmenopausal women trending towards a decrease in BDNF. There was a large effect size within this interaction represented with a partial eta squared value of .25. A Post Hoc test was done to further investigate the interaction. There was not enough statistical power (P = .164) to state that there was a difference in BDNF levels (pre to post) but that there appears to be a trend. Both age and FSH had indirect relationships with BDNF (p<0.05; the greater the age or FSH, the lower the peripheral BDNF levels). The meta-analytic ES of a Go/No-Go Stroop Test time over all time points (P = 0.039 using random pre, post, and post30 exercise respectively). This indicated an age-related decline in choice reaction time capabilities.

CONCLUSION: Within the study, there was not statistical evidence that acute exercise affects BDNF levels nor choice reaction time for the Stroop inconstant group, regardless of menopausal status. However, a clear decline in choice reaction time was noted with increase age. Additionally, there appears to be a blunting of exercise-induced increases in BDNF in postmenopausal women. Further investigation is required to clarify this relationship.

2045 Board #201
May 30 2:00 PM - 3:30 PM
Motivational Differences Between Crossfit And Traditional Resistance Training Participants

PURPOSE: To investigate the motivational factors, behavioral regulations based on self-determination theory framework, and the relationships between basic psychological need satisfaction and actual exercise behaviors of CrossFit and resistance training (RT) participants.

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Acute aerobic exercise exerts a small beneficial effect on cognition. A majority of studies have examined cognitive function following acute bouts of exercise, while very few have evaluated changes that may occur during exercise. The limited research that has been conducted in this area is mixed, demonstrating differential effects on cognitive performance depending on methodological decisions including exercise intensity and duration. PURPOSE: The primary purpose of this study was to examine the effects of low-intensity cycling on cognitive function, measured by behavioral performance (response accuracy and reaction time) and neuroelectric indices of attentional processing (P3 amplitude and latency). METHODS: Twenty-seven (Mage = 22.9 ± 3.0 years old) college-aged individuals were counterbalanced into low-intensity exercise (EX) and sedentary control (SC) conditions. During each condition, participants completed a 10-minute resting baseline period, 20 minutes of either sustained cycling or seated rest, and a 20-minute recovery period. Electroencephalography (EEG) data were recorded during a modified oddball paradigm in order to assess primary cognitive outcome measures at 10-minute intervals (60 trials each) throughout the study. RESULTS: Individuals in EX and SC conditions displayed lower accuracy to rare trials across conditions, F(2,3) = 0.37, η² = 0.08, *p > .05*, suggesting reductions in performance to more difficult trials as testing sessions progressed. There were no significant differences in reaction time between EX and SC conditions. Significant reductions in P3 latency were observed in EX compared to SC during the 20-minute cycling period compared to seated rest, F(2,3) = 3.31, *p = .023*, η² = .38, while no differences in P3 latency were observed between EX or SC conditions. CONCLUSIONS: Taken together, results indicate that exercise at lower doses may have small but significant effects on behavioral and neuroelectric outcomes of cognitive performance. These changes may be due in part to the shifting of attentional resources from the cognitive task to the maintenance of exercise. Information gathered from this study may aid in the development of appropriate exercise prescription for populations looking to specifically target cognitive function deficits through acute aerobic exercise.

**Impact of Stress on Resting Skeletal Muscle Oxygen Consumption with and without Prior Exercise**

Melissa J. McGranahan, Edward S. Green, Kevin K. McCully, FACSM, Nathan T. Jenkins, University of Georgia, Athens, GA. Email: mmcgp@gmail.com. UGA (No relevant relationships reported)

The effects of acute exercise on muscle metabolism are well established, however the impact of mental stress (MS) on muscle metabolism is not well understood. PURPOSE: To assess muscle oxygen consumption (mVO2) after acute MS and evaluate the effect of acute exercise prior to MS on mVO2. METHODS: Participants (N = 15, mean age = 22 ± 2 years, 5 men and 10 women, VO2peak = 50 ± 5 ml/kg/min) were classified into two groups based on prior exercise: (1) sedentary or exercise (E). On two separate days, participants either rested for 25 minutes (CON) or completed 25 minutes of exercise (EX) at 10% ventilatory threshold on cycle ergometer. MS was evoked by a short subtraction test administered by two research assistants dressed in white lab coats. Data were analyzed using a 2 x 2 repeated measures ANOVA with Fishers LSD post hoc tests, and are presented as mean ± standard deviation (SD). RESULTS: A significant interaction effect of Condition x Time on mVO2 was observed (F = 6.3, *p = .05, η² = .036*). Post hoc comparisons indicated mVO2 was significantly increased after EX compared to CON by 21.8 ± 28% (*p = .05*). Within CON, MS increased mVO2 by 12.6 ± 10.2% (p = .001). In EX, there was an increase in mVO2 from BL to after EX by 12.1 ± 14% (*p = .05*) and from BL to after MS by 12.6 ± 6% (*p = .05*). Conclusions: To our knowledge, these data are the first to suggest that acute MS increases the metabolic rate of resting skeletal muscle. Interestingly, the combination of prior EX and MS does not further augment metabolic activity beyond MS alone.

**The Impact of Qigong Baduanjin on Cognitive Function & Mental State in Patients with type 2 Diabetes**

Yan Zhao, Chengdu Sport Institute, Chengdu, China. (No relevant relationships reported)

**Affective and Perceptual Responses to High-Intensity Interval Training: Comparing Graded Walking to Ungraded Jogging**

Abby Fleming, Nic Martinez, Maureen Chioldini-Rinaldi, Larry Collins, Candis Ashley, Marcus Kilpatrick, FACSM. University of South Florida, Tampa, FL. (Sponsor: Marcus Kilpatrick, FACSM) Email: afrleming@mail.usf.edu. (No relevant relationships reported)

Benefits associated with high-intensity interval training (HIIT) are well-established. Research has also demonstrated that HIIT can be well-tolerated in a variety of populations, protocols, and modalities. Treadmill-based HIIT has almost exclusively included running interspersed with walking. Research to date has not investigated the delivery of HIIT by way of walking interspersed with ungraded jogging. PURPOSE: Compare the effects of ungraded jogging to graded walking as a modality of HIIT on perceived exertion, affect, and enjoyment. METHODS: Nine healthy participants (3 men, 4 women) of mean BMI = 22 ± 3 years old = 2 completed two 20-minute counterbalanced HIIT trials. The order of completion was randomized. Both trials alternated between workloads associated with 30% of VO2max and a brisk and comfortable walking speed (mean = 3.2 mph). The interval portions of the trials were performed at elevated grade (mean = 17.4 degrees) for the WALK-HIIT trial and elevated speed (mean = 6.7 mph) for the RUN-HIIT trial. Affect, enjoyment, and perceived exertion, both overall (RPE-O) and legs only (RPE-L), were measured throughout each trial. Enjoyment was measured upon completion of each trial. RESULTS: A significant relationship between affect and enjoyment was observed. Data was analyzed using dependent t-tests. RPE-O, RPE-L, affect, enjoyment, and HR (all *p-values > .05*; all ES values < .50) were not significantly different for the WALK-HIIT and RUN-HIIT trials. CONCLUSIONS: Findings indicate that WALK-HIIT and RUN-HIIT protocols produce similar perceptual and affective responses, providing a significant exercise stimulus sufficient to improve cardiometabolic health. The production of relatively similar responses suggests that graded walking is a viable alternative to running for the delivery of the many benefits associated with interval-based exercise without negative impacts on the exercise experience.

**Abstracts were prepared by the authors and printed as submitted.**
control group (P=0.05). QBDJ training also contributed to improving the ability of emotion regulation. Compared with the control group, participants in the QBDJ group had significantly lower total HAMA score (P<0.05). CONCLUSIONS: These results indicate that regular QBDJ exercise can effectively improve cognitive function and produce positive effects on mental state in type 2 diabetic patients with MCI.

**TABLE 1. COMPARISON OF SCORES FOR ALL MoCA SUBTESTS IN TWO GROUPS**

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Control group (N=30)</th>
<th>QBDJ group (N=10)</th>
<th>Significant Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visuospatial/executive</td>
<td>3.61 ± 0.74</td>
<td>3.06 ± 0.82</td>
<td>-0.55 ± 0.38</td>
</tr>
<tr>
<td>Naming</td>
<td>2.51 ± 0.62</td>
<td>2.50 ± 0.71</td>
<td>-0.01 ± 0.38</td>
</tr>
<tr>
<td>Attention</td>
<td>4.43 ± 0.75</td>
<td>4.44 ± 0.53</td>
<td>0.01 ± 0.38</td>
</tr>
<tr>
<td>Language</td>
<td>2.62 ± 0.46</td>
<td>2.50 ± 0.57</td>
<td>-0.12 ± 0.38</td>
</tr>
<tr>
<td>Abstraction</td>
<td>3.08 ± 0.62</td>
<td>2.82 ± 0.62</td>
<td>-0.26 ± 0.38</td>
</tr>
<tr>
<td>Delayed recall</td>
<td>1.94 ± 0.66</td>
<td>1.91 ± 0.58</td>
<td>-0.03 ± 0.38</td>
</tr>
<tr>
<td>Orientation</td>
<td>5.78 ± 0.52</td>
<td>5.72 ± 0.54</td>
<td>-0.06 ± 0.38</td>
</tr>
<tr>
<td>Total score</td>
<td>20.82 ± 1.24</td>
<td>21.14 ± 1.52</td>
<td>0.32 ± 0.38</td>
</tr>
</tbody>
</table>

Whereas difference is significant (p<0.05), the F-ratio is calculated with QBDJ group vs. Control group and compared with before intervention in QBDJ group.

**TABLE 2. COMPARISON OF HAMA SCORE IN TWO GROUPS**

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Control group (N=30)</th>
<th>QBDJ group (N=10)</th>
<th>Significant Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAMA</td>
<td>15.44 ± 1.50</td>
<td>16.27 ± 1.80</td>
<td>0.83 ± 0.32</td>
</tr>
</tbody>
</table>

When the difference is significant (p<0.05), the F-ratio is calculated with QBDJ group vs. Control group and compared with before intervention in QBDJ group.

Prior work has found that heavy cannabis use (CU) is associated with learning and memory impairments, whereas physical activity (PA) has been linked to enhanced memory and cognition. **PURPOSE:** To determine whether PA moderates the link between CU and memory among adolescents, such that CU leads to greater memory deficits in those who report less PA. **METHODS:** Participants were 387 adolescents (ages 15-19) from a larger study, among adolescents, such that CU leads to greater memory deficits in those who report less PA. **RESULTS:** Greater past 6-month CU frequency was associated with poorer immediate and delayed memory in separate regression models. To assess whether PA frequency of CU (in days) was assessed over the last 6 months; 70% endorsed some CU. Participants completed the California Verbal Learning Test-II and Wechsler Memory Scale-IV Logical Memory and Details subtests. We used composite scores from these tests' immediate and delayed free recall trials to derive latent constructs of immediate and delayed memory, respectively. We examined the independent influence of CU and PA on our latent constructs of memory and cognition. Greater past 6-month CU frequency was associated with poorer immediate, ß = -0.22, p < .001, and delayed memory, ß = -0.23, p < .001. However, past 6-month PA was not associated with immediate, ß = -.01, p = .94, or delayed memory, ß = -.07, p = .49. The PA X CU interaction effect was not significant for either immediate, ß = -.03, p = .85, or delayed memory, ß = -.03, p = .80. Results were unchanged after controlling for other substance use and lifetime CU frequency, which accounted for significant variance on immediate, ß = -.27, p = .03, but not delayed memory, ß = -.11, p = .39. **CONCLUSION:** Our findings replicate the well-established link between CU and memory impairments, whereas physical activity (PA) has been linked to enhanced memory and cognition.

Successful execution of operational tasks requires accurate and efficient action boundary perception. An action boundary is the task- and individual-specific threshold where an action is possible. The inability to accurately perceive changes in action possibilities due to changing action boundaries may increase errors adopted during a task, possibly compromising mission success. Astronauts must maintain effective operational performance in isolated, confined and extreme (ICE) environments for extended time periods, similar to those expected on the proposed mission to Mars. It is unknown how these environments affect action boundary perception. **PURPOSE:** Investigate changes in action boundary perception behavior during a 30-day Human Exploration Research Analog (HERA) mission. **METHODS:** Sixteen subjects completed six trials of the perception-action coupling task (PACT), a novel tablet-based action boundary perception task, in the afternoon of days 3, 10, 17, 24, and 30. The 15-minute PACT presents a series of virtual balls and apertures varying in ball to aperture size ratio (B:AR) from 0.2 to 1.8 in a ratio of 1:1 representing the action boundary. Subjects determined whether the ball could fit through the aperture, then responded based on their perception of this action possibility. (x) x (time) repeated measures ANOVAs were performed to assess changes in response time (RT), accuracy (ACC) and lapses. **RESULTS:** No significant ratio x time interactions were observed. RT (F1,14 = 3.81, p = .010, n² = .18), was faster on day 24 (0.738 ± 0.088s) than day 17 (0.768 ± 0.092s). No differences were observed between other timepoints. ACC and lapses did not vary during the mission (p > 0.05). RT (F1,14, 72.03 = 3.85, p < .001, n² = 0.83) and ACC (F1,14, 23.84 = 3.85, p = .002, n² = 0.67) were sensitive to changes in B:AR; responses were slower and less accurate near the action boundary. **CONCLUSION:** Minimal change in action boundary perception performance was observed in HERA ICE analog, with improvements in RT detected. Faster RT may reflect more efficient responses or behavioral changes due to ICE environments, suggesting action boundary perception is not compromised by a 30-day ICE analog assessment. This material was based on work supported by NASA (NNX11AD15G).

Cognitive impairment is prevalent in patients with chronic kidney disease (CKD), but little is known about its relationship with physical and vascular function. **PURPOSE:** To investigate the relationship between cognitive function, and physical and vascular function in older adults with stage 3–4 CKD and preclinical cognitive impairment. We hypothesized that physical and vascular function would be related to cognitive function. **METHODS:** Participants (n=28) with CKD and preclinical cognitive impairment (female, 62% black, eGFR 27.8 ± 11.8 mL/min/1.73 m²), that was associated with physical fitness levels. These results indicate a concomitance between higher levels of fitness, physical, and vascular function, and higher scores in psychomotor speed and executive control in patients with CKD. The clinical
implications of our work remains to be further explored, but interventions to improve fitness levels, and physical and vascular function may contribute to lessening the impact of CKD-associated cognitive alterations.

Physical education classes provide an opportunity for students to be physically active and also to help in school learning. **PURPOSE:** To compare the effects of physical education program combined with scholarly contents named “Playing actively and Learning (PAL)” on selective attention in boys and girls. **METHODS:** 38 children with low academic achievement (9.5±0.9yr) from an elementary public school of vulnerability area at Brasilia - Brazil, undertook Stroop test before and after intervention. The anthropometric data (weight and stature) were assessed for school of vulnerability area at Brasilia - Brazil, undertaken Stroop test before and after intervention. The stimuli at Stroop test GO / No-go was a colored bar after intervention. The results studies with a neuroelectric analysis (i.e. event related potential component) can be observed in congruent or incongruent conditions between groups. The reaction time decreased in incongruent Go condition in both groups after intervention for boys (958.3±113.3ms) and girls (982.8±138.5ms). ANOVA mixed was used to compare data before and after intervention. **RESULTS:** No differences were observed in congruent or incongruent conditions between groups. The reaction time decreased in incongruent Go condition in both groups after intervention for boys (958.3±113.3ms) and girls (982.8±138.5ms). ANOVA mixed was used to compare data before and after intervention. **CONCLUSION:** Three months of PAL resulted in improvement in a similar way in boys and girls at the most difficult part of Stroop test. To support these results studies with a neuroelectric analysis (i.e. event related potential component) can be recommended.

The prevalence of cognitive deficits is increasing worldwide, making risk factor reduction a crucial target on the global public health agenda. Adulthood physical activity (PA) is suggested to protect against old-age cognitive deficits, but the independent role of childhood / youth PA for adulthood cognitive performance is unknown.

**PURPOSE:** We investigated the association between PA from childhood to adulthood and midlife cognitive performance. **METHODS:** This study is a part of the Cardiovascular Risk in Young Finns Study. From 18, a population-based cohort of 3:8 children (baseline age 3-18 ears) has been followed-up for 31 years in 3-9 year intervals. PA was PA cried in all study phases. Cumulative PA was determined in childhood (age 6-12 years), adolescence (age 12-18 years), young adulthood (age 18 24 years) and adulthood (age 24 34 years). Cognitive performance was assessed using computerized neuropsychological test in 2011 among 2,026 participants aged 34 49 years.

**RESULTS:** High PA level in childhood (β 0.119, 95% confidence interval (CI) 0.055-0.182, p=0.0002), adolescence (β=0.125 SD, 95% CI 0.063-0.207, p=0.0002) and adulthood (β=0.135 SD, 95% CI 0.111-0.171, p=0.0002) was independently associated with better reaction time in midlife. Additionally, an independent association between high PA level in young adulthood (β=0.101, 95% CI 0.001-0.200, p=0.048) and adulthood (β=0.064 SD, 95% CI 0.018-0.110, p=0.006) and better visual processing and sustained attention in midlife was found among men. Associations for other cognitive domains were not found.

**CONCLUSIONS:** Cumulative exposure to PA from childhood to adulthood was found to be associated with better midlife reaction time both in men and women. Furthermore, cumulative PA exposure in young adulthood and adulthood was associated with better visual processing and sustained attention in men. These associations were independent of PA levels in other measured age frames. Therefore, physically active lifestyle should be adopted already in early childhood, and continued into midlife to ensure the plausible benefits of PA on midlife cognitive performance. Concluding, this study provides novel insight into cost-effective and well-timed promotion of cognitive health.

**Purpose:** The purpose of this study was to determine why cancer patients choose to participate and remain in an exercise rehabilitation program. **Methods:** 38 participants in a cancer rehabilitation program were asked to complete a questionnaire consisting of 60-64 items asking 1. Who referred them, 2. What did they follow through with the referral, 3. Why they have chosen to remain in the program, 4. What their initial thoughts of the program were, 5. What their current thoughts about the program are, and 6. Are they satisfied with the program. This study was approved by the Saint Francis University IRB. **Results:** 38% of clients were referred by either an oncologist or family doctor, 25% by hospital staff, 24% by friend or support group and 13% by media outlets. 9 of clients followed through for their health, and 15% for supervision of their exercise sessions. 5% of clients continued in the program because of the results they obtained and 2% because they had not yet met their goals, while 2% continued because of their cancer exercise trainer. 3% of clients had positive thoughts about the program, and 9 had the same or improved thoughts. Finally 9% of clients were satisfied with the program. **Conclusion:** The majority of clients were referred by their oncologist, or hospital staff indicating the power that physicians and hospital staff have in providing guidance for their clients. Further, once clients join a cancer rehabilitation program the benefits motivate them to continue in the program.
Impact of Nutrient Intake During Exercise on Hydration Markers Following Exercise and Rehydration

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Endurance athletes commonly strive for optimal hydration status during and after events, and have vast nutrient options available to support performance and well-being.

PURPOSE: We aimed to evaluate relationships among nutrients consumed during exercise and markers of hydration status. METHODS: Fifty-one cyclists (age mean±SD: 22.4±2.5 y) completed three experimental sessions: control (seated rest; CON), dehydration (EHS-DEH) induced by 2.5 h intermittent walking in the heat (45º C, 60% RH) among trials for the contingent negative variation (movement anticipation) or N2 (22.4±2.5 y) completed three experimental sessions: control (seated rest; CON), dehydration (EHS-DEH) induced by 2.5 h intermittent walking in the heat (45º C, 60% RH), and euvhydration (EHS; 2.5 h intermittent walking in the heat but matching sweat loss with water ingestion). Performance during a bimanual probabilistic choice reaction time task (PCRT; 30 min) consisting of randomly presented dominant (~ 67% ) vs. non-dominant (~33%) stimuli was examined concurrently with visual evoked potentials. Perceived PCRT mental workload (NASA-TLX, 21-point scale) was assessed following task completion. RESULTS: PCRT reaction time was not different (p = 0.08) across trials (CON: 385.2±39.2 ms; EHS: 389.2±38.8 ms; EHS-DEH: 382.6±38.0 ms). EHS-DEH was not different from each other (p = 0.60). No differences (p > 0.05) were observed among trials for the contingent negative variation (movement anticipation) or N2 (stimulus categorization). EHS-DEH elicited greater levels of perceived effort vs. CON (3.7±2.4; p = 0.03) and frustration vs. EHS (11.8±5.0; p = 0.004). CONCLUSIONS: Dehydration increased perceived effort, frustration, and perceptual processing demands, resulting in impaired accuracy for this cognitive-motor task requiring vigilance during prolonged fine motor movements. Prevention of dehydration during exercise-heat stress preserved cognitive-motor performance, brain activity, and mental workload similar to control conditions.

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Supported by Carl V. Gisolfi Memorial Fund ACSM Foundation Grant
Purpose: Motor-racing drivers compete in hot, humid environments demanding fluid management and adequate hydration. Our study’s aim was to assess the effect of a dehydration-induced reduction on performance and physiological outcomes during a simulated motor-race.

Methods: Fifteen healthy male drivers (age: 25.2 ± 5.4 y, body mass: 84.8 ± 10.7 kg, O2peak: 43.6 ± 2.8 mL·kg⁻¹·min⁻¹) participated in this controlled crossover study. Participants were randomized (counter-balanced) to a no fluid trial (1.90 ± 0.1% body mass loss [BML]) or a fluid trial (1.05 ± 0.5% body mass gain via room temperature water consumption every 10 min during sauna exposure). All participants completed 6 visits in Australian simulated motor-racing in a heated (WBGT: 33.7 ± 0.3°C) laboratory with no fluid provided to both trials which resulted in a 1.3 ± 0.4°C and 0.9 ± 0.2% BML for the fluid and no fluid trials, respectively. Lap time, physiological strain, core temperature, and satisfaction were measured throughout the task. Urine specific gravity (USG), osmolality (Uosm), and plasma volume (PV) samples were collected pre- and post-sauna and race.

Results: Mean lap time was not different between trials (fluid: 134.98 ± 2.40 s, no fluid: 134.71 ± 2.47 s, p = 0.293). The no fluid trial resulted in significantly higher heart rate (128 ± 18 vs. 121.1 ± 18 b·m⁻¹, p < 0.01), core temperature (38.0 ± 0.2 vs. 37.7 ± 0.3°C), and physiological strain (4.1 ± 1.1 vs. 3.5 ± 1.1) compared to the fluid trial. 

Discussion: Dehydration has no influence on simulated motor-race performance. This study examined the effect of dehydration-induced reduction on performance and physiological outcomes during a simulated motor-race. Further research is warranted on simulated race performance measured by mean lap time, despite significantly lesser cardiovascular and thermoregulatory demand. Dehydration may impact a driver’s health, safety and well-being of drivers.

Board 2060 #218 May 30 2:00 PM - 3:30 PM
Self-Reported Changes in Thirst and Alertness during Variable Prescribed Fluid Intake

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Purpose: To evaluate the relationship between self-reported thirst and alertness in people drinking variable amounts of prescribed water. METHODS: Subjects (n = 1155; 86% males, 32 ± 10 y; 24 ± 2 kg·m⁻²) visited the lab 3 times over 10 days: V1, a baseline visit that prior to participants were drinking ad libitum; V2, following 3 days of fluid restriction (1 L·d⁻¹, of which 28 mL was consumed in the morning prior to the visit), and V3, the morning following a prescribed increase in water intake. The increase in water intake at V3 varied by group assignment: a control group (CON) maintained 28 mL of morning water consumption, while LOW and HIGH intake groups (n = 457; each) consumed 496 ± 82 mL and 878 ± 125 mL, respectively. At each visit, which occurred after the morning water consumption period, participants indicated their thirst and alertness along a visual analog scale (VAS) from ‘very thirsty’ and alert to ‘very not thirsty’ and not alert. Two-way ANOVA for thirst and alertness between groups from V1 to V2 and V2 to V3 were completed. Repeated measures correlation procedure was completed for change in alertness and thirst from V1 to V2 and V2 to V3. RESULTS: Groups were similar at baseline (V1) for fluid intake, thirst and alertness (all p > 0.17). Fluid restriction (V2) resulted in a decrease in both fluid intake and alertness (p < 0.01), with no main effect of group. On average, thirst increased (35 ± 35 mm) and alertness decreased (-19 ± 31 mm) from V1 to V2. The prescribed increase in water intake (V3) revealed a significant interaction of time and group for both thirst and alertness (both p < 0.01). Independent-samples t-tests revealed that HIGH reduced thirst (-38 ± 37 mL) and increased alertness (31 ± 24 mL) more significantly than both LOW (thirst, -7 ± 37 mL; alertness, -1 ± 24 mL) and CON (thirst, -6 ± 23 mL; alertness, 0 ± 23 mL; all p < 0.01). There was no difference between LOW and CON (both p > 0.05). Pearson correlation analysis showed a positive relationship between change in alertness and thirst (R² = 0.29, p < 0.01). CONCLUSION: An inverse relationship was observed between self-reported alertness and thirst. Following fluid restriction, drinking a larger volume of water (>1000 mL) in the morning decreased thirst and increased alertness.

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fluid provided established different hydration levels as indicated by the different urine specific gravity (USG) levels post-exercise (LV: 1.018 ± 0.002 vs. HV: 1.002 ± 0.001; p<0.001), with pre-exercise USG were similar between conditions (LV: 1.018 ± 0.002 vs. HV: 1.015 ± 0.001; p=0.09). The percentage of fluid lost was higher in LV (1.2 ± 0.2 %) compared to HV (0.4 ± 0.1 %) (p=0.02), however, mean evaluation in the 3 apparatuses was not different between conditions (LV: 8.72 ± 0.21 vs. HV: 8.6 ± 0.20; p=0.57). CONCLUSIONS: By ingesting fluid equivalent to about 50% of the relative hydricity during a 3-hour interval of 12 years old maintain short-term hydration levels and avoid excessive dehydration (>2 %). Ingesting a higher amount of fluid equivalent to about 1.5 times the fluid lost does not provide an additional benefit in terms of performance evaluation.

**2063 Board #219 May 30 2:00 PM - 3:30 PM**

**The Effects of Mode of Rehydration on Subsequent Exercise-heat Challenge Performance**

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**No relevant relationships reported**

**PURPOSE:** Athletes and soldiers routinely exercise in the heat for extended periods of time without matching fluid intake to sweat rate, risking impaired physiologic function and performance decrements. Intravenous and oral rehydration are both used to overcome performance decrements associated with dehydration. The purpose of this study was to examine the efficacy of mode of rehydration using athletically relevant dehydration-exercise scenarios.

**METHODS:** Ten healthy, active men (age 23.3 ± 1.1 yr; height, 128.3 ± 2 cm; body mass, 78.4 ± 13.1 kg; body fat, 11.0 ± 1.0%); VO2max: 56.8 ± 3.1 ml kg⁻¹min⁻¹) completed four trials consisting of overnight dehydration, exercise dehydration, rehydration, observation and an exercise-heat challenge (EHC) in a hot environment (35.6 ± 0.2 °C, 35.0 ± 1.8% relative humidity) differing only in rehydration mode. Participants were rehydrated to -2% of baseline weight over 30 minutes with intravenous (IV), oral (ORAL), ½ IV + ½ ORAL (I+O), or ad libitum (RBL). Run time and number of boxes lifted per minute were recorded. Performance data was analyzed with a two-way repeated measures ANOVA.

**RESULTS:** Total number of boxes lifted was significantly lower in the ADL and ORAL trials (9 ± 6 vs. 11 ± 2, respectively) compared to I+O (23 ± 1, p<0.05). Boxes lifted during minutes 1 and 5 were significantly higher than minutes 2, 3, and 4 for all trials. Performance times for the 0.5 mile run were not different among trials.

**CONCLUSIONS:** Partial rehydration via IV and oral fluids appears to have an ergogenic effect on high-intensity, total-body exercise in the heat possibly due to a synergistic benefit to total-body performance with I+O rehydration.

**2064 Board #220 May 30 2:00 PM - 3:30 PM**

**Hydration And Gender Differences In Terms Of Non-oxidative Performance**

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**No relevant relationships reported**

Nonoxidative performance is vital to the performance of many high level athletes (Armstrong, Johnson, McKenzie, Ellis, & Williamson, 2015; Chamarri, Chatouchi, & Racins, 2015). Many athletes are voluntarily hypohydrated through training as they do not properly rehydrate after a training session (Cengiz, 2015). The decrease in performance that accompanies changes in hydration can negatively impact athletes (Cengiz, 2015). PURPOSE: The present study examined the effect of hydration status on nonoxidative performance and to examine differences between the genders in terms of nonoxidative performance. METHODS: Twelve subjects, 6 males and 6 females, completed three sessions where a Wingate test was performed while hydrated and lactate was measured. All subjects were NCAA Division III club or varsity athletics. The subjects completed a familiarization trial, a trial in the hypohydrated state and a trial in the hydrated state. The hypohydrated trial was completed after a 12 hour water restriction in order to induce a 2-4% decrease in body weight. No weight was lost prior to the hydrated trial and urine specific gravity was below 1.010. RESULTS: No significant difference was found in terms of hydration and nonoxidative performance (p=0.08, n2 = 27). A significant difference was found in terms of gender and nonoxidative performance. Males had a higher nonoxidative capacity (9.1 W/kg±0.3 vs. 8 W/kg±0.3, p<0.01), nonoxidative power (13.5 W/kg±2.3 vs. 8.8 W/kg±1.2, p=0.02) and fatigue index compared to females (2.8 W/s vs. 3.3 W/s; 0.10 W/s±0.3 W/s; p=0.04). CONCLUSION: The results from this study indicate that hydration does not influence non-oxidative performance in NCAA Division III club or varsity athletics. Female athletes within this study had a decreased nonoxidative performance compared to the male athletes. These results contradict previous findings that indicated that relative measures of nonoxidative performance did not vary between the genders when represented in relative terms (Maud & Shultz, 1986; Van Praagh, Fellman, Bedu, Falgariette & Coudert, 1990). Future research can be performed to look at differences in fat mass between the genders and the impacting collegiate athletes in terms of non-oxidative performance.

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**Effects Of Caffeine Dose Timing On The Time-course Of Diuresis During Sodium-aided Hydration.**

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**No relevant relationships reported**

When used alone, both caffeine and sodium-aided hydration (SAH) can be ergogenic. Caffeine, when used with SAH, promotes diuresis, but hyperhydration can be achieved, albeit at lower levels than with SAH alone. In previous caffeine and SAH work, caffeine-induced diuresis occurred only within 15 min of consumption of a bolus of caffeine, NaCl, and H2O. This suggests that caffeine-induced diuresis may occur for only 15 min after its consumption, and that the diuretic effect of caffeine is dependent on hydration levels. Caffeine has been shown to be ergogenic when taken as little as 5 min before exercise, thus, determining the temporal aspects of caffeine-induced diuresis in conjunction with SAH may lead to better pre-exercise nutritional strategies. **PURPOSE:** To determine the effect of caffeine, consumed at different time-points, on diuresis over a 90 min SAH protocol. **METHODS:** Subjects were 17 men (23 ± 5 yr, 78.0 ± 8.4 kg, 181.5 ± 8.5 cm). Each performed 2.9 min in SAH trials beginning with a bladder void and measurement of urine specific gravity (USG) followed by ingestion of 1 mL L-1 H2O kg⁻¹bm⁻¹ with one of two treatments: 8.5 mg NaCl + 5 mg caffeine kg⁻¹bm⁻¹ taken at the start of the trial (NaCatb), or 0.3 g NaCl kg⁻¹bm⁻¹ taken at the start and 5 mg caffeine kg⁻¹bm⁻¹ taken at 5 min of the trial (NaCaf). After consuming the H2O, subjects performed a measured bladder void every 15 min for 90 min. USGs were compared using a paired t-test. Urine excretions (UE) for each bladder void and measurement of urine volumes of the total H2O consumed and compared with a two-way repeated measures ANOVA and Sidak post hoc analyses. **RESULTS:** USGs were 1.007 ± 0.004 NaCatb), and 1.009 ± 0.004 NaCaf (P = 0.30). UE for NaCatb, and NaCaf were respectively at the urine collection points 1.8 ± 0.3%, 7.6 ± 0.8% (15 min, P < 0.01), 1.5 ± 0.8%, 2% (30 min, P < 0.01), 1.8% ± 1.4%, 8% ± 0.8% (5 min in, P < 0.05), 1.8% ± 1.1%, 9 ± 0.3% (5 min out, P < 0.05), 10 ± 0.5%, 8 ± 0.6% (5 min in, P < 0.25), and 7 ± 0.5%, 6 ± 0.3% (5 min in, P < 0.05). **CONCLUSIONS:** Although consuming caffeine at the start of the trial resulted in significantly greater diuresis for the first 30 min of the trial, waiting to consume caffeine until 75 minutes after the consumption of the water and NaCl did not result in caffeine induced diuresis 15 min after consumption of the caffeine.

**2066 Board #222 May 30 2:00 PM - 3:30 PM**

**Racial Differences in 24 Hour Urinary Hydration Markers**


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**Reported Relationships: W.M. Adams: Consulting Fee; Clif Bar & Company, BSX Technologies, Samsung. Industry contracted research; Statin Technologies, LLC.**

Prior literature has investigated racial/ethnic differences in hydration status based on spot urine samples, however, no literature has examined these differences using 24-h urinary hydration measures. **PURPOSE:** To examine 24-h urinary hydration markers in college-aged non-Hispanic White (WH) and non-Hispanic Black (BL) men and women. **METHODS:** Thirteen men (BL, n=6 WH, n=7) and nineteen women (BL, n=16 WH, n=3) (mean±SD; age, 20±1; height, 176.2±12.2 cm; body mass, 73.3±12.2 kg; body fat, 20.8±4), combined from two separate research projects were included.
Participants provided a 24-h urine sample across 7 (n=13) or 3 (n=19) consecutive days (18±1 total) for assessment of urine volume (UVOL), urine osmolality (UOSM), urine specific gravity (USG), and urine color (UCOL). Differences in 24-h hydration status between sex and ethnicity were assessed using linear mixed effects models with associated Bonferroni post hoc analyses. Significance was set a priori at p<0.05.

RESULTS: UOSM was significantly lower in BL (0.85±0.04 L) compared to WH college students (2.0±0.3 L; p<0.001). Conversely measures of UOSM and USG were significantly greater in BL (716±263 mOsm/kg) and UCOL (1.1±0.1 respectively) compared to WH college students (18±1 mOsm/kg; 1.0±0.1 respectively). Differences in 24-h hydration were sex- and race-dependent, but throughout the study race and sex differences persisted, with non-Hispanic Black men and women being inadequately hydrated compared to their non-Hispanic White counterparts when assessed over consecutive days. Furthermore, women were significantly less hydrated than men, independent of racial background. Given the importance of hydration on acute and long-term health, identifying populations that are inadequately hydrated may allow for the development of targeted strategies to improve habitual fluid intake. Future research examining 24-h hydration status coupled with fluid intake behaviors across a broader sample of races or ethnicities is warranted to further understand the determinants that guide drinking behaviors.

CONCLUSION: Among 541 healthy children (age: 3-13 y, female: 45%; BMI: 17.7±4.0 kg/m²), 24-h urine volume assessed via centrifugation and subsequently analyzed for [Na⁺], [Cl⁻], and [K⁺] was statistically (but not practically) higher when minimal cleaning is conducted. Future research examining 24-h hydration status among children and young adults is warranted to further understand the implications of hydration status on health.

METHODS: Among 18 healthy children (age: 3-13 y, female: 60%; BMI: 12.4±2 kg/m²), equivalent test was performed by comparing UOSM from specific time windows (morning: 0600-1000 h, early afternoon: 1200-1600 h, late afternoon: 1600-1959 h, evening: 2000-2359 h, and first morning: 0600-0959 h) to 24-h urine sample. The equivalency was determined when the mean difference and the confident interval between the spot and 24-h urine sample fell below the bound of 6 m mol·kg⁻¹. The analysis was performed by using the first spot urine sample from each window. Other spot urine samples after the first spot urine within each time window were not used to avoid unequal weighting data.

RESULTS: Equivalence test showed that the late afternoon (1600-1900 h) spot urine sample UOSM value was equal to the 24-h UOSM value in children (p<0.05 mean difference: 62; 95% CI: 45-78). The overall diagnostic ability of urine osmolality assessed at late afternoon (1600-1900 h) to diagnose elevated urine osmolality (>80 m mol·kg⁻¹) on the 24-h sample was “good” (area under the curve: 0.80; sensitivity: 0.86; specificity: 90.5%; threshold: 814 m mol·kg⁻¹).

CONCLUSIONS: These data suggest that in free-living healthy children, 24-h urine concentration can be approximated from a late afternoon spot urine sample.
Assessing regional sweat electrolyte concentrations using standard patch techniques requires post-collection benchtop harvesting and analysis of sweat, which precludes real-time feedback to athletes. A technique enabling on-skin analysis is needed to advance the practicality of sweat testing. **PURPOSE:** To determine the accuracy and reliability of a novel epidermal microfluidic patch with built-in colorimetric assay (Epifluidic patch) to measure regional sweat [Cl−].

**METHODS:** Twenty-three subjects (13 M; 16 ± 1 year; 2.3 ± 1.1 kg·cm−2·min−1) cycled at 15 ± 1 W (ranging from 10 to 40 W) for 240 ± 40 min. A subset of subjects (n = 9) completed two identical trials 2–4 days apart to determine test-retest reliability. Immediately after removal of the Absorbent patch, an image was taken of the post-sweat Epifluidic patch on-skin with a digital single-lens reflex camera for analysis of [Cl−] via colorimetry. Sweat from the Absorbent patch was extracted via centrifugation and subsequently analyzed for [Cl−] by ion chromatography. Data are shown as mean ± SD.

**RESULTS:** There was no difference in sweat [Cl−] between Absorbent and Epifluidic patches (32.9 ± 16.8 vs. 34.5 ± 19.6 mmol/L, p = 0.21). Bland-Altman Limits of Agreement between methods was −0.09°C/±0.12°C. There was a significant correlation between patches (r = 0.96, p < 0.0001) and the coefficient of determination (r²) for predicting Absorbent from Epifluidic patch (C. B. used on Deming regression analysis, the slope and intercept of the regression line describing Absorbent vs. Epifluidic patch sweat [Cl−] were not different than 1 and 0, respectively. Sweat [Cl−] was not different between repeat trials for the Absorbent (1.4 ± 4.4 mmol/L, p = 0.36) or Epifluidic patch (0.4 ± 1.6 mmol/L, p = 0.51) and test-retest CVs were 12% and 4%, respectively.

**CONCLUSIONS:** The Epifluidic patch provides accurate and reliable data for forearm sweat [Cl−] estimation during exercise in controlled laboratory conditions. Future research is needed to evaluate the Epifluidic Colorimetric Patch for on-skin analysis of sweat [Cl−] at other regional sites as well as during live practices and games.

**PURPOSE:** Skin tattoos have been shown to reduce sweat rate and increase sodium concentration when sweating is artificially stimulated. This study investigated whether similar responses are observed with exercise-induced sweating.

**METHODS:** Two-hundred healthy individuals (25 ± 8 years; Mean(SD): 14 ± 4 kg) with a unilateral tattoo ≥11.4 cm at a site other than on the contralateral skin were recruited. Participants undertook 20 min of intermittent cycling (85% HRmax in a randomized manner) on a stationary ergometer in a controlled environment (24.6 ± 1.1°C, RH 37 ± 4%). Resultant sweat was collected into absorbent patches applied to two pairs of contralateral skin sites (pair 1: Tattoo vs. Non-Tattoo; pair 2: Control 1 vs. Control 2 [both non-tattooed]), for determination of sweat rate and sweat [Na+] concentration. Subjects underwent 2073 separate sweating rate observations made. Outdoor track testing was provided in the published reports. A prospective field study of n = 37 participants was performed with n = 3 separate sweating rate observations made. Outdoor track testing was completed through a range of environmental conditions (temperature range: 10–31.3°C). The performance of three sports-oriented sweat prediction equations (H2Q™, Putnam, and Barr & Costill) was compared to measured sweating rates.

**RESULTS:** Measured sweating rates from the literature ranged from 0.41 to 2.129 L/h; track sweating rates ranged from 0.29 ± 0.33 to 1.30 ± 0.59 L/h. Agreement between measured (x-axis) and predicted (y-axis) sweating rates were assessed using the concordance correlation coefficient (CCC ≥ 0.800). The relative error (RE; < 1.000) and accuracy (percent agreement; ≥ 70%) were also assessed. For retrospective data (n = 109), the CCC ranged from 0.37 ± 0.09 to 0.90 ± 0.19. For prospective data, the CCC ranged from 0.00 ± 0.10 to 0.90 ± 0.19. In all instances the three equations performed better on the more highly controlled prospective data set. One equation (H2Q™) performed best on all three agreement parameters and on the two data sets.

**CONCLUSIONS:** These results illustrate the difficulty of accurately predicting sweating rates in runners, but also the possibility of achieving good accuracy with the right equation.

**PURPOSE:** Continuous measurement of rectal temperature using a telemetric pill (TP) inserted as a suppository has been validated. However, the use of TP may remain limited because of its high cost and single use. We have determined in our laboratory that the CorTemp™ TP can be used repeatedly over time; in fact, it has a large battery autonomy, can be turned on and off at will and easily survives high-level disinfection. Reuse of the TP is possible using a technique involving inserting the TP inside a condom, attaching it to a dental floss and introducing the TP inside the rectum with an over-the-counter suppository applicator. **PURPOSE:** The aim of this study was to examine the validity and reliability of CorTemp™ TPs during repeated use in a water bath for a duration of 0 h.

**METHODS:** Three TPs already used for less than 8 h each in a previous human study were tested in a water bath during 20 trials ranging from 1 to 60 h at different conditions of temperature ranging from 37 to 40°C. Trials were conducted in a randomized manner and temperatures of the TPs were compared to those of a wired rectal probe (YSI 410, WRP). After each trial, TPs were placed in a 2.5% glutaraldehyde solution for 20 min to achieve high-level disinfection, as recommended when a probe is used with a condom. The WRP and each TP were calibrated before the start of the experiment. Acceptable agreement between sensors was taken as a bias ≤ 0.2°C (sum of both instrument measurement errors). **RESULTS:** Mean biases and random errors between TP 1, 2 and 3 and the WRP were of −0.09°C ± 0.12°C, −0.10°C ± 0.14°C and −0.12°C ± 0.15°C, respectively. Mean biases and random errors at 1 h, 10 h and 60 h were of −0.01°C ± 0.11°C, −0.06°C ± 0.10°C and −0.11°C ± 0.11°C for TP 1 vs. WRP, −0.09°C ± 0.13°C, −0.08°C ± 0.12°C and −0.13°C ± 0.16°C for TP 2 vs. WRP and −0.14°C ± 0.17°C, −0.10°C ± 0.13°C and −0.11°C ± 0.12°C for TP 3 vs. WRP.

**CONCLUSION:** Our results indicate that the CorTemp™ TP can be reused up to at least 60 h while still providing valid and reliable temperature readings. Furthermore, the CorTemp™ TP can undergo high-level disinfection repeatedly while maintaining full structural and functional integrity.
vasodilation is thought to originate from increased nitric oxide bioavailability, thus increasing blood flow into the limb. However, the different aspects of the downstream microvascular oxygen delivery (i.e. perfusive and diffusive) to the exercising muscle have yet to be described. PURPOSE: The purpose of this study was to determine the effect of seven days of passive heating on oxygen delivery during handgrip exercise. We tested the hypothesis that, 30 min of passive heating would result in a decrease in the oxygen delivery (total-[heme]) and an increase in the perfusive oxygen delivery (deoxy-[heme]) in the exercising muscle. METHODS: Three participants (2 women, 23.0 ± 1.0 yrs, 0.9: 13.5 kg; 17.1 ± 10.1 cm) participated in this study. Peak power was determined by an incremental two-hand handgrip exercise test. Subjects performed 10 minutes of dynamic handgrip exercise at 40% peak power pre and post 7 days of passive heating. Absolute concentrations of deoxy-[heme] and total-[heme] of the flexor digitorum superficialis muscle were measured continuously via frequency-domain multi-distance near-infrared spectroscopy (OxiplexTS, ISS). The passive heating protocol consisted of immersion up to the shoulder in a 40°C hot tub until rectal temperature reached 38.5°C. RESULTS: From baseline to the last 30 seconds of exercise there was no significant difference in the Δ deoxy-[heme] (perfusive oxygen delivery) for pre (52.3 ± 2.2 µM) and post passive heating (47.7 ± 14.3 µM; p=0.42). However, the Δ total-[heme] (diffusive oxygen delivery) was significantly lower following passive heating (p<0.001). Pre and post passive heating Δ total-[heme] was 75.1 ± 13.8 µM and 30.7 ± 13.3 µM, respectively. CONCLUSION: The significant decrease in Δtotal-[heme] after passive heating suggests that the diffusion of oxygen into the exercising muscle was reduced. This finding, along with no change in the perfusive oxygen delivery as represented by the Δ deoxy-[heme], suggests that the oxygen uptake of the exercising muscle was decreased.

EFFECT OF PASSIVE HEATING ON PERFUSIVE AND DIFFUSIVE MICROVASCULAR OXYGEN DELIVERY

Kaylin D. Didier, Lillie M. Huckaby, Andrew M. Alexander, Shane M. Hammer, Camryn N. Webster, Thomas J. Barstow, FACSM. Kansas State University, Manhattan, KS.

NO RELEVANT RELATIONSHIPS REPORTED

EFFECT OF HEAT AND HUMIDITY ON THE INFLAMMATORY RESPONSE DURING AEROBIC EXERCISE

Kylene Boka1, Brandon M. Gibson2, Jeremiah A. Vaughn3, Brittany N. Followay1, Elliot Arroyo1, Joseph A. Laudato4, Ellen L. Glickman, FACSM5, Adam R. Jain7. King’s College, Ripon, WI. (Sponsor: Ellen L. Glickman, FACSM)

NO RELEVANT RELATIONSHIPS REPORTED

EFFECT OF PASSIVE HEATING ON PERFUSIVE AND DIFFUSIVE MICROVASCULAR OXYGEN DELIVERY

Kaylin D. Didier, Lillie M. Huckaby, Andrew M. Alexander, Shane M. Hammer, Camryn N. Webster, Thomas J. Barstow, FACSM. Kansas State University, Manhattan, KS.

NO RELEVANT RELATIONSHIPS REPORTED

PREVIOUS STUDIES have demonstrated that passive heating has led to increases in endotheelial function and vasodilation of the brachial artery. The increase in
A wet bulb globe temperature (WBGT) policy with suggestions for practice modifications can potentially help decrease the number of exertional heat illnesses (EHIs) reported in high school football. It is unknown what impact such a policy would have on the number of outdoor football practices that would be cancelled or modified.

**Purpose:** To assess WBGT during a full season of football at various high schools in Florida to determine how a regional WBGT policy would have impacted football practices.

**Methods:** Environmental data was collected daily throughout the duration of the regular football season by athletic trainers stationed at 10 high schools in west central Florida. WBGT measures were recorded at approximately 8 M (R1) and again at 8 M (R2) to correspond with practice start and end times. These measures were then allocated into 5 previously defined, regional WBGT categories which corresponded to different activity modifications ranging from no modifications (WBGT < 28°C) to no outdoor practices (WBGT ≥ 33.4°C). An ANOVA was used to determine differences in WBGT between schools and across the various months during football season. **Results:** There were no statistical differences in the WBGT measures between the 10 schools at the R1 (P = 0.6) and R2 (P = 0.6) timepoints. Nearly 39% (n=19) of all WBGT measures at R1 (8 M) across the 10 schools were ≥ 28°C and would not have required any practice modifications. Only 7.5% (n=33) of the measures for this same R1 timepoint were ≥ 33.4°C which would have resulted in cancellation of practice. Fifty-seven percent (n=20) of R2 WBGT measures were ≥ 28°C while only 1.1% (n=4) were ≥ 33.4°C. Also, the maximum WBGT measurement in August (33.1 ± 0.7°C) was significantly higher than in October (28.6 ± 0.7°C; P=0.000) but similar to maximum WBGT in September (32.0 ± 0.9°C) and November (31.0 ± 1.9°C; P=0.05). Conclusion: Our findings revealed that if existing regional heat guidelines would have been applied in Florida during our study, the policy would have resulted in the cancellation of outdoor practices on only a few days. It is also clear that the risk of dangerously elevated WBGT was not limited to preseason practices in August. Finally, delaying practices to later in the afternoon would likely decrease the risk of EHI and minimize the number of practices affected by a heat policy.
Females utilize thermal behavior more than males during low intensity aerobic exercise. Core temperature is elevated during high vs. low intensity aerobic exercise because of greater heat production. Thus, thermal behavior is greater during high intensity exercise because of the heightened stimulus to behave. It is unknown if sex modulates thermal behavior during high intensity exercise.

**Purpose:** Test the hypothesis that thermal behavior differs between males and females during high intensity exercise and recovery.

**Methods:** 10 males (M) and 10 females (F) (23±3y) underwent 30 min of cycling exercise at a power output that elicited 5±5 W/kg (M) and 8±5 W/kg (F), followed by 120 min seated recovery in a 27±1°C, 21±2% relative humidity environment. Subjects were instructed to maintain a thermally comfortable neck temperature throughout using a custom-made neck device. Neck device temperature provided an index of thermal behavior. Mean skin (10 site) and core (intestinal) temperatures, mean skin wettedness (8 site), neck device temperature, skin blood flow (laser Doppler) and local sweat rate (ventilated capsule) were measured continually.

**Results:** There were no sex differences in heat production during exercise (F: 399±68, M: 283±87 W/m², P=0.39). During exercise, core and mean skin temperatures, skin wettedness, skin blood flow and local sweat rate increased, while neck device temperature decreased (all P<0.01). There were no sex differences in core (F: 37.7±0.2°C, M: 37.9±0.3°C, P=0.50), mean skin (F: 32.6±0.3°C, M: 32.6±0.3°C, P=0.99) or neck device (F: 12.1±0.6°C, M: 11.9±0.2°C, P=0.23) temperatures, mean skin wettedness (at 30 min: F: 0.8±0.06, M: 0.8±0.04, P=0.99), skin blood flow (F: 163±50, M: 163±50 μL·min⁻¹·mm⁻², P=0.99) and local sweat rate (F: 0.2±0.1, M: 0.8±0.2 μL·cm⁻²·min⁻¹, P=0.33) during exercise (data collected at 30 min). During exercise, core and mean skin temperatures, skin wettedness, skin blood flow and local sweat rate decreased, and neck device temperature increased back towards pre-exercise levels (all P<0.01). There were no differences in the dynamics of these changes between sexes (all P>0.2).

**Conclusions:** Thermal behavior during and following high intensity aerobic exercise does not differ between males and females. This study was funded by lululemon athletica inc.
2086 Board #242 May 30 2:00 PM - 3:30 PM Circulating Mcp-1 Associated With Prolonged Cycling In Hot Temperature
cody dulaney1, Elliott Arroyo1, Emily Tagesen1, Joseph Laudato1, Elizabeth Dulaney1, Jeremiah Vaughan1. 1Kent state university, Kent, OH. 2Ripon College, Ripon, WI. 3Bemidji State University, Bemidji, MN. (Sponsor: Ellen G. Glickman, FACSM)
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Purpose: The purpose of this investigation was to examine the recruitment of classical monocytes during prolonged aerobic exercise in high temperature and humidity conditions. Methods: Seven recreationally active men (23.4 ± 3.0 yrs; 180.9 ± 5.8 cm; 85.1 ± 11.3 kg; 3.7 ± 0.27 L·min⁻¹) completed five trials: a graded exercise test, and four cycling trials in 37°C/23% Relative Humidity (HT), 37°C/33%RH (HTMH), 24°C/38%RH (MTMH), and 24°C/51%RH (MTHH) in a counterbalanced fashion. During the exercise protocol, participants rested supine for 15m inutes before completing 6m of cycling at 6% VO₂max, a 15 m rest, and cycling until exhaustion at 0% VO₂max (TTE), before 0m inutes of recovery (REC). Blood samples were obtained prior to exercise (PRE), after 6m inutes of cycling (O), after the TTE (O) and following one hour of recovery (REC). Blood was assessed for plasma concentrations of Monocyte Chemotactic Protein 1 (MCP-1) via ELISA, and CCR2 expression on classical monocytes (CD14++CD16-) via flow cytometry. Briefly, CCR2 expression was determined as fold change over fluorescence minus one (FMO). Results: MCP-1 expression was higher in all conditions (P < 0.05). In addition, CCR2 expression on classical monocytes during prolonged aerobic exercise in high temperature and humidity conditions appears to increase circulating MCP-1 and decrease CCR2 expression on classical monocytes. No differences in CCR2 expression were observed between each condition. CONCLUSIONS: These preliminary data indicate that H A causes a profound post-exercise hypotensive response and favorable metabolic, lipid, and immune profile changes. Further examination of heat acclimation on vascular, metabolic, and immune responses will offer insight for benefits in other high heat populations with vascular, metabolic and immune dysfunction.

2087 Board #243 May 30 2:00 PM - 3:30 PM Heat Acclimation Causes Profound Post-Exercise Hypotension and Favorable Improvements In Lipid and Immune Profiles
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Purpose: We have previously reported that passive hyperthermic exposure causes an acute hypotensive response. The animal literature has shown that chronic heat stress causes alterations in metabolic and lipid metabolism. However, it is unknown if heat acclimation also causes chronic blood pressure and lipid responses in humans. This project tested the hypothesis that 10-day exercise-heat acclimation (HA) would cause greater post-exercise hypotensive responses and alter metabolic, lipid, and immune profiles compared to 10-day exercise under neutral conditions (CON).

METHODS: Twelve healthy sedentary subjects (M = 26.3 ± 3.9y; 189 ± 10.7 cm; 83.4 ± 11.3 kg) completed a 10-day (0m in/day exercise bout) clamp controlled (internal work-rate) hyperthermia HA (42°C, 28% RH) and control (CON: 23°C, 42% RH) protocols in a counterbalanced design separated by at least 2 months. Pre- and post-exercise HA/ CON blood pressure was taken post-exercise over 1 hour after day 1 and day 10 exercise. Metabolic, lipid and immune panel was measured pre-HA/CON.

RESULTS: Exercise under heat stress had greater post-exercise hypotension (systolic -6 mmHg, diastolic -6 mmHg; and mean arterial pressure, -9 mmHg) on day 1 and day 10 compared to exercise under neutral conditions (main effect for condition, P<0.004). Only from pre-to-post HA, total cholesterol (170/22 to 152/15; P<0.02) and triglycerides (130.8± 9 to 27; P<0.003) were reduced. A trend for changes in glycemic control (%A1c: 5.9± 0.1 to 5.4± 0.1; P<0.05) was observed. A significant drop in blood lipids was observed in M15 (3.2± 0.3 to 0.9± 0.3; P<0.001), lymphocytes (1.7± 0.5 to 2.9± 3.0; P<0.001), and eosinophils (2.4± 1.7 to 3.1± 1.1; P<0.001) were observed after HA. CONCLUSIONS: These preliminary data indicate that HA causes a profound post-exercise hypotensive response and favorable metabolic, lipid, and immune profile changes.

2088 Board #244 May 30 2:00 PM - 3:30 PM Quantifying the Environmental Thermal Conditions that Exist During Summer Track Meet in South Texas
Juan Gonzalez. The University of Texas Rio Grande Valley, Edinburg, TX. (Sponsor: Alexis Ortiz, FACSM)

No relevant relationships reported

Purpose: To quantify the environmental thermal conditions that track & field officials, volunteers and track & field athletes are exposed during June and July in south Texas. METHODS: Five summer track meets were selected from the Texas Amateur Athletic Federation (TAAF) competition season during June and July for analysis. Air temperature, heat stress index, web bulb globe temperature, relative humidity, thermal work limit, and ultraviolet index (UVI) were recorded at 5am., 10am., noon, 2pm., and 4pm. with a handheld wet bulb globe temperature (WBGT) Kestrel (AN Heat Stress Tracker (TM) pnet.net). RESULTS: The mean temperature reading, standard deviation, and standard error for the five track meets throughout the duration of the track meets were: 5am: 81±2.0°F (3.9); 10am: 86°F ±3.3°F (1.7); Noon: 98°F ±2.6°F (2.3); 2pm: 98°F ±6.3°F, and 4pm: 98°F ±6.3°F. The mean heat stress values were: 6.5±2.1 (1.3); 10am. 6.5±2.1 (1.3); 2pm: 6.5±3.5 (2.0); 4p.m. 6.5±3.5 (2.0). The mean relative humidity readings were: 57.5±4.0% (5.7); 57.5±4.0% (5.7); 2pm: 54.5±7.9 (4.9); and 4pm: 59.0±10.3 (4.9). The mean wet bulb globe temperature readings were: 57.5±4.0 (5.7); 57.5±4.0 (5.7); 2pm: 54.5±7.9 (4.9); and 4pm: 59.0±10.3 (4.9). The mean UVI index readings were: 8 a.m. 0.1±0.0 (0.0); 10:00 a.m. 9.5±9.5 (4.2); Noon. 106.2±9.3 (4.1); 2 p.m. 106.2±9.3 (4.1); 4 p.m.: 106.2±9.3 (4.1). CONCLUSIONS: These preliminary data indicate that H A causes a profound post-exercise hypotensive response and favorable metabolic, lipid, and immune profile changes. Further examination of heat acclimation on vascular, metabolic, and immune responses will offer insight for benefits in other high heat populations with vascular, metabolic and immune dysfunction.

2089 Board #245 May 30 2:00 PM - 3:30 PM Metabolic Recovery Response During Seated Rest In Hot Environment
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Purpose: The purpose of this study was to examine the metabolic recovery response during seated rest in a hot and moderate environmental condition after a prolonged cycling bout. Methods: Eleven recreationally active men (23.6 ± 2.6 yrs; 189 ± 10.7 cm; 83.4 ± 3.9 kg; 3.7 ± 0.27 L·min⁻¹) completed a recovery session under two conditions: 22°C/45%RH (MT) and 35°C/45%RH (HT). Prior to recovery session, each participant completed a 6- min cycling trial at 60% VO₂max and a time-to-exhaustion trial at 0% VO₂max. Data were collected during the 3min (M3), 15m in (M15) 30min (M30), and 60m in (M60) of the 60- min recovery. Metabolic variables were assessed: VO₂, RER, VE, and HR. Data were analyzed using within-subjects repeated measures ANOVA. Results: A significant interaction was observed for VO₂ (F = 2.8 p = 0.043, η² = 0.258). Post-hoc analysis indicated a main effect of time during MT (F = 8.99 p = 0.001, η² = 0.383) but not HT condition (F = 2.433, p = 0.148). A significant main effect of time was observed (F = 11.81 p = 0.001, η² = 0.503) , but not HT condition (F = 2.433, p = 0.148). A significant main effect of time was observed (F = 11.81 p = 0.001, η² = 0.503) , but not HT condition (F = 2.433, p = 0.148). A significant main effect of time was observed (F = 11.81 p = 0.001, η² = 0.503) , but not HT condition (F = 2.433, p = 0.148).
RESULTS: Using near-infrared spectroscopy (NIRS), heart rate (HR), thermal comfort scale saturation index (TSI) were monitored in the left and right prefrontal cortex (PFC). Differences were also between CON and PPE end-exercise Tc (CON = 38.57 ± 0.3°C; PPE = 39.01 ± 0.3°C), TCS (CON = 3.57 ± 0.6; PPE = 4.63 ± 0.3), and TS (CON = 7.57 ± 0.5; PPE = 8.67 ± 0.3). Lastly, there was a 0.04°C/min increase in Tc during PPE and a 0.02°C/min increase in Tc during CON. Important NIRS results were a plateau in left-side O₂Hb and HHb at Tc 38°C in both CON and PPE, 80% of TTT in CON, and 0% of TTT in PPE. Additionally, there was increased left-side PFC activation during PPE as indicated by a significant decrease (p = 0.05) in TSI % from start to end of exercise (Start = 99% ± 6% vs. End = 63% ± 5%) and double the decrease in TSI % in PPE when compared to CON. CONCLUSION: These data suggest that rapid and uncapacitatable Tc acq sition causes an altered cerebral oxygenation and haemodynamic response in the left-side PFC. There were no changes in the cerebral oxygenation and haemodynamic response during CON. The left-side response during PPE could have implications for cognitive processes during and/or following exercise in the heat.

Body water loss due to thermoregulation during exercise in a hot environment may cause a significant decrease in body mass, affecting blood plasma volume and consequent physiological parameters such as blood glucose (BG) concentration. It is not known if the increased rate of thermal acquisition that occurs as a result of exercise in a microclimate such as personal protective equipment impacts BG concentrations differently than a slower rate of thermal acquisition. PURPOSE: The purpose of this study was to determine if rapid heat acquisition impacts body mass, urine specific gravity (USG) and BG concentration differently than slow heat acquisition during exercise. METHODS: Fourteen healthy male subjects (mean age, 33.6 ± 12.1 years) performed an incremental exercise test to a termination criterion in a control condition (CON) and an experimental session (PPE). Body mass, USG and BG were measured before and after each trial. RESULTS: Rate of thermal acquisition was significantly different (p = 0.001) between CON (0.02±0.04 °C/min) and PPE (0.04±0.19 °C/min). Time to termination (TTT) was also significantly different between CON (77.3 ± 22.8 min) and PPE (50.3 ± 12.4 min) and subjects also showed a lower HR throughout CON (pre = 72 bpm; post = 141 ± 20.7 bpm) when compared to PPE (pre = 76 bpm; post = 179 ± 11.7 bpm). Both conditions resulted in an identical and significant loss of total body mass (1.0 ± 0.5 kg; p< 0.05) with a corresponding increase in USG (p<0.01). Despite body water loss, no significant change in blood glucose concentration occurred pre- to post-exercise in either condition (BG pre = 0.04 ± 0.004 mmol L⁻¹; BGpost = 0.34 ± 0.4 mg dL⁻¹). CONCLUSION: This data suggests that constant levels of blood glucose concentration are maintained regardless of rate of heat acquisition and despite body water loss that would affect plasma concentration.

Prefrontal Cortex Oxygenation and Haemodynamics during a Long Duration Incremental Exercise Protocol while wearing Personal Protective Equipment

Lynnette Stuart-Hill, Cory Coehoorn, Patrick Neary, Olave Krigolson

University of Victoria, Victoria, BC, Canada.

(no relevant relationships reported)

Heat stress has been shown to affect cerebral oxygenation and haemodynamics. There is limited research evaluating the effects of rapid and uncompensable core temperature (Tc) acq sition, as which occurs when one is wearing personal protective equipment (PPE), on cerebral oxygenation and haemodynamics. METHODS: Fourteen male subjects (33.6 ± 12.1 years) performed an incremental treadmill test to a termination point in a control condition (CON) and an experimental session (PPE). Changes in oxy-haemoglobin (O₂Hb), deoxy-haemoglobin (HHb), total haemoglobin (tHb), and tissue oxygen saturation index (TSI %) were monitored in the left and right prefrontal cortex (PFC) using near-infrared spectroscopy (NIRS). Heart rate (HR), thermal comfort scale (TCS) and thermal sensation (TS) were also recorded at each 0.5°C increase in Tc. RESULTS: Time to termination (TTT) was significantly different (p = 0.05) between CON (77.3 ± 22.8 min) and PPE (50.3 ± 12.4 min). Subjects also showed significantly lower (p ≤ 0.05) HR throughout CON (pre = 72 bpm; post = 141 ± 20.7 bpm) when compared to PPE (pre = 86.5 ± 9.3 bpm; post = 179 ± 11.7 bpm). Significant differences were also between CON and PPE end-exercise Tc (CON = 38.57 ± 0.3°C; PPE = 39.01 ± 0.3°C), TCS (CON = 3.57 ± 0.6; PPE = 4.63 ± 0.3), and TS (CON = 7.57 ± 0.5; PPE = 8.67 ± 0.3). Lastly, there was a 0.04°C/min increase in Tc during PPE and a 0.02°C/min increase in Tc during CON. Important NIRS results were a plateau in left-side O₂Hb and HHb at Tc 38°C in both CON and PPE, 80% of TTT in CON, and 0% of TTT in PPE. Additionally, there was increased left-side PFC activation during PPE as indicated by a significant decrease (p = 0.05) in TSI % from start to end of exercise (Start = 99% ± 6% vs. End = 63% ± 5%) and double the decrease in TSI % in PPE when compared to CON. CONCLUSION: These data suggest that rapid and uncapacitatable Tc acq sition causes an altered cerebral oxygenation and haemodynamic response in the left-side PFC. There were no changes in the cerebral oxygenation and haemodynamic response during CON. The left-side response during PPE could have implications for cognitive processes during and/or following exercise in the heat.

Effect of Dietary Nitrate Supplementation with Beet Root Juice on Thermoregulatory and Cardiovascular Responses to Extreme Heat in Aged Humans

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(no relevant relationships reported)

PURPOSE: To test the hypothesis that dietary nitrate supplementation with beet root juice attenuates cardiovascular and thermal strain in aged individuals during prolonged non-encapsulated environmental heat stress. METHODS: Study participants were eight healthy, normotensive, non-obese, aged individuals (6: 3 female; BMI: 24.6 ± 5.2 kg/ m²; five females). Before (PRE) and after (POST) 1 week of daily nitrate supplementation with concentrated beet root juice (10 mL twice daily), participants were exposed to 42.5°C and 35% relative humidity conditions for 2 h. Core and skin temperatures, arterial blood pressures, heart rate, cutaneous blood flow and vascular conductance, and forearm blood flow and vascular conductance were measured throughout the exposure. RESULTS: Following nitrate supplementation, mean arterial pressure decreased from 107 ± 8 mmHg (P = 0.02) in thermoneutral conditions. During a subsequent exposure, mean arterial pressure was significantly lower POST vs. PRE (treatment x time interaction: P < 0.01); however, this effect was limited to the first 30 min of the heat exposure. No effect of dietary nitrate supplementation was observed on core temperature, mean skin temperature, heart rate, cutaneous blood flow, cutaneous vascular conductance, forearm blood flow, and forearm vascular conductance throughout heat stress (P > 0.05). CONCLUSION: Our results indicate that dietary nitrate supplementation did not attenuate thermal strain, and only transiently reduces cardiovascular strain, during extreme heat stress.

Wireless Real-Time Transistor-Based Skin Temperature Data Acquisition System

Audrey Johnson, Nisha Charkoudian

Funded by USAMRMC; author views not official US Army or DOD policy.

Environmental physiology studies rely on the accurate measurement of skin and internal temperatures. Many traditional skin temperature systems utilize thermistor or thermocouple measurements. However, utilizing a transistor-based sensor allows for a more linear data set, which could provide more stability, thus allowing for a more robust and accurate measurement over a range of environmental conditions. Field Programmable Gate Arrays (FPGA) are relatively low cost and low power consuming programmable hardware devices that allows for a signal to be processed and viewed in real time. Combining the processing power of the FPGA and the heightened accuracy of transistor-based analog temperature sensors, a modernized data acquisition (DAQ) system could provide linearized real time data.

METHODS: We designed and built a prototype wireless transistor-based skin temperature system that will provide a more accurate and linear set of data for measurement in hot/humid/cold/altitude environments, and will be sufficiently robust for outdoor field studies.

CONCLUSION: Our data suggest that our new FPGA approach is superior to traditional skin temperature measurements in its ability to rapidly attain and maintain accurate temperature readings. Next steps include field testing the device over a wide range of temperature, wind and humidity conditions.

Funded by USAMRMC; author views not official US Army or DOD policy.
Effects On Skin Temperature of Marathon Running in a Hot Humid Environment

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(No relevant relationships reported)

Participating in marathons in hot and humid weather may lead to fatigue, syncope, injuries or even death. In the diagnosis and monitoring of delayed onset muscle soreness and fatigue status, infrared thermography (IRT) has been used as a non-invasive method for assessing skin temperature as a response of muscle hyperthermia after exercise. Purpose: Analyze the effect of running a marathon in a hot and humid environment on skin temperature. Methods: Seventeen amateur runners (age: 35.82 ± 7.03 years, weight: 66.79 ± 11.97 kg) performed a marathon (32.5 km; 3:17:14). Skin temperature was measured using the FLIR T450 infrared camera. Infrared images were used to calculate skin temperature in different areas and mean temperature of each area was used for analysis. A one-way ANOVA was used to compare thermal images taken before and after exercise. Results: Mean skin temperature was 32.9 ± 0.4°C at the start (t0) and 33.5 ± 0.5°C at the finish (t30min) of the marathon, representing a 0.6°C increase due to the exertional heat load. Study group included 11 participants (7 men and 4 women), ages 30.7± 4.6 & 30.1± 4.3 years, and BMI 28.3± 4.3 and 28.2± 4.2 kg/m2 for PWS & controls respectively (NS).

D-66 Free Communication/Poster - Endocrinology

Thursday, May 30, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

Myokine Responses To Resistance Exercise In Prader-willie Syndrome


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(No relevant relationships reported)

Background: Caloric restriction and daily exercise are needed to prevent morbidity and mortality in individuals with Prader-Willi Syndrome (PWS). Resting and activity energy expenditure are lower in PWS than in BMI-matched controls. Hypoactivity, decreased muscle mass, and cognitive impairment make exercise particularly challenging for this population. Myokine responses to RT may have beneficial metabolic effects and promote caloric expenditure.

Purpose: Determine if young PWS adults can perform a RT program and evaluate their myokine response compared to age & BMI-matched controls. Methods: Each study group included 11 participants (7 men and 4 women), ages 30.7± 4.6 & 30.1± 4.3 years, and BMI 28.3± 4.3 and 28.2± 4.2 kg/m2 for PWS & controls respectively (NS). Blood samples for glucose, creatinine kinase (CK), lactate, HBA1C, and myokinones were obtained before and after performing a program of eight resistance exercises of large muscle groups (3–4 sets of 12 repetitions). Additional blood samples were drawn 30 & 60 min after completing the RT. Myokinones were assayed using a multiplex myokine panel (Merck). Paired t-test was used for comparing peak laboratory values for RT vs controls. The unpaired t-test was used for comparing peak laboratory values with basal levels.

Results: Basal levels of glucose, HBA1C, and lactate were similar for PWS & controls but CK was lower in PWS vs controls (p<0.04). Peak lactate was 3.7 ± 2.2 in PWS vs 2.5 ± 2.2 in controls (p<0.001). Interleukin-6 IL-6 increased by 4± 3 pe percent over baseline in PWS (p<0.03) by 33 percent in controls (p=0.007). Following exercise, peak brain-derived neurotrophic factor (BDNF) levels were 4 ± 3 percent over baseline in control males (p<0.008) but did not increase in PWS males or in females. Positive responses of BDNF and IRS were associated with greater exertion compared to non-responders. Conclusions: PWS young adults are capable of performing strength-building exercise. IL-6 responses to exercise were similar in both PWS and controls, but BDNF increased only in control males. Further studies of myokine levels in PWS may contribute to understanding unique metabolic responses in this population.

2096 Endocrine Responses After Aerobic Exercise Under Inhibition/ Stimulation Of Hpa Axis In Healthy Adult Males.

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(No relevant relationships reported)

Exercise affects the homeostatic mechanisms of the human body, depending on the type, duration, intensity and frequency of exercise. The endocrine responses to acute and excessive exercise are comparable to those related to “stress”. PURPOSE: Analysis of the hormonal responses under inhibition/stimulation conditions of the hypothalamic-pituitary-adrenal (HPA) axis after a selected aerobic protocol was performed in healthy male volunteers. METHODS: Eight healthy male volunteers (age: 29.3 ± 1.6yrs, body mass: 83.8 ± 9.3kg, he i ght: 1.77 ± 0.06m) performed a single bout of 30 min aerobic exercise at 70% VO2max on a treadmill, on three different conditions [control, HPA axis inhibition (induced by exogenous glucocorticoid administration), HPA axis stimulation (induced by exogenous ACTH administration)], following standard diet. Blood samples were collected before (t0), at the end of the exercise bout (t30), and 30 min later (t60). Serum cortisol (COR), adrenocorticotropic hormone (ACTH) and growth hormone (GH) were measured. Two-way ANOVAs were used for statistics. Data are presented as means ± SE. RESULTS: Cort levels significantly decreased 30 min after exercise (p=0.005) (32.9± 6.2; 18.1±3.2 μg/dl at t0, t30 and t60, respectively). ACTH significantly decreased 30 min after exercise (p<0.01) (25.9 ± 2.9; 2.0 ± 2.1 μg/l at t0; t30 and t60, respectively). GH significantly increased after exercise (p<0.05) (0.010; 1.4; 2.3; 1.1 μg/ml at t0, t30 and t60, respectively). Under HPA axis stimulation conditions, COR significantly increased immediately after exercise (p<0.001) and remained increased 30 min after exercise (p<0.001) (17.1± 6.3; 9.6±2.4 μg/dl at t0, t30 and t60, respectively). GH significantly increased immediately after exercise (p<0.001) and decreased 30 min after exercise (0.1± 0.1 μg/ml at t0, t30 and t60, respectively). This decrease between the end of exercise (t30) and 30 min after exercise (t60) was significant (p<0.01). CONCLUSION: This exercise regimen does not appear to trigger significant effects on the stress axis other than an HPA-independent increase of GH. Prescription of specific training programs should be characterised by stress-induced parameters before recommended for healthy and diseased population groups.

2097 Modeling Growth Hormone Dynamics through Indices of Cardiac Control at Rest and Exercise

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(No relevant relationships reported)

Growth hormone (GH) is released in a pulsatile manner from the anterior pituitary and these secretory dynamics provide important context to the functioning of the hypothalamic-pituitary (HP) axis. Similarly, heart rate variability (HRV) provides insights into the autonomic nervous system. Exercise and stress have been shown to increase GH secretion, however, the exact dynamics and inter-relationships remain unclear. This study aimed to investigate the GH response to exercise and its relationship with HRV and cardiac control indices. METHODS: Seven healthy males (28.2 ± 5.4 yrs; 1.79 ± 0.08m) completed 24h heart rate variability profiles separated by a minimum of 8-weeks. Participants were randomly assigned to an exercise (30s30s) sprints; 3-min of rec) and resting condition [Exercise: 7:2s: 10:4s: 3:3 μg/BF, VO2max: 7.2s: 11.2 μg/kg/min; Rest: 12.1 kg: 0.7 μg/BF, VO2max: 90 μg/kg/min]. Serum was collected via intravenous catheter every 10-min and RR-intervals were collected continuously. The 24h RR-interval was split into 3-min epochs taken every 10-minute throughout the 24h period; providing an index of acute cardiac regulation throughout the 24h period. The sample entropy of each of these epochs was used to create an additional time-series (SampleEn) that was used to predict changes in GH output. A long-short-term-memory (LSTM) network was trained on the SampleEn data and predictions were made about the expected changes in GH output.

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Modeling Growth Hormone Dynamics through Indices of Cardiac Control at Rest and Exercise

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Growth hormone (GH) is released in a pulsatile manner from the anterior pituitary and these secretory dynamics provide important context to the functioning of the hypothalamic-pituitary (HP) axis. Similarly, heart rate variability (HRV) provides important insight to cardiac control. These two systems are often investigated separately, however, evidence suggests that they share a common attractor. The PURPOSE was to examine how changes in cardiac-dynamics during daytime hours during rest and exercise could be used to predict GH output through machine-learning algorithms. METHODS: Seven healthy males (28.2 ± 5.4 yrs; 1.79 ± 0.08m) completed 24h heart rate variability profiles separated by a minimum of 8-weeks. Participants were randomly assigned to an exercise (30s30s) sprints; 3-min of rec) and resting condition [Exercise: 7:2s: 10:4s: 3:3 μg/BF, VO2max: 7.2s: 11.2 μg/kg/min; Rest: 12.1 kg: 0.7 μg/BF, VO2max: 90 μg/kg/min]. Serum was collected via intravenous catheter every 10-min and RR-intervals were collected continuously. The 24h RR-interval was split into 3-min epochs taken every 10-minute throughout the 24h period; providing an index of acute cardiac regulation throughout the 24h period. The sample entropy of each of these epochs was used to create an additional time-series (SampleEn) that was used to predict changes in GH output. A long-short-term-memory (LSTM) network was trained on the SampleEn data and predictions were made about the expected changes in GH output.
Evidence tying ultraviolet (UV) light exposure to endogenous vitamin D synthesis presents a possibility for naturally enhancing serum testosterone via endogenous vitamin D. PURPOSE: 1) Determine the effect of an acute bout of UV light exposure on post-resistance exercise serum testosterone in older men and 2) to investigate whether serum testosterone was influenced by endogenous vitamin D. METHODS: Six older adult men (age 62± 1.79 yr s., height 179.92± 1.12 cm., body mass 83 .79± 3.12 kg., BMI  25.95± 1.15 kg/ m2) participated in two identical resistance exercise sessions with acute UV light exposure followed by a 30-minute recovery. Sessions were approximately one week apart and the exercise protocol consisted of 6 sets of 10 repetitions of leg press, chest press, and back row with one minute of rest between sets. After the second exercise session, participants were exposed to an UV light source during the first 10 minutes of recovery. Serum testosterone and vitamin D were measured pre- and post-resistance exercise in 9 minute increments during the 30-minute recovery. RESULTS: Exercise alone did not significantly affect serum testosterone or vitamin D. Exercise combined with acute UV light exposure significantly increased serum testosterone area under the curve (p<0.05) but did not significantly alter serum vitamin D. CONCLUSION: These findings suggest that acute UV light exposure may positively impact serum testosterone response following a single bout of resistance exercise in older adult men.

Hypothyroidism: The control switch: for the onset of puberty. Obesity induced by high-fat diet and/or physical inactivity is a leading cause of precocious puberty. PURPOSE: To observe the effect of high-fat diet on the hypothalamic expression of Kiss-1, the G-protein coupled receptor (GPR54) and GnRH mRNA and explore the modulatory role of moderate-intensity exercise in the high-fat-diet feeding male rats, which are in growth period. METHODS: Male weanling rats (21±d) were fed high-fat-diet were randomly assigned to chow diet sedentary (CS, n=24) , chow diet exercise (CE, n=24) and high-fat diet sedentary (HS, n=24) , high-fat diet exercise (HE, n=24) groups. SE and FE groups did the 60%-0% V(•)O2max treadmill training (3ha/week, 1 hour/day). The V(•)O2max of exercise groups were remeasured every two weeks. At of each group was killed on the 33±d day, 4±d day, which had the trend of increase. Both in CE and HE groups, the mRNA of Kiss-1 and GPR54 got to the maxium level on the 33±d day, which opposited with the lowest level of GnRH mRNA. CONCLUSIONS: The changed trend of kisspeptin/GPR54/ GnRH signaling pathway during the growth period were obvious increase in high-fat diet rats. Exercise could change the trend of kisspeptin/GPR54/ GnRH signaling pathway induced by high-fat diet especially after puberty.

Salivary cortisol (C.) represents the free cortisol concentration of serum cortisol (C.). It has been suggested that C. is approximately 5% of total C., however, the inter-individual variation in C. and how this pattern affects the proportion of C. and C. (C. related to C.) at each time point. Multilevel growth models with varying fixed/random coefficients were tested and compared (AIC). The final cubic growth model controlled for condition and freely estimated the intercept, velocity, and acceleration terms while the initial trajectory of C. was fixed across all individuals. RESULTS: The IQR of C. was 1.6% 0%. The greatest C. values were consistently observed during nighttime sampling with the magnitude of C. being greatest at 2300hr. The cubic growth models were determined to best-represent 24-hr changes in C.. The model showed a significant effect for exercise (β = −1.37, p = 0.036; AIC = 1030.781). CONCLUSION: The greatest C. at 2300hr appears to be driven primarily by elevations in C.. This shift may be influenced by night time cortisolsecretion interactions with binding proteins, alterations in salivary flow rate, or salivary gland enzymatic activity. Exercise appears to influence C. dynamics, especially during late afternoon and nighttime hours. It is therefore recommended that cortisol profiles be constructed from both total and free C. for the most accurate monitoring of the HPA-axis, especially within an exercise context.
Low muscle strength and decline in the power are associated with low walking speed and with mobility limitations, disabilities and falls among older populations. Whether menopause per se accelerates decline in physical performance in women and in this way contributes to functional limitations in later years remains controversial. The aim of this study was to examine changes in physical performance in women aged 40–55 following the menopausal transition. METHODS: This longitudinal study is a part of the Estrogenic Regulation of Muscle Apoptosis study. Women aged 40–55 were randomly selected from the Finnish National Registry (n=5) and perimenopausal women (n=23) were followed until postmenopausal. The baseline menopausal status was defined based on menstrual cycle diary and follicle stimulating hormone (FSH) level. The progression of menopausal transition was followed at three-to-six months’ intervals for early perimenopausal and late perimenopausal women, respectively. When FSH >30 IU/l was recorded, the measurement was repeated within two-to-four weeks and if FSH was determined in two consecutive blood samples to be elevated and no bleeding had occurred in past 6 months participant was considered to be postmenopausal. To capture a comprehensive understanding of the physical performance, measures of muscle power (vertical jump), muscle strength (grip and knee extension), aerobic capacity (6min walking distance), walking speed were carried out. RESULTS: A significant decline in hand grip force (-2.9%, CI -1.1; -d.20) in knee extension force for -3.1% (CI -1.3; d.23) and in vertical jumping height for -3.2% in females (CI 1.4–1.7; d.0.2) was observed following the menopausal transition. Walking distance significantly increased in 1.2% (CI 1.2, 2.7; d.0.38) while in walking speed changes were not significant (0.2% (CI C1.6; d.0.02) non-significant). CONCLUSIONS: The menopausal transition influences muscle strength and power, whereas the influence on mobility/walking was less evident and may follow after. Supported by the funding from the European Union’s Horizon 2020 research and innovation Programme under the Marie Skłodowska-Curie grant agreement No603, and by the Academy of Finland (ERMA study grant agreement 2141).

Vitamin D deficiency, defined as total hydroxyvitamin D (25(OH)D) <50 nmol/L, is associated with poor bone health, impaired muscle function and increased risk of some diseases. The biologically active form of vitamin D is dihydroxyvitamin D (1,25(OH)D) to the catabolic metabolite (24,25(OH)2D) determines biological activity. In women, higher 25(OH)D concentrations have been reported in oral contraceptive users (n=50) vs non-users (n=50) (p<0.01). There were no differences in the VMR (25(OH)D/24,25(OH)2D) and aCa were higher, in POP than in no-POP users (p=0.05). CONCLUSION: Oral contraceptive pill users have higher 25(OH)D, possibly from the stimulation of vitamin D binding protein and increased bioavailability of 25(OH)D, but the balance between the active and catabolic vitamin D metabolites is not dependent on POP use.
and sex-specific standard deviation scores (SDS) using the CDC growth charts. In athletes with >1 examination, generalized estimating equa-
tions were used for repeated measures analyses. RESULTS: Data on 2,328 athletes were available, of which 8 ha d >1 height measurement and formed the study population (9.8 males, mean age 11.5 ± 2.4 years, range 6-18, from 46 sport types). The median duration between the first and last examinations was 1.4 years (IQR 0.9-2.9 years) with a maximum of 9.3 years. Height SDS was not significantly changed throughout the follow-up period in the total cohort (0.13 per year, p = 0.5; 0.03, p = 0.1; see Figure). In subgroup analyses, no significant change in height SDS was seen among athletes aggregated from classic height-advantageous sports (basketball, volleyball, tennis and swimming, p = 0.3), basketball players (p = 0.84) or gymnasts (p = 0.24). No significant change in height SDS over time was seen when participants were stratified by first measurement age (<9, 9-12, 12+ years) and sex.

CONCLUSIONS: In this large cohort of pediatric athletes with repeated physical examinations, competitive sports were not associated with significant changes in body height relative to age. This finding remained true regardless of age at first measurement and sex, as well as when focusing on sports with typically tall or short statures. Competitive sports do not seem to hinder growth in children.
Association Between Mitochondrial DNA Sequence, Heteroplasmy, And Indels With Response To Aerobic Exercise Training

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Purpose:

Aerobic exercise training provides numerous biological and physiological health benefits towards the prevention and treatment of various chronic diseases. However, not all individuals increase cardiorespiratory fitness (CRF) with exposure to a given dose of aerobic training: some individuals are highly trainable and increase CRF, while others respond poorly. Genetic background is known to contribute to interindividual variation in adaptations to aerobic training. Our current understanding of genetics and exercise is limited primarily to the nuclear genome as only a few laboratories have investigated the role of the mitochondrial genome. The purpose of this study was to determine whether mitochondrial DNA (mtDNA) sequence, heteroplasmy, and indels differed among individuals previously characterized as elite endurance athletes, and high- or low-responders to aerobic training.

Methods:

DNA was isolated from whole blood in healthy subjects part of the GENATHLETE (world class endurance athletes, n=15) and HERITAGE (CFR response levels: high responders: n=15, low responders: n=15) study cohorts. mtDNA was amplified by long-range polymerase chain reaction, then tagged with Nextera libraries and sequenced on a MiSeq instrument. Unique mtDNA sequence variants were called when at least two individuals in a group had the variant.

Results:

Compared to athletes and high-responders, low-responders had unique mtDNA single nucleotide polymorphisms (SNPs) in D-loop (dispacement-loop) hypervariable region (HVRI) 2 at positions 2, 12, 181, 182, 236, 295, 462, and 489. mtDNA sequence variants included: a nA, nM, nD, nT positions. mtDNA Heteroplasmy was not different between groups.

Conclusions:

Our results highlight an area of the mitochondrial genome responsible for DNA replication and transcription that may contribute to an individual’s ability to improve CRF with aerobic training. Ongoing work aims to 1) confirm present findings in low responders through increasing sample size from the HERITAGE cohort, and 2) test for interactions between mitochondrial and nuclear genomes associated with response to a given dose of aerobic training.

Circulating DNA As A Monitoring Tool In Professional Soccer

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No relevant relationships reported

Purpose:

Player monitoring in elite sports settings is becoming increasingly important. Questionnaires or biomarkers, such as circulating, cell-free DNA (cfDNA) are used to monitor overtraining in weightlifters. Thus, the purpose of this study was to examine whether mitochondrial DNA (mtDNA) sequencing is feasible as a monitoring tool in elite soccer players.

Methods:

mtDNA was isolated from whole blood in healthy subjects part of the GENATHLETE (world class endurance athletes, n=15) and HERITAGE (CFR response levels: high responders: n=15, low responders: n=15) study cohorts. mtDNA was amplified by long-range polymerase chain reaction, then tagged with Nextera libraries and sequenced on a MiSeq instrument. Unique mtDNA sequence variants were called when at least two individuals in a group had the variant.

Results:

mtDNA sequencing was feasible as a monitoring tool in elite soccer players. However, cfDNA concentrations and VAS scores did not significantly correlate with higher values during weeks that included an additional midweek game (1.3-fold, p=0.02). Moreover, cfDNA was associated with increased proportion of fast-twitch MF were over-represented in strength athletes (vs endurance athletes). Only r80S SNPs were associated with increased proportion of fast-twitch MF were over-represented in sprinters compared to endurance athletes). Of those, sprint-related alleles of SNPs (rs801, rs1233, rs206, rs235) were also over-represented in sprint athletes (vs endurance athletes). Only rs80s SNP located in the DDB2 gene (encodes cytoskeletal protein) was found to be associated with the relative peak power in wrestlers. Endurance-orientated athletes have a high proportion of slow-twitch muscle fibers (MF), whereas muscles of sprinters and strength athletes predominantly consist of fast-twitch MF. The heritability of the MF composition was estimated at 45%.

Conclusions:

To perform a genome-wide association study for MF composition and to validate the results in additional studies using sport-related phenotypes. Methods: MF composition of M. vastus lateralis in 14 female elite healthy Russian subjects (15 males) was evaluated with immunohistochemistry. The case-control study involved 24 elite Russian athletes. Results: 37a rants were associated with sprinter athlete status (alleles associated with increased proportion of fast-twitch MF were over-represented in sprinters compared to endurance athletes). Of those, sprint-related alleles of SNPs (rs801, rs1233, rs206, rs235) were also over-represented in sprint athletes (vs endurance athletes). Only rs235 SNP was associated with increased proportion of fast-twitch MF (P=0.004), ability to become a sprinter (P=0.021) or a strength athlete (P=0.016) and increased peak power of wrestlers (P=0.017). The study was supported by grant from the Russian Science Foundation (Grant 17-15-0130).

Hypothalamic-pituitary-adrenal (HPA) hormone profiles are informative mediators of health status. Existing studies link candidate genetic variants in the corticosteroid and serotonin systems to basal cortisol function in diverse populations. Potential connections of such variants to the HPA end-product, dehydroepiandrosterone (DHEA), is essentially unexamined and virtually nothing is known of their effects in military populations. Purpose: To determine whether candidate genetic variants in the mineralocorticoid receptor (MR [i.e., -2 C/G]), glucocorticoid receptor (GR [i.e., BclI]), and serotonin transporter (i.e., 5HTTLPR, triallelic version) modulate daily HPA function (cortisol and DHEA) of specialized military men. Methods: Seventy-three elite military men were studied (mean ± SE age = 33.2±0.7yr s). Salivary cortisol and DHEA were collected on 2 consecutive weekdays at wake, wake + 30 min, wake + 6 min in 100, a nd 2100. TaM ± nrF genotype assays were performed for BclI and -2C/G. Variable number tandem repeat analyses were conducted for 5HTTLPR, Unie and combined associations of the genetic variants were assessed with respect to daily patterns of salivary cortisol and DHEA. Results: Homozygous GG carriers of -2C/G had higher DHEA concentrations across the day in comparison to C carriers (F1,11 = 3.9, p = 0.05). Homozygous SS carriers of B BTLPI had higher DHEA concentrations at wake + 30 and 6 min in, followed by convergence with the L carrier profile in the afternoon and evening (interaction effect, F2,1132 = 1.5, p = 0.11).
Combined effects on DHEA patterns: −2CG + 5HTTLPR (interaction effect, F(3, 1266) = 3.7, p < .001), −2CG + Bcll (group effect, F(3, 3) = 4, p = .01), and 5HTTLPR + Bcll (interaction effect, F(2/13) = 3.7, p < .001). Salivary cortisol profiles were not modulated by candidate variants. CONCLUSION: Whereas MR’s affinity for cortisol and aldosterone is well researched, the link between −2CG and DHEA helps to resolve eqi: vocal literature regarding MR’s potential compatibility with DHEA. Also, the connection between HTTLPR and DHEA implies the signaling between serotomeric and HPA systems extrapolates beyond the primary end-product, cortisol. Finally, this study demonstrates that genetic modulation of salivary DHEA profiles is additive, if not synergistic.

In endurance athletes, chronic mechanical stress to tendon and ligament induces local inflammation, leading to tendon and ligament injuries. Type 1, 5 and 12 collagen is the major structural component of tendon and ligament and other component is type 3 and 6 collagen. Several studies were identified the relationship between tendon or ligament injuries and collagen gene polymorphisms such as, rs1800121 n COL1A1, rs1222 a nd nd rs3188 in COLA1, rs18025 n COLA1A1 and rs39 in COLA 1. However, effect of tendon and ligament inflammations on collagen-related gene polymorphisms remains unclear in Japanese endurance athletes. PURPOSE: This study aimed to clarify whether single nucleotide polymorphisms (SNPs) within the collagen genes were associated with the incidence of tendon and ligament inflammations in Japanese male endurance athletes.

METHODS: Twenty-four Japanese elite male long-distance runners participated in a cross-sectional study. All subjects were investigated the onset number of tendon and ligament inflammations in the student period of their respective age.

RESULTS: The observed genotype frequencies, in both Cases and Controls, met Hardy-Weinberg eqi: librium (X², P RESULTS: Genotype and allele frequencies were statistically different (P<0.01) between cases and controls. Odds ratio revealed that the C allele was 1.33 times more likely prevalent in the cases than in the controls (95% CI: 1.171; P<0.001). The magnitude of the statistical power for the present study was 0.8.

CONCLUSIONS: The findings strongly suggest that KCNq gene rs1238 ( C/T transition) is auxiliary in the complex phenotype of endurance running performance level in Hispanic male marathon runners.

To the best of our knowledge, the pertaining sources of information on the Potassium Voltage-Gated Channel Subfamily A Member 4 (KCNQ4) gene do not evidence a single study evaluating the possible association between its genotypic and allelic fre: eqi:ies with endurance performance. PURPOSE: We tested the hypothesis of an association between the prevalence of the genotypic and allelic fre: eqi:ies distribution of the KCNq gene rs1238 ( C/T transition) and endurance performance level in Hispanic male marathon runners (MR). METHODS: The present is an observational study following a genetic epidemiology model using a case-control design. The subjects (n = 32) were adult Hispanic male MR. Fast-MR (Cases; n = 9) were finishers in the top 3 percentile. Slow MR (Controls; n = 23) were finishers in the lowest 3 percentile of their respective age. Genomic DNA was purified from a whole blood sample. Polymerase chain reaction was used to amplify a KCNq NP which consists of a C/T (rs1238) transition. The observed genotype frequency, in both Cases and Controls, met Hardy-Weinberg eqi: librium (X², P RESULTS: Genotype and allele fre: eqi:ies were statistically different (P<0.01) between cases and controls. Odd ratio revealed that the C allele was 1.33 times more likely prevalent in the cases than in the controls (95% CI: 1.171; P<0.001). The magnitude of the statistical power for the present study was 0.8.

CONCLUSIONS: The findings strongly suggest that KCNq gene rs1238 ( C/T transition) is auxiliary in the complex phenotype of endurance running performance level in Hispanic male marathon runners.
in what sports they would allow their children to participate. Sports were subdivided into four categories (high-contact, partial-contact, non-contact, and all of the above) and analyzed using chi-square tests, followed by a logistic regression to investigate any differences between professional categories and rate of selection of high-contact sports. Results: Preliminary chi-square tests indicated no difference between medical (MP) and non-professionals (NMP) and the four sport subdivisions (χ²=3 p=0.23). Between-group nominal logistic regression was non-significant (p=0.20) in examining the choice of profession and selection of sports. More specifically, there was insignificance between professions and likelihood of choosing high-contact sports (p=0.09). Conclusion: Initial analyses suggest no difference in the choice of sport participation among children with parents in medical and non-medical backgrounds despite an increased attention on concussion in recent years. Future analyses will investigate the specific sports chosen, as well as additional covariates such as parental sport participation and concussion history.

2119 Board #275 May 30 3:30 PM - 5:00 PM Changes in Fixational Eye Movements following Concussion

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Concussions can affect smooth pursuit, saccadic, and vergence eye movements. Fixational eye movements (FEMs) - the small, involuntary motion of the eye that occurs while focusing on a target - are affected by Alzheimer’s, Parkinson’s, and mild cognitive impairment. However, little is known about changes in FEMs following concussions.

Purpose: To compare FEMs in concussed patients to controls using a retinal image-based eye tracking device.

Methods: Participants included 6 patients with a concussion and 38 age- and gender-matched controls aged 13-23 yrs. FEMs were measured with a tracking scanning laser ophthalmoscope (TSLO) that tracks retinal image motion at 11 Hz with an accuracy of ±0.2 arcmin. Eye traces were analyzed offline to compute microsaccadic amplitude, peak velocity, and peak acceleration. Fixational spread, using bivariate contour ellipse area (BCEA), inter-saccadic intervals, blink rate, and total blink time were also analyzed. Concussed patients completed the Vestibular Oculomotor Screening (VOMS), Post-conussion Symptom Scale (PCSS), and Immediate Post-conussion Assessment and Cognitive Test (ImPACT) for comparison with FEMs.

Results: Microsaccades were larger (amplitude – controls: 0.397° SD 0.32, concussion: 0.597° SD: 0.45; p<0.001) and faster (peak velocity: control: 27.9°/sec SD: 22.2; concussion: 39.7°/sec SD: 30.3; p<0.001; peak acceleration: control: 6.27°/sec² SD: 9.29; concussion: 9.47°/sec² SD: 14) in concussed participants. Although concussed patients and controls made eqa numbers of microsaccades during a 30 sec recording, concussion patients had a greater proportion of larger, faster microsaccades - with 9% more microsaccades at amplitudes greater than 0.75° and 22% more microsaccades ≥30°/sec. The BCEA was 22% larger in concussed patients (0.56°) compared to controls (0.26°).

Conclusions: These findings support changes in FEMs following concussion as measured using retinal image-based eye tracking. Microsaccades in concussed patients were larger in amplitude, peak velocity, and peak acceleration compared to controls. Specifically, fixation is less precise, with a larger spread (i.e., increased BCEA). Retinal imaging and eye-tracking of FEMs may be useful in identifying and monitoring recovery following concussion.

2120 Board #276 May 30 3:30 PM - 5:00 PM Examining Persistent Deficits in Gait Utilizing Inertial Measurement Units

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Purpose: The effects of concussion on gait have been studied using three-dimensional motion capture technology. However, the equipment expense may not be feasible for all clinicians and researchers. Inertial Measurement Units (IMU) are inexpensive, portable, and have been used to evaluate gait. The purpose of this study is to utilize IMUs to evaluate gait deficits in concussed patients (CON) (time >1 year since concussion incidence) compared to non-concussed patients (NC). Methods:

- 50 patients with a concussion and 39 age- and gender-matched controls.
- Participants completed the Vestibular Oculomotor Screening (VOMS), Post-conussion Symptom Scale (PCSS), and Immediate Post-conussion Assessment and Cognitive Test (ImPACT) for comparison with FEMs.
- Data were collected through an anonymous electronic Qualtrics survey administered to faculty and staff at a large midwest university and associated medical center between 2017 and 2018 (n=130; age: 13.82 ± 2 sd).
- Respondents indicated their gender, age, highest degree awarded, whether or not they were a medical professional, and
Fourteen participants (n=14) completed all three testing sessions. Conclusion: The 3D-MOT head-impact data demonstrated that collegiate men’s and women’s ice hockey players sustained fewer in-game head impacts (3D-MOT = 181 head impacts; C = 282 head impacts) and head impacts with a mean peak rotational velocity less than control head impacts (3D-MOT = 11.3 ± 8.01, Time 2: 14.64 ± 6.38, t32= 1.64, p= 0.11), or the X LN Tbrain total score (Time 1: 16.44 ± 8.01, Time 2: 14.77 ± 10.30, t32= -1.02, p=0.31). There was a moderate reliability score for the BESS total score (I CC 3,1=0.54, p<0.005) and a low reliability score for the X LN Tbrain Balance Test. **Purpose:** To determine the concordant validity and reliability of the X LN Tbrain Balance Test compared to the BESS. **Methods:** Thirty-seven physically active participants (15m ales, 22 females, 20.3 ± 2.02 yrs, 1.80 ± 10.2K m, 0.12 ± 1.43 kg) completed the BESS and X LN Tbrain Balance Test in a counterbalanced order. A subset of the sample (n=33) repeated the tests one week later. Concurrent validity was established through correlation analysis examining the relationship between scores on the BESS and X LN Tbrain Balance Test. Reliability was established using paired-samples t-tests and Intraclass Correlation Coefficients (ICC1,3) computed for the BESS and X LN Tbrain Balance Test. Results: A significant moderate relationship was found between the total scores of the Balance and X LN Tbrain Balance Test (r=0.43, p=0.008), and between the firm tandem stance condition of the BESS and the eyes closed tandem stance condition of the X LN Tbrain Balance Test (r=0.4, p=0.013). There were no statistically significant differences in scores between testing sessions for the BESS total score (Time 1: 16.44 ± 8.01, Time 2: 1.80 ± 10.2K m, 0.12 ± 1.43 kg), and between the firm tandem stance condition of the BESS and the eyes closed tandem stance condition of the X LN Tbrain Balance Test (r=0.4, p=0.013). There was a moderate reliability score for the BESS total score (ICC1,3=0.80, p<0.005) and a low reliability score for the X LN Tbrain Balance Test (ICC1,3=0.72, p<0.013). Conclusions: Although the X LN Tbrain Balance Test appears to demonstrate moderate concurrent validity against the BESS, it did not demonstrate improved reliability. Future research should determine if the X LN Tbrain Balance Test demonstrates validity against force plates. Additionally, the sensitivity of the BESS and X LN Tbrain Balance Test to the effects of concussion should be explored.

**BACKGROUND:** Eighteen years after Guskiewicz et al. (2000) began studying sport related concussion in college and high school football players, head and spine injuries remain a very serious concern for the sport. An upward trend in serious catastrophic brain and spinal cord injuries still exists (Meehan and Landry, 2018), despite greater awareness of signs and symptoms, improved injury evaluation, more accurate symptom assessment, cautious return to play decisions, better helmet technology, new tackling styles, updated coach education, and rule changes limiting contact in practice (Yang et al., 2017). A consistent, cost effective method to evaluate and screen unsafe tackling behaviors has yet to be established. The Standard Assessment of Tackling Technique (SATT) is an observational tool designed to score movement proficiency on five critical elements of an American football tackle. Each element is rated on a four step, ordinal scale from zero - did not occur to three - performed with proficiency. **Purpose:** To determine the concurrent validity and reliability of the X LN Tbrain Balance Test while equipping participants with 10 IMU’s during the 2Walk. However, no significant differences were noted in turn velocity and duration in the 2Walk task. Conclusion: Preliminary findings show altered gait and turning strategies among those with a concussion history. These differences may be explained by concussion history. Alternatively, differences in activity levels and sporting experience may also contribute. Future analyses will reassess these changes in addition to other kinematic metrics as sample size increases.

**CONCLUSION:**: The results showed that the SATT can be independently scored by two raters, following a 45 minute training session and more experienced raters. Intrarater reliability was moderate to good for both raters (ICC = 0.57 - 0.79) and leg drive was the most reliable component (ICC = 0.95; 95% CI: 0.92-0.97) . Intrarater reliability was moderate for session 3 (ICC = 0.602; 95% CI: 0.076-0.867) . The individual SATT component confidence interval [CI]: 0.446-0.938) and 2 (ICC = 0.856; 95% CI: 0.575-0.956) and moderate for session 1 (ICC = 0.26; CI: 0.09-0.89) . The individual SATT components showed Arm Rip was the least reliable component (ICC = 0.00; 95% CI: 0.31-0.5) and leg drive was the most reliable component (ICC = 0.98; CI: 0.99-0.99) . Intrarater reliability was moderate to good for both raters (ICC = 0.5-0.9) . **CONCLUSIONS:**: The results showed that the SATT can be independently scored by two raters, following a 45 minute training session and more experienced raters demonstrated increased intrarater reliability.
Purpose: To examine the association between objective and subjective measures during recovery from concussion injury. The primary hypothesis is to describe changes in cognition, balance, and symptom severity over a one-month timeframe following concussion injury. A secondary hypothesis is that symptom severity at time of injury will be associated with objective measures during the recovery period.

Methods: Fifty-one young adults (18.01 ± 5.96 years old) who recently sustained a concussion completed a battery of four cognitive tests, eight balance tests, and a 22-item symptom report using a commercially available assessment tool (ClearCut, Quadrant Biosciences Inc; Syracuse, NY). All subjects completed test 1, on average, 3.53 days after injury, and test 2, 23.06 ± 10.93 days after test 1. Group comparisons (repeated measures ANOVA or T-Test) and effect sizes (Cohen’s d) were used to compare recovery across time. To address the secondary hypothesis, those within the group reporting low symptom severity (symptoms < 10; n=19) and high symptom severity (symptoms > 40; n=14) were compared.

Results: Across the sample, symptom severity at initial testing ranged from 0-89. Statistically significant differences between test 1 and 2 were seen for all cognitive tests (p<0.001) and 1 of the 80 balance tests (p=0.028). When comparing symptom severity groups, significant differences (p<0.05) at the first testing session were seen on 3 cognitive tests and 2 balance tests. No differences were seen between groups at test 2. The low symptom severity group had no changes in cognitive or balance scores between test 1 and 2. The high symptom group had large effects sizes towards improvement on Tandem Stance Eyes Closed (d=1.18), and Simple Reaction Time (d=1.36).

Conclusion: Symptom severity is associated with objective measures of balance and cognition during the recovery period. The low symptom group appears to have reached full recovery prior to initial testing. The high symptom group showed signs of injury at initial testing with large changes in cognitive and balance performance at re-test.

D-69 Free Communication/Poster - Exercise Testing II
Thursday, May 30, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

Obesity has increased exponentially within the last three decades and is now widely recognized as one of the leading health threats due to its association with such as type 2 diabetes, cardiovascular disease, and hypertension. In recent years, there have been advances in technology such as bioelectrical impedance analysis (BIA), dual-energy X-ray absorptiometry (DEXA), and air-displacement plethysmography, and hydrostatic weighing. All tests were conducted in one continuous two-hour session for each subject. Subjects were instructed prior to testing to refrain from eating for a minimum of five hours but no more than ten, to avoid consuming alcohol within twelve hours of testing, to avoid caffeine within three hours of testing, to avoid large amounts of fluid within four hours of testing, and to refrain from exercising within four hours of testing. RESULTS: The one-way ANOVA with repeated measures and follow-up paired samples t-tests indicated that percent body fat estimated from DEXA (mean ± SD = 31.0 ± 8.9%) resulted in significantly greater values than hydrostatic weighing (23.3 ± 8.5%), air-displacement plethysmography (23.3 ± 8.5%), and BIA (23.8 ± 10.5%). In addition, the constant error (CE) and mean error (TE) values of predicting hydrostatic weighing percent body fat from DEXA (CE = -7.7%, TE = 8.2%) was significantly greater than those associated with DEXA.
Aortic stiffness and cardiorespiratory fitness (CRF) are independent predictors of cardiovascular disease (CVD), cardiovascular (CV) events, and early mortality. However, the relationship between arterial stiffness and CRF is largely unknown.

PURPOSE: To examine the relationship between arterial stiffness and CRF in apparently healthy adults.

METHODS: Two hundred three subjects (64% men, age 32.8 ± 12.0 years) were enrolled in a single-center, single-blind, randomized, placebo-controlled, crossover study. Participants performed a symptom-limited treadmill test using a modified Bruce protocol. Cardiac output (CO) was calculated from a Swan-Ganz catheter placed in the pulmonary artery. Hemoglobin concentration was measured from an arterial blood sample. Arterial stiffness (aortic carotid pulse wave velocity [PWV]) was determined using applanation tonometry. CRF was determined from peak VO2 (% of age-predicted maximum). Results: Mean arterial stiffness was 11.4 ± 2.2 cm/s/m. CO increased from 3.9 ± 0.7 L/min to 6.7 ± 1.2 L/min with exercise. VO2peak was 31.6 ± 10.9 mL/kg/min, and aortic PWV increased from 7.3 ± 1.6 cm/s/m to 8.7 ± 1.9 cm/s/m during exercise. Mean arterial stiffness during exercise was positively associated with %predicted VO2peak (r = 0.42, P < 0.001). Changes in arterial stiffness during exercise correlated with changes in CO (r = 0.41, P < 0.001), VO2peak (r = 0.39, P < 0.001), and systolic blood pressure (SystBP) (r = 0.37, P < 0.001). Conclusions: Arterial stiffness during exercise is positively associated with CO and VO2peak. These findings suggest that arterial stiffness may be an important predictor of CRF in apparently healthy adults.
The evaluations were performed in the follicular phase between the 9th and 11th day and in the luteal phase between the 19th and 21st day after the beginning of the menstrual cycle. Statistical analysis employed parametric tests with two-tailed p value set at 5%. RESULTS: At rest, HR was [supine: 6.2 ± 2.8 bpm, 1.9 ± 1.6 bpm, (p < 0.05)] and [orthostatic: 3.6 ± 3.1 ± 3.4 bpm (p < 0.05)] in the follicular and luteal phases, respectively. Chronotropic reserve was not different (p > 0.05) during Follicular (6.2 ± 2.8 bpm) and Luteal (3.6 ± 3.4 bpm). Also, absolute HRR, Δ% HRR and HRR Coefficient did not show any difference between both phases of menstrual cycle (p > 0.05).

CONCLUSIONS: We concluded that HR responses during rest, maximal treadmill exercise and 5 minutes post-exercise were not affected by the menstrual cycles, even with all physiological changes that occur during Follicular and Luteal phases.

Table 1: Effects of Combined Exercise on Vascular Inflammatory Markers and Arterial Stiffness in Elderly Women

<table>
<thead>
<tr>
<th>Variable</th>
<th>Follicular</th>
<th>Luteal</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR_{min} (bpm)</td>
<td>6.2 ± 2.8</td>
<td>1.9 ± 1.6</td>
<td>0.84</td>
</tr>
<tr>
<td>HR_{max} (bpm)</td>
<td>18.5 ± 3.2</td>
<td>18.1 ± 2.9</td>
<td>0.93</td>
</tr>
<tr>
<td>C.R. (bpm)</td>
<td>6.2 ± 2.2</td>
<td>3.8 ± 0.91</td>
<td></td>
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</tbody>
</table>

Glycogen storage disease III (GSDIII) is a rare inherited metabolic disorder caused by glycogen debranching enzyme (GDE) deficiency which primarily affects the liver, skeletal muscle and heart and results in muscle weakness and profound exercise limitation. Despite exercise intolerance being a major complication associated with the disease, the influence of GSDIII on aerobic capacity is largely unstudied. PURPOSE: To preliminarily describe the impact of GSDIII on aerobic capacity and investigate potential mechanisms responsible for any impairment. METHODS: In this descriptive study 5 atients (3 female) 11 years with GSDIII underwent an incremental cycle exercise test to volitional exhaustion. During the breath-by-breath gas analysis took place to determine oxygen utilisation (VO_{2}), carbon dioxide production (VCO_{2}), and minute ventilation (VE) and heart rate (HR) was measured continuously. The study received institutional and NHS ethics approval. RESULTS: Peak VO_{2} was lower in the GSDIII patients than predicted based on their demographic data (18.6 ± 3.2 ml/kg/min, 5% 23% of predicted), as was peak work rate (WR) (8.5 ± 8.5 30% 50% predicted), peak HR (139 ± 29 m, 7 11% predicted), and VE peak (30:1L/min, 36 113% predicted). Peak RER was low for a test completed to maximal exertion (0.9: 0.07). CONCLUSION: VO_{2} peak is lower in patients with GSDIII than would be expected for their age, height, mass and sex. The mechanisms responsible for this impairment are yet to be fully determined, but the small data set presented here indicate a reserve in respiratory and central cardiovascular function. Previous literature has identified energy deficiency as a primary cause of exercise intolerance in GSDIII due to impaired glycogen breakdown, and these results are supported here by the low HRR values at peak exercise.

CONCLUSION:

Women become more likely to develop chronic diseases as their metabolic function decreases after menopause. Vascular disease is a major problem for elderly women. The problem of these elderly women is due to a decline in health status due to lack of physical activity. PURPOSE: The purpose of this study was to analyze the effects of a combined exercise training regimen on vascular inflammatory markers (WBC, CRP, fibrinogen) and arterial stiffness (blood pressure, pulse wave analysis and velocity) in elderly women. METHODS: Forty-five healthy elderly female volunteers, aged 75.44 ± 5.30 years, were randomly assigned to combined exercise group (EX; n = 24) trained for 12-week or to a “non-exercise” control (CON; n = 21) group. The variables of vascular inflammatory markers, BP, PWA and PWV were measured in all the subjects before and after the 12-week combined exercise training. The 6 min inute combined exercise program(tic exercise 1 time, strength exercise 2 times/week) was performed 3 times per week for 12 weeks, and the intensity was progressively increased every four weeks(1.4e ceks: RPE 12 to 13, 5 8 e ceks: RPE 13 to 14) 12weeks: RPE 14 1 1. RESULTS: The vascular inflammatory markers were as follows; All variables showed interaction effects and there was a significant difference in delta values between the two groups. WBC and CRP levels significantly decreased in the EX (p < 0.05). But control group CRP(p < 0.05) and fibrinogen(p < 0.01) levels significantly increased in the CON. SBP showed interaction effect and significant difference in delta-value. CON had significantly increased. However, there was no significant difference between PWA and PWV. CONCLUSION: Our findings indicates that regular aquatic and resistance exercise were effective in improving the serum vascular inflammatory makers and blood pressure of the elderly women with lower cardiovascular disease risk, which are all due to the decreased physical activities. Therefore, if senior citizens continuously improve their efficiency of exercise, they can get the benefit of improving anti-inflammation and delaying the aging process with aging so that they can improve their level of healthy life in the old age.
this sport modality, favors athletes presenting morning types profile. There are no data about amateur triathletes chronotype, but probably there are also a high percentage of morning type, mainly because the training sessions occur even earlier, once amateurs need to work after the training. As the training sessions occur early in the morning, it is possible for morning-type athletes are able to develop higher intensity trainings and thus having better physiological adaptions. However, there are no data about chronotypes and physiological profile.

PURPOSE: Characterize the chronotype profile in a group of triathlon amateur competitors who participate in the Olympic distance triathlon race. Verify if there are association between chronotype profile and physical fitness in amateur triathletes.

METHODS: Thirty-nine men and six women who had subscribed to compete in the sixth stage of the 26th Brazil Triathlon Trophy (26ª Troféu Brasil de Triathlon) in the Olympic distance participated in this cross-sectional observational study. Participants were evaluated for anthropometric characteristics (body mass, height, and body composition through [DXA]), aerobic physical fitness ([V̇O2max], anaerobic threshold and respiratory compensation point, maximum aerobic velocity [MAV] and running economy [RE]). Chronotype profile was evaluated using Horne-Ostberg morning-eveningness questionnaire.

RESULTS: According to the chronotype questionnaire of the volunteers (69.2% men and 50.0% women were classified as morning profiles (22.2% definite morning and 44.4% as moderate morning) and only 6.7% were classified as evening profiles. There were no significant correlations between chronotype profiles and the physiological profiles.

CONCLUSIONS: Amateur triathletes show to comprise high proportions of morning-types, but the physiological profile is similar between the different existing chronotypes.

2137 Board #293 May 30 3:30 PM - 5:00 PM The Effect Of Time Of Day On Jump Potentiation In Distance Runners Elaine Vieira, Ilaria Maria Holanda Almeida, Daniel Alexandre Boullosa, Sebastían Del Rosso, Stephany Melo Vieira, Filipe Brandão Santos, Douglas Araújo Vargas, Luiz Djamal Rodrigues Filho, John Robert dos Santos Silva, Catholic University of Brasilia, Brasilia, Brazil. Email: elaine.vieira@uab.br

Results: The overall mean ± SD for each parameter is presented in the following text. The Effect of Time of Day on Jump Potentiation in Distance Runners: Time of day is a key factor that influences athletic performance. No study has specifically investigated the effect of early morning vs. late afternoon training on jump potentiation in distance runners. This is important because circadian rhythms and alterations in sleep patterns can affect training adaptations and athletic performance.

PURPOSE: To determine whether the time of day influence jump potentiation in distance runners. METHODS: We recruited 18 male runners that were divided into two groups: novice runners (NOV) with ≤3 years of racing experience (n=6; age 34.7±6.4) and experienced runners (EXP) with ≥3 years of experience (n=12; age 34.5±5.1). Chronotypes were identified using the Horne-Ostberg Morningness-Eveningness questionnaires and sleep quality was assessed using the Pittsburgh Sleep Quality Index. Counter movement jump (CMJ) was determined with the My Jump App. CMJ height was measured after 5 min warm-up and after 30 min test (7:00 HR) on a treadmill at 8:00 am and 8:00 pm. Following the 30 min test treadmill CMJ height was measured at 0, 3, 6 and 9 min. No significance was observed at 0 min of recovery and was decreased to warm-up levels at 3, 6 and 9 min (p<0.01) during recovery. Interestingly, jump potentiation only occurred in the morning while no significant increases were observed in the evening in the EXP group (p=0.8). The NOV group had no changes in jump potentiation in both morning and evening tests. CONCLUSION: We conclude that jump potentiation could be only observed during morning in experienced distance runners probably because of their chronotypes.

2138 Board #294 May 30 3:30 PM - 5:00 PM Effects Of Time Restricted Feeding On Metabolism Depression And Circadian Rhythms Marqe A. Fleischacker, Emma P. Masulewicz, Andrew L. Kezar, Corbyin R. Bendisen, Megan M. Coyle, Cassie A. Filecica, Lauren M. Kaminiski, Megan M. Lind, Eric A. Norman, Nicole L. Schiwetz, Justin R. Geijer, Winona State University, Winona, MN. Email: elaine.vieira@uab.br

Time restricted feeding (TRF) is a form of intermittent fasting limiting the time to intake calories throughout the day. TRF has been shown to affect substrate concentration and utilization at rest and exercise. Changing patterns in substrate availability and utilization can have effects on metabolism, cognitive functioning and circadian rhythms. PURPOSE: The purpose of this study was to evaluate the effects of TRF on overall physiological functioning, specifically sleep, resting energy expenditure (REE), resting respiratory quotient (RQ), and likelihood of depression. METHODS: A longitudinal design was used to examine physiological changes associated with four weeks of TRF among 34 male adults between the ages of 18-60 yrs. Sleep was evaluated via self-report and objective measures given to participants during testing sessions. REE and RQ were measured using a metabolic cart while subjects were in a fasted state. The Brief Anxiety and Depression Survey was administered, and each subject was given a score indicating their likelihood of depression at each testing session. Variable differences within subjects were determined using a repeated measures ANOVA or a paired samples T-test. RESULTS: A significant decrease in total sleep (p=0.034) and BADS scores (p=0.046) occurred between non-TRF and TRF. Analysis revealed that resting RQ values experienced a significant increase (p=0.002) between testing non-TRF and TRF testing periods (p=0.034) and pre-test and TRF testing sessions (p=0.034). Direct correlations were found between BADS, total sleep and resting RQ. Conclusion: TRF may influence glucose utilization during rest. Past studies have shown that different forms of intermittent fasting, such as TRF, enable an organism to create more regulated circadian rhythms, allowing less reliance on glucose, resulting in benefits in prevention and treatment of various diseases. The results of the present study are in opposition of previous literature and may provide insight into how glucose utilization affects other physiological processes. Increased glucose utilization may have been a factor in the decrease in sleep and depression observed in the study. Future research is needed to verify if increased utilization of carbohydrates at rest influences changes of circadian rhythms and depression occurrence.
Hypoxic Conditions on Melatonin

Valdir A. Lemos1, Ronaldo Vagner Thomatieli Dos Santos1, Hanna Karen Moreira Antunes1, Claus Behn2, Gines Viscor3, Valdir A. Lemos1, Ronaldo Vagner Thomatieli Dos Santos1, Hanna Karen Moreira Antunes1, Claus Behn2, Gines Viscor3.

1Federal University of São Paulo, São Paulo, Brazil. 2Faculty of Medicine, University of Chile, Santiago, Chile. 3University of Barcelona, Barcelona, Spain. 4University of the State of São Paulo, Presidente Prudente, Brazil. 5Federal University of Minas Gerais, Belo Horizonte, Brazil.

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Melatonin is a hormone which controls sleep, inflammation, and oxidative stress. Aerobic physical exercise can influence melatonin in normoxia. However, there is controversy about the effects of exercise on the melatonin level in hypoxia, which is characterized by impaired sleep.

PURPOSE: To investigate the association between chronotype and mood profile in presence of SJL.

METHODS: A sleep questionnaire battery composed by Pittsburgh Sleep Quality Index (PSQI), Morningness-Eveningness Questionnaire (MEQ), Munich Chronotype Questionnaire (MCTQ), Epworth sleepiness scale (ESS) and Brunel Mood Scale to determinate a mood profile (subscapes: anger, confusion, depression, fatigue, vigor, tension). The SJL was categorized in accord to MCTQ results in 3 groups: a) No SJL (≤30 min), b) SJL until 1 h (1-6 min), c) SJL more than 1 h (>6 min). Results: The groups were compared, and no differences were found between all subscapes of Brunel. Moreover, we didn’t find any differences regard the sleep quality and diurnal excessive sleepiness. On the other hand, the groups were different on sleep duration and chronotype. Longer SJL is associated to higher Evenness index (F=7.48; p<0.05). Conclusions: Our finds suggest that the presence of SJL didn’t impact the volunteer’s humor profile and longer SJL is associated to higher eveningness index.

RESULTS: Thirty participants (14 females and 16 males) were divided into 3 groups based on their MCTQ scores: a) No SJL (≤30 min), b) SJL (1-6 min), c) high SJL (>6 min). The SJL was categorized in accord to MCTQ results in 3 groups: a) No SJL (≤30 min), b) SJL (1-6 min), c) high SJL (>6 min). The SJL was categorized in accord to MCTQ results in 3 groups: a) No SJL (≤30 min), b) SJL (1-6 min), c) high SJL (>6 min).

CONCLUSIONS: Hypoxia acutely increases melatonin. Diurnal remission of the nocturnal increase in melatonin seems to be delayed by hypoxia and to an even greater extent if acting together with exercise.

Table 1. Values of Sleep Quality, Respiratory Functions and Depression Scale

<table>
<thead>
<tr>
<th>Pittsburgh Sleep Quality Parameters</th>
<th>Values(mean;standard deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep duration</td>
<td>0.8 ± 0.28</td>
</tr>
<tr>
<td>Sleep latency</td>
<td>1.22±0.0</td>
</tr>
<tr>
<td>Subjective sleep qa lity</td>
<td>0.9±0.31</td>
</tr>
<tr>
<td>Habitual sleep efficiency</td>
<td>1.8±0.3</td>
</tr>
<tr>
<td>Sleep disturbances</td>
<td>0.9±0.6</td>
</tr>
<tr>
<td>Daytime sleep dysfunction</td>
<td>0.3±0.25</td>
</tr>
<tr>
<td>Use of sleep medications</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0.1±0.23</td>
</tr>
<tr>
<td>Respiratory Parameters</td>
<td></td>
</tr>
<tr>
<td>Forced Expiratory Volume in 1 Second (FEV1)</td>
<td>16±20.11</td>
</tr>
<tr>
<td>Forced Vital Capacity (FVC)</td>
<td>1±16.2</td>
</tr>
<tr>
<td>Peak Expiratory Flow (PEF)</td>
<td>1.6±2.6</td>
</tr>
<tr>
<td>Self-Depression Scale</td>
<td>Score</td>
</tr>
</tbody>
</table>

Individuals with Down Syndrome (DS) have a broad range of respiratory problems. These problems are important cause of morbidity, mortality and may increase tendency to sleep disturbances. Also depression has been frequently reported in individuals with DS.
**Board #300** May 30 3:30 PM - 5:00 PM

**Impact Of Sleep Deprivation On Flexibility Performance**

Fernanda Veruska Narciso, Beatriz M. Pereira, Andressa Silva, Mauro H. Chagas, Matheus M. Reis, Carlos Amaral Costa, Valdenio M. Brant, Lucas A. Facundo, Aline A. Cruz, Marco Tulio de Mello. *Universidade Federal de Minas Gerais, Belo Horizonte, Brazil.*

**PURPOSE:** The purpose of this study was to verify the impact of sleep deprivation in flexibility of young adults. **METHODS:** Ten sedentary male young adults (Mean age: 24.3 ± 3.8 years old, body mass index: 24.8 ± 2.5 kg/m²) wore wrist actigraph and performed static tests (shoulder abduction and biceps curl) and 20RM to seated low row exercise. The push up exercise was used as no elastic band. In following training sessions, the participants were instructed to perform the four exercises in the maximal number of repetitions possible each new session. The estimated arm muscle area, exercises repetition number and sleep (sleep duration, sleep latency, sleep efficiency and weak after sleep onset) were assessment pre and post-training. The sleep variables were determined by actigraphy technique during seven days. The pre and post-test comparisons were made using paired t test. **RESULTS:** The arm muscle area, was improved after training (F1,38 = 17.951, p<0.05) as well as exercises repetition number (shoulder abduction: 10.3±6.6 vs. 22.3±4; push up: 11.2±2.3 vs. 18±3; seated low row: 20.2±1.0 vs. 32.8±2; biceps curl: 10.2±0.6 vs. 23.7±2; P<0.001). There is no change in sleep variables after training (Sleep Duration: 38±6 vs. 36±6; Sleep Latency: 28.5±32.7 vs. 14.0±15.0 min; Sleep Efficiency: 86.7±7.7 vs. 86.5±7.5%; Weak after sleep onset: 39.8±22.2 vs. 38.3±23.7 min, p>0.05). The histopathological evaluation of the soleus revealed the presence of interstitial edema in SD96 compared to CTL (19.5±4.2% vs 0%, P<0.001), associated with intense cellular infiltration, alterations in the arrangement of muscle fibers, as well as areas of tissue degeneration and reduction of muscle parenchyma (2.7±2.3% vs 1.8±1% , P<0.001). In the plantar muscle, the changes were more subtle, with slight increase in cellularity in the SD96 and fibers presenting smaller cross-sectional area in SD96. **CONCLUSIONS:** SD induces degradative process and oxidative damage in the skeletal muscle, being more intense in type I fibers.

**Board #301** May 30 3:30 PM - 5:00 PM

**Effects Of Sleep Deprivation On Histopathological Changes And Oxidative Damage In Different Type Muscle Fibers**

Marcos Mônico-Neto, Kil Sun Lee, Daniel Araki Ribeiro, Caroline Margonato Cardoso, Luciana Le Sueur Maluf, Hanna Karen Moreira Antunes. *Federal University of Sao Paulo, Sao Paulo, Brazil.*

**PURPOSE:** To determine the effect of elastic band resistance training in strength, muscle mass and sleep of shift workers. **METHODS:** Twelve sedentary workers with weekly work schedule of 12 hours of work for 5 hours a day and 107.2°, 24h (71.0 ± 2.6°; CI 95% = 67.6-76.3) and 36h (69.8 ± 2.6°; CI 95% = 66.2-72.5) were compared with baseline (73.0 ± 2.7°; CI 95% = 65.8-76.3) and 36h (69.8 ± 2.6°; CI 95% = 66.2-72.5) were evaluated by the modified knee extension test with a fleximeter in 4 different moments: at onset of sleep deprivation (8:00am, day 1 = baseline), and after 12h (8:00pm, day 1), 24h (8:00am, day 2) and 48h (8:00pm, day 2) of sleep deprivation. Volunteers lay back with the hip flexed at 90°, and the initial knee ROM (°) was considered as 90° right knee flexion. **RESULTS:** PRO M max values showed significant differences were found between conditions for RtPk (WR: 5.19 ±0.73g, SR: 9.64 ±1.4g, P<0.001). The histopathological evaluation of the soleus revealed the presence of interstitial edema in SD96 compared to CTL (15.9±4.2% vs 0%, P<0.001), associated with intense cellular infiltration, alterations in the arrangement of muscle fibers, as well as areas of tissue degeneration and reduction of muscle parenchyma (2.7±2.3% vs 1.8±1%, P<0.001). In the plantar muscle, the changes were more subtle, with slight increase in cellularity in the SD96 and fibers presenting smaller cross-sectional area in SD96. **CONCLUSIONS:** SD induces degradative process and oxidative damage in the skeletal muscle, being more intense in type I fibers.
**Purpose:** Inadequate sleep is associated with an increased risk of injury, however it is unknown what physical risk factors for injury are altered by inadequate sleep.

We hypothesized that one night of sleep restriction would affect reaction times and landing mechanics but not leg strength.

**Methods:** Ten healthy subjects (3m, 5f, aged 21±3yrs, 0.11m, 11.7kg) completed cognitive testing, strength testing and a series of jump assessments following 8 hours (well-rested, WR) or 3 hours sleep (sleep-restricted, SR) in a randomized crossover design. Subjects woke at the same time for each assessment and testing was conducted at the same time of day, in the same order, and separated by at least one week. Reaction time was assessed using the computerized Automated Neuropsychological Assessment Metrics (ANAM) assessment. Strength testing (isokinetic dynamometer-60°/s) included maximal knee extension (KE) and flexion (KF) strength for each leg. Subjects completed 5 trials of a double leg drop-landing task, as well as 3 trials on each leg of a single leg drop-jump task. Peak knee flexion angles (PKKF) were captured using 3D motion capture. Vertical ground reaction forces (VGRF) for each leg were captured with two force plates mounted at the end of the force plates.

**Results:** There were no significant differences between conditions for reaction time (p=0.16), or KE (p=0.8), KF (p=0.09). When comparing the WR to the SR condition during the drop-landing task. The difference in VGRF during the single leg drop-jump task approached significance for the left leg (WR: 2.52±0.41, SR: 2.72±0.44, p=0.052). No other significant differences in VGRF or PKKF were observed during the single-leg drop-jump task (p>0.3). Conclusions: No significant differences in strength and landing mechanics were observed following one night of sleep restriction. Knee flexion angle data trends suggest additional nights or chronic sleep restriction may be required to significantly alter movement mechanics.

**D-71b**

**Title:** Free Communication/Poster - Sports Medicine Fellow Research Abstracts

**Author:** Thursday, May 30, 2019, 1:00 PM - 6:00 PM

**Room:** CC-Hall WA2

**2148 Board #304**

**Title:** May. 30 3:30 PM - 5:00 PM

**Parameters Associated with Abnormal Cardiac Conditions in Adolescent Athletes: Analysis using Simon’s Heart Heartbytes Registry**

**Author:** Jacob Jones1, Dai Sugimoto2, Gregory Kobelski1, Prashant Rao2, Stanton Miller2, Chris Koil2, Gian Corrado1, David Shipponi1, Boston Childrens Hospital, Boston, MA.

**Email:** jacob.jones@childrens.harvard.edu

**No relationships reported**

**Purpose:** To determine clinical parameters that are related to abnormal cardiac conditions in the physically active youth.

**Methods:** We used the Simon’s Heart Heartbytes National Youth Cardiac Registry to collect cardiac related data from middle and high school athletes in southeastern Pennsylvania. We collected age, race/ethnicity, symptoms suggestive of abnormal cardiac conditions, past medical history, medication use, caffeine intake and family history. We also obtained height, weight, blood pressure, and cardiac murmur findings, as well as an ECG in all individuals. Binary logistic regression analysis was performed to identify an independent association between abnormal cardiac symptoms and potential indicators (all collected variables). The odds ratio (OR), 95% confidence interval (95% CI), and p-values were used as statistical values. RESULTS: There were a total of 32,127 (8m, ales and 34,486, 11.7m, height=1.70, 11.7m, eight=0.01) . There was an independent association between abnormal symptoms and presence of significant past medical history (OR: 4.75, CI: 3.1270, p= 0.001) and prescribed medication use (OR: 1.7, CI: 1.04 2.9p= 0.038). Although the association between the presence of abnormal symptoms and African-American race (OR:2.01, CI: 0.569p= 0.09) and average daily consumption of at least 2 types of caffeine drinks (soda, energy drinks, tea, and coffee) (OR:2.11, 95%CI: 0.87, 5.07, p=0.097) were not significant, there was a trend to reach the a priori significance level.

**Conclusions:** The current study identified several clinical parameters that are associated with symptoms suggestive of abnormal cardiac conditions. Further research needs to be done on a larger scale to better sort out the clinical history that may contribute to false positives in an effort to reduce false positives at heart screenings.
although the knee is the most commonly injured body part that requires surgery. Quarterback injuries are primarily acute in mechanism, and the majority of these acute injuries occur during game competition.

2151 Board #307
May 30 3:30 PM - 5:00 PM
Spine Injuries and Concussions among Figure Skaters
Kristen M. Lambrinakos-Raymond, Gregory Kobelski, Ellen Geminiani, Dai Sugimoto, William P. Mechan, III, Boston Children’s Hospital, Boston, MA.

No relationships reported.

PURPOSE: To determine the prevalence and mechanism of spine injuries and concussions among a sample population of figure skaters. To assess for potential risk factors for these injuries.

METHODS: This is a cross-sectional analysis of spine injuries and concussions reported by figure skaters. Data was obtained through an anonymous, confidential online questionnaire distributed to members of participating figure skating clubs. The main outcomes included diagnoses, mechanism, and source of medical care. Simple descriptive statistics were used; Fisher’s exact test was used to assess for statistical differences in categorical variables between groups. SPSS was used for all analyses.

RESULTS: Thus far, 89 participants had completed the questionnaires (recruitment ongoing). The mean age of participants is 19 ± 3.22 years (SD 17.1). Most (99.9%) respondents are female. Most (88.8%) practice figure skating year-round; 85% participate in competitions. Some skaters participate in more than one discipline including singles (n = 8) pairs (n = 3), ice dance (n = 21), synchronized skating (n = 29), theatre on ice (n = 1). More than a quarter (27%; n = 24) of participants reported spine injuries/back pain. The most common diagnosis was muscular back pain. Treatment was primarily guided by primary care (n = 10), sports medicine (n = 13), physical therapists (n = 1) and athletic trainers (n = 10). Almost half of those who reported back pain did not present to a health care provider (HCP) (n = 8); n = 11/24. All injuries occurred in practice. More than a quarter (25%; n = 24) sustained at least one concussion; 3 sustained two concussions. Several (24%); n = 10/24 skaters did not present to a HCP for evaluation of their first concussion. All concussions occurred during practice and most (88%); n = 22/25 were during ice activities. The most common mechanism of injury was a fall (88%); n = 15/17. The sex of the skater was not associated with either mechanism of spine injury or history of concussion.

CONCLUSIONS: Nearly a third of skaters sustained a concussion or spine injury, yet nearly half did not report their injuries to a HCP. Our findings warrant further investigation into the reasons for such a low reporting rate among figure skaters and the potential effect on injury outcomes.

2152 Board #308
May 30 3:30 PM - 5:00 PM
Development and Evaluation of an Electronic Preparticipation Physical Evaluation System: A Pilot Feasibility Study
Jordan Knox,1 Daniel Cushman1, Matthew Brobeck1, Masaru Teramoto1, Kimberly Harmon, FACSMD, Stuart Willick, FACSMD,1 University of Utah, Salt Lake City, UT; University of Washington, Seattle, WA. (Sponsor: John Hill, FACSM)

Email: jordan.knox@hsc.utah.edu

No relationships reported.

The preparticipation physical evaluation (PPE) is important for athlete health and safety, and is required for participation in collegiate sports and the majority of US high schools. The vast majority of PPEs are completed using a paper PPE form. Previous work had developed an ePPE system and found it was efficient and yielded good athlete compliance and high physician satisfaction. Another study showed ePPE’s value for collecting and analyzing college athlete injury and illness data, suggesting strong potential for the ePPE to improve injury analysis as well as efficiency of the PPE. Despite these reports, use of electronic PPE forms has not become widespread.

PURPOSE: 1) to develop and implement an ePPE system for collegiate athletes that simultaneously serves as a relational database for research purposes, 2) to assess perceptions of providers on the ePPE system compared to paper PPE forms, and 3) to demonstrate the research potential of an ePPE system by conducting a sample epidemiologic analysis using electronically collected data.

METHODS: In this pilot feasibility study, researchers developed an ePPE system using REDCap, a HIPPA-compliant web application designed for academic research purposes. The ePPE form had the identical contents and questions as the paper PPE forms and the identical data collection and analysis tools. The ePPE system was successfully developed and implemented. All athletic trainers and physicians preferred the ePPE over the paper PPE, and felt that the ePPE was more efficient. Data were easily extracted for analysis from the ePPE system. A sample epidemiologic analysis established concerns about concussions sustained by athletes (23% of athletes) and some behavioral and psychological symptoms reported by athletes (trouble sleeping, depression, and anxiety; 13.6 22.7% of athletes).

CONCLUSIONS: While this was only a pilot feasibility study involving relatively small teams, we show that development and implementation of an ePPE system is technically feasible, is preferred by users, and facilitates sports research.

2153 Board #309
May 30 3:30 PM - 5:00 PM
Psychological Factors Related to Return to Sport After ACL Reconstruction in Adolescents
Aubrey Armento, David Howell, Alexia Gagliardi, Jay Albright, Stephanie Mayer. University of Colorado School of Medicine, Aurora, CO. (Sponsor: John Hill, FACSM)
Email: aubrey.armento@childrenscolorado.org

No relationships reported.

PURPOSE: The present study aimed to assess the relationship between psychological factors, including perceived social support and pre-operative expectations, and return to sport after ACL reconstruction in adolescents.

METHODS: 65 participants completed the Hospital for Special Surgery Pediatric Functional Activity Brief Scale (HSS Pedi-FABS), the Psychovitality (PV) questionnaire, and the Multidimensional Scale of Perceived Social Support (MSPSS) prior to undergoing ACL reconstruction. We performed a multiple linear regression to assess if MSPSS score was associated with confidence in returning to sport (total PV score). Adolescents were divided into competitive and non-competitive groups based on their response to the HSS Pedi-FABS. Outcome variables obtained from the PV questionnaire addressed pre-operative expectations of returning to sport following surgery were compared between the competitive and non-competitive groups using a series of Chi-sqa re analyses.

RESULTS: Among all participants, 65% (n = 43) reported that they expected to return to sport within less than six months of surgery. A higher proportion of competitive athletes (83%) expected to return to sport within six months post-operatively compared to the non-competitive athletes (63%); p = 0.18. In addition, a significantly lower proportion of competitive athletes (16%) compared to non-competitive athletes (3%) reported that they would be content returning to an activity level that was less than their pre-injury activity level (p = 0.037) and would be willing to settle for a less strenuous sport than their pre-injury sport (16% vs 42%); p = 0.034. There was no significant association between MSPSS total score (mean = 2.12±0.375; range = 4-7) and PV total score (mean = 13.83±3.0; range = 8-19); β coefficient = 0.1, CI = 1.7 0.2, p = 0.28

CONCLUSIONS: The majority of all participants reported the expectation of returning to sport within six months of surgery. A significantly lower proportion of competitive athletes compared to non-competitive athletes reported that they would be content returning to a lesser activity level or less strenuous sport. There was no significant association between perceived social support and confidence in returning to sport.
Influential. Self-ranking importance of clinical variables is similar between physicians and athletic trainers who participated. ImPACT testing was the most significant contributor in RTP decisions. Nine factors were randomly varied within the scenarios: age, gender, sport, prior concussion history, and a further 13% had severe iron deficiency. Of those with iron deficiency (ferritin <15 ng/mL), 44% were insufficient, and 69% were sufficient. CONCLUSIONS: When compared to the prevalence of iron deficiency in the general US female population ages 16–49 (11%), there was an increased prevalence in our sample (28%). Interestingly, we noted a similar prevalence of iron deficiency anemia (3–5% general population vs. 4.3% in our sample). Furthermore, our results showed a 2% prevalence for Vitamin D Insufficiency consistent with the general US female population of similar age at 24–26%. The prevalence of Vitamin D deficiency was higher in the US population at 10–11% when compared to our study at 7%. The effects and benefits of screening, intervention, and performance outcomes are a topic of ongoing investigation.

**Purpose:** To identify the prevalence of Iron and Vitamin D deficiency in D1 female track and field (T&F) athletes.

**Methods:** In a retrospective review of medical records at a single institution, laboratory data were reviewed for female T&F athletes [B1] from 2013 to 2019. Labs were acquired as part of the entrance pre-participation physical (PPE) including ferritin, hemoglobin, and Vitamin D. Iron deficiency was defined as serum ferritin below 30 ng/mL and severe deficiency below 13 ng/mL. Vitamin D was classified as; below 15 ng/mL - deficient, 16-29 ng/mL - insufficient, and above 30 ng/mL - sufficient. Anemia was defined as hemoglobin (Hgb) < 11.1 g/dL.

**Results:** Seventy-seven student-athletes were screened, 48% were iron deficient, and a further 13% had severe iron deficiency. Of those with iron deficiency (ferritin <30 mg/L, n=37), four had anemia (n=3). For Vitamin D, 7% were deficient, 24% were insufficient, and 69% were sufficient. Anemia was defined as hemoglobin (Hgb) < 11.1 g/dL.

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PURPOSE: Health and weight management benefits may influence athletes’ decisions regarding specific dietary practices. Eating disorders/disordered eating (ED/DE) are highly prevalent in the athletic population. The purpose of this study was to determine if following specific diets correlated with a greater likelihood of responding positively to ED/DE screening tools compared to not adhering to a diet. METHODS: 1000 female athletes (18-30 yrs) were asked to complete a comprehensive health and wellness survey. Athletes were asked to specify their diet and completed 3 ED/DE screening tools: the Brief Eating Disorder in Athletes Questionnaire, the Eating Disorder Screen for Primary Care, and self-reported current or past history of ED/DE. We hypothesized that athletes adhering to specific diets were more likely to score positively on ED/DE screening tools than those not following a diet. The most common diets were included in the analyses: vegan, vegetarian, pescatarian, gluten free, low carbohydrate, low dairy, and ≥2 diets. Athletes following diets for health issues (e.g. Celiac disease) were excluded. Descriptive statistics were calculated for all study measures and Chi-sq re-testing was performed to assess relationships between athletes’ dietary practices and their responses to ED/DE screening tools.

RESULTS: 234 of 1000 female athletes reported adherence to specific diets; 766 reported no diet adherence. Of the 234 athletes following diets for health issues (e.g. Celiac disease) that were excluded, 54 (23%) were excluded due to medically-related dietary practices or vague dietary descriptions. 133 athletes reported following a single diet and 100 athletes followed ≥2 diets. Of the diet-adherent athletes, 67.9% responded positively to ≥1 of the 3 ED/DE screening tools. Athletes practicing vegetarian, vegan, low carbohydrate, low dairy, or ≥2 diets were more likely to respond positively to ≥1 ED/DE screening tool vs. athletes without dietary restrictions (70.0%, 79.7%, 79.5%, 60.0%, and 65.6%, respectively vs. 41.8%, p<0.048). CONCLUSION: Specific diet adherence in female athletes is associated with greater likelihood of positive screening for ED/DE using survey self-report. Health practitioners should consider further ED/DE questioning of athletes reporting specific diet adherence in order to enhance nutritional knowledge and help treat and prevent ED/DE.

Purpose: To evaluate differences in concussion symptom reporting across age levels.
Methods: Between 2008-2018 post-concussion symptoms were reported by Middle School (MS), High School (HS) and Collegiate athletes (CA) utilizing the post-concussion symptom scale after a concussion injury. Repeat evaluations and initial evaluations with a symptom score of zero were excluded. ANOVA was performed assessing total symptom scores and number of symptoms reported by age group and gender.
Results: 1,942 athletes (8% male, 22 sports) were included: Middle School (8%, n=110), High School (86.4%, n=1511) and Collegiate (7.3%, n=127). Significant differences were found in total symptom scores (p=0.006) and number of symptoms reported (p=0.00003). Symptom scores were highest in High School athletes (23.37 S D 20.2) compared to MS (mean 17.8 S D 17) and CA (20.13 S D 21.3). Total number of symptoms reported was also highest in High School athletes (8 S D 4) compared to MS (7.55, S D 5.4) and CA (8.02, S D 5.9). High School females report significantly higher symptom scores (2.25/-22.9 vs 2.16/-18.9, p< 0.0001) and number of symptoms (10.7/-6 vs 8/-4, p= 0.0002) relative to male peers.
Conclusion: In student athletes who have suffered a concussion, the post injury symptom scores and total number of symptoms and individual symptoms reported varied significantly across age levels, with significantly less symptoms being reported in the middle school athletes.
2163 Board #319 May 30 3:30 PM - 5:00 PM
Field Of View: A Football Player With Acute Visual Changes
Samantha Smith, James J. Kinderknecht. Hospital for Special Surgery, New York, NY.
(No relationships reported)

HPI
A 23 year old professional football player self-reported abnormal vision during a game. He had two episodes of blurriness in the superior visual field of the right eye lasting 18 20 minutes each and separated by 13min inutes. He had no eye pain or headache. No identified head trauma preceding symptoms. He was not removed from play.

Exam

Post-game: Normal visual acuity and remainder of exam normal.

Differential Diagnosis
1. Retinal detachment
2. Retinal vessel occlusion
3. Acephalgic migraine
4. Concussion
5. Otic ptc nerve lesion

Tests and Results
Athlete referred to ophthalmology for full eye exam the day following the game. Ophthalmology Findings:
- normal intraocular pressure
- bilateral AV nicking consistent with hypertensive retinopathy
- right retinal venous engorgement with few dot blot hemorrhages consistent with central retinal vein occlusion
- no retinal detachment

Carotid artery ultrasound and transthoracic echocardiogram were unremarkable.

Final/Working Diagnosis
Central retinal vein occlusion and hypertensive retinopathy, likely associated with obstructive sleep apnea, an associated description in the literature, with no other identified etiology.

Treatment and Outcomes
- Athlete did not miss any football practices or games
- Vision remained normal and follow up retina exam was unchanged
- Blood pressure monitored frequently without any documented daytime hypertension
- Began to use CPAP at night
- Reported improved sleep qa lity and reduced daytime fatigue

2164 Board #320 May 30 3:30 PM - 5:00 PM
It’s More Than A Headache
Juan M. Guzman, Jr., Darin Rutherford, Denny’s Maldonado. Mercyhealth, Janesville, WI.
Email: micajg@glink.drexel.edu
(No relationships reported)

HISTORY:
A 17 yo m ale high school soccer player with headache and dizziness following injury 1 month prior.

Event was soccer ball striking right temporal area with fall to the ground without secondary head trauma or loss of consciousness. On rising, the patient was knocked down by the opponent. He removed himself from the game due to symptoms of headache, balance problems, dizziness, sensitivity to light and noise, irritability, feeling slowed down, feeling mentally foggy, difficulty concentrating, and having visual problems. He had associated neck pain, numbness and tingling in the left upper extremity and left lower extremity after the injury.

No weakness in the upper or lower extremities.
No retrograde or anterograde amnesia reported.
He continued to play the game.

Reported his symptoms to the coach and licensed athletic trainer (LAT) when the game finished.

2165 Board #321 May 30 3:30 PM - 5:00 PM
When Leg Pain In A Runner Does Not Mean Stress Fracture Or Shin Splints
Sayedmajid Reza Alavi Dehkordi, Carlos R. Rodriguez. Bayfront Health System, St. Petersburg, FL.
Email: alavidehkordi@hotmail.com
(No relationships reported)

HISTORY: A 17 year-old male participating in high school middle-distance running presented with a 6 week history of lower left leg pain and limp. The pain was getting worse with increased training. He was running an average of 12-15 miles per day five days a week. This was evenly split on streets and cross-country roads. Although he had taken analgesics, the pain did not improve. He had no pain at rest but had noted some occasional pain at night. There was no history of antecedent trauma and the remaining history did not reveal any significant abnormalities.

PHYSICAL EXAMINATION: Local examination revealed diffuse tenderness over the anterior aspect of the left lower leg. There was no bruising or palpable swelling noted. The musculature and strength was normal. The range of motion of the left knee and ankle joints was normal and there was no neurovascular deficit noted. General physical examination did not reveal any significant abnormalities.

DIFFERENTIAL DIAGNOSIS: 1- Shin Splint 2- Stress Fracture 3- Brodie Abscess

4 Osteoid Osteoma TEST AND RESULTS: Plain radiographs revealed cortical thickening in the middle 3rd of medital cord of Tibia(Figure-1). The central nidus and the surrounding sclerosis of the bony lesion was apparent on the CT scan (Figure-2).

FINAL WORKING DIAGNOSIS: Osteoid Osteoma
TREATMENT AND OUTCOMES: The patient underwent surgical en bloc excision as an outpatient procedure. A shark bite excision of cortical lesions along with the surrounding sclerotic bone was performed under image guidance. The specimens were sent for histopathological examination which was consistent with Osteoid Osteoma. He was kept partial weight bearing for 6 weeks, followed by gradual progression to full weight bearing. Three months post-surgery, the patient was completely asymptomatic. Follow-up radiographs revealed a well-healed excision site and no evidence of recurrence. He returned to his running without problems.
1. Tall walking boot and ice therapy, with work modifications to limit weight bearing status.
2. Ortho Foot and Ankle referral to address operative management in process.
3. Referral to Rheumatology after case discussion given concern for inflammatory arthritis.
4. Final Outcome pending; patient has yet to consult with either of the above.

1688 Board #324 May 30 3:30 PM - 5:00 PM
Tumbling Triceps in Gymnastics
Alicia Gende, Mederic Hall. University of Iowa, Iowa City, IA.
Email: alicia-gende@uiowa.edu
(No relationships reported)

HISTORY: 21-year-old female, D-1 gymnast, with 2 weeks of tight and achy right triceps pain. Athlete noted pain after practice, denies specific injury. Her pain is worse with resisted elbow extension. She is treating conservatively, rehabbing with ATC with strengthening both shoulder and arm, and is now tolerating forward tumbling, but soreness remains with backward tumbling. She feels she has plateaued in progress.

DIFFERENTIAL DIAGNOSIS:
1. Grossly unremarkable, no ecchymosis or swelling. She has tenderness to triceps muscle belly without palpable muscle defect. ROM and strength are intact at her shoulder and elbow. She is neurologically intact distally. DDx: Triceps tear, triceps tendinopathy, shoulder pathology TEST & RESULTS: MSK US proximal, mid belly of long head of triceps muscle fiber disruption with 2 cm fiber gap and hematoma. Extensive hyperemia in zone of injury and 8 m of fascial thickening. Active contraction demonstrates fiber gap without contraction at zone of injury and abnormal contraction of surrounding fibers. FINAL WORKING DX: Acute tear of right triceps, long head, grade 2b TREATMENT & OUTCOMES: Platelet-rich plasma injection into triceps tear followed by compression and 2 days rest. Progressive, sport-specific, pain-free strengthening with ATC guidance. Athlete avoided weight bearing on hands and stretching of triceps. She tolerated dance and trampoline work without issue. Upon reaching 8% speed/power without pain or functional limitation, 2 weeks after diagnosis, we performed serial US exams to evaluate tissue healing and guide progressive muscle loading. 2 week US demonstrated decreased fascial thickening, 2 cm fiber gap w/hyperemia persisted. Absent contraction at site of injury remained, abnormal contraction of surrounding fibers was improved. Continued rehab, did not progress beyond 8% at this time regardless of pain-free status. 4e week US revealed resolution of hematoma and fascial edema. Mild hyperemia remained at zone of injury. Some abnormal contraction at site of injury present, and normalized contraction of surrounding fibers. Athlete was released to gradually RTP under ATC guidance. Athlete progressed overhead loading, reached 100% power/speed and was advanced to forward and eventually backward tumbling. She tolerated full RTP 8e weeks after initial US. Athlete remains without re-injury.
X-ray Knee 4/1: e ws Left: avulsion fracture of lateral femoral condyle-m minimally displaced
Medial knee without contrast: popliteus tendon rupture with retraction. Edema surrounding ACL.

Final / Working Diagnosis
Left popliteus tendon femoral avulsion

Discussion
Isolated popliteus tendon rupture is a rarely reported finding in the literature. The vast majority of popliteus tendon ruptures occur in combination with other ligamentous injuries specifically in the posterolateral structures of the knee. Generally, reported cases are treated non-operatively with a high rate of return to play at previous level.

Outcome
Patient was evaluated by an orthopedic surgeon at Andrews Sports Medicine and Orthopedic Center in Birmingham, AL and underwent arthroscopic left popliteus tendon repair

Return to Activity and Follow Up
After surgery the patient followed an ACL rehabilitation protocol, weight bearing as tolerated in a controlled motion brace, locked in extension for two weeks and began physical therapy after his initial post-operative appointment two weeks after surgery. At his 2-week post-operative appointment he could walk off crutches and weight bear as tolerated with his knee brace locked in extension. Physical therapy following ACL rehab protocol was initiated for the next 4 wks, allowing for range of motion exercises out of the brace. After six weeks total he was released to return to full activities.

2170 Board #326
May. 30 3:30 PM - 5:00 PM
Hurting Humeri in a Teenage Fencer
Jacob Jones, William Meehan, III. Boston Children's Hospital, Boston, MA.
Email: jacob.jones@childrens.harvard.edu

HISTORY: Patient is a 13-year-old right-hand-dominant male fencing athlete who presented with one year of intermittent right upper arm pain without a specific injury. The pain was diffuse throughout the entire upper arm. The dull, achy pain rated 5/10 and lasted weeks at a time. The pain was worse at night, causing him to cry. Advil and BenGay helped with the pain. PT did not seem to help. He had seen by two other physicians previously and had a working diagnosis of referred pain from the shoulder. He had shoulder x-rays that were reportedly normal. After initial evaluation and imaging, the patient rested and restarted upper extremity PT. At 2 month follow-up, he endorsed similar symptoms on his left upper extremity, despite not using the arm for any strenuous activities apart from PT.


TEST AND RESULTS: Right humerus xray: Cortical thickening of the right mid humeral shaft, consistent with periosteal reaction. Mottled cortical thickening which could represent an atypical stress reaction location. Left humerus xray: Unremarkable. Right humerus MRI: Diffuse, primarily diaphyseal marrow and periosteal edema of the right humerus. Findings could be consistent with chronic stress injury. Left humerus MRI: Diffuse bone marrow edema of the left humerus, with adjacent periosteal and mild muscular edema, consistent with left humeral stress reaction with no fracture line. Labs: BMP, Mg, TSH, Free T4, TH, Vit D, Celiac panel are normal. Phos mildly elevated. FINAL WORKING DIAGNOSIS: Bilateral humeral stress reactions

TREATMENT AND OUTCOMES: PT to work on upper extremity strengthening. Rest from fencing for 3 months. Recommended formal evaluation by bone specialist but family declined. Patient returned to full fencing activity 6 mos after his initial right arm stress injury diagnosis without any return of symptoms.

2171 Board #327
May. 30 3:30 PM - 5:00 PM
Different Strokes for Different Folks
Shannon Carroll. Edward Via College of Osteopathic Medicine at Auburn University, Auburn, AL.

HISTORY: A 21 year-old right-hand dominant Division 1 women’s golfer presented with gradual onset right wrist pain starting July 2018 with no change in grip, pronation,和技术, grip or shaft, but did increase tournament play over the summer. She was initially diagnosed with radiocarpal impingement and treated with posterior deltoid release with anterior subcutaneous nerve transposition with a nerve protection wrap, possibly reflecting low-grade stress reaction, intact UCL, anomalous epineurial branch identified. T2-weighted axial images 11-12-11/09 Right Upper Extremity EMG/NCV - no evidence of right cervical radiculopathy or ulnar neuropathy 2/19 Right Upper Extremity Dynamic EMG/NCV. No significant change in activity, recruitment or motor unit seen pre-or post-exertion of right upper extremity; parenthetically despite normal studies, significant tenderness palpated in the area of the anconeus/flexor carpi ulnaris origin on the median elbow region

PHYSICAL EXAMINATION: Right Wrist/Hand: No muscular atrophy, full range of motion active and passively, non-tender to palpation, ligamentously stable Right Elbow: No soft tissue swelling, bruising, or muscle atrophy, tender to palpation over the flexor pronator mass, medial epicondyle, and sublime tubercle with resisted digital flexion and wrist flexion as well as pronation, stable in varus and valgus at 0 and 30 degrees, positive Tinel’s test and elbow flexion test, positive subluxable ulnar nerve, negative moving valgus test, negative Milking maneuver, decreased sensation in the distribution of the ulnar nerve, negative Froment sign, negative Scott Earl test, negative Wartenberg syndrome. DIFFERENTIAL DIAGNOSIS: 1. Medial Epicondylitis 2. Cubital Tunnel Syndrome 3. Flexor Pronator Syndrome

TEST AND RESULTS: 8/2/19 MRI Right Elbow - minimal tendinopathy of the common flexor tendon without tear, small spurring at the sublime tubercle with subtle marrow edema, possibly reflecting low-grade stress reaction, intact UCL, anomalous epineurial branch identified. T2-weighted axial images 11-12-11/09 Right Upper Extremity EMG/NCV - no evidence of right cervical radiculopathy or ulnar neuropathy 2/19 Right Upper Extremity Dynamic EMG/NCV - no significant change in activity, recruitment or motor unit seen pre- or post-exertion of right upper extremity; parenthetically despite normal studies, significant tenderness palpated in the area of the anconeus/flexor carpi ulnaris origin on the median elbow region

DIFFERENTIAL WORKING DIAGNOSIS: Dynamic Compression of Ulnar Nerve secondary to Anconeus Epineurial Branch with Medial Epicondylitis

TREATMENT AND OUTCOMES: Surgical cubital tunnel release with anterior subcutaneous nerve transposition with a nerve protection wrap, neurolysis of the posterior medial antebrachial cutaneous nerve and excision of the Flexor Carpi Ulnaris. Post-operatively she will be in a long arm splint for two weeks followed by a removable long arm splint with 30 degrees extension at the wrist and 90 degrees flexion at the elbow. Continue progression at 4 weeks post-operatively to full active range of motion, then 6 wks full passive range of motion if indicated. At 8 weeks patient can begin sport-specific activity with full return to play after 12 weeks of post-operative recovery.

S472 Vol. 51 No. 5 Supplement

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

ACSM May 28 – June 1, 2019
Orlando, Florida

THURSDAY, MAY 30, 2019
Institutions: Authors: Joshua Wilner, MD, Michael Fong, MD (Sponsor: Aaron Rubin, FACSM)

A Jaw Crushing Line Drive in a Baseball Pitcher

He was referred for a second opinion to a neurosurgeon regarding clearance for return to play. Although he had wrestled for 20 years without issues, he did sustain a congenital cervical canal stenosis.

PHYSICAL EXAMINATION: A young healthy male in no distress. Normal ambulation. Neck range of motion demonstrated full flexion, but 50% in extension, right and left rotation and lateral tilting. Pain reproduced with neck extension. There were no wound complications.

Final Diagnoses: Mandible dislocation

Test and Results:

1. Non-displaced left subcondylar mandible fracture
2. No fracture of right body of mandible
3. No acute intracranial hemorrhage or pathology

Facial laceration Treatment and Outcomes:

1. Mandible fracture was treated with observation and soft diet for 4 wk.
2. All concussion symptoms resolved within 4 da ys, and the patient graduated return to play protocol.
3. The laceration was treated with simple interrupted suture repair for 3 da ys. There were no wound complications.

The patient returned to full baseball activities 4 wk after date of initial injury.

A Jaw Crushing Line Drive in a Baseball Pitcher

18 yo M football player presented to college training room clinic with painful right-sided neck swelling after blunt neck trauma from another player’s shoulder pad 2 weeks prior. He had presented to ER 2 days after the incident with acute neck pain and limited ROM, headaches, and difficulty concentrating. CT head & cervical spine were unremarkable. Diagnosed with concussion and SCM strain. He started concussion and muscle strain rehab. Concussion symptoms improved over the next two weeks, but his cervical pain and ROM didn’t, and his neck became more swollen. He denied recent illness, cough, rash, fever, chills, dyspnea, dysphagia. POCUS was performed before referral to ER.

PHYSICAL EXAMINATION: VS: Normal; Gen: No acute distress HEENT: tender 3 x 3 cm subcutaneous mass on the antero-lateral neck, no bruits appreciable; MSK (Neck): tenderness to palpation along the entire right SCM, no spinous process tenderness, decreased lateral flexion and rotation towards the contralateral side; Card: Regular rate and rhythm, no murmurs; Resp: Clear bilaterally

DIFFERENTIAL DIAGNOSIS: Occult cervical spine fracture, Intramuscular infection, Ruptured sternocleidomastoid, Internal jugular thrombosis, Arterial pseudoaneurysm

TEST AND RESULTS: POCUS: diffuse heterogeneous regions throughout the SCM musculature, increased vascularity; ED Labs: WBC: 15.40; ED CT Neck with Contrast: diffuse inflammation of the right SCM muscle with multiple intramuscular abscesses collections in the deep aspect, largest measuring 2.1 x 2.4 x 6.0 cm with associated narrowing of the right internal jugular vein. POCUS was performed before referral to ER.

Diagnosis: Cervical Spine AP and Lateral Radiographs: Seven cervical vertebrae seen in AP view. Pedicle shadows intact. Lateral view shows loss of cervical lordosis. Intervertebral disc spaces are well maintained.


MRI Cervical Spine WO Contrast: No evidence of acute injury. Multilevel cervical spondylosis with congenital stenosis with the diameter of the spinal canal measuring 6-7 mm. No significant CSF surrounding the spinal cord.

Torg ratio measured on all imaging had values of 0.7 or less.

FINAL/WORKING DIAGNOSIS:

Cervical Cervical Stenosis with associated Cervical Cord Neurapraxia and Cervical strain TREATMENT AND OUTCOMES:

Based off of imaging and Torg ratio of 0.7 or less, the athlete was not cleared to return to participation. Although he had wrestled for 20 years without issues, he did sustain a transient spinal cord injury necessitating a visit to the ER. He was referred for a second opinion to a neurosurgeon regarding clearance for return to play.

A Jaw Crushing Line Drive in a Baseball Pitcher

3. Mandible dislocation

Test and Results:

1. Non-displaced left subcondylar mandible fracture
2. No fracture of right body of mandible
3. No acute intracranial hemorrhage or pathology

Final Diagnoses:

Mandible dislocation

Facial laceration

TREATMENT AND OUTCOMES:

The patient presented with atypical shortness of breath and atypical shortness of breath. The patient was referred to the emergency room for further evaluation and imaging.

DIFFERENTIAL DIAGNOSIS:

Mandible fracture

Mandible dislocation
She was referred to pediatric rheumatology for further management. Her symptoms resolved and she remained symptom-free for 2 months.

**TREATMENT AND OUTCOMES:**

- Eosinophilic fasciitis

**FINAL/WORKING DIAGNOSIS:**

- Severe eosinophilic inflammation, no bacterial growth

Tissue biopsy and cultures:

- Normal

CBC, CRP and ESR:

- Within normal limits, preserved ejection fraction and without significant stenosis or regurgitation

Spirometry—FVC 3.3L, FEV1 3.0L, FEV1/VC 0.5

 Spirometry—P —ost albuterol administration — FVC 3.3L , FEV1 3.0L, FEV1/VC 0.5

N — Northern long volumes

FLEX: "Laryngeal obstruction, vocal cord dysfunction"

**TREATMENT AND OUTCOMES:**

1. Referred to Otolaryngologist for diagnosis and treatment; diagnosed with Exercise-Induced Laryngeal Obstruction as diagnosis of exclusion. 2. Treated with boxot to the bilateral thyro-arytenoid muscles on 3 separate occasions separated by 4 weeks with positive clinical response. 3. Regular behavioral voice/speech therapy with Speech Language Pathologist tolerated well. 4. Port psychology counseling was utilized and subjectively helpful to address the underlying anxiety associated with her dyspnea. 5. Patient with improved exercise tolerance, although continues to have symptoms and was unable to return to NCAA Division 1 competition level.

**2177 Board #333 May. 30 3:30 PM - 5:00 PM**

**Eosinophilic Fasciitis Presenting as Benign Subcutaneous Emphysema**

Karim Elghawy, Aditya Mehta, Karen Bovid, Robert Baker, FACSM. Western Michigan University, Homer Stryker MD School of Medicine, Kalamazoo, MI. (Sponsor: Robert J. Baker, FACSM)

(No relationships reported)

**HISTORY:** A previously healthy 12 year old female presented with left forearm pain and subcutaneous crepitus of one week duration. She sustained a minor fall 6 weeks ago where she scratched her forearm against a wooden deck. No bruising, cut wounds or penetrating injury. Few days later she developed dull aching pain and subcutaneous crepitus at the front of her left forearm. No redness, warmth, swelling or limitation of movement. X-rays showed air under the skin. She was started on oral antibiotic without improvement. Ten days later, she was admitted to the hospital and started on IV antibiotics with partial improvement. After 2 days she was discharged on oral antibiotics. Symptoms resolved within 10 days of discharge. A week from finishing antibiotics, she presented with similar symptoms without new injuries. No fever, malaise, weight loss or joint pains. She has family history of JIA in a 19 year old brother and Psoriasis in a 15 year old sister.

**PHYSICAL EXAM:** She looked non-ill and non-toxic with normal vital signs. There was no malaise, weight loss or joint pain. No localized swelling, erythema or fluctuation. Normal active range of motion with respiration and phonation.

**DIFFERENTIAL DIAGNOSIS:**

1. Necrotizing fasciitis
2. Benign subcutaneous emphysema
3. Autoimmune disease

**TESTS AND RESULTS:**

- Forearm AP and lateral radiographs:
  - Moderate subcutaneous gas in the left volar forearm
- MRI left forearm:
  - Subcutaneous, muscle as well as superficial and deep fascial edema suggestive of cellulitis, myositis and fasciitis. Multiple foci of gas within the subcutaneous tissues and deep fascia- No osteomyelitis or abscess
- CBC, CRP and ESR:
  - Normal

**Treatment and Outcomes:**

1. Immobilization in CAM boot for 6 weeks caused no improvement in pain or swelling.
2. Physical therapy for 6 weeks led to improved balance and walking mechanics, but no change in pain.
3. Corticosteroid injection to peroneal tendons at level of lateral malleolus lead to no improvement.
4. Podiatry referral and surgery including tunneling of peroneal tendons, creation of 6mm fibular groove and repair of peroneal retinaculum. 3 months post-operatively, the patient was full weight bearing pain free with daily activities in lace-up ankle brace.
he was unable to complete any overhead or chest work due to pain. The pain is focal over the anterior-lateral shoulder with no radiation. No numbness or tingling. He is unsure if his weakness is due to pain or a separate issue.

PHYSICAL EXAMINATION: There was no bony abnormality or muscle atrophy. Patient had full active range of motion of the left shoulder in forward flexion and abduction, with mild pain at end range. Passively, he had 100% range of external rotation and 140° range of internal rotation with arm abducted to 90° degrees. There was tenderness to palpation along the distal clavicle and acromion, as well as over the supraspinatus, infraspinatus, teres minor/major, biceps, and anterior deltoïd. Jobe’s test positive for pain and weakness. Positive cross-arm test. Negative Hawkins’, Neer’s, O’brien’s, Speed’s, and Yergason’s. Pain with resisted external rotation and shoulder abduction. Strength was 5/5 with bilateral deltoid, biceps, triceps, wrist extenders, finger flexors, and finger abductors, but 4/5 during resisted left glenohumeral external rotation due to pain.

DIFFERENTIAL DIAGNOSIS: 1) Glenohumeral subluxation 2) Rotator cuff tear 3) Labral tear 4) AJ joint sprain/separation 5) Clavicle fracture

TESTS AND RESULTS: 1) XR Chest from ER visit for unrelated incident: Visualized left clavicle normal, shoulder not visualized. 2) MRI left shoulder without contrast: Nondisplaced fracture of the distal clavicle with associated bony edema of the clavicle and acromion at the AC joint with mild surrounding soft tissue edema. Low grade tendinosis of the infraspinatus and supraspinatus with suspicion for a tiny undersurface tear without retraction.

3) XR Clavicle: Clavicle is intact and negative for fracture.

FINAL WORKING DIAGNOSIS: Nondisplaced fracture of distal clavicle

TREATMENT AND OUTCOMES:

1. Given no signs of fracture healing after 3 months, ordered laboratory work which revealed Vitamin D deficiency. Patient started on Vitamin D 1200mg and Calcium 800mg daily.
2. Activity modified to abstain from weight bearing exercises through the left upper extremity until next follow up visit.

2181 Board #337 May. 30 3:30 PM - 5:00 PM Osteitis Pubis: A Career Ending Diagnosis?

Stephen Sanker, Amanda Goodale. TriHealth, Cincinnati, OH. (Sponsor: Henry Steine, FACSM)

(No relationships reported)

HISTORY: A 19-year-old Division III collegiate basketball player presents with gradual onset of right groin pain during training. There is no known acute injury. He notes increasing pain during basketball workouts which occurs with running, squatting, and standing from a seated position. There are no radiacular symptoms. No numbness, tingling. No genital pain or bulges in the groin. Of note, patient had similar symptoms in high school which reportedly never fully subsided. Treatment has included occasional NSAIDS and intermittent rest.

PHYSICAL EXAMINATION: Skin intact. No warmth, erythema, or swelling. Full active and passive range of motion of bilateral hips, pain at extremes of external rotation. Tender anteriorly at bilateral groin and over pubic symphysis. Mildly tender proximal adductor tendons. Pain with FADIR and FABER testing, resisted straight leg raise, and abdominal crunch 5+ strength of major muscle groups of the lower extremity.

NVI

DX:

1. Hip flexor strain / tear
2. Adductor strain
3. Femoroacetabular impingement syndrome

Osteitis pubis

Athletic pubalgia

TESTING:

AP and lateral Xrays of right hip:

- No acute osseous abnormalities.
- No signs of degenerative changes.
- MRI of the pelvis:
  - Symmetric stress edema on either side of pubic symphysis consistent with osteitis pubis.

FINAL WORKING DIAGNOSIS:

Osteitis Pubis

TREATMENT AND OUTCOMES:

1. Several weeks of rest and oral NSAIDS with mild improvement in symptoms, followed by athletic trainer supervised therapy focused on core and pelvic strengthening.
2. Corticosteroid injection of pubic symphysis two months after initial presentation with modest improvement in symptoms, though short-lived.
3. Patient continues to have significant pain with any increased levels of activity.
4. Recently prescribed topical NSAID.
5. Consult with local surgeon recommended against surgical intervention at this time. Discussed further work-up and treatment options with patient including: protected weight-bearing with crutches, repeat MRI with athletic pubalgia protocol, diagnostic femoroacetabular injection, MRI arthrogram of hips evaluating for labral pathology, platelet rich plasma injections, pubic symphysis excision. Patient has recently been only exercising in limited fashion, and is not currently participating in collegiate athletic due to pain.

2182 Board #338 May. 30 3:30 PM - 5:00 PM Left Knee Pain In A 9-year-old Female

Braden Turner. Kaiser Los Angeles Sports Medicine, Los Angeles, CA. (Sponsor: Aaron Rubin, FACSM)

Email: branden.turner@kp.org

(No relationships reported)

HISTORY: A 9-year-old female presents with 2 years of recurring left knee pain. Patient is unable to extend the knee and has pain with ambulation. History of a fall, 1 year ago and worsening pain at the lateral patella. Patient worked with PT after initial fall with resolution of symptoms. Subsequently, the patient had multiple episodes of acute pain and decreased extension of knee with no acute trauma. Patient was referred to Sports Medicine for further evaluation. There is a 2-year history of symptoms since onset. Patient with 2/10 left lateral knee pain with sensation of pressure and inability to extend.
to completely extend knee. Denies acute trauma. Pain is improved with massage and stretching. Occasional taken NSAIDS for pain management. Denies numbness, tingling, weakness, numbness, redness, fever, or chills. X-ray and US performed in clinic. Subsequent mtr, MRI of left knee was ordered.


**DIFFERENTIAL DIAGNOSIS:** Hamstring hypertonicity, Mass/tumor, Reactive arthropathy, Enteropathic arthropathy, Meniscus tear

**TEST AND RESULTS:** X-ray left knee, standing: flattening of the lateral tibial plateau and tibial spines, no acute fracture, no joint disease, open physi US left knee: normal hamstring tendon and muscle no fluid appreciated along tendon sheath, no pes anserine bursitis, no IT band bursitis, no effusion, meniscus not visualized

MRT Left knee: discoid lateral meniscus with horizontal tear

**TREATMENT AND OUTCOMES:** Left discoid meniscus saccrocomisation and Physical therapy for rehabilitation. Patient doing well after surgery, with return to full activity without pain or other symptoms.
morphology has become increasingly common and has been related to sports injury and menstrual dysfunction among female high school distance runners. The association between sport specialization and low bone mineral density (BMD) is poorly described in this population. **PURPOSE:** To determine the association between sport specialization and low BMD in female high school distance runners.  

**METHODS:** Participants consisted of 64 female runners (age 15.6 ± 1.4y), not currently on birth control medication, who competed in interscholastic cross-country and distance track events in southern California. Each runner completed a survey on sport participation and menstrual function, and had her height and weight measured. Each runner’s spine and hip BMD were assessed using DXA, standardized to BMD Z-score by age and sex normative values. Sport specialization classifications were: low specialization (distance running sport(s) for ≤8 months/year and participation in ≥1 other non-running high school sports); moderate specialization (only distance running sport(s) for ≤8 months/year, or participation in distance running sport(s) ≥9 months/year and ≥1 other non-running sports); and high specialization (participation in distance running sport(s) for ≥9 months/year and no other sports). Multivariable logistic regression was performed to determine the adjusted odds ratio (OR) and 95% confidence interval (CI). Adjusting for BMI and gynecological age, and distance running sport(s) for ≥9 months/year and no other sports. Multivariable logistic regression was performed to determine the adjusted odds ratio (OR) and 95% confidence interval (CI). Adjusting for BMI and gynecological age.  

**RESULTS:** Overall, 21.9% of the runners were high sport specializers, and 37.5% and 40.6% were moderate and low sport specializers, respectively. Twenty-three (35%) runners had low BMD (Z-score ≤ -1.0). After adjusting for gynecological age and BMI, high sport specializers were five times more likely (OR=5.4, 95% CI: 1.3-23.3; p=0.02) to have low BMD. After adjusting for gynecological age and BMI, high sport specializers were five times more likely (OR=5.4, 95% CI: 1.3-23.3; p=0.02) to have low BMD (Z-score < -1.0). After adjusting for gynecological age and BMI, high sport specializers were five times more likely (OR=5.4, 95% CI: 1.3-23.3; p=0.02) to have low BMD.  

**CONCLUSIONS:** Our findings indicated that high sport specialization was associated with low BMD among female high school distance runners. Further investigation of this association is warranted as low BMD has been related to increased risk of stress fracture.

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**Board #4 May 30 6:00 PM - 7:00 PM**

**Association Between Sport Specialization and Low BMD Among Female High School Distance Runners**

Mitchell J. Rauli, Michelle T. Barrack, Adam S. Tenforde, Michael D. Rosenthal, Jeanne F. Nichols, FACSM, FACSM, San Diego State University, San Diego, CA. California State University Long Beach, Long Beach, CA. Spaulding Rehabilitation Hospital/Charlestown Rehabilitation Hospital/Harvard Medical School, Charlestown, MA. University of California San Diego, La Jolla, CA.  

(NO relevant relationships reported)

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**Board #6 May 30 6:00 PM - 7:00 PM**

**International Clinical Scholar Award - Effects of Mistletoe Extract Supplementation on Inflammation Markers after Strenuous Exercise in Runners**

Soo-Min Ha, Jung-Sook Kim, Bo-Sung Kim, Jeong-Ah Lee, Yoong-Jung Choi, Do-Yeon Kim, Pasun National University, Busan, Korea. Rep. of. Kyungsung University, Busan, Korea, Republic of.  

(NO relevant relationships reported)

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**Board #7 May 30 6:00 PM - 7:00 PM**

**Specific Dietary Practices In Female Athletes And Their Association With Disordered Eating**

Celina Francesca de Borja, Lauren M. McCall, Bryan Holtzman, Laura Moretti, Nicole Farnsworth, Kathryn E. Ackerman, FACSM, Boston Children’s Hospital, Boston, MA.  

(NO relevant relationships reported)

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**Board #8 May 30 6:00 PM - 7:00 PM**

**The Effects Of Subconcussive Impacts On The Neurocognitive Function Of Men's Collegiate Lacrosse Players From Pre-season To Post-season**


(NO relevant relationships reported)
**2204**  
**Board #8**  
**May 30 6:00 PM - 7:00 PM**  
**The Impact of Clinical Factors in Physician and ATC Decision Making for Concussion Return to Play: Insight from Policy Capturing Study**  
Darwin McKnight, Vicki Nelson, Franklin Sease, FACSM, Rg Gilliland. Greenville Health System, Greenville, SC.  
(No relevant relationships reported)

**PURPOSE:** To scrutinize the role of several clinical factors in physician and clinical athletic trainer (ATC) return-to-play (RTP) decision making in high school athletes who sustained a concussion.

**METHODS:** Sports Medicine physicians and ATCs completed a policy capturing survey of 8 cases; clinical scenarios and rated how likely they were to clear the athlete for RTP. Nine factors were randomly varied within the scenarios: age, gender, sport, prior concussion, initial symptom score, symptom duration, and ImPACT performance. Participants then ranked how important each variable was in their decision making process.

**RESULTS:** Physicians managed an average of 1.38 concussions per month and 29 ATCs managed an average of 1.28 concussions per month. ImPACT testing was the most significant contributor in RTP decisions. Physicians and ATCs weighed ImPACT changed from baseline (β 0.42 respectfully) most heavily. Respondents self-ranked prior concussion and ImPACT compared to normative values (0.39 respectfully) and ImPACT most influenced RTP decisions. There was no correlation between variables self-ranking of importance and the observed contribution of a variable to process.

**CONCLUSIONS:** Respondents displayed poor insight to the role of various clinical factors in their management of concussion RTP. ImPACT testing has a greater influence on RTP decisions than physicians and ATCs realize. Despite having low self-ranked importance, variables related to ImPACT results were among the most influential. Self-ranking importance of clinical variables is similar between physicians and ATCs; however, symptom duration is less important to ATCs compared to physicians. Although age was considered important in self-ranking it was not a significant contributor to RTP decision making.

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**2205**  
**Board #9**  
**May 30 6:00 PM - 7:00 PM**  
**Spine Injuries and Concussions among Figure Skaters**  
Kristen M. Lambrianakos-Raymond, Greggory Kobelski, Ellen Geminiani, Dai Sugimoto, William P. Meehan, III. Boston Children’s Hospital, Boston, MA.  
(No relevant relationships reported)

**PURPOSE:** To determine the prevalence and mechanism of spine injuries and concussions among a sample population of figure skaters. To assess for potential risk factors for these injuries.

**METHODS:** This is a cross-sectional analysis of spine injuries and concussions reported by figure skaters. Data was obtained through an anonymous, confidential online questionnaire distributed to members of participating figure skating clubs. The main outcomes included diagnoses, mechanism and source of medical care. Simple descriptive statistics were used; Fisher’s exact test was used to assess for statistical differences in categorical variables between groups. SPSS was used for all analyses.

**RESULTS:** Thus far, 89 participants have completed questionnaires (recruitment ongoing). The mean age of participants is 25.2 years (SD 17.1). Most (79%) were female. Seventy-one (79%) reported back pain. The most common diagnosis was muscular back pain. Treatment was primarily guided by primary care (n=10), sports medicine (n=13), physical therapists (n=14) and athletic trainers (n=10). Almost half of those who reported back pain did not present to a health care provider (HCP) (n=32; n/N=11/24). All injuries occurred in practice. More than a quarter (n=24) of participants reported spine injuries/back pain. The most common diagnosis was muscular back pain. Treatment was primarily guided by primary care (n=10), sports medicine (n=13), physical therapists (n=14) and athletic trainers (n=10). Almost half of those who reported back pain did not present to a health care provider (HCP) (n=32; n/N=11/24). All injuries occurred in practice. More than a quarter (n=24) of participants sustained at least one concussion; 3 sustained two concussions. Several (4%; n/N=10/24) skaters did not present to a HCP for evaluation of their first concussion. All concussions occurred during practice and most (62% ; n/N=15/24) were during on-ice activities. The most common mechanism of injury was a fall (38%; n/N=15/24). The sex of the skater was not associated with either mechanism of spine injury or history of concussion.

**CONCLUSIONS:** Nearly a third of skaters sustained a concussion or spine injury, yet nearly half did not report their injuries to a HCP. Our findings warrant further investigation into the reasons for such a low reporting rate among figure skaters and the potential effect on injury outcomes.
E-05  Thematic Poster - Cardiac
Friday, May 31, 2019, 9:30 AM - 11:30 AM
Room: CC-101A

2227  Chair: Daniel A. Boulosa. Universidade Católica de Brasilia, Brasilia, Brazil.
(No relevant relationships reported)

2228  Board #1
May 31 9:30 AM - 11:30 AM
Cardiac Adaptation in Sprint Athletes: A New Phenotype Of Athlete’s Heart?
Jake Samuel1, Samuel Cooke2, Martin Schultz3, Jason Z. Apperly4,5,6, Koki Akizumi2, Marie-Jeanne Buscot2, Eric J. Sür6. 1University of Texas At Arlington, Arlington, TX. 2University of Lincoln, Lincoln, United Kingdom. 3University of Tasmania, Hobart, Australia. 4Columbia University Irving Medical Center, New York City, NY. 5Kyoto Prefectural University of Medicine, Kyoto, Japan. 6Cardiff Metropolitan University, Cardiff, United Kingdom.

While it is widely accepted that chronic endurance exercise training leads to cardiac remodeling called ‘athlete’s heart’, the effects of high intensity interval training on left ventricular (LV) structure and function remain equivocal. PURPOSE: To determine whether the most extreme form of high intensity interval training, namely sprinting, leads to significantly different LV structure and function at rest and during exercise. We hypothesized that sprint athletes (SPR) would have similar systolic wall stress but reduced diastolic function because of the reduced compliance of smaller hearts compared with endurance athletes (ET).

METHODS: Eleven male ET and nine SPR were examined at rest and during progressive exercise (30, 40 & 50% of peak power output). To estimate differences in peripheral blood flow demand, the change in skeletal muscle oxygen saturation (sMOV) during exercise was quantified with near-infrared spectroscopy. LV systolic and diastolic function were assessed using echocardiography (2D, speckle tracking, color M-mode). Modification of Laplace’s Law allowed for the estimation of LV wall stress and function at rest and during exercise. We hypothesized that sprint athletes (SPR) would have similar systolic wall stress but reduced diastolic function because of the reduced compliance of smaller hearts compared with endurance athletes (ET).

RESULTS: Despite a larger peripheral blood flow demand in SPR (ΔsMOV, P < 0.0001) and smaller hearts than ET (LV mass at rest: 95 ± 12 vs. 73 ± 7 g/m², P < 0.0001), cardiac index was similar (2.37 ± 0.15 vs 2.55 ± 0.23 L/min/m², P = 0.44; slope: P = 0.89). In SPR, aortic systolic blood pressure (163 ± 14 vs 115 ± 21 a.u., P = 0.03; slope: P = 0.39). In contrast, diastolic relaxation, as represented by the validated LV untwisting rate, increased more during exercise in SPR (-103 ± 12 vs -94 ± 19 degrees/s, P = 0.64; slope: P = 0.04), but LV blood dynamics, as per intra-ventricular pressure gradients, were comparable (2.79 ± 0.29 vs 2.55 ± 0.44 mmHg, P = 0.48; slope: P = 0.89).

CONCLUSION: Compared to ET, the similar cardiac output with lower LV wall stress and a greater LV relaxation with similar filling dynamics in sprint athletes indicates a specific ‘athlete’s heart’ that is characterized by different associations between demand, haemodynamics and LV mechanical function. Future investigations in patient populations are warranted.

2229  Board #2
May 31 9:30 AM - 11:30 AM
Exercise-Induced Cardiac Fatigue is Similar Across Increasing Trail-Running Race Distances
Alexandra M. Coates1, Katharine D. Currie2, Trevor J. King1, Philip J. Millar1, Jamie F. Burr1. 1University of Guelph, Guelph, ON, Canada. 2Michigan State University, East Lansing, MI.
(Sponsor: Jamie Burr, FACC/S)
(No relevant relationships reported)

A transient reduction in cardiac function following prolonged endurance exercise, termed exercise-induced cardiac fatigue, has previously been reported during events ranging from 2-40hrs. Right-ventricular dysfunction has been demonstrated to occur prior to left-ventricular dysfunction and, similarly, diastolic impairments may occur prior to systolic impairments. While highly-trained athletes are more fatigue-resistant than less-trained subjects, the timing and magnitude of cardiac alterations following prolonged racing is unclear. PURPOSE: The aim of this study was to investigate the effects of varying distance trail running races on cardiac function in recreational runners of varying fitness levels, to determine the dose-response of cardiac fatigue.

METHODS: Forty-three distance runners competing in the Sulphur Springs trail races (25k,n=9; 50k,n=13; 80k,n=13; 160k,n=8) completed pre and post testing measurements including resting echocardiography, and an incremental running test to determine maximal oxygen consumption (VO2max). RESULTS: Mean race durations were as follows: 25k:2.5±1.3hrs, 50k:6.0±2.2hrs, 80k:11.6±1.8, and 160k: 25.2±3.6hrs (all P<0.001). Echocardiographic results indicated diastolic impairments of both ventricles, with minimal systolic impairments, across all race distances post-race. Of the parameters investigated, only early-to-late diastolic filling ratio (E/A) was different between groups such that the 160k racers did not have as great of a reduction (mean Δ=0.51±0.50, 160k A=0.20±0.05, P=0.02). All racers had decreased blood pressure (MAP pre: 94±10 vs post: 83±9mmHg, P<0.0001), and elevated heart rates (pre:55±8 vs post:78±12b/min, P<0.0001) post-race. Fitness (VO2max) and age were not related to changes in cardiac function, whereas race duration was related to changes in E/A ratio (r=0.37, P=0.02) only. Changes in diastolic blood pressure were related to many changes in cardiac function including peak longitudinal strain (r=0.34, P=0.03).

CONCLUSIONS: Prolonged trail-races appear to alter diastolic function regarding race duration, fitness, likely due to similar reductions in blood pressure post-race. A clear relationship between race duration and level of cardiac impairment is not apparent.

2230  Board #3
May 31 9:30 AM - 11:30 AM
Cardiovascular Adaptations During the Hormonal Transition of a Male-to-Female Transgender Athlete
Shannon L. Wilson1, Andrew C. D’Lugos1, Nathan Serrano2, Theresa M. Joannou1, Joanna Harper1, Glenn A. Gaesser1, FACC/S, Jared M. Dickinson1, FACSM2, Siddhartha S. Angadi1, FACSM2, 1Arizona State University, Phoenix, AZ; 2Providence Portland Medical Center, Portland, OR.
(No relevant relationships reported)

PURPOSE: Cardiovascular consequences of female sex hormone exposure on human male biology are currently unknown. This level of investigation is critical given potential adverse outcomes reported in rodent models. This case study aimed to comprehensively assess cardiovascular phenotypes before and during estrogen treatment for gender reassignment.

METHODS: This is the case of a biologically male, distance runner (28 yr) undergoing male-to-female gender reassignment. Two baseline assessments were made prior to initiation of hormone treatment. Testing following initiation of estrogen treatment took place at 4-8 week intervals depending on subject’s availability. Testing included resting echocardiography for assessment of biventricular function, dual energy x-ray absorptiometry (DXA), and central vascular blood pressures and stiffness assessments. Treadmill-based VO2peak and running economy, as well as non-invasive cardiac output and aV02 difference at rest and at peak exercise were quantified at each visit.

RESULTS: Throughout the first 12 months of treatment, stroke volume decreased (136 to 80 ml/beat) with an initial reduction in peak heart rate (ranged 188-180 bpm). Consequently, peak cardiac output declined (28.4 L/min to 15.5 L/min) while aV02 difference increased (11.6 to 19.9 ml O2/100 ml blood). This resulted in only a minor decrease in absolute VO2max (3.3 to 3.1 L/min). Ejection fraction (calculated using modified Simpson’s method via echocardiogram) decreased (61% to 57%) along with left ventricular diastol (mitral valve E/e 6.0 to 4.1). Right Ventricular Fractional Area change was unaffected (53% to 53%), while measures of right heart diastol (tricuspid valve E/e 3.9 to 4.6). Both right ventricular (RV) and left ventricular (LV) strain initially improved with the addition of estrogen, before worsening over the course of hormone treatment (RV strain ranged from -36 to -31.5%; LV strain ranged from -23.5 to -19%).

CONCLUSIONS: Therapeutic estrogen administration and testosterone blockade may adversely affect cardiopulmonary fitness via reduction in myocardial performance at peak exercise. This may be associated with a worsening of LV and RV strain at rest. More research is needed to examine the long-term effects of gender reassignment therapy on cardiovascular function.

2231  Board #4
May 31 9:30 AM - 11:30 AM
Cardiovascular Disease Risk In Middle-Aged Ultra-Endurance Athletes
Nate P. Bachman1, Janéé D. Terwood1, Jennifer C. Richards2, Barry Braun1, FACC/S, 1, Patrick Green1, 2, Glenn A. Dinennon1, 2, Andrew C. D’Lugos1, 2, 1Colorado State University, Fort Collins, CO; 2Medical Center of the Rockies Foundation, Loveland, CO.
Email: nbachman@colostate.edu
(No relevant relationships reported)

It is widely accepted that aerobic exercise reduces cardiovascular disease (CVD) risk. However, recent studies suggest that volumes of exercise that greatly exceed physical activity guidelines may be damaging to the heart. Currently, it is unclear if individuals who train for ultra-endurance races have an elevated risk of developing CVD compared to those that perform lower amounts of physical activity. Additionally, little work has been done to examine cardiac function in these athletes. PURPOSE: To evaluate cardiovascular function and calculate CVD risk to determine if athletes who train for ultra-endurance races have a greater risk compared to individuals that engage in moderate physical activity. METHODS: We examined cardiovascular function...
function in athletes (ATH, 14M/11F, 50±1 y) that had been training for ultra-endurance events for 10+ years and controls (CON, 9M/9F, 40±2 y) that were meeting current ACSM physical activity guidelines. We used cardiac computed tomography (CT) to calculate coronary artery calcium scores (CACs) and contrast-enhanced magnetic resonance imaging (MRI) to identify myocardial fibrosis (MF). Carotid-femoral pulse wave velocity (cPWV) was used to evaluate aortic stiffness and ultrasound assessment of carotid intima-media thickness (CIMT) was used to determine vascular structure of the carotid artery. Additionally, we used Doppler ultrasound to assess vascular endothelial function by measuring flow-mediated dilation (FMD) of the brachial artery. Finally, we used a risk score calculator to determine 10-year CVD risk. RESULTS: CACS > 0 was observed in 8 ATH and 2 CON; however, the presence of CAC was not significantly different between groups (P=0.05). Additionally, no participant in ATH or CON had MF. ATH had lower cPWV compared to CON (6.2±0.2 vs 6.9±0.2 m/s, P=0.05), while no difference in CIMT (ATH: 0.64±0.02 vs CON: 0.62±0.03 mm, P=0.05) or FMD (ATH: 3.6±0.8 vs CON: 5.6±1.2 %, P=0.05) was observed. Furthermore, there was no group difference in calculated CVD risk (ATH: 2.4±0.6 vs CON: 1.6±0.3 %, P=0.05). CONCLUSION: Middle-aged ATH with 10+ years of training for ultra-endurance races are not at a greater risk of developing CVD than individuals that are meeting current physical activity guidelines.

2233 Board #6 May 31 9:30 AM - 11:30 AM Right Ventricle Systolic And Diastolic Function In Renal Transplant Recipients after 12 Months Of Unsupervised Exercise Training
Laura Stefani1, Beatrice Leone2, Elena Zappelli1, Gianni Pedrizzetti3, Giorgio Galanti1, Pietro Amedeo Modesti4. 1Sports Medicine-FIMSI (Italian Federation of Sport Medicine), Florence, Italy. 2Sports Medicine, Florence, Italy. 3Engineering and Architectural department -University of Trieste, Florence, Italy. 4Sports Medicine-Center University of Florence, Florence, Italy.

Purpose: RV function is strongly associated with clinical outcomes in the population at high cardiovascular risk. The RV chamber has been largely studied especially in the cardiopulmonary disease as predictive aspect for a reduced exercise capacity. More recently particularly deformation parameters as Speckle tracking echocardiography (STE) is applied as imaging technique for an accurate evaluation. Renal Transplant Recipient(RTR) is the new category involved in the physical activity program despite the high CV risk. The study aims to assess the global RV function in the RTR regularly submitted to physical activity(PA) at moderate intensity for 1 yr. Methods: a group of 50 RTR, aged 50±5, was trained for 1 year following a mixed exercise program 30 subjects with a high quality of image and trained for at least 3 times a week, were followed by echocardiographic exam every 6 months. They were investigated by 2D RV standard parameters and strain analysis by X-Strain software with the measurement of the Free wall (FW) of the RV at T0, T6, and T12 months. Results: RTR had at initial phase, low values of RVFW strain with respect of the normal range and vs to the HC ; The RVFW strain was found significantly(P<0.01) increased at the end of the exercise program , restoring the normal range. The RV diastolic function maintained normal with a significant(p<0.05) and progressive adjustment of the E/A ratio in RTR only . No significant variations in controls.

CONCLUSION: One year of moderate intensity of unsupervised physical exercise improves the RV chamber performance. The investigation of both of the systolic and diastolic parameters and by the strain analysis can contribute to a correct follow-up in RTR patients. This approach could be proposed especially in case of complete asymptomatica and during physical exercise program . More data will be necessary in future to support this hypothesis.

2234 Board #7 May 31 9:30 AM - 11:30 AM Cardiac Reinnervation Affects Blood Pressure and Cardiorespiratory Adaptation to Exercise after Heart Transplant
Emmanuel G. Ciolac1, Raphael E. Castro2, Awassi Y. Ggomane1, Ariane A. Viana2, Fernando Bacal3, Emmanuel G. Ciolac1, Günter V. Guimarães3, 1University of São Paulo - UNESP, Bauru, Brazil. 2University of São Paulo - USP, São Paulo, Brazil. 3University of São Paulo - USP, São Paulo, Brazil.

PURPOSE: To investigate the hemodynamic and cardiorespiratory adaptation to exercise in individuals with heart transplantation (HTx) with (CR group) versus without evidence of cardiac reinnervation (NOCR group).

METHODS: Sedentary individuals with HTx (age = 45 ± 2.2 years; time elapsed since surgery = 6.7 ± 0.7 years) were allocated to the CR (N = 16) and NOCR (N = 17) group according to their heart rate response to cardiopulmonary exercise testing (CPX). 24-h ambulatory blood pressure (BP), carotid-femoral pulse wave velocity (PWV) and cardiorespiratory fitness were assessed before and after 12 weeks of a thrice-weekly exercise program (5 min of warm-up, 30 min of aerobic exercise, 1 set of 10-15 reps in 5 resistance exercises, and 5 min of cool-down).

RESULTS: The CR group had reduced (P < 0.01) 24-h systolic/diastolic BP (79 mmHg), daytime systolic/diastolic BP (90/61 mmHg) and nighttime diastolic BP (67/41 mmHg) as compared to NOCR group (P < 0.05). In addition, the latter group had increased heart rate (20 ± 3 vs 15 ± 2 bpm, P < 0.05) and lower number of chest pain episodes (20 ± 4 vs 3 ± 2, P < 0.05).

CONCLUSION: Heart transplantation is associated with altered cardiorespiratory and cardiovascular responses to graded exercise. These results suggest that cardiac reinnervation plays a role in the cardiovascular response to exercise.
**Conclusion:**

For recreational athletes, drop-landings (SJ) (p<0.05) produced lower extremity joint power compared to double-leg landings (SJ and DVJ) (p>0.05). For single-leg landing, the mean±SD of the knee joint power was calculated. One way repeated measures ANOVA was used to examine the sex-specific differences and the differences between the landing tasks, with and without patellar tendinopathy. The CR group also improved both maximal oxygen consumption (10.8 %) and exercise tolerance (13.4 %) after training, but the NOCR group improved only exercise tolerance (9.9 %). PWV did not change in both groups.

**Methods:**

On four separate occasions, 11 female recreational athletes (22±2 yr, 65±7 kg, 1.67±0.06 m) performed drop-landings (single-leg and double-leg landings) from a 0.6-m height following 30-minute immersion in thermoneutral water (22±2 °C) to the hip-joint level and in cold-water (20 °C) to the ankle- (LOW), knee- (MED), and hip- (HIGH) joint levels. 3D motion capture was conducted. Lower-extremity joint power was calculated. One way repeated measures ANOVA was used to compare sex differences and the differences between the landing tasks, with and without patellar tendinopathy.

**Purpose:**

To investigate sex-specific differences in lower extremity landing mechanics between the SJ and DVJ. METHODS: Fifty healthy participants, 26 male (23±3 years, 1.79±0.64 m, 78.8±10.7kg) and 24 female (23±3 years, 1.67±5.9m, 61.4±6.5kg), were recruited and signed informed consent. Participants performed seven trials per task (SJ and DVJ). Data was collected using a modified Helen Hayes marker set and a ten-camera motion capture system (120 Hz) time synchronized with 2 embedded force plates (1440 Hz). Peak posterior GRF (pGRF), vertical GRF (vGRF), peak knee flexion (KF) and abduction/adduction (KA) angles, KF and KA range of motion (ROM), and peak knee extension (pKEM) and abduction moments (pKAM) were quantified for the dominant limb. To examine the sex-specific differences and the differences between the landing tasks, a 2x2 mixed model, repeated measures ANOVA was conducted in SPSS (α=0.05).

**Results:**

No main effects for female sex were found for the pKEM or KA ROM. Main effects for landing and sex were found for peak KF moment and angle (Table 1). Interactions between sex and landing type existed for the remaining variables of interest (Table 1). CONCLUSION: Landing mechanisms are different between the SJ and the DVJ with and these responses are sex dependent. Therefore, selection of the landing task could influence results and needs to be considered when assessing injury risk as well as return to sport readiness.

**Table 1:** Sex and landing task differences.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Female SJ</th>
<th>Male SJ</th>
<th>Female DVJ</th>
<th>Male DVJ</th>
<th>Interaction</th>
<th>ME Landing</th>
<th>ME Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak KA Angle (deg)</td>
<td>-5.4±0.8</td>
<td>5.7±0.7</td>
<td>5.8±0.6</td>
<td>6.0±0.8</td>
<td>0.911</td>
<td>0.003</td>
<td>0.001</td>
</tr>
<tr>
<td>Peak KA Moment (N.m)</td>
<td>0.6±0.5</td>
<td>0.0±0.3</td>
<td>0.3±0.1</td>
<td>0.3±1.0</td>
<td>0.755</td>
<td>0.022</td>
<td>0.006</td>
</tr>
<tr>
<td>pGRF (N)</td>
<td>15.9±0.3</td>
<td>17.0±0.4</td>
<td>18.0±0.4</td>
<td>18.0±0.3</td>
<td>0.045</td>
<td>0.001</td>
<td>0.409</td>
</tr>
<tr>
<td>pKEM (N.m)</td>
<td>4.0±0.4</td>
<td>5.1±0.1</td>
<td>6.4±0.2</td>
<td>6.0±0.1</td>
<td>0.032</td>
<td>0.125</td>
<td>0.816</td>
</tr>
<tr>
<td>pGRA (N.m)</td>
<td>15.6±12.5</td>
<td>52.6±16.0</td>
<td>60.2±16.0</td>
<td>61.2±15.1</td>
<td>0.021</td>
<td>0.023</td>
<td>0.007</td>
</tr>
<tr>
<td>Knee ROM</td>
<td>204.9±34.5</td>
<td>120.8±18.5</td>
<td>176.1±13.2</td>
<td>135.4±25.0</td>
<td>0.082</td>
<td>0.297</td>
<td>0.016</td>
</tr>
</tbody>
</table>

**Abstracts were prepared by the authors and printed as submitted.**
data points across stance phase (0–100%), and plotted with 95% confidence intervals for each group. Statistical significance was defined as a lack of 95% CI overlap for ≥ 3 consecutive %; area under mean differences (MD) were calculated.

RESULTS: SYM-PTA had lesser KF than CON over stance phase (8.76%; MD: 15.81±2.7°). ASYM-PTA had lesser KF than CON in the early (8–13%; MD: 8.00±0.4°; 21–24%; MD: 11.11±0.32°) and late (74–94%; MD: 9.6 ± 1.1) stance phase. SYM-PTA group had lesser KEM than CON in early stance (6.5%-9%; MD: 0.04 ± 0.004 Nm[kg^-1]); as well ASYM-PTA in mid-stance of overloads compared to CON. Our findings support the use of individualized treatments for athletes along the continuum of patellar tendinopathy to maximize load-bearing capabilities of tendon.

CONCLUSIONS: Male athletes with SYM-PTA demonstrated a PT load-avoidance profile during a double-limb landing task compared to ASYM-PTA and CON athletes. ASYM-PTA did not demonstrate biomechanical differences among loading conditions. Future research should be investigated in a prospective trial.

2239 Board #4 May 31 9:30 AM - 11:30 AM Is Visual-Cognitive Loading During Jumping A Potential Risk Factor For Sports Injuries? 
Jan Wilke, Florian Giesche, Daniel Niederer, Tobias Engeroff, Sebastian Barabas, Saskia Tröller, Lutz Vogt, Winfried Banzer, FACSM. Goethe University Frankfurt, Frankfurt am Main, Germany.
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(No relevant relationships reported)

PURPOSE: Failed jump landings represent a key mechanism of musculoskeletal trauma. It has been speculated that cognitive dual-task loading during the flight phase may moderate the injury risk. This study aimed to explore whether increased visual distraction can compromise landing biomechanics.

METHODS: Twenty-one healthy, physically active participants (15 females, 25.8±0.4 years) completed a series of 30 counter-movement jumps (CMJ) the use of an arm swing and overhead target on force plates sampled at 1 kHz. For both conditions, participants stood in the middle of the force plates, performed jumps. Outcomes included the number of recall errors as well as landing errors and movement velocity.

RESULTS: Reaction forces (N). Performance outcomes included peak force (PF, N), peak rate of force development (pRFD, N’s), peak power (PP, W), and eccentric impulse (ECC, Ns) were used to compare means between CMJA and CMJ conditions.

RESULTS: There were no differences between CMJA and CMJ for PF (CMJA=102.5±17.6 Ns, CMJ=88.1±17.5 Ns, p=0.015). Reducing eccentric pre-loading, while increasing power production is optimal for youth performance testing. Since PF, pRFD, and CON were not different, while ECC was lower during CMJA, it may moderate the injury risk. This study aimed to explore whether increased visual distraction can compromise landing biomechanics. Our findings support the use of individualized treatments for athletes along the continuum of patellar tendinopathy to maximize load-bearing capabilities of tendon.

CONCLUSIONS: Including an arm swing and reaching for an overhead target resulted in 23% greater PP with 14% less ECC during the vertical jump test. Reducing eccentric pre-loading, while increasing power production is optimal for youth performance testing. Since PF, pRFD, and CON were not different, while ECC was lower during CMJA, it may moderate the injury risk. This study aimed to explore whether increased visual distraction can compromise landing biomechanics. Our findings support the use of individualized treatments for athletes along the continuum of patellar tendinopathy to maximize load-bearing capabilities of tendon.

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2240 Board #5 May 31 9:30 AM - 11:30 AM Effects of Arm Swing and Overhead Target on Vertical Jump Performance in Children and Adolescents 
Zachary M. Gillen, Marni E. Shoemaker, Brianna D. McKay, Nicholas A. Bohannon, Alegra I. Mendez, Lacey E. Jahn, Joel T. Cramer, FACSM. University of Nebraska-Lincoln, Lincoln, NE. (Sponsor: Joel T. Cramer, FACSM)

(No relevant relationships reported)

PURPOSE: To examine the effects of including an arm swing and overhead target on vertical jump performance in children and adolescents.

METHODS: Young males (n=21, mean:95% confidence interval, age=12.1±1.1 years) performed counter-movement vertical jump testing with (CMJMA) and without (CMJ) the use of an arm swing and overhead target on force plates sampled at 1 kHz. For both conditions, participants stood in the middle of the force plates, performed a rapid counter-movement of self-selected depth, and immediately finished with a maximal, explosive vertical jump. For the CMJMA, participants were instructed to visually focus on the overhead target (Sports Imports, Freestanding Vertec Jump Trainer, Hilliard, OH, USA), use the arms to swing during the countermovement phase, and use the dominant hand to reach for the overhead target. For the CMJ, participants kept their hands on their hips and eyes forward. Vertical ground reaction forces from force plates under each foot were summed to provide total vertical ground reaction forces (N). Performance outcomes included peak force (PF, N), peak rate of force development (pRFD, N’s), peak power (PP, W), and eccentric impulse (ECC, Ns) were used to compare means between CMJMA and CMJ conditions.

METHODS: Participants’ (male [n=7] and female [n=14], 21.3±2.1 yrs, 1.69 ± 0.09 m, 96.3 ± 13.0 kg) right hip, knee, and ankle kinematics were captured with a 3D motion capture system. Electromyography (EMG) signals were recorded from rectus femoris (RF), vastus lateralis (VL), vastus medialis (VM), semimembranosus (SM), and biceps femoris (BF) muscles. EMG were normalized to maximum voluntary efforts. Participants performed 10 single leg landings from a 30 cm height onto a force platform before and after static knee landing. Participants were seated and secured to a chair while the right knee was flexed and secured at 35° during static landing. A load (150 N/218 N) was applied at a 90° angle to the proximal leg for...
High fear of reinjury following ACL reconstruction (ACLR) is related to lower rates of return-to-sport (RTS) and altered neuromuscular and biomechanical patterns during single-leg landings that increase the risk of secondary ACL injury. However, single-leg landings are observed as an ACL injury mechanism and used for RTS decisions following ACLR. Whether fear of reinjury is related to landing patterns on single limb in ACLR individuals is unknown. PURPOSE: To determine the relationship between fear of reinjury and lower extremity muscle activation and biomechanics during single-leg landings in individuals with ACLR. METHODS: Thirty-six females (18.9 ± 1.5 yrs, 168.7 ± 6.5 cm, 67.2 ± 10.0 kg) with a history of ACLR completed the Tampa Scale of Kinesiophobia-11 (TSK-11) and three trials of a single-leg hop for distance. 3D motion capture recorded lower extremity biomechanics. Surface electromyography recorded the average peak root mean square (RMS) amplitude of 6 muscles [gluteus medius, gluteus maximus, biceps femoris, semitendinosus, vastus lateralis, rectus femoris] 50ms prior to initial contact (PRE) and during landing (LAND), and was normalized to peak RMS. Spearman’s rank correlations examined the relationship between total TSK-11 scores and lower extremity muscle activation and biomechanics. RESULTS: Fear of reinjury was not related to any lower extremity single-leg landing muscle activation or biomechanics. Specifically, there was no significant relationship to knee kinematics (t_m = -0.251 vs. 0.000, P_m = 0.146-0.999) or kinetics (t_k = -0.273 vs. 0.249, P_k = 0.150-0.705), hip kinematics (t_h = -0.055 vs. 0.182, P_h = 0.295-0.753) or kinetics (t_k = -0.091 vs. 0.161, P_k = 0.353-0.652), or lower extremity muscle PRE activation (t_m = -0.129 vs. 0.190, P_m = 0.274-0.861), or LAND activation (t_h = -0.234 vs. 0.283, P_h = 0.100-0.852). CONCLUSIONS: Caution should be used when assessing RTS readiness using single-leg landings. ACLR individuals who demonstrate proper single-leg landings may still be at risk of secondary ACL injury if they have a high fear of reinjury. To comprehensively assess RTS readiness, single-leg landings should be used in conjunction with measures that effectively identify fear of reinjury.
Nitrates supplementation via oral beetroot juice (BR) has been shown to increase the partial pressure of oxygen in the interstitial space (PiO2) in rat skeletal muscle. PiO2 reflects the balance between oxygen delivery and oxygen consumption, and BR is thought to increase PiO2 and to slow PiO2 on-kinetics via increased nitric oxide availability. However, it is unknown whether nitrates supplement via BR enhances skeletal muscle contractile performance. PURPOSE: The purpose of this study was to 1) validate the effect of oral BR juice on PiO2 in the rat extensor digitorum longus muscle (EDL) and 2) to determine whether nitrates supplementation attenuates fatigue in the EDL. METHODS: Twenty female Sprague Dawley rats (~270g) were randomly divided into three groups: beet juice (BR, n=7), nitrates depleted beetroot juice (dBR, n=8), and water (CON, n=5). BR rats received beetroot juice in their drinking water (1 mol/l/kg/day; Beet It, James White, UK) for 5 days before experimentation while dBR rats received an equivalent volume of nitrates depleted BR. CON rats received water ad libitum. After pentobarbital anesthesia (50 mg/kg ip), the EDL muscle was isolated and attached to a load cell interfaced with a muscle tension analyzer. PiO2 was measured using the phosphorescent quenching flow analysis. Echocardiographic determination of right ventricular (RV) morphometry and cellular function, and 2) Test the ability of deoxyadenosine triphosphate (dATP), which steps of the myosin-actin cross-bridge cycle are altered and whether these changes are reversible at the molecular and cellular levels are unclear. PURPOSE: The study objectives were to: 1) Examine the effects of simulated fatigue on muscle function and cellular function, and 2) Test the ability of deoxyadenosine triphosphate (dATP), an alternative energy to adenosine triphosphate (ATP), to reverse fatigue-induced changes in skeletal muscle. METHODS: Maximal power output, muscle biopsies were taken from the vastus lateralis after 14 days, and immunohistochemical analysis was performed to determine muscle fibre cross-sectional area (CSA), myonucleus content, SC content (PAX7+ cells), and total (C/F) and fibre type-specific (C/Fi) capillary-to-fibre ratios. RESULTS: Type I and II fibres CSA was greater in SR + EX compared with SR. Whereas there were no differences across fibre types between SR + EX and CON, type II fibre CSA was significantly lower in SR compared with COM. Type II myonuclear domain was greater in SR + EX compared with COM and SR. Pax7+ cells associated with type I and II fibres were lower in SR compared with SR + EX. Type II Pax7+ cells were also lower in SR compared with COM with a similar trend for type I fibres. There were trends for a lower SV (in SR compared with SR + EX) for both fibre types with no differences for each compared with COM. Minimal LLRE during a period of decreased physical activity is associated with greater muscle fibre CSA, SC content, and capillarization. CONCLUSION: These results support the use of LLRE as an effective countermeasure to inactivity-induced alterations in muscle morphology with age. Skeletal muscle fatigue, or the contraction-induced decline in whole muscle force or power, decreases physical function in older adults. Fatigue primarily results from elevated hydrogen (H+) and phosphate (P_i) altering myosin-actin interactions; however, which steps of the myosin-actin cross-bridge cycle are altered and whether these changes are reversible at the molecular and cellular levels are unclear. MCTs were demonstrated to change during exercise (MCT, n=7), or vehicle control (saline) (CON, n=7). Fluorescent microspheres injected during run and rest bouts were utilized to determine blood flow via photo spectroscopy of harvested skeletal muscles. VO2max was measured prior to terminal blood flow studies to characterize exercise capacity of each rat and determine relative exercise intensity for flow analysis. Echocardiographic determination of right ventricular (RV) morphometry and function was also performed. Values are mean ± SE. RESULTS: As expected, MCT exhibited RV hypertrophy (as elevated ratio of RV to LV+S mass, p<0.002, and RV wall thickness in echocardiography, p=0.004), higher RV systolic pressure (p<0.002) and lower VO2max (p=0.003) vs. CON. During exercise, blood flow (expressed as ml/min per 100g tissue) of the vastus lateralis, semitendinosus, gastrocnemius and biceps femoris was significantly reduced (p<0.02) to MCT (0.187±0.07) compared to CON (0.662±0.17; p<0.001), higher (p<0.008) whole blood lactate in MCT (10.44+1.65 mM/l) vs. CON (4.33±0.72 mM/l). Further, exercising blood flow was inversely related to lactate blood at exercise (r=−0.60, p<0.03), and positively related to cardiac output (r=0.61, p<0.05). At rest, there was a tendency for both blood flow reduction (p=0.06) and higher lactates (p=0.09) in MCT (0.053±0.01, 5.98±2.48 mM/l) vs. CON (0.148±0.04, 1.82±0.19 mmol/l). CONCLUSIONS: Exercising blood flow is reduced in a rat model of PH and may contribute to metabolic limits to exercise capacity. Future studies will explore ways to augment skeletal muscle exercising blood flow in PH, with the hope of improving tolerance for exercise in patients. Funding: NIH-NHLBI R-15 (MB Brown)
The effective stimulation of satellite cells (SCs) is crucial for muscular adaptations to various forms of exercise. **PURPOSE:** to find out if strength training with eccentric overload (CON/ECC), which is known to cause microtraumata in skeletal muscle, induces enhanced SC activation, proliferation and differentiation to new myofibers. **METHODS:** 30 recreationally active male subjects were randomly assigned to one bout of intense leg-extension strength training performed as conventional concentric/eccentric exercise (CON/ECC; n = 15, 25 ± 3.3 yr, 182 ± 6 cm, 77.4 ± 8.9 kg). Biopsies from the vastus lateralis muscle were obtained in rested condition and again 7 days after the resistance exercise from the contralateral leg. Immunohistochemical analyses of cryosections were performed for myosin heavy chain isoforms I, II and neonatal (MHC neo I) as well as for total SC number (DAPI/Pax7; SCtot) and for activated SCs (DAPI/Pax7/MysD; SCact). CK and myoglobin were determined in venous blood. **RESULTS:** CK (CON/ECC: 4587 ± 7069 vs. 142 ± 55 U · L⁻¹; CON/ECC: 3942 ± 5422 vs. 128 ± 51 U · L⁻¹) and myoglobin (CON/ECC: 720 ± 1335 vs. 41 ± 20 µg · L⁻¹; CON/ECC: 796 ± 1248 vs. 34 ± 12 µg · L⁻¹) were significantly (P < 0.005) increased after resistance exercise. Only after CON/ECC, significant increases in total SC number per myofiber (1.3 ± 0.7 vs. 0.0 ± 0.0, P=0.017) and related to type II fibers (0.13 ± 0.04 vs. 0.10 ± 0.05, P=0.009) were observed. Also, the proportion of activated SCs went up after CON/ECC only (from 13.2 ± 8.9 to 20.7 ± 9.2 % of SCtot, P=0.008), the average 8% increase being significantly (P=0.026) different from the non-significant 0.5% decrease after CON/ECC (from 11.0 ± 10.5 to 7.4 %). After CON/ECC, the proportion of SCneo was significantly correlated with the maximal values for CK (r = 0.607, P=0.016) and myoglobin (r = 0.679, P=0.005). No change occurred in the low number of MHC neo positive myofibers in either group. **CONCLUSION:** The considerable increases in CK and myoglobin suggest substantial myofiber damage after both forms of intense resistance exercise. However, only CON/ECC induced a significant activation and proliferation of SCs. With regard to the lack of increase in MHC neo expression, there was no evidence for de-novo synthesis of myofibers.

**Purpose:** Doubles, two action potentials (AP) with a very short inter-impulse interval, frequently occur initially in impulse trains from motor nerves during muscle activation. Such doubles improve dynamic contractile parameters such as rate of force development (RFD), velocity and power. In addition, previous studies have shown delayed fatigue development from repeated isometric contractions when a double initiates a sub-tetanic train compared with constant frequency stimulation. However, these comparisons were not matched for impulse number, train duration and work, which may have confounded the interpretations. Furthermore, it is unknown how doubles would affect endurance during dynamic contractions. We, therefore, compared the development of fatigue from repeated shortening contractions activated with double-initiated sub-tetanic train (DT) or constant-frequency sub-tetanic train (CFT) using protocols matched for work, AP and train duration. **Methods:** EDL muscles were isolated from 4 week old rats and incubated at 30°C in Krebs Ringer buffer. To induce fatigue, 100 shortening contractions were elicited either by a double-initiated sub-tetanic train (DT; 60 Hz) or a constant-frequency sub-tetanic train (CFT; 71 Hz). Contractions in the two groups were matched for work, train duration and pulse number. Isometric contractility was tested before and after fatigue development, fatigue with dATP moderately improved force production similarly in both fiber types (10-12%) compared to fatigue with ATP. In MHC I fibers, fatigue with dATP returned the number or stiffness of myosin heads and cross-head kinetics to normal values. In MHC II fibers, fatigue with dATP left the number or stiffness of myosin heads similar to fatigue conditions, while the cross-bridge kinetics were 19-22% faster than normal. **CONCLUSION:** These results identify novel fiber-type specific changes in myosin-actin interactions and myofilament stiffness that help explain fatigue-related force reduction in older adults as well as an alternative energy source that partially reverses the effects of fatigue.
Exercise type and intensity in older women: Preliminary results of community-based interventions on functional capacity
Gabriel de Souza Zanini, Guilherme Moreno Falcão, Isabela Roque Marçal, Vanessa Teixeira Amaral, Emmanuelle Gomes Ciocac. Universidade Estadual Paulista, Bauru, Brazil.

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(No relevant relationships reported)

Exercise type and intensity in older women: Preliminary results of community-based interventions on functional capacity
Gabriel de Souza Zanini, Vanessa Teixeira do Amaral, Gabriel Falcão, Emmanuelle Gomes Ciocac
São Paulo State University - UNESP, School of Sciences, Physical Education Department, Exercise and Chronic Disease Research Laboratory

PURPOSE: To assess the effect of different community-based exercise interventions on functional capacity in older women.

METHODS: 80 sedentary or insufficiently active older women (69.2 ± 7.9) were randomly assigned to perform a twice-weekly community-based moderate-intensity continuous aerobic training plus resistance training (MICT+RT) (N=28), high-intensity interval training plus resistance training (HIIT+RT) (N=24) or resistance training (RT) (N=28) programs. Anthropometric (weight, height and BMI) and functional capacity (seat-and-reach, handgrip, sit-up, timed up-and-go (TUG), and 6-minute walking (6MW)) tests were assessed before and after 12 weeks of follow-up.

RESULTS: Weight, BMI and seat-and-reach did not change significantly during follow-up in any group. Handgrip strength improved (P<0.05) after MICT+RT and RT, but not after HIIT+RT. Sit-up, TUG and 6MW performance improved (P<0.05) similarly between groups during follow-up (Table 1).

CONCLUSION: The present preliminary results suggest that community-based exercise programs are effective to improve functional capacity in older women, independent of their type and intensity.

Table 1. Functional capacity before and after follow-up.

<table>
<thead>
<tr>
<th>Variable</th>
<th>MICT+RT</th>
<th>HIIT+RT</th>
<th>RT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>72.2±12.7</td>
<td>71.8±14.9</td>
<td>68.9±10.1</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td>27.6±4.5</td>
<td>27.6±4.7</td>
<td>26.8±3.7</td>
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<tr>
<td><strong>HandGrp</strong></td>
<td>21.5±6.8</td>
<td>21.8±6.7</td>
<td>26.4±4.9</td>
</tr>
<tr>
<td><strong>SitUp</strong></td>
<td>12.9±2.9</td>
<td>12.9±2.9</td>
<td>12.5±2.3</td>
</tr>
<tr>
<td><strong>TUG</strong></td>
<td>8.5±1.5</td>
<td>7.2±1.8</td>
<td>9.4±2.6</td>
</tr>
<tr>
<td><strong>6MW</strong></td>
<td>423.9±149</td>
<td>463.3±166</td>
<td>459.7±108</td>
</tr>
</tbody>
</table>

* P < 0.05

2255 Board #2 May 31 9:30 AM - 11:30 AM Exercise Type And Intensity In Older Women: Preliminary Results Of Community-based Interventions On Functional Capacity

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

May 31 9:30 AM - 11:30 AM

Device Measured Physical Activity And Sedentary Behavior In Chilean Older Adults: The Latin American Cities For Healthy Aging Study
Nicolas Aguilar-Farias, Damian Chandra-Poble, Pia Martinowicz. Universidad de La Frontera, Temuco, Chile.
(Sponsor: Wendy J Brown, FACSM)
Email: nicolas.aguilar@ufrontera.cl
(No relevant relationships reported)

PURPOSE: To describe device measured physical activity (PA) and sedentary behavior (SB) in older adults from Temuco, Chile.

METHODS: Community-dwelling adults aged 60 and older were recruited from 17 different neighbourhoods in Temuco, Chile. The participants were asked to wear an Actigraph GT3X+ accelerometer on the hip for 7 consecutive days. A sleeping and a non-wear-time algorithms were used to detect daily wearing time. Accelerometer data were considered valid if the participant wore the device for at least 8 hours on any 4 days of the week. Accelerometer vector magnitude counts (cpm) were used to classify all worn time as either SB (<200 cpm), light (LPA, 200-2689 cpm), moderate (MPA, 2690-6166 cpm), vigorous (VPA, 6167-9642 cpm), very vigorous PA (VVPA, ≥9643 cpm) and moderate-to-vigorous PA (MVPA, ≥2690 cpm) using a combination of Aguilar (2014) and Sasaki (2011) cut-points. For those participants who were unable to complete 7 days of daily wearing, accelerometer data were imputed as missing at random using a Markov Chain Monte Carlo method. The final valid sample comprised 316 participants recruited, but 228 provided valid accelerometer data (69.5±6.86 years, 32% male). On an average day the participants spent 303.7±81.7 min/day in SB, 375.4±88.5 min/day in LPA and 40.8±29.3 min/day in MVPA. In relative terms, the older adults spent 42.3±11.5% of their waking hours in SB and only 5.6±3.0% in MVPA per day. Age was negatively associated with time spent in SB (β=0.75 min/day, p=0.003) and MVPA (β=0.78 min/day, p=0.001). Being male was positively associated with MVPA (β=0.14 min/day, p=0.001), VPA (β=0.10 min/day, p<0.001) and MVPA (β=0.17 min/day, p<0.001). 33.3% of the sample met the PA recommendations with no differences by gender. The oldest old were less likely to meet PA recommendations (OR=0.93, p<0.003). CONCLUSIONS: This study provides relevant information for reinforcing strategies to promote PA in elderly population, considering that the oldest old and women were less likely to engage in MVPA. Funded by CONICYT-CNPq PUCI/449170/2016-8, DIUFR016-0101, DE17-0006

2256 Board #3 May 31 9:30 AM - 11:30 AM Longitudinal Relationship between Energy Reserves and Brain Atrophy

2256 Board #5 May 31 9:30 AM - 11:30 AM Moderate Intensity Walking Cadence (Steps/min) in 61-85 Year Old Adults

ACSM May 28 – June 1, 2019 Orlando, Florida
included 5 minute bouts increasing by 0.5 mph increments from 0.5 to 6.0 mph until: 1) the participant naturally selected to jog or run, 2) reached >75% of their age-predicted maximum heart rate, or 3) reported a Borg scale rating of perceived exertion (RPE) >13. Oxygen consumption (VO_{2} \text{mL/kg/min}) was measured using indirect calorimetry and cadence was determined by dividing directly-observed steps by bout duration. METs were calculated as the average VO_{2} over the last two minutes of each bout, divided by 3.5 mL/kg/min. Receiver Operator Characteristic (ROC) curves and Youden’s index were used to determine moderate intensity based on cadence. Additionally, the cadence-intensity relationship was evaluated using a segmented regression model with random coefficients. RESULTS: All but three participants reached at least 3 METs during treadmill walking. The ROC cadence threshold for absolutely-defined moderate intensity was 100.3 steps/min. Specificity and sensitivity values were above 85% for moderate intensity. The cadence-intensity relationship was also explained by bi-linear relationship with a breakpoint at 94.4 steps/min, where cadence explained 74% of the variance. The cadence threshold for absolutely-defined moderate intensity was 101.3 (95% Prediction Intervals=68.2-112.8). CONCLUSION: A growing number of studies have provided evidence supporting the utility of 100 steps/min as a reasonable heuristic threshold value associated with absolutely-defined moderate intensity in ambulatory and ostensibly healthy older adults. FUNDING: NIH-NIA-5R01AG049024

Board #6 May 31 9:30 AM - 11:30 AM Effects Of Exergaming On Cognition And Dual-task Mobility In Older Adults At Risk For Falling Elisa F. Ogawa, Haikun Huang, Lap-Fai Yu, Philimon N. Gona, Richard K. Fleming, Suzanne G. Levellie, Tongjian You, FACSFM, University of Massachusetts Boston, Boston, MA. (Sponsor: Tongjian You, FACSFM) Email: elisa.ogawa001@umb.edu

Exergaming is a new and popular exercise regimen that can combine physical exercise and cognitive training, and has the potential to improve cognitive function and dual-task mobility among older adults. PURPOSE: To test whether an 8-week exergaming program that utilizes custom Microsoft Kinect-based motion-tracking exergames would improve cognitive function and dual-task mobility compared to a traditional physical exercise program among older adults at risk for falling. METHODS: A quasi-experimental intervention study was conducted with adults aged ≥65 years living in senior living communities and reporting mobility difficulties or a fall in the past year were enrolled to an exergaming program or a traditional physical exercise program, offered twice weekly for 8 weeks. Cognitive function and dual-task mobility were measured before and after the 8-week intervention. A Wilcoxon rank-sum test was used to compare the group difference and further adjust for exercise intensity (ratings of perceived exertion, RPE) using a rank transform method. RESULTS: Twenty-nine participants (age 77.7± years) completed either the exergaming program (n=15) or the traditional physical exercise program (n=14). Statistically significant group differences in Trail Making Test Part A (TMT-A, p<0.05) and single-task gait speed, stride length, and stride width (all p<0.05) and marginal group differences in Mini-Mental State Examination (MMSE, p=0.06) were observed, all favoring the exergaming program. After adjusting for RPE, effects remained statistically significant for most single-task gait measurements (all p<0.05), and marginal group differences in TMT-A (p=0.06) and MMSE (p=0.07) were observed. There were no statistically significant group differences in dual-task gait performance. CONCLUSIONS: Exergaming marginally improved global cognitive status and had a protective effect against declines in executive function and single-task gait measurements compared to traditional physical exercise. The findings support the need for larger studies to determine cognitive and mobility benefits related to exergaming. (Supported by a Doctoral Dissertation Research Grant from the University of Massachusetts Boston)

Board #7 May 31 9:30 AM - 11:30 AM Associations of Accelerometer and Questionnaire Measured Physical Activity and Sedentary Behavior with All-cause Mortality in Older Multiethnic Women Michael J. LaMonte, FACSFM, John Belliettere, Kelly R. Evenson, FACSFM, Eileen Rillamas-Sun, M-In Lee, FACSFM, Chengzi Di, Andrea Z. LaCroict. 1University at Buffalo - SUNY, Buffalo, NY. 2University of California, San Diego, CA. 3University of North Carolina, Chapel Hill, Chapel Hill, NC. 4Fred Hutchinson Cancer Research Center, Seattle, WA. 5Harvard University, Boston, MA. Email: mlamonte@buffalo.edu

PURPOSE: Few studies have evaluated whether associations with health risks differ between accelerometer and questionnaire measures of physical activity (PA) and sedentary behavior (SB), which was the objective of this study. METHODS: We followed 5,992 women (mean age 79 yr; 49.8% white, 33.3% black, 16.9% Hispanic) for all-cause mortality in the Objective PA and Cardiovascular Health Study. Vector magnitude counts/15 sec epoch from a hip worn ActiGraph GT3X+ triaxial accelerometer (required 24 of 7 days with ≥10 hr/d wear) were used to define time spent in SB (<19 counts/15 sec), light (19-518), moderate to vigorous (MVPA; ≥519), and total PA (≥19). The CHAMPS and CARDIA questionnaires were used to obtain detailed self-reports on PA and SB, respectively. Cox regression was used to estimate hazard ratios (HR) and 95% confidence intervals (CI) for a 30-min/day increment in PA or SB, controlling for age, race-ethnicity, education, smoking, number of comorbidities, self-rated health and SF36 physical function score (and awake wear time for accelerometer model). RESULTS: Mean time (min/day) from the accelerometer (wear time adjusted) and questionnaire were 337.9 and 600.4 for total PA, 287.3 and 337.8 for light PA, 50.7 and 222.6 for MVPA, and 555.7 and 482.7 for SB. Wear time-adjusted Spearman correlations between these measures were 0.29, 0.16, 0.34, and 0.28 for total time, light, MVPA, and SB, respectively. There were 706 (11.9%) deaths documented during a mean 4.5 year follow-up. HRs (95% CI)s for accelerometer and questionnaire were 0.88 (0.87, 0.91) and 0.98 (0.97, 0.99) for total PA; 0.88 (0.85, 0.91) and 0.98 (0.97, 0.99) for light PA, 0.65 (0.59, 0.72) and 0.94 (0.97, 0.99) for MVPA, and 1.14 (1.10, 1.17) and 1.02 (1.01, 1.03) for SB. Associations did not meaningfully differ when stratified on categories of race-ethnicity (white, black, Hispanic) or age (<80 vs ≥80 year). CONCLUSIONS: Associations with all-cause mortality risk are stronger for accelerometer compared with questionnaire measures of PA and SB. The differences in strength of associations and the modest correlations between accelerometer and questionnaire measures suggest less precision with questionnaires and that accelerometer measures are capturing health-promoting aspects of movement in older women that are not captured in widely used questionnaires.

Thematic Poster - Resistance Training Friday, May 31, 2019, 9:30 AM - 11:30 AM Room: CC-104B

Chair: Matthew D. Barberio. George Washington University, Washington DC., DC.

Board #1 May 31 9:30 AM - 11:30 AM Eccentric and Blood Flow Restriction Exercises in Women Induce Hypertrophy Jennifer Bunn, Elizabeth Wells, Danielle Eustace, Stuart Gupton, Greg Dedrick, Campbell University, Buies Creek, NC. (Sponsor: Michael J Webster, FACSFM) Email: bunnj@campbell.edu

Blood flow restriction (BFR) is a new clinical method used to induce hypertrophic responses with low mechanical loads. However, women have been largely under-represented in this area of research. PURPOSE: To assess the mechanical and metabolic effects of eccentric (ECC) exercise and BFR therapy on the elbow flexors in recreationally trained females. METHODS: Seventeen healthy, recreationally trained females (ECC: 30.0 ± 7.6 yrs, 165.6 ± 5.4 cm, 67.1 ± 8.5 kg; ECC+BFR: 24.4 ± 2.2 yrs, 163.7 ± 9.3 cm, 67.6 ± 12.2 kg) were randomly assigned to either the ECC+BFR group or the ECC group. Testing was conducted at weeks 0 and 4, and included: body composition via bioelectrical

Abstracts were prepared by the authors and printed as submitted.
impendance analysis, cross-sectional area (biceps brachii) and thickness of the elbow flexors via ultrasound measures, arm circumference, 1-rep max (1-RM) of a bench, and maximal reps of an inverted row. All participants underwent training on the elbow flexors twice per week for four weeks. The ECC+BFR group trained at 30% 1-RM, 3 x 20 repetitions and the ECC group trained at 60% 1-RM, 3 x 10 repetitions. Participants performed an eccentric bicep curl with the technician lifting the participant’s arm from the bottom of the bicep curl to return to the standing position. Thirty seconds of rest was provided in between sets with occlusion maintained for the ECC+BFR group. Rate of perceived exertion (RPE) was taken following each set and blood lactate measurements were taken at the end of the second training session each week.

RESULTS: There was no significant group difference for any of the variables (p>0.05). A training effect was shown with both groups increasing right arm circumference (p=0.004), muscle thickness (p=0.001), cross-sectional area (p=0.001), 1-RM for the right (p=0.001) and left arms (p=0.014), and inverted rows (p=0.001). Both groups showed significant decreases in lactate (p=0.047) and RPE (p=0.001) over time.

CONCLUSION: Training at a lower percentage of 1-RM with BFR can induce significant changes in muscle mass composition that equate to functional gains (inverted rows completed) similar to training at a higher percentage of 1-RM without BFR. BFR is a viable alternative for patients and athletes who are unable to lift 70% 1-RM due to surgical protocols or other medical restrictions and was shown to not be more physically demanding to the patient.

2263 Board #2 May 31 9:30 AM - 11:30 AM
Muscular Morphological Adaptations Following Two High Intensity Interval Training Configurations
Masoud Moghaddam, Carlos A. Estrada, Bert H. Jacobson, FACSM. Oklahoma State University, Stillwater, OK. (Sponsor: Bert H. Jacobson, FACSM)
Email: masoud.moghaddam@okstate.edu

No relevant relationships reported

High intensity interval training (HIIT) refers to a group of short bouts separated by rest periods. It has been suggested that HIIT activates fast-twitch muscles; the shorter and more intense the burst is, the more it targets fast-twitch fibers. PURPOSE: To compare the effects of ultrashort (UH) versus short (SH) functional HIIT on muscular adaptations of rectus femoris (RF) and vastus lateralis (VL). METHODS: Thirty-four recreationally active participants were randomly assigned to SH (8 males and 9 females) and UH (8 males and 9 females) groups to complete 6 cycles of 6 exercises at all-out intensity (i.e. kettlebell snatches; step-up jumps; jumping jacks; goblet squat; burpees; high knees) 3 d/wk for 4 weeks. SH was performed with 20s:10s work-to-rest ratio, and 2-minute recovery between cycles, while UH was completed with 10s:5s work-to-rest ratio, and 1-minute recovery after each cycle. Muscle thickness (MT), fat thickness (FT), cross-sectional area (CSA) and echo intensity (EI) of RF and VL were assessed via ultrasound before and after 4-week interventions. The MT and FT scans were captured in sagittal plane, while the CSA and EI were taken in transverse plane. Two-way mixed factorial ANOVAs were used for analyses. RESULTS: No significant differences between groups were observed following training. The results displayed no significant (p>0.05) change in EI of the RF and VL. However, both groups significantly (p<0.05) increased RF CSA (UH: 12.1 ± 4.2 to 13.0 ± 4.3 cm², SH: 11.5 ± 3.1 to 12.1 ± 3.2 cm²), as well as VL CSA (UH: 26.2 ± 6.6 to 28.4 ± 7.0 cm², SH: 24.6 ± 5.8 to 27.0 ± 5.2 cm²). Additionally, the thickness of RF (UH: MT = 1.3 ± 0.3 to 1.5 ± 0.4 cm; FT = 0.6 ± 0.3 to 0.5 ± 0.3 cm; SH: MT = 1.2 ± 0.3 to 1.4 ± 0.3 cm; FT = 0.5 ± 0.2 to 0.4 ± 0.2 cm) and VL (UH: MT = 1.3 ± 0.4 to 1.4 ± 0.3 cm; FT = 0.5 ± 0.3 to 0.4 ± 0.2 cm; SH: MT = 1.4 ± 0.4 to 1.5 ± 0.4 cm; FT = 0.5 ± 0.3 ± 0.3 ± 0.2 cm) significantly (p<0.05) improved in both groups. CONCLUSION: To date current literature has shown functional HIIT to be an effective protocol to improve anaerobic and aerobic performances. However, in the present study, both groups similarly improved muscular morphology of the RF and VL by performing functional HIIT. Furthermore, these findings suggest that the UH protocol induces benefits comparable to those of the SH protocol, while reducing the total exercise time to 50 percent.

2264 Board #3 May 31 9:30 AM - 11:30 AM
Resistance Training With Or Without Load Promotes Similar Changes In Electromyography Activity But Not In Blood Lactate
Rafael Ribeiro Alves, Sr., Bruno Cavalcante Gomes, Murilo Augusto Soares de Araújo, Carlos Alexandre Vieira, Vitor Alves Marques, Thaynã Coelho Guimarães, Claudio André Barbosa de Lira, Douglas de Assis Teles Santos, Paulo Roberto Viana Gentil. Federal University of Goiás, Goiânia, Brazil, Goiânia, Brazil.
Email: alves.rafael.ribeiro@gmail.com

No relevant relationships reported

PURPOSE: to comparison the changes in peak electromyography (EMG) activity and levels of blood lactate (mmol/L) during a specific resistance exercise by three different moments, with extra load (TL), no load (TWL) and no load but with visual feedback (TLF). METHODS: twenty healthy men (age: 26.5±4.8 height: 1.77±0.1 weight: 80.6±12.9) volunteered to participate in the study. Participants were scheduled in two visits on laboratory: a) 10 repetition maximum test (10-RM test) and b) performance of three aleatory and different situations of a knee extension (1 - extra load, 2 - no load and 3 - no load with visual feedback) with movement velocity of a 2-second to concentric and eccentric phase (controlled by a mobile app metronome) and 10 minutes of rest between then. Blood lactate was measure before and after each situation. EMG activity was evaluated on vastus medialis (VM), vastus lateralis (VL) and rectus femoris (RF). A significance level of p<0.05 was adopted for all statistical tests. RESULTS: There were an increase in blood lactate after all the moments when compared to before exercise performance (p<0.05) and the blood lactate was higher in post situation TL (p<0.05) when comparison TLF and TLF (8.2±2.9, 4.2±1.8, 4.3±1.7, respectively). Additionally, significant difference was found between in all moments (p<0.05). The significant difference on EMG activity (p<0.05) only occurred on rectus femoris in TL, and inversed to TWL (7.7±3.25, 1.97±2.625, respectively), but not significant difference (p<0.05) in the TLF situation (573.2±219.7). CONCLUSIONS: Performing exercise using no load can be efficient to promote increase in EMG activity and metabolic responses being an important training strategy when extra load is not possible.
2266

**Board #5 May 31 9:30 AM - 11:30 AM**

**The Effects of a Short-Term Guideline Recommended Hypertrophy Training Versus Blood Flow Restriction Training on Pulse Wave Velocity**

Murat Karabulut, FACS&M, Ulku Karabulut, Michael G. Bemben, FACS&M. "University of Texas Rio Grande Valley, Brownsville, TX." University of Oklahoma, Norman, OK.

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(No relevant relationships reported)

**PURPOSE:** To determine the effects of guideline recommended hypertrophy and blood flow restriction training protocols on pulse wave velocity in recreationally active males.

**METHODS:** Fourteen male subjects (age= 23.7±2.6) were randomly assigned to one of two groups that trained the knee flexors, extensors, and split squat for 6 weeks. The two training groups included: a blood flow restriction group (BFR, N=8) and hypertrophy (HYP, N=6). All training groups began with subjects warming up on the cycle ergometer at 50 rpm with 2.0 kg resistance and subjects were then lead through the resistance training programs that remained constant for each session thereafter. The HYP group followed NSCA guideline for recommended intensity, set, and rest period. The HYP group performed exercise for 4 sets of 10 repetitions 3x/wk at 75% of IRM with 90 second rest between each set. The BFR group performed exercises for 4 sets of 30, 15, 15 reps 3x/wk at 40% of IRM with 30 second rest between each set. Each training session was monitored by a trained individual to make sure the correct breathing pattern were maintained during lifts to avoid the Valsalva maneuver. As for pre and post test sessions, fasted subjects (for at least 8 hours) reported to the lab and hydration level was assessed by clinical urine refractometer before testing sessions. PWV was measured non-invasively using application tonometry, in which a probe was used on the surface of the skin over the carotid, radial, femoral, and pedal arteries to obtain segmental measures.

**RESULTS:** One-way ANOVA found no between-group differences in any of the outcome measures of interest at baseline. There were no significant condition main effects for carotid-radial (CR), carotid-femoral (CF), femoral-distal (FD), however a significant time main effect was detected for CR (p < 0.05). CF-PWV significantly decreased from baseline to post testing. The findings of the study suggest that both BFR and HYP training programs are similarly effective in decreasing the central arterial stiffness. The data also indicates that avoiding the Valsalva maneuver may be necessary for positive changes in aortic stiffness and BFR training protocol can be used as an alternative method for those who can’t or do not want to lift high loads to improve central arterial elasticity.

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**Board #6 May 31 9:30 AM - 11:30 AM**

**Effects of an 8 Week Upper Body Resistance Training Program on Aerobic Capacity in Untrained Females**

Jennifer Bossi, Emily Pitts, Adam Keath. Winthrop University, Rock Hill, SC. Anderson University, Anderson, SC.

(Sponsor: Janet Wojcik, FACS&M)

Email: bossij@winthrop.edu

(No relevant relationships reported)

**PURPOSE:** VO2peak and 1RM in untrained females were compared before and after an eight week upper body strength training plan to determine the effect of upper body strength training on aerobic capacity.

**METHODS:** Twelve untrained college females completed a VO2peak and 1RM bench press test. The subjects were then randomly split into 2 groups of 6. Both groups maintained their normal aerobic exercise routine with the exception of the treatment group, who completed an upper body strength training protocol twice a week for eight weeks. VO2peak and 1RM were reassessed immediately following the eight week period.

**RESULTS:** A one-way repeated measures ANOVA was conducted to determine whether a statistically significant difference existed in VO2peak, RERmax, HRmax, final time, and 1RM over the course of the 8 week strength training program. A change did occur in VO2peak for the treatment group from pre to post exercise intervention (34.22 mL/kg/min pre to 35.37 mL/kg/min post). In addition, 1RM increased in the training group from 70.83 lbs to 75.83 lbs. However, the exercise intervention did not elicit statistically significant changes in measures of training variables over time, F(5, 6) = .40, p = .742, partial η2 = .310. No change was seen in either VO2peak or 1RM the control group.

**CONCLUSIONS:** Although not statistically significant, a slight overall increase in VO2peak in the treatment group was observed, while no change in the VO2peak of the control group occurred. A longer resistance training period could result in more significant differences in both 1RM and aerobic capacity. Therefore, upper body resistance training alone will not impact aerobic capacity dramatically in untrained athletes, especially when done short term. Resistance training may, however, be beneficial in competitive athletes where even a slight difference in performance could be the difference between winning and losing. Future researchers should look at how upper body resistance training impacts running biomechanics specifically, and if a direct connection exists with running economy.

2268

**Board #7 May 31 9:30 AM - 11:30 AM**

**Effects of Dynamic or Static Stretching Performed Before Resistance Training on Muscle Adaptations in Untrained Men**

João B. Ferreira-Júnior1, Ricardo P. C. Benin2, Suene F. N. Chaves1, Hugo M. Costa2, Eduardo D. S. Freitas1, Michael G. Bemben, FACS&M, Carlos A. Vieira1, Martim Bottaro2. 1Federal Institute of Sudeste of Minas Gerais, Rio Pomba, Brazil. 2Catholic Pontiff University of Minas Gerais, Belo Horizonte, Brazil. 3University of Oklahoma, Norman, OK. 4Federal University of Goiás, Goiania, Brazil. 5University of Brasília, Brasilia, Brazil.

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(No relevant relationships reported)

**PURPOSE:** VO2peak and VO2max were measured in untrained females before and after an 8 week upper body resistance training program. A change did occur in VO2peak for the treatment group from pre to post exercise intervention (34.22 mL/kg/min pre to 35.37 mL/kg/min post). In addition, 1RM increased in the training group from 70.83 lbs to 75.83 lbs. However, the exercise intervention did not elicit statistically significant changes in measures of training variables over time, F(5, 6) = .40, p = .742, partial η2 = .310. No change was seen in either VO2peak or 1RM the control group.

**CONCLUSIONS:** Although not statistically significant, a slight overall increase in VO2peak in the treatment group was observed, while no change in the VO2peak of the control group occurred. A longer resistance training period could result in more significant differences in both 1RM and aerobic capacity. Therefore, upper body resistance training alone will not impact aerobic capacity dramatically in untrained athletes, especially when done short term. Resistance training may, however, be beneficial in competitive athletes where even a slight difference in performance could be the difference between winning and losing. Future researchers should look at how upper body resistance training impacts running biomechanics specifically, and if a direct connection exists with running economy.

Stretching and resistance exercises are often recommended due to their positive effects on health and quality of life. Stretching exercises are frequently performed before a session of resistance exercise, however, muscle stretching has been shown to acutely reduce muscular strength, and impair chronic muscular adaptations to training. However, the chronic effects of static stretching exercises performed prior to bouts of resistance exercise are conflicting. Additionally, the chronic effects of dynamic stretching on muscle adaptations to resistance training remain unknown. Therefore, research that evaluates the chronic effects of both static and dynamic muscle stretching before resistance exercise is needed. **PURPOSE:** To evaluate the chronic effects of dynamic and static stretching performed before resistance training on muscle adaptations in untrained young men. **METHODS:** Forty-five untrained young men (21.2±0.5 yrs., 72.2±5.6 kg and 178±1 cm) were randomly assigned to one of three groups: 1) static stretching (SS, n= 14) in which subjects performed 80s of static stretching prior to resistance exercise; 2) dynamic stretching (DS, n= 13) that included 80s of dynamic stretching prior resistance exercise; or 3) control group (CON, n= 18) in which subjects performed no stretching prior to exercise. All subjects performed 4 sets of 8-12RM (repetition maximum) of knee flexion exercise two days per week for 8 weeks, with a period of at least 48 h between sessions. Unilateral knee flexor maximal isometric strength (MIS) and maximal isokinetic leg muscle thickness (MT) were measured before and after the training period. Data normality was confirmed by the Shapiro-Wilk test and a two-way repeated measures ANOVA (group x time) was performed. Statistical significance was set a priori at p≤0.05. **RESULTS:** There were significant increases in MIS (SS= 48.3%, DS= 37.6%, CON= 49.4%, p< 0.05) and MT (SS= 13.3%, DS= 13.1%, Control= 11.4%, p= 0.05) with no significant differences across groups (p>0.05). **CONCLUSIONS:** Eighty seconds of static or dynamic muscle stretching performed prior to bouts of resistance exercise did not affect the training-induced muscular adaptations in untrained young men. Supported by FAPEMIG and IF Sudeste MG- Brazil.

2269

**Board #8 May 31 9:30 AM - 11:30 AM**

**The Impact of Volume-Matched, Heavy vs Moderate Weight Resistance Training on Inflammation and Muscular Damage**

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**Background:** It is well documented that resistance exercise training improves muscular strength and hypertrophy. Heavy loads greater than 65% of 1 repetition maximum (1RM) are typically required for optimal induction of muscular hypertrophy. Heavy loads tend to induce greater muscular damage and repair, resulting in enhanced muscular hypertrophy. However, there is little information comparing intensities...
of hypertrophy inducing resistance loads on muscle damage and inflammatory response. The purpose of this study was to compare heavy vs moderate hypertrophy loads on markers of post-exercise muscular inflammation and blood volume.

METHODS: 11 resistance-trained, college-aged males were recruited for this study. Participants were asked to complete 3 data collection sessions, each 1 week apart. During session 1, a baseline venous blood draw was collected, followed by evaluation of 1RM barbell squat. With sessions 2 and 3, participant performed volume-matched barbell squats at 2 different intensities using a counter-balanced design. On day 2, 5 sets of 5 reps at 85% (High) or 3 sets of 11 reps at 67% (Low). Blood draws were taken 1 hour post-exercise for sessions 2 and 3. Plasma was isolated and evaluated via ELISA assay.

RESULTS: There were no significant changes (p>0.05) in plasma C-Reactive Protein (CRP) for any of the 3 time points (358.7±180.32, 454.5±250.68, 322.0±180.02 ng/mL for Baseline, High, Low, respectively). Myoglobin, a marker of muscular damage, is awaiting analysis.

CONCLUSIONS: Current results suggest that the utilized volume of hypertrophy inducing resistance training, at either load, does not induce detectable changes in inflammation in the plasma.

E-10 Free Communication/Slide - Pediatric Exercise Science

May 31 9:30 AM - 9:45 AM

Testosterone Determines Erythropoiesis And Changes In Hemoglobin Mass During Adolescence

Erica Mabel Mancera1, Edgar Cristancho1, Diana Ramos1, Walter Schmidt2, Lohover Duque3, Joel Rojas3. 1Universidad Nacional de Colombia, Bogotá, Colombia. 2Bayreuth University, Bayreuth, Germany. 3Unidad Central del Valle, Talcahu, Colombia. (Sponsor: William Byrnes, FACSIM) Email: emmanceras@unal.edu.co

In prepubertal stage, total hemoglobin mass (Hbmass) is similar in boys and girls. With the beginning of puberty, Hbmass increases in boys, while it stagnates in girls. This divergence might be explained by the selective increase in androgen production in males which has, however, not yet been studied.

PURPOSE: To study the relationship between the blood testosterone concentration and hemoglobin mass in boys and girls. A second aim was to find out the impact of altitude and training status.

METHODS: In total, 313 children and adolescents with different endurance training status and different altitude of residence entered the study (age 9 to 18 yrs; females n=94, males n=219; low altitude (1000m) n= 150, moderate altitude (2500m-3000m) n= 163; endurance trained n=190, untrained n=123). The sexual maturation was estimated by the scale of Tanner (stage I-V). Hbmass and blood volume (BV) were determined by the optimized CO-rebreathing method. Testosterone (Test) and erythropoietin (EPO) were measured in cubital venous blood. For statistical purposes multiple linear regression analyses and regression trees (CART) were used.

RESULTS: While Test was low in all females (0.2±0.6ng/ml) it markedly increased in boys there is a strong increase in Test from Tanner stage III, (aged >11 years, PAQ-A) or for Children (aged <11, PAQ-C). The associations between VO2max and PAQ were analyzed using ANCOVA adopting PAQ and PAQ2 as covariates, allowing the intercepts but more importantly the slope parameters of PAQ and PAQ2 to vary with the categorical variables sex, age group and weight status. RESULTS: ANCOVA identified a significant quadratic polynomial association between VO2max and PAQ (entered as both a linear PAQ and PAQ2 terms), where the positive linear PAQ term varied by weight status and sex but the quadratic PAQ2 term was negative (-39; 95% CI .57 to -21), common to all groups. The curvilinear (inverted U) association suggests that the benefits of increasing PA (same dose) on VO2max is greater when children report low levels of PA compared to children who report higher levels of PA. These dose-response rates were also steeper for boys and steeper in lean compared with overweight/obese children. CONCLUSIONS: In this paper we demonstrate, for the first time in children, that the dose response between physical activity and VO2max is curvilinear in nature, i.e., the benefit of increasing physical activity on aerobic fitness is greater in children who report low levels of habitual physical activity. This has important public-health implications, in that getting sedentary children active is likely to have a disproportionately greater benefit to their health and fitness.

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2272 May 31 9:45 AM - 10:00 AM

Modeling The Dose-Response Rate Associations Between VO2max And Self-reported Physical Activity In Children

Alan M. Nevill1, Michael J. Duncan2, Gavin Sandercock1. 1University of Wolverhampton, Walsall, United Kingdom. 2University of Coventry, Coventry, United Kingdom. 3University of Essex, Colchester, United Kingdom. (Sponsor: Giles Warrington, FACSIM) Email: a.m.nevill@wlv.ac.uk

The benefits of physical activity (PA) on aerobic fitness are well known. What is not so well understood is the nature of this relationship, i.e., is the association between PA and fitness linear or curvilinear and does the dose-response rates vary in different populations? PURPOSE: To explore the dose-response rate and association between VO2max and self-reported physical activity, and to assess whether this association varies by sex, age and weight status. METHODS: VO2max was assessed in 8,002 (10.0-15.9-year olds) children (3,775 girls) using the 20-metre shuttle-run test. Physical Activity was assessed using the Physical Activity Questionnaire for Adolescents (aged <11 years, PAQ-A) or for Children (aged <11, PAQ-C). The associations between VO2max and PAQ were analyzed using ANCOVA adopting PAQ and PAQ2 as covariates, allowing the intercepts but more importantly the slope parameters of PAQ and PAQ2 to vary with the categorical variables sex, age group and weight status.

RESULTS: ANCOVA identified a significant quadratic polynomial association between VO2max and PAQ (entered as both a linear PAQ and PAQ2 terms), where the positive linear PAQ term varied by weight status and sex but the quadratic PAQ2 term was negative (-39; 95% CI .57 to -21), common to all groups. The curvilinear (inverted U) association suggests that the benefits of increasing PA (same dose) on VO2max is greater when children report low levels of PA compared to children who report higher levels of PA. These dose-response rates were also steeper for boys and steeper in lean compared with overweight/obese children. CONCLUSIONS: In this paper we demonstrate, for the first time in children, that the dose response between physical activity and VO2max is curvilinear in nature, i.e., the benefit of increasing physical activity on aerobic fitness is greater in children who report low levels of habitual physical activity. This has important public-health implications, in that getting sedentary children active is likely to have a disproportionately greater benefit to their health and fitness.

2274 May 31 10:00 AM - 10:15 AM

Skeletal Muscle Oxidation During an Incremental Exercise Test In Younger and Middle-aged Individuals

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Previous research has suggested that age-related decline in mitochondrial enzymes consequentially results in reduction of skeletal muscle oxidative function. Limited research exists investigating effects of healthy aging on these observed changes, especially with middle-aged individuals. PURPOSE: The purpose of this study was to investigate the effects of healthy aging on changes in tissue oxygenation in skeletal muscle (SmO2) during a self-paced VO2max (SPV) test in younger and middle-aged subjects. METHODS: This study included seven younger (ages 18-35 years, 4 males, BMI 28.1±3.4 kg/m2) and nine middle-aged (ages 40-55 years, one male, BMI 25.1±3.8 kg/m2) healthy, recreationally active individuals. Subjects visited the lab once to complete the SPV test on a Watbijk cycle ergometer. The Moxy sensor, which uses near-infrared spectroscopy, was used to estimate SmO2. Four Moxy sensors were used and were placed on the right and left quadriceps (vastus lateralis), and right and left gastrocnemius muscles. The SPV test was exactly ten minutes in length, with five 2-minute stages. Each stage was perceptually regulated using the 6-20 rating of perceived exertion (RPE) scale: 11, 13, 15, 17, and 20 (in that order). Repeated-measures ANOVAs were used to compare SmO2 between anatomical sites and stages of the SPV. Age group was used as a between-subjects factor. RESULTS: Measured VO2max was 48.3±7.56 mL/kg/min for the younger and 38.10±7.45 mL/kg/min for the middle-aged subgroup. For SmO2, there was no main effect of age group or sex, but there was an interaction effect (p=0.170) and no differences between age groups (p=0.906). A main effect was present for SPV stages (p<0.001); values remained steady until the last two stages, where they decreased in both groups (younger: 71.0±3.1, 69.5±3.5, 67.9±3.7, 63.6±4.5, 58.3±5.9 percent; middle-aged 69.4±2.8, 70.4±3.1, 70.4±3.3, 65.4±4.0, 56.1±5.3 percent). Conclusion: Since no age-related differences were found in SmO2 during the exercise test, healthy aging (i.e. regular aerobic exercise) can be seen as an effective intervention for maintenance skeletal muscle blood flow and a profound influence for sustaining quantity and quality of mitochondria function. Future research should determine whether the same findings occur with healthy, active elderly subjects.
**PURPOSE:** This study assessed the effectiveness of a five-week high intensity exercise program offered over two years for high-functioning children with autism spectrum disorder (HFASD). METHODS: Children with HFASD (n=56, M age: 10.22 ± 1.5 yr) engaged in a 1 hr exercise session, 4 d/wk for 5 weeks. Each session included an instruction period, warm-up, high intensity workout, related game, and cool-down to be completed in either an individual (I) or cooperative (CO) format. Child satisfaction surveys (7-pt. Likert) assessed perceived enjoyment, level of support, physical benefits, etc. Staff satisfaction surveys assessed their enjoyment of running the session(s), and clarity and utility of the training. Fidelity of implementation (accuracy) was assessed in 64.9% of all sessions. Biometric (i.e., height, weight, waist circumference, BMI) and physical performance data (i.e., strength, flexibility, aerobic fitness, power, physical activity intensity) were also collected. Paired t-tests were used to assess pre to post program performance differences. RESULTS: Results indicated that the program was implemented accurately (94%). Satisfaction ratings indicated that the overall feeling about the program was very positive from both the participants (M: 6.4) and staff (n=14, M: 6.93). There was no difference in post-satisfaction ratings between the I and CO formats (IM = 5.81, CO M = 5.45, p = .30). Pre-posttest comparisons yielded statistically significant improvements in sit-ups in 60 sec (MΔ = 3.5 reps, 95% CI = 1.41, 5.59), squats in 60 sec (MΔ = 4.4 reps, 95% CI = 1.87, 7.15), and standing long jump (MΔ = 4.0 in., 95% CI = 79, 7.21). Additionally, the rounds completed on repeated parallel workouts improved significantly (MΔ = 2.3, 95% CI = 1.49, 3.07). Significant improvements in percentage of time in moderate-vigorous activity were observed in both the I and CO exercise formats (IMΔ = 4.1%, 95% CI = 3.19, 5.06; CO MΔ = 1.9%, 95% CI = 59, 3.24). The I format produced significantly greater improvement in activity level (% time) than the CO format across the 5-weeks (MΔ = 2.22%, 95% CI = 63, 3.81). There were no significant changes in biometric measures. CONCLUSION: A high intensity exercise program for children with HFASD is feasible (high fidelity, satisfaction) and improves physical performance.

**2276**

**Talent Identification in Elite Youth Sports**

Kewei Zhao1, Andreas Hohmann2, Binghong Gao3. 1Shanghai University of Sport, Shanghai, China. 2University of Bayreuth, Bayreuth, Germany. Email: zhao_kw@hotmail.com (No relevant relationships reported)

Several talent selection programs in elite sport schools are based on motor diagnostics for the purpose of recommending or transferring promising talents to general groups of sports; game sports, combat sports or endurance sports, and to more concrete sports such as gymnastics, skiing, or tennis. However, in most sports, the predictive value of such testing is unclear.

**PURPOSE:** The aim of the talent prediction was to assign each individual of the Under-15 athletes to his own sport. METHODS: The sample consisted of N = 97 youth athletes from Shanghai Elite Sport school belonging to different sports including basketball (n = 7), fencing (n = 23), judo (n = 20), swimming (n = 10), table tennis (n = 15), and volleyball (n = 22). The performance diagnosis took place between September 2016 and March 2017, and comprised eighteen anthropometric parameters, two motor tests on back strength and complex reaction speed, five physiological measurements of the heart rate at rest, vital capacity, systolic and diastolic blood pressure, and hemoglobin concentration in the blood. The prognostic validity of the morphological, motor, and physiological tests was determined using linear discriminant analysis and nonlinear neural networks (multilayer perceptron). RESULTS: The between-sports differences in a battery of generic anthropometric, motor, and physiological tests allow one to distinguish the young athletes' talents according to their individual sport provenience. The linear and nonlinear statistical methods that were used in parallel to identify the most relevant talent characteristics of each of the six sports by means of the leave-one-out procedure reversely confirmed the quality of the results. CONCLUSION: All diagnostic methods exhibited medium to high validity to discriminate between the six different sports. The relevance of the eighteen body dimensions, five physiological measures, and two motor tests for talent identification was confirmed.

**2277**

**Physical Literacy Levels of Canadian Children in Grades 7-9 (12-16 Years): Descriptive Results**

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PURPOSE: The Canadian Assessment of Physical Literacy (CAPL) is the first validated protocol to accurately and reliably assess the physical literacy level of children between 8 and 12 years of age. However, a ceiling effect was found when using the CAPL in older children, within the knowledge/understanding domain and in the Canadian Agility and Movement Skill Assessment, one component of the physical competence domain. The purpose of this study was to evaluate the validity of a modified version of the CAPL for older children.

METHODS: The modified CAPL (CAPL 789) was used to assess physical literacy among Canadian youth in grades 7-9 (aged 12-16 years). Data were collected from schools and recreation facilities in the provinces of Alberta and Ontario (Canada), yielding a sample of 245 participants (129 girls, mean age 13.7 ± 0.9 years). Descriptive statistics were calculated for all CAPL assessments. Age and gender effects were examined to establish the validity of the CAPL 789 within this age group.

RESULTS: Physical competence increased significantly with age (p<0.05), the means in grades 7 to 9 being 19 ± 3, 21 ± 4 and 21 ± 3 respectively. Gender did not influence most scores. For example, the Canadian Agility and Movement Skill Assessment total score (36) showed no significant difference (p>0.05) between boys (25 ± 5) and girls (25 ± 4). Girls scored significantly higher (p<0.05) than boys (6.6 ± 1.2 vs. 6.3 ± 1.3) in the knowledge assessment (10). There was also a significant increase (p<0.05) in knowledge scores among girls as they got older.

CONCLUSIONS: This study described the physical literacy of youth in grades 7 to 9 (12-16 years old). Gender did not influence physical competence, a result different from the data for younger children. Knowledge increased with age among girls but not boys. Future research might be necessary to identify if these unexpected results can be explained by different rates of maturation at this age, unique characteristics of this sample or that the CAPL 789 requires additional protocol modifications.

**2278**

**Associations of Awareness of National Physical Activity Recommendations and Self-Reported Physical Activity Behaviors among Students**

Taylor A. Wahl1, Benjamin T. Pope1, Jennifer R. Ricketts1, Naofumi Yamamoto2, Nobuko Hongu, FACSM1. 1The University of Arizona, Tucson, AZ. 2Ehime University, Matsuyama, Japan. (Sponsor: Nobuko Hongu, FACSM)

PURPOSE: College students majoring in nutritional sciences are taught the national recommendation of weekly moderate-vigorous physical activity within their curriculum. The objective of this study was to examine 1) the awareness of the national physical activity recommendation for moderate-vigorous exercise (150 min/week), 2) where nutrition students obtain their recommendations, and 3) if their awareness and knowledge affected their physical activity behaviors. METHODS:
Using a 10-question survey, 331 introductory level nutrition students and 89 upper division nutrition students were asked an array of questions. The questions involved demographic questions, the number of days of their regular physical activity, if they knew the weekly physical activity recommendation, and where they have acquired most of their physical activity knowledge from. RESULTS: Of the total student responses, 70.9% (n=295) responded that they did not know the national physical activity recommendation, leaving 29.1% (n=121) saying that they did. Of the 121 students who responded saying that they did know the recommendation, 18% of these students (n=22) knew the recommended minutes (150 minutes), with an additional 36 students overestimating the recommendation. The results showed that male students exercised significantly more often than female students (p < 0.001). Additionally, looking at ethnicity as a factor, African Americans exercised significantly less than Whites (p = 0.02). There was a significant positive association between the amount of people who exercised and whether they knew the recommendation correct or not (p = 0.0041).

CONCLUSION: Nutrition students who are not exercising do not know the physical activity recommendation, despite being taught the recommendation in their curriculum. Further studies need to find more effective ways to communicate the physical activity recommendation to college students.
to valgus stress. Increased ER with the dial test. Positive Lachman’s. 0.5 EHL and tibialis anterior strength, otherwise 5/5. Absent sensation to light touch along the deep and superficial peroneal nerve distributions.

DIFFERENTIAL DIAGNOSIS: ACL tear, LCL tear, Meniscus tear, Peroneal nerve injury, PCL tear TEST AND RESULTS: XR: Intra-articular calcifications near ACL tibial attachment. No other fractures identified. MRI: Full-thickness tear of the ACL without definite evidence of fracture, Full-thickness tear of the biceps femur tendon at the fibular insertion with 3.2 cm of proximal retraction, disruption of the fibular collateral ligament, interstitial tearing of the distal popliteus tendon.

FINAL WORKING DIAGNOSIS: Left ACL tear, Left LCL tear, Left partial popliteus tear, left knee hamstring avulsion of the biceps femur, left complete foot drop with peroneal nerve injury.

TREATMENT AND OUTCOMES: 1. Placed in a brace and referred to orthopedic surgery 2. Surgery done for ACL/PCL/LCL reconstruction, distal hamstring repair, popliteus tendon reconstruction, and decompression of the peroneal nerve as scar tissue was noted around the nerve3. NWB in a boot for 6 weeks with limited ROM from 0-90 degrees 4. Referred for PT 5. Referred for EMG 6 weeks post-surgery
He eventually developed 1+ strength of the EHL. Sensation in the deep and superficial peroneal distribution significantly improved. He was placed in a custom AFO. He understands it is unlikely he will be able to play football at the same level again.

2285 May 31 10:30 AM - 10:50 AM
Atraumatic Recurrent Knee Effusion in a Collegiate Athlete - Soccer
Darwin R. McKnight, Vicki R. Nelson, Wayne F. Sease. Greenville Health System, Greenville, SC. (Sponsor: Wayne Sease, FACSM)
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(No relevant relationships reported)

HISTORY: An 18-year-old male sophomore collegiate soccer player presented to training room with a 2 month history of recurrent atraumatic left knee effusion and lateral knee pain. He reported multiple episodes of swelling that lasted several days before resolving. An X-ray obtained after initial evaluation was unremarkable and patient was advised to use ice, compressive dressing and take oral anti-inflammatories which improved symptoms temporarily and allowed him to participate with team. Two weeks later, he reported intense sharp anterior pain while walking down the steps with subsequent inability to bear weight. During follow up evaluation he was given crutches, allowed to partial weight bear and MRI was ordered.

PHYSICAL EXAMINATION: No angular deformity of either lower extremity. Left knee has moderate effusion. Full extension with flexion to 90°. Tenderness present over patella facets and lateral joint line. He has no medial joint line tenderness. No increased anterior/posterior translation or varus/varus instability. He reports lateral sided pain with McMurray and Thessaly. Full range of motion and strength at the left hip and ankle.


right leg. Heart rate was 62 beats per minute and respiratory rate of 14. Body weight was 58.3 kg with a height of 1.75 meters, body mass index (BMI) of 19 kg/m². Resting electrocardiogram: sinus rhythm, 71 beats per minute, right axis deviation, right bundle branch block, right ventricular hypertrophy and early repolarization pattern.

DIFFERENTIAL DIAGNOSIS:
1. Borderline electrocardiogram findings in athlete 2.

TEST AND RESULTS:
Treadmill Exercise Stress Test: Attained 98% of age-predicted maximum heart rate. Normal exercise ECG. Thoracic echocardiogram: Normal left ventricular function with an ejection fraction of 58%. Bicuspid aortic valve, left sided aortic arch, image suggestive of turbulent blood flow in descending aorta with a pressure gradient of 12 mmHg.

Physical exam

Differential diagnosis:

Tests and results:
DXA:
- Total Body Z-score: -0.3 - L1-L4 Z-score: -1.8 - L/R femoral neck Z-score: -0.3/0.5 - Total body fat: 18.3% Lab workup: - T2 IgG 19 U/mL, T2 IgA 2 U/mL, ferritin 53 mg/L - Estradiol 24 pg/mL, FSH 5.8 mIU/mL, LH 3.1 mIU/mL, Prolactin 4.3 ng/mL, total Testosterone 21 ng/mL, T3 T2 2.5 pg/mL - Vitamin D 55 ng/mL - 24 hour urine Ca:Cr ratio 167, BS Alk Phos 22.2 mcg/mL, PTH 21 pg/mL, Ca 10.1 mg/dL

Final working diagnosis:
Recurrent bone stress injuries due to: Low bone density secondary to uncontrolled Celiac Disease during time of adolescence bone mass accrual. Functional hypothalamic amenorrhea due to current low energy availability.

Treatment and outcomes:
1. Treatment for sacral stress fracture, running progression started at 9 weeks with patient of treatment with transdermal estrogen. This was deferred given return of menses due to transition socially to male gender.

Diagnosis:
Menstrual Dysfunction - Cross Country/Track

Bryan Holtzman, Kathryn E. Ackerman, FACSM

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ACSM May 28 – June 1, 2019 Orlando, Florida

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**2229 May 31 10:10 AM - 10:30 AM**

**Bone Health - Running, Can You Outrun Your Past?**

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(Historic relationships reported)

**HISTORY:**
A 20-year-old female distance runner with a history of recurrent bone stress injuries was referred for evaluation of back pain. Diagnostic workup revealed a left sacral stress fracture. Her workup was expanded to address her significant injury history. She had recently returned to her typical training volume of 70 miles/week following a left fibula stress fracture. She had a history of 2 prior stress fractures - left tibia & left sacrum. She reached menarche at age 17 & reported fewer than 6 periods per year. A short trial of oral contraceptives was discontinued 6 months prior to presentation. She had not had a menstrual cycle since that time. She had a history of Celiac Disease, diagnosed during a workup of iron deficiency as a teenager. She reported compliance with a gluten free diet since age 16. She had no history of disordered eating, chronic illness, or chronic medication use.

**PHYSICAL EXAMINATION:**
The patient was a well appearing, fit female. Her BMI was 21 kg/m². She exhibited no acne or signs of hirsutism including abnormal weight distribution or hair growth. Single leg hop test was positive.

**DIFFERENTIAL DIAGNOSIS:**

**TEST AND RESULTS:**

DXA:
- Total Body Z-score: -0.3 - L1-L4 Z-score: -1.8 - L/R femoral neck Z-score: -0.3/0.5 - Total body fat: 18.3% Lab workup: - T2 IgG 19 U/mL, T2 IgA 2 U/mL, ferritin 53 mg/L - Estradiol 24 pg/mL, FSH 5.8 mIU/mL, LH 3.1 mIU/mL, Prolactin 4.3 ng/mL, total Testosterone 21 ng/mL, T3 T2 2.5 pg/mL - Vitamin D 55 ng/mL - 24 hour urine Ca:Cr ratio 167, BS Alk Phos 22.2 mcg/mL, PTH 21 pg/mL, Ca 10.1 mg/dL

Final working diagnosis:
Recurrent bone stress injuries due to: Low bone density secondary to uncontrolled Celiac Disease during time of adolescence bone mass accrual. Functional hypothalamic amenorrhea due to current low energy availability.

**TREATMENT AND OUTCOMES:**

**2293 May 31 10:30 AM - 10:50 AM**

**Lung Function - Ultraendurance Marathon**

Courtney M. Wheatley1, Caitlin C. Fermoy2, Glenn M. Stewart1, Bryan J. Taylor1, Loic Chaibrodin3, Alice Gavert1, Briana L. Ziegler1, Jesse C. Schwartz2, Paul Robach1, Bruce D. Johnson2. 1Mayo Clinic, Scottsdale, AZ. 2Mayo Clinic, Rochester, MN. 3University of Leeds, Leeds, United Kingdom. 4Ecole Nationale des Sports de Montagne, Chamonix, France.

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(Historic relationships reported)

**HISTORY:**
An experienced 39-year-old male ultraendurance runner started experiencing shortness of breath, coughing and inspiratory difficulties 80km into the 170km Ultra-Trail du Mont Blanc. He was able to finish the race by reducing his exercise intensity and was examined ~2 hours after crossing the finish line.

**PHYSICAL EXAMINATION:**
The runner appeared weak, pale, with breathing shallow and constrained and oxygen saturation reduced from 97 to 92%. Resting respiratory rate and heart rate were elevated pre vs. post-race at 15 vs. 8 breaths and 52 vs. 103 beats per minute respectively. Lung auscultation found diffuse crackling in both lungs, but no wheezing.

**DIFFERENTIAL DIAGNOSIS:**
1. Exercise-induced asthma/bronchoconstriction 2. Pulmonary edema

**TEST RESULTS:**

Pulmonary function testing:
- FVC and FEV1 dropped 3L from baseline, with coughing making PFTs difficult
- DLCO dropped 25%, higher than the 13-16% range seen in other racers
- Alveolar-capillary membrane conductance (Dm) fell 50%, this was not observed in other racers
- Pulmonary capillary blood volume (Vc) dropped 28% from baseline, this was typical of the group

Resting Echocardiography:
- Post-race stroke volume was reduced, but cardiac output remained elevated compared to baseline (SV: 70 vs. 50mL; Q: 3.9 vs. 4.8L/min)
- RV diastolic area and RA area both increased post-race and RV function was reduced

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(Historic relationships reported)
A 21-year-old female division 1-track athlete presented multiple times with episodes of lightheadedness and headache with visual symptoms. Also reported recurrent rhinitis, residual cough and chest congestion. Symptoms were intermittent during periods of increased activity and relieved by rest. She missed multiple practices and workout sessions. Pt. was seen in 2013, 2016, 2017 and 2018 with dx including migraine, URI, influenza, and concussion with prolonged symptoms. She was empirically treated with albuterol and antibiotics without relief. Initial CXR negative but given the ongoing symptoms, serial x-rays noted a prominent main pulmonary artery. PHYSICAL EXAMINATION: Over the course of multiple examinations: NAD Nasal congestion and cough present RRR with normal heart sounds No respiratory distress but decreased breath sounds in the left lung’s upper and middle field. No rales/wheezes Neuro exam was unremarkable Skin was warm and dry DIFFERENTIAL DIAGNOSIS: 1) Recurrent Upper Respiratory Tract Infection 2) Asthma (EIB) 3) Vocal Cord Dysfunction 4) Migraine 5) Cardiovascular abnormality unspecified 6) Conussion with prolonged symptoms TESTS AND RESULTS: 9/2016: Labs: wnl, EKG: NSR, no acute ischemic change 2/2017: CXR: wnl 4/2018: Repeat CXR: normal heart size, prominent main pulmonary artery 5/2018: EKG: wnl, TTE: pulmonic valve not well seen, tricuspid regurgitation with PA systolic pressure of 32 6/2018: MRA chest w/o contrast: mild diffuse cardiomegaly, prominent right atrium & main pulmonary outflow. Partial anomalous right pulmonary venous return to right-sided SVC. 7/2018: EKG wnl, TEE: Moderate increased right ventricular size & right atrial enlargement. 8/2018: Cath noted PAPVR of entire right lung to azygous vein with large left to right shunt. FINAL WORKING DIAGNOSIS: Partial v. Total Anomalous Pulmonary Venous Return TREATMENT AND OUTCOMES: 1) Referral placed to pediatric cardiac surgery for repair. 2) Exercise stress test to quantify exercise tolerance. 3) Counseled and encouraged to participate in steady-state aerobic exercise. 4) Counseled on approximately 5% chance of passing on congenital heart disease to her offspring and fetal echo is indicated at 20 weeks. 5) Infective endocarditis prophylaxis not indicated.
2299
May 31 9:50 AM - 10:10 AM
Little Finger Injury - Football

André A. Abadin1, Raul A. Rosario-Concepcion1, John Cicciaro2, George Pujalte, FACSMD, Kristina DeMatas1. 1Mayo Clinic, Jacksonville, FL; 2University of St. Augustine for Health Sciences, St. Augustine, FL.
(No relevant relationships reported)

HISTORY: A 16-year-old, high school football running back, sustained a left 5th finger injury while catching a football at practice. He ran a route to his right and caught the ball with a low pass thrown to him. He initially reported pain and then noticed that his left little finger bone was sticking out of the skin. The mechanism of the injury was unclear. He did not recall whether he hit his finger on his leg or the football hit his finger while attempting to catch the ball.

PHYSICAL EXAMINATION: Examination revealed swelling of the left 5th digit with a two-centimeter laceration over the palmar side of the proximal phalanx. The left 5th proximal interphalangeal phalanx (PIP) joint appeared superficial to the musculature and skin, exposing the PIP joint. There was no evidence of fracture or any additional deformity of the finger. He was unable to move the PIP and DIP joint actively with normal MCP range of motion.

DIFFERENTIAL DIAGNOSIS
Interphalangeal open dislocation
Interphalangeal fracture
Interphalangeal collateral ligament strain

TEST AND RESULTS
Left hand x-rays pre-reduction
Left PIP 5th finger dislocation
No acute or healing fracture
Soft tissue swelling of the fifth digit
Left hand x-rays post-reduction
No acute or healing fracture
Soft tissue swelling of the fifth digit
Alignment of the PIP joint was normal

FINAL WORKING DIAGNOSIS
Unusual volar PIP open dislocation of the left 5th finger without fracture

TREATMENT AND OUTCOMES
Reduction of left 5th digit PIP joint in the emergency department
2-cm laceration repair with sutures
Placed an extension block splint and on cephalixin antibiotic for 10 days
Referred to Hand Orthopedic Surgery for evaluation of PIP post-reduction
Orthopedic surgeon recommended diagnostic hand ultrasound to evaluate any ligament or tendon damage
Ongoing evaluation

2300
May 31 10:10 AM - 10:30 AM
Musculoskeletal Injury - Weightlifting - More Than Just a Hand Injury in a World Champion

Joseph Medellin1, Ryan Rompola2, Mark E. Lavallee, FACSMD. 1WellSpan York Hospital Sports Medicine, York, PA; 2Franciscan Health Sports Medicine, Lafayette, IN. (Sponsor: Mark E. Lavallee, MD, CSCS, FACSMD)
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(No relevant relationships reported)

HISTORY: LB, a 51-year-old female competing for team USA at the International Weightlifting Federation (IWF) World Masters Championships in Barcelona, Spain on August 20, 2018 was on her third attempt (70kg) in the clean and jerk when she sustained intense pain in her right hand on the bottom of the jerk which caused her to not complete the lift. She came directly to medical area for evaluation.

EXAMINATION: Right Hand: Sensation intact, 2+ radial pulse, <2 second capillary refill of first finger. The first finger extended posteriorly angulated off the metacarpophalangeal (MCP) joint.

DIFFERENTIAL DIAGNOSIS
1. Dislocation of MCP joint of 1st finger 2. Ulnar collateral ligament of thumb injury 3. First finger fracture

TEST AND RESULTS: None obtained

FINAL WORKING DIAGNOSIS: Dislocation of MCP joint of first finger

TREATMENT AND OUTCOMES: Reduction of first finger MCP joint dislocation was achieved in the medical area at the competition with normal exam post reduction. The patient then found out her prior lift of the clean and jerk (66kg) was enough to secure her the World Championship title for her weight class. We then found out her complete medical background, which included an ongoing battle with breast cancer for the past two years, diagnosed in the fall of 2016. Due to the aggressive nature of the cancer, she has undergone a bilateral radical mastectomy (including resection of both pectoralis major muscles), partial right lung resection, partial diaphragm resection and partial gastrectomy in November 2017. The operation kept her from training for 8 months. She has undergone chemotherapy and radiation as her cancer has metastasized to her brain and bone. In February 2018, 6 months prior to the competition, she sustained a pelvic fracture after a fall. Despite this, she continued to train in her garage in Arizona leading up to the Master’s competition. Her finger was completely healed two weeks after competition. LB, the IWF Master’s World Champion for the Female 90kg Class, had another surgery one month after the competition with radiation to follow. Upon completion of surgery, her first question to the surgeon was, “when can I start lifting?” Despite the 8 months her Oncologist has given her, LB is hopeful, kind spirited and a World Champion.

2301
May 31 10:30 AM - 10:50 AM
Sports-Related Wrist Pain In A Musician

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(No relevant relationships reported)

HISTORY: 23-year-old man, fell on an outstretched left wrist while playing flag football 5 months prior to presentation. He developed ulnar wrist pain was told he had a fracture of one of the carpal bones at an urgent care center. He followed up at an orthopedic center, where a congenital carpal coalition was noted. He wore a wrist brace for a month. He returned to regular activity until 2 months prior to presentation when he had a repeat injury to the left wrist and developed recurring pain on the ulnar aspect of his left wrist. He wore a brace for another month with improvement. Two weeks prior to presentation, he felt a popping sensation on the ulnar aspect of the left wrist while lifting. He only has pain with loading activities. No numbness or tingling. He is a trombone player and a music major and plans on using his hand for his career.

PHYSICAL EXAMINATION: MSK: Left wrist. Skin is dry, clean, intact. Wrist range of motion is 70 degrees of extension and 75 degrees of flexion with full pronation and supination. NON-TTP over the ECU or TFCC. Mildly tender over the triquetrum. Painful click reproduced with volarily-directed pressure on the triquetrum. Strength 5/5 in FPL, EPL, interossei and FDP. Grip strength on left side is 70 lbs and 130 lbs on the right side.

DIFFERENTIAL DIAGNOSIS
Extensor carpi ulnaris tendinopathy and subluxation
Triangular fibrocartilage complex injury
Triquetral, hook of hamate or ulnar styloid fracture
Ulnar nerve entrapment at Guyon’s canal
Ulnocarpal abutment syndrome
Lunotriquetral ligament injury
Lunotriquetral coalition with injury
Ulnar styloid impaction syndrome
Pisotriquetral or ulnocarpal arthritis

TESTS AND RESULTS: MRI of the left wrist:
with secondary tenderness at the ulnar and radial PIP. On active ROM his 5 in injuries. These mechanisms have shown to be increased in a fatigued state therefore of knee flexion, greater knee valgus angles, and greater knee valgus moments maneuvers. During landing, studies have prospectively linked insufficient amounts of knee flexion, greater knee valgus angles, and greater knee valgus moments.

**FINAL WORKING DIAGNOSIS:**
Congenital left-sided lunotriquetral coalition with an injury resulting in instability.

**TREATMENT AND OUTCOMES:**
- Discussed fusion of the lunotriquetral joint
- Wrist brace for several weeks
- NSAIDs
- Use grips for wrist-loading activities
- Possibility of a cortisone injection if no improvement with conservative measures

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**PHYSICAL EXAMINATION:**
On inspection, there was mild soft tissue swelling joint (MCPJ) without radiation.

**Mechanism:**
There was no sensation of dislocation. Pain localized to the dorsal MCP in injury requiring medical attention occurred during a tackling attempt with unclear joint. Again there was pain, swelling, and improvement with buddy taping. The final x-rays 4. More follow up to be presented at the conference as patient returns osseous edema and risk of fracture until 4 week follow up 3. Follow up in 4 weeks for.

**TREATMENT AND OUTCOMES:**
- Discussed fusion of the lunotriquetral joint
- Wrist brace for several weeks
- NSAIDs
- Local cortisone injection if no improvement with conservative measures

**FINAL WORKING DIAGNOSIS:**

**TEST AND RESULTS:**
Hand X-rays: Small avulsion fracture off the volar aspect of the base of the 5th middle phalanx. MSK Ultrasound: Intact distal extensor mechanism MRI hand: Distal 5th metacarpal bone contusion without acute fracture, MCPJ capsular sprain with low-grade partial tear of the ulnar collateral ligament, and joint effusion.

**FINAL WORKING DIAGNOSIS:**
Left 5th MCP capsule sprain, partial tear of the 5th MCP ulnar collateral ligament, and 5th metacarpal bone contusion

**TREATMENT AND OUTCOMES:**
- Immobilization with hand based intrinsic plus splint encompassing the 4th + 5th MCP for 4 weeks 2. No contact sports due to oseous edema and risk of fracture until 4 week follow up 3. Follow up in 4 weeks for x-rays 4. More follow up to be presented at the conference as patient returns suggesting an athlete may be at greater risk for ACL injury when they are fatigued. Research to support this claim, however, is inconclusive. PURPOSE: To examine the difference in peak knee flexion angle (pkFA), peak knee valgus angle (pkVA), peak knee valgus moment (pkVM), and peak vertical ground reaction force (vGRF) pre and post fatigue during the landing phase of a drop jump task in basketball athletes.

**METHODS:**
Twenty-five subjects participated in the study and performed three drop jump trials before and after a fatigue protocol involving repeated counter movement jumps targeting a customized target specific to each subject. Data was captured using a Qualisys 9-camera motion capture system sampling at 240 Hz and two AMTI force plates sampling at 2400 Hz. RESULTS: Paired t-tests showed subjects landed with significantly greater pkFA post fatigue (p < .05) while pkVA, pkVM, and pkGRF showed no difference pre- and post-fatigue (p > .05). CONCLUSION: Subjects in this study adopted a safer landing strategy post fatigue, hence, suggesting our study did not support the claim that athletes would be at greater risk for ACL injuries in a fatigued state.

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**E-14**
**Rapid Fire Platform - Biomechanics in Fatigue**
Friday, May 31, 2019, 9:30 AM - 10:40 AM
Room: CC-Hall WA2

**Chair:** Roger Enoka. University of Colorado, Boulder, CO.

**2303**

**2304**

**May 31 9:40 AM - 9:50 AM**

**Dynamic Postural Stability During Rested and Fatigued Backwards Single-Leg Jump-Landings**
Colin W. Bond, Benjamin C. Noonan. Sanford Health, Fargo, ND

**Email:** colin.bond@sanfordhealth.org
(No relevant relationships reported)

Poor time to stabilization (TTS) during backward single-leg jump-landing (BSLJL) is a risk factor for injury. PURPOSE: The purpose of this study was to assess the reliability of TTS and effect of fatigue on TTS. It was hypothesized that TTS would demonstrate adequate reliability, and that fatigue would worsen TTS. METHODS: Nine active subjects (4 F, 5 M, 24.8 ± 4.4 y, 74.7 ± 15.3 kg) performed BSLJL on the dominant (D) and non-dominant (ND) leg. BSLJL was performed barefoot by jumping backwards on the test leg over a 0.15 m hurdle, landing on the test leg on a force plate with hands on the hips, and stabilizing as quickly as possible. During session 1, subjects performed 10 trials without familiarization. During session 2, subjects performed 3 trials (PRE), rested for 5 minutes, and re-performed 3 trials (POST). During session 3, subjects completed 5 to 7 minute fatigue protocol consisting of step-ups, L-drills, vertical jumps, and agility ladder drills between PRE and POST instead of resting. Sessions 2 and 3 were completed in a randomized order. TTS was quantified as time from initial contact to when vertical ground reaction force remained within 5% of the subject’s body mass for 1 s. RM ANOVA and paired t-tests were used to compare TTS, and typical error (TE) was used to quantify reliability. Significance was set to p ≤ 0.05. RESULTS: During session 1, BSLJL TTS did not improve over 10 trials on D (p = 0.18) or ND (p = 0.49). During session 2, TTS was similar PRE and POST on D (1.2 ± 0.47 vs 1.17 ± 0.40 s, p = 0.81) and ND (1.27 ± 0.53 vs 1.05 ± 0.57 s, p = 0.09), and had a within-day TE of 0.02 and 0.16 s, respectively. During session 3, TTS was similar PRE and POST on D (1.21 ± 0.32 vs 1.05 ± 0.35 s, p = 0.02), but greatest at POST compared to PRE on ND (1.21 ± 0.51 vs 1.60 ± 0.58 s, p = 0.04). The between-day TE assessed using PRE TTS from session 2 and 3 was 0.36 s on D and ND. CONCLUSION: BSLJL learning effects are negligible, although familiarization trials are likely needed. Between-day reliability does not appear adequate. Using TTS to longitudinally monitor injury risk may be inappropriate. Fatigue appears to degrade TTS, but does not appear to affect all subjects equally, and effects may be masked by large inter-subject variation in TTS. Identifying factors related to susceptibility to fatigue induced decrements may improve injury prevention measures.

**2306**

**May 31 9:50 AM - 10:00 AM**

**Fatigue Increases Center of Pressure Swing**
Gustavo Sandri Heidnerg, Caitlin O’Connell, Nicholas Murray, J C. Mizelle, Patrick Rider, Zachary J. Domire. East Carolina University, Greenville, NC.

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(No relevant relationships reported)

Posture and stability are key components in the accurate performance of a myriad of physical tasks. Recent research suggests that fatigue may lead to an increase in center of pressure (COP) oscillation, but the conditions in which balance is impaired are unclear. PURPOSE: To investigate the effects of fatigue and other perturbation conditions on the sway of the COP. METHODS: Eighteen participants completed three trials under each condition, pre- and post-fatigue protocol. The conditions were eyes open (EO), eyes closed (EC), single leg stand (SL), subtraction of seven (SS), unstable surface (US), virtual reality baseline (VB) and virtual reality perturbation (V2). The x- and y-axis COP coordinates were measured using a Borelli force plate. After the first 21 trials, the participants walked on a treadmill at a RPE of 14 for 30 minutes while carrying a 25 kg weighted backpack. Anterior-posterior (APd) and medio-lateral (MLd) displacement of COP were calculated. Results are presented in millimeters (Mean ± SD). A two-factor mixed-design ANOVA was used to test for statistically significant differences (α = .05). RESULTS: APd increased under EC.
Comparison to other muscle groups (e.g., elbow flexors), few studies (two) have investigated the role of sex on muscle fatigue of the elbow extensors (EE). The greater fatigability usually seen for males compared to females was not observed, so the EE warrant further study. PURPOSE: To investigate the effect of sex on peripheral, somatoneural, and cortical excitability as well as central fatigue with a submaximal EE task. METHODS: To date, 13 participants (7 females) have performed a 15-min sustained isometric contraction at the level of electromyographic activity (EMG) recorded at 15% of maximal torque, followed by recovery contractions over 5 min. Pre- and post-fatigue as well as at the end of each minute, evoked potentials were recorded from triceps brachii in response to transcranial magnetic stimulation of the motor cortex (TMS; motor evoked potentials, MEPs), cervicomedullary stimulation (cervicomedullary motor evoked potentials, CMEPs) and brachial plexus stimulation (maximal M-wave; Mmax). MEPs and CMEPs were elicited 100 ms after a conditioning TMS pulse. To assess central fatigue, voluntary activation (VA) was calculated pre- and post-fatigue using superimposed and resting tetani evoked via trains of 5 stimuli (100 Hz) delivered over triceps brachii. RESULTS: During fatigue, Mmax area did not change. The CMEP (normalized to Mmax) was reduced to 46.9 ± 15.6% and 50.1 ± 16.9% of the control ratio in females and males, respectively. The MEP (normalized to CMEP) was facilitated to 153.8 ± 9.6% in females and 260.4 ± 19.1% in males. At 5 min of recovery, the normalized CMEP remained depressed in females and males (57.1 ± 13.8% and 47.6 ± 34.0%, respectively), whereas the normalized MEP remained facilitated at 220.1 ± 106.4% in females and 184.5 ± 101.3% in males. VA decreased from 97.0 ± 1.8% to 84.3 ± 18.0% in females and 95.5 ± 3.3% to 76.7 ± 21.0% in males at task termination, and showed incomplete recovery at 5 min (89.0 ± 8.9% in females and 84.6 ± 13.0% in males). CONCLUSIONS: Apart from a trend toward greater central fatigue in males, the preliminary results support published findings, which show negligible sex differences with isometric fatigue of the EE. Additional research is needed to ascertain why the EE differ from other muscle groups in this regard. Supported by NSERC, CFU, and BCKDF

Stress fractures are common injuries in runners and military recruits, with females at greater risk than their male counterparts. Impact variables including peak axial tibial shock and vertical average load rate during running have been shown to be higher in females with a history of tibial stress fractures and increase with fatigue. However, the relationship between mechanical and foot strike pattern and those with multiple lower extremity stress fractures has not been examined. PURPOSE: To investigate whether impact increase with fatigue in runners with no history of stress fractures (CON), one (1SFx), and 3 or more (3SFx) stress fractures. METHODS: Impact variables were calculated for 43 females (14 CON, 14 1SFx, and 15 3SFx) at a speed of 2.67 m/s before and after a fatigue run. Variables included peak axial and resultant tibial shock (VTA, RTA) and vertical average and instantaneous loading rates (VALR, VILR). The fatigue run was performed at a 5 km predicted pace and stopped when a RPE reached ≥ 18. Absolute change comparisons were made using one-way ANOVAs and post-hoc tests. RESULTS: SFx had larger changes (i.e. increased values) after fatigue than CON or 1SFx, with fatigue compared to those with history of one stress fracture. Change in foot strike pattern greatly influences impact mechanics before and after fatigue. Supported by United States Department of Defense, Defense Health Program, and Joint Program Committee W81XWH-16-1-0652. The views expressed are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government

Mental fatigue leads to declines in performance of tasks such as cycling time trial performance and skill-based outcomes such as soccer shot accuracy. The neuromuscular mechanisms leading to these declines are not well understood. Although force variability has been shown to increase under dual-task conditions, it is not known if these results extend to conditions of mental fatigue. PURPOSE: The purpose of this study was to assess the impact of mental fatigue on variability in motor output in healthy, young individuals. Specifically, we sought to determine if a task that induces mental fatigue has effects on force and motor unit firing variability. METHODS: Nineteen participants (10 female, 9 male) performed 10-s isometric contractions at 20% and 50% maximum voluntary contraction (MVC) before, during, and after completing 20 min of the psychomotor vigilance task (PVT). The PVT is a sustained attention task that induces mental fatigue, as indicated by increases in reaction time (RT) to visual stimuli. Force and indwelling motor unit (MU) firings were measured prior to and immediately following performance of the PVT (single task), and within the first and final minutes of PVT performance (dual task). Subjective ratings of fatigue were also obtained using a 10-point Likert scale before and after the PVT. RESULTS: Reaction time increased by 14% from the beginning of the PVT (276.14 ± 31.54 ms) to the end (314.15 ± 37.74 ms, p < 0.001). Subjects also subjectively reported greater levels of fatigue following the PVT (4.93 ± 1.84) compared to before (3.00 ± 1.20, p < 0.001), indicating successful induction of mental fatigue. For the coefficient of variation (CV) of force there was a significant main effect of time (p = 0.14) or contraction intensity (p = 0.33), and no significant interaction (p = 0.23). CONCLUSION: Inducing mental fatigue did not lead to changes in the variability of force production or motor unit firing during isometric contractions at 20 and 50% MVC as a single-task or during a concurrent cognitive task.
rehydration. Control may explain resulting declines in performance following dehydration and be negatively affected by relatively small changes in hydration status and that the dehydration achieved through fluid restriction (r = .025, n.s.). Hierarchical regression analyses revealed that these rowing performance decrements were better explained by fluid restriction and subsequent sauna exposure.

Body mass reduction. Weight loss was achieved through a combination of 12-hour battery: once euhydrated and once after mild dehydration (mean -1.68 ± .23% (N=14) twice performed a 2000 m rowing ergometer time trial and visuomotor running form and hip/pelvic kinematics and kinetics.

Further research is needed to examine segmental kinematics and muscle EMG around the hip to fully understand the relationship between the compensation during fatigued running form and hip/pelvic kinematics and kinetics.

Dehydration is an acute weight loss technique used by lightweight rowers to become eligible for competition. While rowing allows a two-hour window between weigh-ins and racing that athletes can use to rehydrate, it is unclear what effect this procedure may have on performance. Purpose: To determine whether mild dehydration with rehydration, as a weight reduction strategy for lightweight rowers, compromises rowing performance. METHODS: Experienced rowers (N=14) twice performed a 2000 m rowing ergometer time trial and visuomotor battery: once euhydrated and once after mild dehydration (mean -1.68 ± 23% body mass reduction). Weight loss was achieved through a combination of 12-hour fluid restriction and subsequent sauna exposure. RESULTS: Participants were significantly slower on the 2000 m rowing trial in the dehydration condition than in the euhydration condition (2.44 ± 4.5 s, p<0.05). Hierarchical linear regression analyses revealed that these rowing performance decrements were better explained by dehydration achieved through fluid restriction (r² = .504, p<0.01) than by dehydration achieved in the sauna or total dehydration magnitude (r² = .025, n.s.). Hierarchical regression revealed that dehydration-related changes in visuomotor function were also explained by dehydration by fluid abstinence but not sauna exposure and were predictive of dehydration-related rowing performance decrements (r² = .310, p<0.01). CONCLUSION: These findings suggest that rowing time-trial performance can be negatively affected by relatively small changes in hydration status and that the technique by which dehydration is achieved is important. Performance losses were associated with fluid abstinence and not with sauna dehydration. Reduced motor control may explain resulting declines in performance following dehydration and rehydration.

Dehydration Protocol Impairs Lightweight Rowing Performance: Exploring Differences In Dehydration Technique
Dayton J. Kelly, Liana E. Brown. Trent University, Peterborough, ON, Canada.
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High intensity functional training (HIIT) is a novel exercise intervention that may test body systems in a balanced and integrated fashion through challenging individuals’ abilities to complete mechanical work; however, research has not determined if work capacity (WC) is a unique measure of fitness. PURPOSE: To determine if change in WC is related to change in the underlying physiologic measures. METHODS: Twenty-five healthy men (n=13; age = 22.6±3.5; body mass = 86.1±13.9 kg; height = 182.8±1.8 cm) and women (n=12; age = 21.0±1.5; body mass = 75.5±11.3 kg; height = 165.6±5.7 cm) completed a six-week (5 days/week) HIIT intervention with WC and various physiologic measures of fitness assessed pre- and post-intervention. Physiologic variables assessed included aerobic capacity (VO2 max); one-repetition maximums for back squat, shoulder press, and deadlift exercises; peak power and fatigue index from a 30-second Wingate bout; and WC (i.e., the maximal amount of mechanical work performed in a given time domain). RESULTS: At baseline, all physiologic measures of fitness were significantly associated with WC and this relationship was even stronger at post-intervention assessment (all p < 0.05). Further, there were significant improvements across these measures in response to the HIIT intervention (all p < 0.05). However, a multiple regression model using the change in these measures did not significantly predict the change in WC induced by HIIT (F = 0.330; Sum of Squares = 637.3; df = 5; p = 0.908; R² = 0.141). In addition, no single measure of fitness was significantly associated with the change in WC (Table 1). CONCLUSION: HIIT may be a unique challenge to individuals’ fitness beyond traditional exercise programs; as evidenced by the independence of changes in WC from changes in the associated physiologic components. Elucidating the translational impact of increasing WC via HIIT may be of great interest to health and fitness practitioners.

Master sports is increasingly popular and arguably becoming more competitive worldwide. Engagement in master sports has a positive impact on athlete’s health & fitness. Master swimming is a good proxy of overall master sports as it is deemed to have one of the highest number of competitive participants. Several fitness components are performance determinants in master swim. However, it is unknown the progression of World Records (WRs) in master swim over time. It can provide insight on the overall trend of master swimmers’ fitness level and competitiveness over the past decades. PURPOSE: To analyze the progression of WRs in master swim in the past decades. METHODS: The WRs in all men’s freestyle events (50m, 100m, 200m, 400m, 800m, 1500m) in all age groups (from 25-29 to 100-104 years-old) between 1984 and 2016 were extracted from FINA database. To enable comparisons across events, WRs were converted into swim speed. For each event and age-group the percentage of change in the swim speed between Olympic cycles was calculated. Then, it was computed the relative variability within-cycle and within-event. Small, moderate and large worthwhile effects between time of Olympic cycles were calculated as 0%, 5%, and 10% of between-cycle variability, respectively. Whereas the within-events variability was high (33.93-CV=128.38%; 400m and 800m events, respectively). Small, moderate and large worthwhile effects between-cycles were 0.16%, 0.47% and 0.93%, respectively. Changes that time had a substantial effect on the WRs progression ranged between 97.5% (in the 50m events) and 100% (800m). Changes that event had a substantial effect ranged from 80.9% (in 2012-2016) and 100% (in 1984-1988 and 1992-1996). CONCLUSIONS: Master swim WRs showed largest progressions in the first Olympic cycles than recently. Middle- and long-distance events denoted higher percentage of change than sprints. Supported by: Portuguese Foundation for Science and Technology (UID/DTP/04045/2013); European Fund for regional development (FEDER)-COMPETE 2020 (POCI-01-0145-FEDER-060696).

ATOMIC Profile Of Elite Alpine Ski Racers: A Systematic Review And Meta-analysis
Pierre-Marc Ferland, Alain Steve Comtois. UQÀM, Montreal, QC, Canada.
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The purpose of this study was to review all anthropometric and physical test results performed on alpine ski racers that were published in the scientific literature to build an athletic profile specific to the skier’s sex and level as well as to quantify the effect size of presented factors on alpine ski racing performance.

METHODS

Abstracts were prepared by the authors and printed as submitted.
Four electronic databases were systematically searched using the following key words: alpine skiing physiology. The manual search was performed through the reference list of all suitable publications, the author’s personal collection and the proceedings of the International Congresses on Science and Skiing.

SUMMARY OF RESULTS

The search and selection strategy permitted to gather data from 28 peer reviewed publications that was collected on a total of 1107 skiers coming from 11 different countries to build the athletic profile as well as 6 peer-reviewed publications that presented suitable correlations for the meta-analyse. Results of this study present the athletic profile, review the different testing protocols, present correlations between physiological factors and alpine ski racing performance and combine them to present the overall effect size of these factors on alpine ski racing performance. Findings show that men generally present higher tests results than woman, that higher level ski racers generally present higher test results than lower level ski racers and that age, weight, body fat % and lower limb power presented significant effects on alpine ski racing performance (-0.52 [95% IC : -0.73; -0.31] (p< 0.0001), -0.57 [95% IC : -0.78; -0.36] (p<0.0001), -0.25 [95% IC : -0.43; -0.07] (p=0.0055) and 0.8 [95% IC : 0.44; 1.17] (p< 0.0001) respectively).

CONCLUSION

The present review should serve as guidelines for professionals working with alpine ski racers since some of the factors presented in the athletic profile have been shown to be related with performance. Further research should include more details on the testing protocols used, be directed towards female athletes, present results from groups of athletes of the same sex and clearly identified as established at a certain level and be directed on the effect of physiological factors on alpine ski racing performance. These measures could help support further theoretical investigations.

SUMMARY OF RESULTS

International Congresses on Science and Skiing

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

ACSM May 28 – June 1, 2019
Orlando, Florida
Despite the importance of peak power output (PPO) to many cycling disciplines, particularly in sprint events, little is known about the structural and functional determinants of PPO in elite cyclists. **PURPOSE:** To determine the relationship and contribution, in elite cyclists spanning a range of disciplines, of putative neuromuscular determinants with cycling PPO during sprint cycling. **METHODS:** Thirty-five elite male cyclists volunteered to take part in the study (mean ± SD age, 22 ± 4 yr; stature, 179.1 ± 5.9 cm; mass, 77.4 ± 11.3 kg) and conducted a series of isovelocity sprints to assess PPO on two separate occasions. Surface EMG (sEMG) of the gluteus, hamstring and quadriceps muscles were recorded during the PPO test. Muscle volume was assessed and quantified using MRI and muscle architecture of the gluteal, hamstring and quadriceps muscles were recorded during the PPO test. Muscle volume was assessed and quantified using MRI and muscle architecture of the gluteal, hamstring and quadriceps muscles were recorded during the PPO test. Significant correlations were included in a step-wise regression to predict PPO. **RESULTS:** Positive bivariate relationships were found for quadriceps volume (r = 0.87; P < 0.001), hamstring volume (r = 0.71; P < 0.001) and PPO (r = 0.81; P < 0.001) with PPO. The remaining measures (Fl, and sEMG) were unrelated to PPO. A step-wise multiple regression analysis was conducted with the three predictor variables: %BF, PédVL, and fascicle length (Fl). The model explained 71% of the variance in PPO. **CONCLUSION:** These data provide valuable information on the characteristics of elite cyclists. Importantly, determinants of PPO in this elite population have been identified as muscle volume of the quadriceps and pennation angle of the VL. These data provide a basis that allows coaches and practitioners to understand the contributing factors to cycling PPO performance. Consequently, it is recommended that athletes, coaches and practitioners use this information to target these physical qualities to inform training programme design of elite cyclists to maximise pennation angle and quadriceps volume.

**2345** Board #9 May 31 9:30 AM - 11:00 AM The Influence of Fatiguing Exercise on Power Output
Lenka K. Perry, J. Mark VanNess, William P. Lydon, Joey Rossi, Courtney D. Jensen. University of the Pacific, Stockton, CA. Email: lkperry2@up.acap.com (No relevant relationships reported)

Physical fatigue impairs performance during high power, short duration activities. As technological developments permit new methods of measuring this effect, it is important to validate existing paradigms. **PURPOSE:** To determine if kinetic measurements from vertical jump (VJ) tests are influenced by fatigue based on explosive power outputs. **METHODS:** A sample of athletes (9 men, 20 women) from a Division I NCAA sports program completed testing. To establish baseline VJ kinetics, athletes performed a controlled warm-up and then completed 6 jumps on a SpartaTrac force plate, each separated by 15s rest. SpartaTrac software computed 3 outputs: Load, Explode, and Drive. After baseline VJ calculation, all athletes performed an anaerobic fatigue protocol on a mechanically-braked cycle ergometer: 3 sprints lasting 15s separated by 10s rest. Peak and mean power were recorded from the cycle trials. Subjects then repeated the VJ protocol. This pattern was repeated until 6 sets of VJ were recorded. Repeated measures ANOVA tested differences between successive VJ performances. **RESULTS:** Male athletes were 20.8 ± 1.5 years old, weighed 175.8 ± 14.3 lbs, had a baseline VJ of 46.9 ± 3.6 cm. Load of 53.3 ± 13.3, Explode of 49.4 ± 6.6, and Drive of 49.4 ± 11.9. Female athletes were 20.2 ± 1.2 years old, weighed 142.3 ± 13.2 lbs, had a baseline VJ of 32.7 ± 4.3 cm. Load of 49.8 ± 46.1, Explode of 40.7 ± 8.0, and Drive of 63.1 ± 49.7. The only differences between men and women were weight (p<0.001), VJ (p<0.001), and Explode (p=0.006). ANOVA found VJ height to decrease between baseline and trial 2 (p=0.001); there was no difference between men and women (p=0.210); between trials 2 and 6, VJ height was consistent (p=0.400). Load was not affected by the fatigue protocol across the total sample (p=0.418) or by sex (p=0.239). Explode was not affected by fatigue across the sample (p=0.233) or by sex (p=0.406). Drive was affected by fatigue (p=0.040), decreasing in successive trials; there was no interaction with sex (p=0.742). **CONCLUSION:** VJ is more sensitive to fatigue than SpartaTrac force plate calculations. An initial fatigue insult was sufficient to compromise performance, whereas accumulated fatigue did not have an additive effect. Drive was the only variable in SpartaTrac outputs that was affected by fatigue.
trained athletes to maintain performance components over the course of the season. Purpose: To examine potential changes between pre-season and post-season measures of agility, strength, endurance between players who averaged 20 or more minutes per game and those that averaged less. Methods: 14 female collegiate basketball players (average age 18.7±0.21 years) participated. Participants engaged in 2 separate testing periods (end of pre-season and end of competitive season). During each testing period speed, agility, strength, endurance, anaerobic condition, and power were tested using 40-yard dash, Pro-agility test, squat, mile run time, and beep test, respectively. Paired t-tests were used to determine significant differences between testing period 1 and 2. Athletes were also identified as being either a starter (ST), which was an indicator of playing time averaging greater than 20 minutes per game, or non-starter (NST). Results: Performance components were measured at the beginning and end of the basketball season. At season start, ST and NST players were statistically similar in regards to all reported tests of performance. Of the components tested at the post-season time point, only two were found to change significantly. Pro-agility scores improved over the course of the season for both ST (pre-season 5.5±0.1, post season 5.1±0.07, t(5)=2.43, p=0.04) and NST (pre-season 5.6±0.07, post season 5.2±0.07, t(5)=2.85, p=0.01) players. NST players demonstrated a significant decrease in performance on 0-yard-dash (pre-season 5.5±0.06, post-season 5.8±0.07, t(5)=2.8, p=0.02) while ST players had no difference. For the mile run, NST athletes demonstrated a significant increase in time (3%) when compared to the ST players (6%), with a p<0.05. Conclusion: These findings demonstrate the ability of female collegiate basketball athletes to maintain, and even improve upon, certain performance related components. For athletes with less playing time, some measures may suffer over the course of the season.

2349 Board #13 May 31 9:30 AM - 11:00 AM Confirming The Coach’s Bias: Power Begets Performance At The Plate Kento J. Moriguchi, Nathaniel J. Holmgren, J. Mark VanNess, William P. Lydon, Courtney D. Jensen. University of the Pacific, Stockton, CA. Email: k.moriguchi@u.pacific.edu (No relevant relationships reported)

Baseball coaches value specific traits in their batters; this is reflected in starting lineups. The success of those batters depends on their ability to produce base hits. This is a complex skill affected by many factors, but a key component is the kinematic fingerprint of the swing. Purpose: To test which biomechanical domains of a baseball swing predict entry into the starting lineup, and which associate with the likelihood of getting base hits. Methods: We enrolled 13 batters from a D1 baseball team (7 starters, 6 non-starters) and conducted 3D analyses of swing mechanics using Proteus (Boston Biomotion, USA). Each athlete performed six sets of five swings at increasing loads between 1lb and 9lbs of magnetic resistance. Independent-samples t-tests measured the difference in performance between starters and non-starters, with special attention paid to mean swing power (MSP) and mean swing consistency (MSC), i.e., how accurately successive swings are replicated in 3D space. Logistic regression tested how MSP and MSC affected the odds of being in the starting lineup. Linear regressions measured the effect of MSP and MSC on the number of hits in a season and hits per at-bat. Results: Players in the starting lineup had 0.27 ± 0.03 hits per at-bat; non-starters had 0.17 ± 0.15 (p = 0.170). Starters exhibited a weak trend for lower consistency (p = 0.092) but generated more power (p = 0.003) and achieved greater bat speed (p = 0.009). MSP and MSC were not significant predictors of starting status: for each additional point of MSP, the odds of being a starter increased 29% (p = 0.106); for each additional point of MSC, the odds were decreased by 24% (p = 0.123). Owing to a small sample, power was not significantly different throughout the lineup, but consistency was lowest in batters 3-5 (p = 0.048). Linear regressions found each additional point of MSC to predict 2.1 fewer hits per season (p = 0.029) while each additional point of MSP predicted an increase of 0.7 hits per season (p = 0.014). When measuring these effects per at-bat, significance was lost. A post hoc power analysis revealed a need for 6 additional athletes to achieve significance. Conclusion: Even in a small sample, analysis of swing mechanics is helpful in determining performance. An increase in swing power associated with more hits and an increase in consistency associated with fewer.

2350 Board #14 May 31 9:30 AM - 11:00 AM Intervention Of Cordyceps Sinensis On Exercise Fatigue wenjuan zhen. Chengdu Sport University, CHENGDU, China. Email: 1286245074@qq.com (No relevant relationships reported)

Purpose: To investigate the intervention of Cordyceps sinensis on exercise fatigue and search for the reasons of such phenomena. Methods: Forty 6-week SD rats were randomly divided into two groups: control group (n=15) and medic group (n=15) treated with cordyceps sinensis (0.004g/kg). lasted for 10 days, then all rats were trained to swim until exhaustion. Immediately after the exhaustion, test its exhaustion time and some biochemical indexes, such as BUN, Blood testosterone and Lactate. RESULTS: Compared with the control group, Exhausted time of medicine group was significantly prolonged (108.23±42.12 vs. 199.05±62.18 min. p<0.001); the blood lactate level was higher(6.75±1.68 vs. 9.35±2.01 mmol/L); the blood testosterone level was higher(0.21±0.098 vs. 0.31±0.068 mmol/L,p=0.05 ); and the urea nitrogen level was lower(1.89±0.20 vs. 1.52±0.34 mmol/L, p=0.05). CONCLUSION: Cordyceps sinensis has the ability to improve the exercise capacity of rats, increase the threshold of lactate, increase the secretion of serum testosterone, inhibit the catabolism of protein, and prevent the decline of lean body mass.

2351 Board #15 May 31 9:30 AM - 11:00 AM No Changes in Depth Jump Height but Longer Ground Contact Times as Box Height Increases Cameron D. Addie1, Emily E. Grammer2, Marisa K. Straughn3, Giovanna C. Ramos4, Tyler J. Nelten5, Jeffrey D. Simpson6, Ludmila Josia Lima5, Eric K. Greska5, Lee E. Brown, FACSM7, University of West Florida, Pensacola, FL. University of Delaware, Newark, DE. (No relevant relationships reported)

Depth jumps (DJ) are commonly implemented in plyometric training programs in an attempt to enhance lower extremity jump performance. However, it is unknown how different box heights affect jump height (HJ) and ground contact time (GCT).

Purpose: To assess HJ and GCT of depth jumps from various box heights.

Methods: College students who engaged in plyometric training (M=13, F=7; age: 22.8±2.7y, height: 175.65±11.81cm, mass: 78.32±13.50kg) performed DJs from 30cm (DJ30), 45cm (DJ45), 60cm (DJ60), 76cm (DJ76) and 91cm (DJ91). A 16 camera Vicon system was used to track reflective markers bilaterally to calculate HJ (ASIS, PSIS), while a Kistler force plate was used to measure GCT. HJ and GCT were compared using separate 2x5 (sex x box height) repeated measures ANOVAs.

Results: There was no interaction but there was a significant main effect for sex where both HJ (M>F) and GCT (F>M) showed a significant M bias. There was no box height main effect for HJ (DJ30:49.4±11.26cm, DJ45:50.03±13.44cm, DJ60:49.46±1.195m, DJ76:49.97±1105mm, DJ91:47.83±1162mm) but there was for GCT where DJ30 (.358±.097s), DJ45 (.365±.105s) and DJ60 (.372±1.104) were not significantly different from each other but were all less than DJ76 (396.1±116) and DJ91 (420±115). Conclusion: Increasing box height beyond 60cm increased GCT but did not affect HJ. Therefore, practitioners designing plyometric training programs to increase HJ that implement DJs may utilize box heights between 30 and 60cm. This would insure minimal GCT which might be vital in other power and speed events.

2352 Board #16 May 31 9:30 AM - 11:00 AM Effect of Sex on Pacing Behaviour in Elite 1500m Short-Track Speed Skating Competitions Lars van Leeuwen1, Marco J. Konings2, Florentina J. Hettinga, FACSM3, Rijksuniversiteit Groningen, Groningen, Netherlands. University of Essex, Colchester, United Kingdom. Northumbria University, Newcastle upon Tyne, United Kingdom. (No relevant relationships reported)

Purpose: The aim of this study is to examine the effect of sex on pacing behavior during elite 1500m short-track speed skating events. Methods: In short-track speedskating, a 1500m race is 13.5 laps. Lap times from 13805 skating performances from World Cups, World and European Championships and the Olympics in the seasons 2012/2013 up until 2017/2018 were collected from the ISU website and examined using ANOVA statistical analysis in which lap velocities were chosen as dependent variables and sex was chosen as independent variable (p<.05). In order to compare men (M) and women (W), the data were normalized by calculating individual normalized lap velocities, and dividing those by the actual lap velocity. This procedure was repeated for each lap separately and mean velocity as outcome variable. Results: Pacing behavior of both sexes is shown in figure 1. The absolute velocities male short-track skaters achieved are significantly higher than female skaters achieved in every lap (p<.001). Examining the normalized lap velocities, significant differences occurred as well. Men demonstrated relatively higher velocities up until lap 5 (lap 1 to 5, M: 0.86±.08, W: 0.85±.09, p<.001). In lap 6, no significant difference in velocity was found (M: 1.04±.07, W: 1.04±.08, p=.109). Nonetheless, in lap 7 until the final lap 14, women demonstrated relatively higher velocities than men (for lap 7 to 14, M: 1.11±.20, W: 1.12±.10, p<.001). Conclusion: Elite men are faster than elite women in absolute velocity. Additionally, elite men and women short-track skaters show different pacing behavior in a 1500m race in which men start more aggressively and finish slower than women do.
Lower limb skeletal muscles play an important role in athletic performances. However, due to the difficulty in obtaining detailed information on each individual muscle, their quantitative impact on performance is unknown. High resolution magnetic resonance imaging (MRI) of the muscles can be used for accurate measurements of the volumes of each muscle and study their quantitative impact on performances. PURPOSE: To develop an accurate muscle volume measurement tool using MRI and use it to study the quantitative impact of individual volume on performances of jump and sprint on basketball players. METHODS: 10 male varsity basketball players and 8 club players were recruited in this study. MRI was performed on a Siemens 3T Trio scanner using a customized sequence based on the spiral k-space sampling method. Proton-density weighted images of the entire lower limb from T12 to the ankle were acquired with a customized sequence based on the spiral k-space sampling method. Feature selection was used to reduce sprint tests. Correlations between muscle volumes and each performance metric were estimated by equation (Harman Formula): Peak power (W) = 61.9 · jump height (cm) + 36.0 · body mass (kg) + 1,822. All Data were represented mean and standard deviation and analyzed by one-way ANOVA with repeated measures. RESULTS: There was no significant difference at 70, 75, 80, 85, and 90% of 1-RM. The CMJ increased significantly in 1-RM 75% (PRE: 51.3 ± 13.9 cm, 75%: 52.8 ± 13.6 cm, p<.036). At 1-RM 80%, increasing tendency was shown (PRE: 51.3 ± 13.9 cm, 80%: 52.8 ± 14.5 cm, p=.069). CONCLUSION: The results may indicate that barbell back squat at 75-80% of 1-RM can improve a CMJ performance acutely in adolescents who plays in UIL level.

Vo2peak Associated With Breath Hold Capacity In Surfers
Cory J. Greener, Kaden Grocosele, April Denny, Adele Looper, Danielle Jones. California Polytechnic State University, San Luis Obispo, CA.
Email: greener@calpoly.edu

COMPETITION: Competitive surfing is a growing sport with evolving performance and safety demands. One particular challenge surfers face is the need to endure long breath holds following bouts of surf paddling. PURPOSE: The purpose of this study was to examine the association between aerobic fitness markers, such as VO2peak, and ventilatory thresholds, and post-paddling breath hold capacity in competitive surfers. METHODS: Eleven male collegiate level competitive surfers completed both a maximal graded exercise test and a simulated post-paddling breath hold challenge on a modified paddling ergometer. Associations between markers of aerobic fitness and post-paddling breath-hold capacity were tested using linear regression modeling. RESULTS: The overall regression model indicated a positive linear association between the assessed markers of aerobic fitness and post-paddling breath-hold capacity. CONCLUSION: These findings suggest that VO2peak may be an important training target for programs aimed at improving breath hold capacity in surfers.
The joint range of motion (ROM) is related to flexibility, constituting a physical quality that influences in technical skills and biomechanical economy of movement; however, this physical ability has been little investigated in different sport’s disciplines, so they are unknown normative ranges for specialties and competition level, especially related with dominance of the athletes. The shoulder complex of swimmer is submitted to a high number of repetitions, especially overhead, to achieve propulsion and overcome aquatic drag, requiring joint’s symmetry of movement, from side to side. **PURPOSE:** To describe active and passive ROM, testing shoulder complex, identifying differences between side to side, in elite young swimmers that belong to Bogota State’s Team. **METHODS:** Fifty one healthy young swimmers participated in a cross-sectional study (23 males, 28 females; age: 16.51±1.10 yr; weight: 59.86±7.74 kg; height: 167.32±0.05 cm). We include subjects with no previous shoulder injuries. Seven tests were performed for Active and Passive ROM (flexion, abduction and extension; horizontal adduction and abduction; medial and lateral rotation). Mean and standard deviations (SD) values were calculated by dominant and non-dominant shoulder, for all ROM measurements. We applied paired t-test to determine statistical differences (sd) between dominant and non-dominant shoulder, at p <0.05. **RESULTS:** Analyzing all ROM measurements. We applied paired t-test to determine statistical differences (SD) values were calculated by dominant and non-dominant shoulder, for horizontal adduction and abduction; medial and lateral rotation). Mean and standard deviations (SD) values were calculated by dominant and non-dominant shoulder, for all ROM measurements. We applied paired t-test to determine statistical differences (sd) between dominant and non-dominant shoulder, at p <0.05. **RESULTS:** Analyzing shoulder active ROM in males, we have found sd for Active medial rotation between dominant (91.70± 6.12º) and non-dominant (99.09±16.23) sides (p<0.05); also sd for Active lateral rotation between dominant (97.83±31.24) and non-dominant (91.70±6.12) parents (p<0.001). In females, we have found sd for Active medial rotation between dominant (87.21±13.91º) and non-dominant (89.5±7.70) values (p <0.05); also sd for Active lateral rotation between dominant (101.14±9.18º) and non-dominant (87.46±9.74) values (p<0.003). No sd were found in Active and Passive ROM, for other variables measured. **CONCLUSIONS:** We found symmetrical shoulder ROM’s values, to side, for elite young swimmers, except for Active medial and lateral rotation, in both genders. Probably, this evidence does not allow load balance and should be considered as a risk factor of “swimmer’s shoulder” painful.

In 2014 the structure of international field hockey matches moved from 2 x 35-minute halves to 4 x 15-minute quarters. The intention was to create a higher intensity, faster paced and more exciting game. The physical challenges presented by the new game structure are largely unknown. **PURPOSE:** This study examined the presence and extent of performance decrements across quarters in matches during an international women’s field hockey tournament. **METHODS:** Twenty international, female field hockey players (mean ± SD: age 23.0 ± 2.9 y, body mass 59.9 ± 4.9 kg, height 161.5 ± 8.8 cm) participated in the study. Seven matches from one international tournament were analysed. Based on global positioning satellite data, locomotor activities were categorised into three bands corresponding to low (0.00 - 1.68 m s⁻¹), moderate (1.69 m s⁻¹ - 4.18 m s⁻¹), and high (4.19 m s⁻¹ - 5.27 m s⁻¹) speed running. Data were analysed using a two-level repeated measures multi-level model, with match number at level 1 and player at level 2. Model fit was assessed using the ²loglikelihood statistic. **RESULTS:** During the tournament the total distance completed by players was 1778 (258), 1620 (229), 1613 (225), 1501 (255) m in quarters 1 to 4 respectively (mean and standard deviation). The corresponding averages for high speed running were 376 (258), 297 (146), 310 (135), 270 (125) m respectively. When controlling for position, the decrement in high-speed distance covered between quarter 2, 3 and 4 compared with quarter 1 was -78, -64 and -98 m respectively (all P<0.05 compared with quarter 1). **CONCLUSIONS:** This study demonstrates that players cover their maximum total distance and high-speed distance during quarter 1, but are unable to maintain this performance level in the remaining quarters of a match during an international hockey tournament.
of a sport specific focal point vs. a generic set focal point on broad jump performance with males and females who participate in sports where horizontal power is highly associated with high speed performance.

The dynamic movement of the windmill softball pitch requires the body acting as a kinetic chain working in a proximal to distal manner. Optimal energy transfer from the lower to upper extremity requires the stability of the lumbopelvic-hip complex (LPHC). PURPOSE: To examine the differences in knee valgus between LPHC stability groups, defined by knee valgus while performing a single leg squat (SLS), and if knee valgus could predict ball speed during the windmill softball pitch. METHODS: Eleven right-handed softball pitchers (13.7 ± 2.1 y; 163.8 ± 8.0 cm; 67 ± 11.0 kg; 48.4 ± 5.1 mph) volunteered to participate. Kinematic data were collected via an electromagnetic tracking system. Participants performed a SLS on their stride leg (left leg) and threw 3 fastballs for strikes to a catcher (43 ft).Stride leg knee valgus was assessed at 45° of knee flexion during the SLS and top of back swing (TOB), foot contact (FC), and ball release (BR). RESULTS: There was no statistical differences in knee valgus between groups (stable vs unstable) at the pitching events of TOB (F 0.03; p = 0.86), FC (F 0.01; p = 0.91), and BR (F 0.23; p = 0.64). Examing knee valgus at the pitching events as a predictor of ball speed revealed no significance (F 0.64, p = 0.62, R 0.46, R = 0.21). CONCLUSION: In this study, there was no difference in knee valgus between LPHC stability groups as determined in the SLS. Overall knee valgus, at the pitching events, did not predict ball speed. As knee valgus is an outcome of an unstable LPHC, the authors postulated that having less knee valgus during the pitching cycle would have assisted in energy transfer and thus increased ball speed in windmill softball pitching. Limitations to this study include the small sample size used. Future studies should consider a multivariable model to determine LPHC stability and examine the influence of the trunk at events within the windmill softball pitching cycle to determine their effect on increasing ball speed. 

**Mean and standard deviations of knee valgus (in degrees) and ball speed (mph)**

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<tr>
<th>LPHC Stability</th>
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| Ball speed     | Stable         | 50.4(8.1)     |
|                | Unstable       | 44.7(6.3)     |

**Knee valgus (°); knee valgus (°); n=12.**

**CONCLUSIONS:** The Functional Movement Screen Deep Squat (DS) is used to assess the quality of fundamental movement patterns. Specifically, the DS assesses musculoskeletal stability and mobility at the ankle, knee, and hip. The DS score is added to a composite score to identify individuals at risk for musculoskeletal injury. PURPOSE: To examine the influence of ankle range of motion (ROM), as measured during a weight bearing lunge, on the individual scoring criteria and overall score for the DS. METHODS: Twenty-two college aged, physically active subjects (11 M, 11 F, 20.3 ± 1.0 yo) were recruited and completed testing. Bilateral peak weight bearing ankle dorsiflexion ROM was measured with a digital inclinometer during the loaded lunge test, with the lower bilateral scores being retained. Participants performed three trials of the DS with their feet flat and three trials with their heels elevated on a 26 block. Standard FMS scoring criteria were applied to assign a score of 3, 2, or 1. Successful completion of the DS requires; 1. torso to be parallel with the tibia or toward vertical, 2. femur to be parallel with the floor or below, 3. knees to track over the toes, & 4. dowel cannot move beyond the toes. A one-way ANOVA with post hoc tests and independent t-tests were used to determine significance (p < 0.05) for the influence of ankle dorsiflexion ROM on DS scores and the presence of the four individual DS dysfunctions respectively. RESULTS: There was a significant difference in ankle dorsiflexion for DS scores (F[2, 19] = 5.20, p=0.016). Post hoc testing revealed a significant difference in dorsiflexion ROM between a score of 3 (51.4° ± 9.7°) and a score of 1 (39.5° ± 5.6°). There was a significant difference (p=0.001) in ankle dorsiflexion for participants that met the torso/tibia criteria (51.0° ± 7.6°) compared to participants that did not meet the criteria (40.1° ± 5.0°), and for participants that met the dowel position criteria (50.5° ± 5.0°) compared to those that did not meet the criteria (41.5° ± 6.3°) (p=0.016). CONCLUSION: Participants with limited weight bearing ankle dorsiflexion ROM are more likely to score a 1 and exhibit a forward lean and bar position during the DS. This information will guide a clinician’s corrective exercise approach for individuals that exhibit these DS dysfunctions.

**Mean and standard deviations of knee valgus (in degrees) and ball speed (mph)**

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| Ball speed     | Stable         | 50.4(8.1)     |
|                | Unstable       | 44.7(6.3)     |

**Knee valgus (°); knee valgus (°); n=12.**

**CONCLUSIONS:** The postioning of the back of the seated knee extension exercise alters hip joint position, which in turn modifies the muscle length of the rectus femoris. The increase the angle between the seat and the back of the chair allows a greater stretching of the rectus femoris a condition that theoretically may have an influence on knee extensors force production and consequently may have an impact on muscle metabolic response. It has been hypothesized that acute muscle thickness (MT) swelling in response to intermittent exercise may occur due to an increase in intracellular osmotic concentration secondary to muscle permselectivity. PURPOSE: To determine the effects of breathing with an ITD during recovery periods between simulated ice hockey shifts. METHODS: Five male collegiate ice hockey players skated a course, the Peterson On-Ice Repeated Sprint Test, eight times (shifts) with 90 s recovery between each shift. Each athlete completed two test sessions separated by 48 hr, one while breathing freely during the recovery periods (control condition) and one while breathing with the ITD during the recovery periods (RESULTS: Performance, measured as time to skate the course, was similar between conditions (p > .05). Average time to complete each shift was 22.10 ± 0.74 s (SEM) and increased with successive shifts. After shift 4, lactate was 12.0 ± 0.8 mM (control) and 11.0 ± 2.0 mM (ITD). After skating eight shifts, lactate continued to increase during the control condition (14.0 ± 0.4 mM) and was 28% higher than the ITD condition (10.9 ± 1.5 mM). Ratings of perceived exertion increased from shift 1 to shift 8 with the average slope of increase greater for the control condition (0.87, 95% CI 0.80-0.94) than the ITD condition (0.65, 95% CI 0.60-0.70, Z = -7.54, p < .001). CONCLUSIONS: Breathing with the ITD during recovery periods did not affect skating performance measured as time to complete each shift, but lactate was lower after shift 8 and athletes rated their exertion lower during the ITD condition. Thus, use of an ITD has potential to enhance recovery during repeated bouts of high-intensity, intermittent exercise.
Surfing demands multifactorial physical fitness and continuing interaction with environmental variables. Sports specific assessment is mandatory in elite athletes and should focus on fitness variables such as cardiorespiratory, muscle strength, power and balance. 

PURPOSE: The purpose of this study was to evaluate 10 elite Brazilian surfers for specific sport protocol.

METHODS: 9 elite surfers (19±4 years) were evaluated for cardiorespiratory fitness during a specific sport protocol. The protocol was structured to increase load every 2 minutes with different elastic rubber bands (8 bands with different increasing elastic capacity each) fixed on athletes surfing board, and the test was considered maximum within voluntary fatigue (BORG scale) or VO\textsubscript{2max} on a pool. The test was considered feasible and should be encouraged.

RESULTS: Mean values for VO\textsubscript{2max} were 47±9 mL/kg/min (43-59 mL/kg/min). None of the athletes reported clinical symptoms of cardiovascular considerations.

CONCLUSIONS: Surfers athletic performance should be focused on a multifactorial matter, and fitness evaluation should consider specific demands. For VO\textsubscript{2} analyses, this specific protocol would be considered feasible and should be encouraged.
Phase change material (PCM) cooling has been shown to decrease muscle damage and accelerate recovery. However, the effects of cryotherapy on the adaptive response to exercise are not well understood. The repeated bout effect (RBE) is a protective adaptation to an initial bout of eccentric exercise and serves as a model to examine acute adaptation.

PURPOSE: To examine (1) the effect of PCM cooling on muscle damaging eccentric exercise, and (2) whether application of PCM cooling blunts the adaptive RBE response.

METHODS: Twenty males (24±5 yo) performed 120 eccentric quadriceps contractions on each leg at 90% of isometric strength and were randomized to receive PCM packs frozen at 15°C (treatment) or melted packs (control) worn inside shorts for 6 h post exercise. Prior to exercise, and on each of the subsequent 3 days, pain, strength, creatinine kinase activity (CK) and high sensitivity C-reactive protein (hsCRP) were measured. The protocol was repeated 2 weeks later with all subjects receiving melted PCMs after the repeated exercise bout. Treatment and RBE were assessed using treatment and/or bout x time ANOVA.

RESULTS: The exercise caused pain in both groups (P = 0.0001) with less pain in the PCM group (P = 0.021). There was an RBE for pain (P = 0.0001) with no difference between treatments (P = 0.38). There was an increase in strength in the PCM group (P = 0.001; treatment x time effect P = 0.035) with no strength loss in the control group (P = 0.90). The RBE for strength differed between treatments (P = 0.005): strength increased after the initial bout in the PCM group but not after the repeated bout (P = 0.006), while strength was unchanged in the control group (P = 0.55). CK was elevated in both groups (P = 0.001) with no difference between groups (P = 0.46). There was a RBE for CK (P = 0.0001) with no difference between groups (P = 0.84). The exercise did not elevate hs-CRP (P = 0.49) with no difference between groups (P = 0.94).

CONCLUSIONS: PCM cooling reduced pain following damaging exercise. While the protocol was insufficient to cause strength loss, it is notable that PCM cooling elevated strength on the days after eccentric exercise. Importantly, the RBE was not compromised by PCM cooling.

Purpose: Photobiomodulation therapy (PBMT) has emerged as an effective non-invasive strategy to attenuate fatigue and muscle damage when applied before different types of exercises; however, there is no evidence regarding PBMT effects on fatigue and muscle damage in judo athletes. Thus, the aim of our study was to investigate the PBMT effect on fatigue and muscle damage in judo athletes.

CONCLUSIONS: The fatigue model (10 sets of 10 reps of CMJ) was efficient to induce fatigue and muscle damage immediately after, 24h, and 48h. However, the adopted PBMT parameters applied before exercise has no effect to attenuate lower limbs fatigue, muscle damage, and soreness in judo athletes.
Foam Rolling and Sport Massage techniques have become increasingly popular methods to help athletes prepare for and recover from bouts of intense exercise. Distance runners in particular use Foam Rolling prior to and after strenuous workouts potentially to improve athletic performance and flexibility, reduce workout-related soreness and decrease recovery time. While these activities are common in intercollegiate athletics (especially track and field running circles), there is equivocal evidence that supports the effectiveness of either method, especially when used prior to exercise. PURPOSE: To compare running efficiency following a bout of Sport Massage and Foam Rolling in female Collegiate distance runners. METHODOLOGY: Nine healthy NCAA D-1 female Cross Country runners volunteered for the study (age=20.89±1.97yrs; WT=54.25±7.15kg; HT=163.02±5.67cm; Percent Fat=15.29±5.72; BMI=20.26±2.01). Volunteers reported to the laboratory and completed an initial VO$_2$peak test (7.0mph with a 3% grade increase every 3 minutes until exhaustion; VO$_2$peak=55.73±2.11 ml/kg/min). Subjects then performed three separate randomized treadmill runs (7.0mph at 3% grade for 10 minutes) following either no intervention (NI), Sport Massage (SM) or a Foam Rolling (FR) session. To estimate running efficiency, heart rate (HR), rate of perceived exertion (RPE) and lactate samples were taken every two minutes throughout the three 10-minute steady state runs. RESULTS: Results showed there were no significant differences (p=0.05) between NI, SM or FR for RPE (NI=10.25±2.31; SM=10.50±2.67; FR=10.63±2.56) or lactate (NI=2.23; SM=2.84±1.09; FR=2.90±0.97). However, there was a significant difference (p=0.028) for HR between NI (149.88±15.33) and FR (144.75±13.79). SM (147.50±14.43) was not significantly different (p=0.05) from NI or FR for HR. CONCLUSION: These results indicate that FR prior to a steady state submaximal run may have a beneficial cardiovascular effect (improved efficiency) in well trained female distance runners.

Sports compression garments (CG) have been proposed to accelerate post-exercise recovery by enhancing blood metabolism clearance and reducing muscle soreness. However, limited information exists on CG-induced hemodynamic responses during recovery and their potential impact on subsequent time-trial (TT) performance. PURPOSE: We examined the effect of wearing thigh-high sports CG (1) on hemodynamic responses, during passive recovery between exercise, using Doppler ultrasound (USCOM®), (2) on subsequent TT performance and 3) to investigate any associated perceptual and affective responses in physically active healthy individuals. METHODS: Thirteen physically active healthy males (age=20.9±1.4 years; weight=65.9±7.8 kg; height=173.3±4.8 cm) underwent two cycling trials separated by one week. Each trial consisted of a 20-min fatiguing preload cycling followed by 60-min of passive recovery whilst wearing either thigh-high sports CG or gymnastic pants (CON). A 5-min TT was subsequently conducted and power output and cadence were recorded. Cardiac output (CO) and stroke volume (SV) were measured using Doppler ultrasound (USCOM®); heart rate (HR), blood lactate (BLA), ratings of perceived exertion (RPE), leg muscle soreness (LMS), non-invasive blood pressure (MAP), and systemic vascular resistance (SVR) were monitored at 5, 15, 30, 45, 60 min during passive recovery. RESULTS: CG exerted a lower body pressure of 28.9±6.9 mmHg in a semi-reclined position. During the subsequent 5-min TT, power output (215.2±24.0 vs. 210.8±21.5 W, CG vs. CON) and cadence (72.5±3.8 vs. 71.2±4.8 rpm, CG vs. CON) were not significantly different (p=0.05) between groups. HR was lower at 15 and 30 min (p<0.05), CO was higher at 5 and 45 min (p<0.05), HR was lower at 15 and 30 min (p<0.05), BLA was lower at 5 and 15 min (p<0.05) during passive recovery with CG, and LMS was lower at all timepoints (p<0.05), compared to CON. Conclusion: Thigh-high sports CG improves subsequent TT performance by enhancing hemodynamic responses and attenuating perceived muscle soreness during passive recovery in physically active healthy males.

Cold water immersion (CWI) is commonly used to expedite recovery from strenuous exercise. However, it is unclear whether recovery with CWI confers any added performance or perceptual benefits during subsequent exercise vs. thermoneutral water immersion (TWI). PURPOSE: To investigate the potential for CWI and TWI in recovery from strenuous exercise to improve subsequent performance in athletes. METHODS: Ten varsity athletes (age 22 ± 2 yrs; height 177.9 ± 10.5 cm; weight 70.6 ± 9.6 kg; VO$_2$max 53.9 ± 6.8 ml/kg/min) performed pre-recovery (PRE) and post-recovery (POST) exercise protocols. The 20 min recovery period involved 10 min of either CWI (14.7 ± 0.3 °C), TWI (34.8 ± 0.8 °C) or room air control (CON) (28.7 ± 0.8 °C) in a randomized, crossover design. The exercise protocols required participants to cycle for 20 min at 57 ± 3% VO$_2$max (WARM) and immediately complete a 10 min post-workout trial (TT) at ~75% VO$_2$max in heat (30 ± 1°C; 59 ± 0.3% rh). This was followed by performance tests of upper and lower body reaction time, maximal countermovement jump height (CMJ), maximum voluntary isometric contraction (MVIC) of the knee flexors, and questionnaires outlining mood states and belief score. Heart rate (HR) and ratings of perceived exertion (RPE) were recorded every 1 min during the TTs and in recovery. RESULTS: No differences between groups were observed for any PRE variable. Mean workloads were higher for every min of the POST TT in the CWI trial compared to TWI and CON trials. There was a trend for CWI to minimize the % change in mean TT workload vs. TWI and CON (1.1 ± 1.9 vs. 4.6 ± 1.4 and -7.2 ± 2.3%, p = 0.11). Mean POST-WARM VO$_2$, did not differ between CWI, TWI or CON trials (2.2 ± 0.2, 2.2 ± 0.2 and 2.2 ± 0.1 L/min). However, mean POST-WARM HR was significantly lower in the CWI trial vs. TWI and CON trials (151 ± 3 vs. 159 ± 3 and 159 ± 4 bpm, p < 0.05). Mean increase in TT RPE was blunted in the CWI trial vs. TWI and CON trials (0 ± 1 vs. ± 1 and ± 1 ± 1, p < 0.05). Belief score correlated with the change in TT workload in the CWI trial only (R = 0.35, p < 0.05). No significant differences in CMJ or MVIC were observed between trials. CONCLUSION: Ten minutes of CWI in recovery from intense exercise in the heat reduced mean HR and RPE during a post-recovery exercise test, which may have contributed to the trend of a higher mean workload in the post-recovery TT vs. TWI or CON.
Gymnasts are required to complete a series of highly difficult routines that need excellent physical condition and plenty of training time, the post-exercise recovery is crucial. Electromagnetic Treated Water (ETW) is very small water molecule clusters caused by the electromagnetic field which can benefit human body in different ways. Infrared radiation (IR) is commonly used in the recovery period of training.

**Purpose:** The aim of the study is to assess the effect of ETW combined with IR on post-exercise recovery.

**Methods:** Twenty gymnasts from China men’s national gymnastics team were randomized to the experimental group (EG, N=10) or the control group (CG, N=10). The CG continued with their daily training. EG received 3-dimensional IR in a specific cabinet for 30 minutes after training and drank no less than 1.500 mL ETW per day for 12 weeks. Both groups followed the same training plan, diet and nutritional supplements. Blood parameters, including Routine Blood Test (RBT), Creatine Kinase(CK), Blood Urea Nitrogen(BUN), Dopamine(DA), Serotonin(5-HT) and Blood Lactate Acid(BLA), were detected before(t1), after(t2) and 1 hour later(t3) of training at D1, D42 and D84. In addition, Athlete Burnout Questionnaire (ABQ) and Pittsburgh Sleep Quality Index (PSQI) were collected.

**Results:** Comparing with CG, BLA(t3) was significantly decreased at D1(0.73±0.26 vs. 1.21±0.34 mmol/L, p<0.01), D42(0.42±0.13 vs. 0.83±0.36 mmol/L, p<0.01) and D84 (0.31±0.16 vs. 0.65±0.25, p<0.01). BLA(t3) was significantly decreased compared with BLA(t2) in EG at D1, D42, D84 (0.73±0.26 vs. 2.50±0.83, 2.40±1.26 vs. 8.21±5.09, 2.05±0.63 vs. 3.46±1.33 mmol/L, p<0.01, respectively).

**Conclusion:** The result of the present prospective study confirmed that ETW combined with IR can eliminate the BLA efficiently, reduce fatigue accumulation, improve sleep quality and decrease athlete burnout, that all can promote the post-exercise recovery.

1. **Purpose:** The role of fascial tissue relative to muscle function and performance has garnered increasing interest in recent years. Foam rolling (FR) has become a very popular form of self-myofascial release; however, the impact of chronic FR on the fascia is not well established.

2. **PURPOSE:** To examine the impact of a FR protocol on myofascial function assessed via the Bunkie test (BT).

3. **Methods:** Participants were randomly assigned to a control group (CG, n = 17) or foam rolling group (FRG; n = 17). FRG completed a 14-day FR protocol. CG subjects were instructed not to FR. Participants completed the BT at baseline and following the 14 days. The BT consists of 5 planks positions held bilaterally to assess myofascial function. Positions include the anterior power line (APL), lateral stabilizing line (LSL), posterior power line (PPL), posterior stabilizing line (PSSL), and medial stabilizing line (MSL). Positions were held for as long as possible with proper form and the time recorded.

4. **RESULTS:** Factorial MANOVA with repeated measures were utilized to examine how BT Scores changed across time (pre/post), between side of body (left and right) and treatment group (FRG, CG). To MANOVA were conducted for APL and PPL, the other for stabilization (MSL, LSL, and PSL). A significant time by treatment interaction was found (p < .01, η² = .14) for power. Univariate analyses for the time by treatment interaction revealed that the APL was significant (F(1,2) = 7.14, p = .01, η² = .14). No significant differences existed for FRG from pre to post test. The CG group had significantly higher scores at post test (p < .01, η² = .39) while FRG did not change (p > .10).

5. **Conclusion:** The result of the present study was to determine if older adults who are physically active demonstrate slower rates of recovery from unaccustomed eccentric exercise.

**Purpose:** The aim of the present study was to determine if older adults who are physically active demonstrate slower rates of recovery from unaccustomed eccentric exercise compared with younger peers. Methods: A total of 39 apparently healthy men and women were studied; young sedentary (n=10, 28±2 years), young endurance-trained (n=15, 27±2 years), and older endurance-trained (n=14, 58±2 years) groups. Subjects performed 45 min (15 min x 3 times with 5 min resting periods) of downhill running (at -16% gradient) at a speed corresponding with 65% of their maximal oxygen consumption. Visual analog pain scale, isometric muscular strength, joint range of motion (ROM), and serum myoglobin concentration were measured at baseline as well as 24h, 48h, and 72h after the downhill running protocol. Results: Compared with baseline, pain scores of each muscle group were greater at 24h, 48h, and 72h in all 3 groups (p<0.05). Isometric muscular strengths decreased following downhill running (p<0.05), but the pattern of this response and recovery did not differ among the three groups. The ROM for hip extension decreased following downhill running (p<0.05), with the most pronounced decline seen in the young sedentary group. ROM gradually increased to baseline levels in all 3 groups. Serum myoglobin concentrations increased at 24h and returned to baseline values at 48h in both the young and older trained groups. Conclusion: The present findings are not consistent with the prevailing notion that older trained adults have a slower rate of recovery from strenuous exercise compared with young adults.

**Purpose:** The use of compression garments during exercise to enhance performance has been endorsed by many athletes. The aim of this study was to determine if compression garments would improve consecutive-day exercise performance in a dose-dependent manner in younger athletes.

**Methods:** A single-blind crossover design with three experimental conditions a) power output (LEM software), oxygen uptake (metabolic cart; Vyntus CPX) and heart rate (Polar) were assessed continuously. Venepuncture blood samples were drawn pre-, at the end of exercise, and 15, 30 and 60 min post-exercise conditions. Blood lactate was lower at 30 and 60 min post-exercise on Day 1 in LOW-CG compared with CON group (LOW-CG: 8.4±2.5mmol; 3.8±1.4mmol vs. CON: 13.4±5.13, 6.5±2.6mmol, p<0.05). Plasma lactate was lower at 30 and 60 min post-exercise on Day 1 in HIGH-CG compared with CON group (HIGH-CG: 8.4±2.5mmol; 3.8±1.4mmol vs. CON: 13.4±5.13, 6.5±2.6mmol, p<0.05). No other significant interactions observed. Compared to Day 1, diastolic (CON: 1±10%; LOW-CG: 1±9%; HIGH-CG: -5±3.4%) and mean arterial pressure (CON: -4.5±1.5%; LOW-CG: -3.8±1.8%; HIGH-CG: -5.5±3.4%) decreased on Day 2 in HIGH-CG only (p<.05). Time trial completion was decreased (p<.05) during HIGH-CG (948±304s) compared
to both LOW-CG (988±319) and CON (1010±364) HR at 30s of exercise was lower in HIGH-CG compared to CON (120±13 vs. 132±16 bpm; p<0.03). No differences occurred for oxygen uptake kinetics. CK, or subjective outcomes on Day 1.

CONCLUSIONS: These results suggest that degree of pressure influences the effectiveness of compression garments for both multi-day cycling and performance recovery in young males.

2378 Board #42 May 31 9:30 AM - 11:00 AM
Assessing the Impact of Passive Vs. Active Recovery on Broad Jump Performance in Collegiate Females
Madeline Phillips, Branden Ziebell, Moroni de Moors, Abraham Frech, Hannah Nelson, Russell Lowell, Anna Blackley, Andy Bosak. Liberty University, Lynchburg, VA. (Sponsor: Dr. James Schoffstall, FACSM) (No relevant relationships reported)

The broad jump test is widely utilized to assess an individual’s horizontal power ability. Traditionally, the type of recovery between subsequent broad jumps is of the passive nature, yet prior studies utilizing other modes of power assessment have evaluated the impact of active recovery on power production. However, to the best of the researchers’ knowledge no prior study has evaluated the impact of passive (PR) vs. active recovery (AR) on broad jump (BJ) performance. PURPOSE: To investigate the potential differences between an PR vs. AR on BJ performance in no less than averagely fit college-age females. METHODS: After having descriptive data (Ht. = 165.07±5.56, Wt. = 62.68±5.78, BF% = 23.88±2.71, age = 21.08±1.74) recorded, 24 averagely fit college-age females participated in an 8 min dynamic warm-up. Subjects were then given a four minute passive recovery period after the warm up and then completed four familiarization jumps (ie. trials). After another four minute passive recovery period, subjects completed two series of jumps (ie. four trials apiece) in a counterbalanced order with either a PR or AR between each jump. The AR period consisted of subjects completing stepping exercises for 60 seconds utilizing a 20cm step height, while PR had subjects stand still until their next jump. The PR and AR jump series were separated by a standardized four minutes passive recovery period. Excluding the first jump of each series, the farthest jump for PR vs. AR was compared using Paired-Samples t-Tests with significant differences occurring at p<0.05.

RESULTS: Significant differences (p = 0.030) occurred between PR (178.32 ± 21.17 cm) and AR (175.74 ± 18.73 cm) with 75% of the subjects benefiting from the PR vs. AR. CONCLUSION: The results suggest that PR may contribute to a further jumping distance vs. AR using no less than averagely fit college-age females. Future research may be required to assess the impact of an PR vs. AR on broad jump performance using no less than averagely fit college-age males. Additional research may need to occur in order to assess the specific type of activity that occurs between an active recovery period and its potential impact on broad jump performance.

2379 Board #43 May 31 9:30 AM - 11:00 AM
The Effects of Stretching on Blood Lactate Concentration after Anaerobic Exercise
Anna Blackley, Brianna Tummons, Katilyn Dombrowski, Bradec Davis. Liberty University, Lynchburg, VA. (Sponsor: Dr. James Schoffstall, FACSM) (No relevant relationships reported)

Blood lactate (BLa) concentration is believed to be one of the contributing factors of muscular fatigue and muscle soreness when lactate is converted into lactic acid. Because of these decrements associated with BLa accumulation during exercise, multiple methods to remove BLa have been investigated. However, the results on the effects of stretching remain inconclusive. Although BLa returns to resting levels within 30-60 minutes after exercise, the primary focus of this study was to further explore the effects of stretching on BLa recovery. PURPOSE: This study aimed to assess the benefits of stretching on BLa levels (mmol/L) after performing a maximal anaerobic exercise compared to sitting down after the same anaerobic maximal exercise. METHODS: After measuring descriptive data (age, ht., wt., age), 15 subjects (age 22 ± 1 years; ht. 1.76 ± 0.09 m; wt. 83 ± 15 kg) performed a Wingate Cycle Ergometer Test, on two separate occasions, followed by two different 10-minute protocols in counterbalanced order: sitting or (active and passive) stretching. BLa levels were measured before and after performing the Wingate test and then 10 minutes after the test. RESULTS: The difference in BLa levels before (p = 0.813) and after (p = 0.212) exercise were similar and showed no significant difference (p = 0.05). However, there was a statistically significant difference in BLa levels between the two post-10 minutes protocols (p = 0.002). CONCLUSIONS: The current results indicate that stretching after a maximal bout of anaerobic exercise can be statistically significant in lowering BLa accumulation.

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2380 Board #44 May 31 9:30 AM - 11:00 AM
Comparison of Perceived Exertion and Recovery Status Scores in Collegiate Male Soccer Players and Coaches
Michelle L. Eisenman, Emily L. Langford, Ronald L. Snarr, Greg A. Ryan. Georgia Southern University, Statesboro, GA. (No relevant relationships reported)

Perceived Recovery Status (PRS) and Rating of Perceived Exertion (RPE) are two subjective methods coaches, athletes, and sport scientists have used to quantify training load and recovery to improve athletic performance. While these values are important to monitor, these tools are more useful if there is an agreement between coaches and players. PURPOSE: To assess subjective measures (PRS and RPE scores) received from athletes and coaches during the course of a preseason. METHODS: PRS scores prior to, and RPE scores after, each of 18 preseason practiced (Pr) were collected on 26 Division I male soccer players (P) and 3 coaches (C). Athletes provided scores away from other athletes and coaches. Coaches were instructed to provide answers to PRS and RPE as to how their athletes felt. Due to the categorical nature of the data, nonparametric Mann-Whitney U Tests were run comparing Pr to C data for each Pr.

RESULTS: P and C RPE were not significantly different (p > 0.05) for 17 of the 18 practices. The only statistically significant difference occurred in Pr8 (median P: 8.0, C: 7.0; p = 0.04). PRS comparisons were slightly more variably different (4 of 18) through preseason training: Pr2 (P: 7.5, C: 9.0; p = 0.02); Pr5 (P: 7.0, C: 9.5; p = 0.02); Pr14 (P: 7.0, C: 5.0; p = 0.01) and Pr15 (P: 4.5, C: 1.5; p = 0.04). CONCLUSION: Results indicate that perception of intensity of practice and recovery were fairly similar throughout preseason. As preseason progressed, a shift in PRS from C overestimating P recovery, to underestimate training, especially following scrimmages occurred. This is an important consideration for coaching and training staffs in determining practice schedules for athletes during preseason training.

2381 Board #45 May 31 9:30 AM - 11:00 AM
A Comparison of Physical Activity Behaviors and Sleep in Female NCAA Division-I Athletes versus Controls
Dillon C. Frisco, Jesse A. Goodrich, Jeffrey Higdon, Kenneth Wright, William G. Byrnes, FACSM. University of Colorado, Boulder, CO. (Sponsor: William Byrnes, FACSM)
Email: Dillon.Frisco@colorado.edu (No relevant relationships reported)

Physical activity behaviors and sleep patterns influence health in the general population but have not been evaluated in collegiate student athletes. For these individuals the demands of academics and athletics alter these parameters but have not been fully characterized or compared to students who are not collegiate athletes. Purpose: This study compared physical activity (PA) behaviors and sleep patterns of female NCAA DI student-athletes (Athletes) to recreationally active female students (Controls). Methods: Across three consecutive semesters, participants completed PA counts (12,040 ± 6498 vs 8,992 ± 5240, p<.01), less SED (63.5±15.0 vs 71.4±13.3, p<.01) and a trend toward decreased MVPA (-2.3%, p=.0563) compared to athletes. Results: Most ADT, MVPA (-.75%, p<.05), and a trend toward decreased SED (-2.3%, p=.0563) compared to athletes. Conclusion: Results indicate that perception of intensity of practice and recovery were fairly similar throughout preseason. As preseason progressed, a shift in PRS from C overestimating P recovery, to underestimate training, especially following scrimmages occurred. This is an important consideration for coaching and training staffs in determining practice schedules for athletes during preseason training.
In United States at least 2.5 million children under 14 years old play soccer (1 million under 10 years; 1.5 million between 10 and 14 years old). At his age they receive at least one subconcussive impact when heading the ball at different game situations. Conuscusive impacts are impacts to the head or body that cannot be diagnosed as a concussion on clinical grounds or with neuroimaging studies (MRI, CT-Scan or PET Scan). A subconcussive impact may alter cognitive functions such as attention, processing speed, reaction time, and memory. The ImPACT Pediatric® is a neurocognitive test that provide pre and post-impact information. PURPOSE: To identify the relationship between subconcussive impact magnitude (G) and rapid processing score difference after at least one blow to the head in youth soccer players. METHODS: A group of 15 youth male soccer athletes between 9 to 11 years old (9.9 ± 0.6 years) wear a head accelerometer in a specialize headband. Each participant was encouraged to perform normally in the game. Descriptive statistics was used to assess subconcussive impacts. T-test was used for the neurocognitive pre and post-test to assess differences in rapid processing. RESULTS: Range of acceleration was from 16 to 60g (Ave=23.8 ± 9.1g). T-Test showed differences in rapid processing for males (p = 0.01). However, although there is a significant difference between the pre-test and the post-test, there is no relationship between the difference in values between the pre- and post-test of rapid processing and the magnitude of the impact received (r = 0.04). CONCLUSION: These results suggest that males that play soccer and receive a subconcussive impact can reflect significantly changes in rapid processing. However, the magnitude of the impact does not appear to be the obvious factor in creating greater differences or major changes in rapid processing.
E-31 Free Communication/Poster - Cellular/ Molecular

Friday, May 31, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

2387 Board #51 May 31 9:30 AM - 11:00 AM Post-Natal Moderate Exercise Reduces the Harms of Protein Deprivation on the Cardiac Oxidative Stress Biomarkers

Diorgins José S. Ferreira1, Anderson Pedroza2, Diego Araújo2, Cristiane Freitata1, Talita Lima1, Mariana Fernandes1, Claudia Lagranha1

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(No relevant relationships reported)

Purpose: A maternal diet low in protein results in morphologic and functional damage to the offspring’s hearts. Moderate exercise, on the other hand, is thought to improve metabolism and function, improving the overall health in adulthood. Thereby, we speculate that moderate exercise performed during early post-natal development could ameliorate the cardiac damage resulted from a perinatal protein deprivation. Methods: We used a rat model of protein restriction during gestation and lactation to assess the effect of moderate post-lactation physical exercise on oxidative stress parameters in the heart. Pregnant rats were divided into two groups: normoprotein (NP) receiving 17% casein in the diet, and low-protein (LP), receiving 5% casein. At 30 days of age, the male offspring born to each group were further subdivided into control (NP and LP) and exercise groups (NP-Ex and LP-Ex). At 55 days of age, the rats were sacrificed in the morning. Blood and heart were collected for biochemical analysis. The data were analyzed using the ANOVA two-way followed by the Tukey’s multiple comparisons test. Results: We observed significant increases in the lipid (NP: 33.2 ± 5.01 vs. LP: 67.13 ± 6.88 µM/mg prot; p<0.0001) and protein oxidation (NP: 3.01 ± 0.48 vs. LP: 6.32 ± 0.26 µM/mg prot; p<0.0001) without calf raises on CD34+, CD62E+, and CD31+/42b MPs (50±7 vs. 38±12 events/µl, p=0.04). We found a main effect of exercise to decrease CD34+ MPs (119±2 vs. 106±7 events/µl, p=0.01) and CD62E+ MP (53.5±6 vs. 34.4±4 events/µl, p=0.001) regardless of condition. There were no significant differences in CD34+/42b MPs (50±7 vs. 38±12 events/µl), CD34+ cell frequency (85±3 vs. 87±2 % of parent), CD34+ cell frequency (704±169 vs. 560±122 per 500,000 events) or CD31+ cell frequency (52±2 vs. 50±2 % of parent) after sitting or between conditions. Conclusion: Contrary to our hypothesis, a three-hour bout of sitting with or without calf raises was not sufficient to affect CAC numbers. Furthermore, sitting decreased MPs linked to endothelial activation and CAC paracrine activity, and calf raises did not ameliorate these changes. Future studies assessing longer durations of sitting with a more potent stimulus (e.g., intermittent walking) should be done to further understand the effects of sitting on the CAC and MP response.

2388 Board #52 May 31 9:30 AM - 11:00 AM Circulating Angiogenic Cell and Microparticle Response to Prolonged Sitting

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(No relevant relationships reported)

Prolonged sitting increases the risk for cardiovascular disease. However, markers of vascular repair and damage such as circulating angiogenic cell (CAC) populations and microparticles (MP) have not been characterized with prolonged sitting or sitting with intermittent activity. Purpose: To examine the effects of prolonged sitting (3h of sitting with or without calf raises) on circulatory CACs and MP populations which are linked to endothelial activation, apoptosis and CAC paracrine activity, respectively, and CD13/31’, CD31’, and CD34’ CACs which are linked to endothelial repair. METHODS: After familiarization, sedentary subjects (n=18) sat still for 180 minutes (controlled condition) or sat for 180 minutes (experimental condition) in a random order. Blood samples were obtained at baseline and at 180 minutes for analyses. CACs and MPs were isolated and analyzed using multicolor fluorescent flow cytometry. Data were analyzed with repeated measures ANOVA and are presented as mean ± standard error. RESULTS: There was a main effect of sitting to decrease CD34+ MPs (119±2 vs. 106±7 events/µl, p<0.01) and CD62E+ MPs (53.5±6 vs. 34.4±4 events/µl, p<0.01) regardless of condition. There were no significant differences in CD34+/42b MPs (50±7 vs. 38±12 events/µl), CD34+ cell frequency (85±3 vs. 87±2 % of parent), CD34+ cell frequency (704±169 vs. 560±122 per 500,000 events) or CD31+ cell frequency (52±2 vs. 50±2 % of parent) after sitting or between conditions. CONCLUSION: Contrary to our hypothesis, a three-hour bout of sitting with or without calf raises was not sufficient to affect CAC numbers. Furthermore, sitting decreased MP populations linked to endothelial activation and CAC paracrine activity, and calf raises did not ameliorate these changes. Future studies assessing longer durations of sitting with a more potent stimulus (e.g., intermittent walking) should be done to further understand the effects of sitting on the CAC and MP response.

2389 Board #53 May 31 9:30 AM - 11:00 AM Differences in CD31+ Circulating Angiogenic Cell Subtypes Between Endurance Trained and Sedentary Younger Adults

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(No relevant relationships reported)

Circulating angiogenic cells expressing the CD31 surface marker promote neangiogenesis and vascular repair. Additional surface markers present on CD31+ cells may dictate the physiological function of these cells and their ability to contribute to vascular repair. PURPOSE: To determine if regular endurance exercise influences the composition of CD31+ cells by comparing total CD31+ number and subtypes in endurance trained and sedentary younger adults. METHODS: Fasted blood was obtained from healthy endurance exercise trained (n=12) and sedentary men (n=11) 18-39 years old. Peripheral blood mononuclear cells were isolated, FcR blocked and immunostained with antibodies specific to CD31-BB155, CD14-PECy5, CD11b-Pacific Blue, CD3-APC and CD34-Alexa Fluor700 and fixed in paraformaldehyde. The forward-side-scatter plot was used to identify the lymphocyte and monocyte gates from a total of 100,000 events/sample using a LSR II flow cytometer. Total CD31+ cells and the number of events with positive co-expression of CD31 and CD14, CD3, CD11b, or CD34 surface markers were quantified. RESULTS: No significant differences between groups were observed in total CD31+ number in both mono-lymphocytic (P=0.09) and monocytic (4×109/l) population within the mono-lymphocytic population, CD31+/CD3+ cells were 52% higher in the endurance trained compared to the sedentary individuals (P=0.04). No differences between groups were
observed in the CD31+/CD14+ (P=0.3), CD31+/CD11b+ (P=0.5) or CD31+/CD4+ (P=0.17) subtypes. In the lymphocytic population, 48% more CD31+/CD14+ cells were observed in the endurance trained group compared to the sedentary group (P=0.06) and a trend was also observed for higher CD31+/CD4+ cells in the endurance trained compared to the sedentary group (88% higher, P=0.07). No differences in CD31+/CD11b+ were observed between groups (P=0.7).

CONCLUSION: Despite significant differences in total CD31+ cell number, a higher proportion of CD31+ cells from endurance trained men were found to have pro-angiogenic markers compared to sedentary men which may improve their functional capacity and angiogenic potential.

Supported by NIH T32-HL007698 and the Baltimore VA GRECC

We previously demonstrated that tumor suppressor p53 plays a crucial role in mitochondrial biogenesis and mtDNA quality control by transcriptional regulation of mitochondrial transcription factor A (TFAM) gene. Human P53 gene contains a common polymorphism at codon 72 (p53Arg72Pro), which has been shown to be associated with mitochondrial integrity and their function. PURPOSE: Here, we investigate whether p53Arg72Pro is associated with exercise response with respect to cardiovascular and mitochondrial functions using humanized p53 knock-in mouse model. METHODS: Humanized P53 Knock-In mice (HUPKI) containing either the human version of P53R72 or P53P72 genes were randomly assigned to sedentary or a model. Exercise exercise capacity was similar between R72 HUPKI vs P72 HUPKI in sedentary group.

HUPKI mice were infused for 4 weeks before mice were euthanized. Maximal aerobic capacity was associated with mitochondrial integrity and their function.

We previously demonstrated that tumor suppressor p53 plays a crucial role in mitochondrial biogenesis and mtDNA quality control by transcriptional regulation of mitochondrial transcription factor A (TFAM) gene. Human P53 gene contains a common polymorphism at codon 72 (p53Arg72Pro), which has been shown to be associated with mitochondrial integrity and their function. PURPOSE: Here, we investigate whether p53Arg72Pro is associated with exercise response with respect to cardiovascular and mitochondrial functions using humanized p53 knock-in mouse model. METHODS: Humanized P53 Knock-In mice (HUPKI) containing either the human version of P53R72 or P53P72 genes were randomly assigned to sedentary or a model. Exercise exercise capacity was similar between R72 HUPKI vs P72 HUPKI in sedentary group.

HUPKI mice were infused for 4 weeks before mice were euthanized. Maximal aerobic capacity was associated with mitochondrial integrity and their function.

Despite no significant differences in total CD31+ cell number, a trend to increase at RER 0.9 - probably indicating the onset of EV-release - with the endothelial marker CD105 on CD81+EVs as the only significantly 1.4-fold (95% CI: 1.1-1.9; p<0.05) elevated candidate following only 15min of aerobic exercise. CONCLUSIONS: EVs released during exercise originate from a diverse group of cell types that are in direct contact with the blood stream and may preferentially contribute to signaling mechanisms affecting angiogenesis, coagulation, adaptive immunity and tissue repair.

While the pathogenesis of diabetic cardiomyopathy is poorly understood, impaired insulin signalling within the heart is thought to contribute to the development of this pathology. TBC1D1, a Rab-GTPase activating protein, is involved in glucose homoeostasis and substrate metabolism within skeletal muscle, however, the function of TBC1D1 within the heart is relatively unknown. PURPOSE: To examine the role of TBC1D1 in overall cardiac morphology and substrate utilization using a rat knock-out (KO) model. METHODS: 7 weeks of high-fat feeding was provided as a metabolic perturbation to further elucidate the interaction between TBC1D1 and diet-induced cardiac contractile function. Experiments were conducted at 12 weeks of age, with the exception of cardiomyocyte isolation, which was conducted at 7 weeks of age. Animals were anaesthetized with 2.5% isoflurane before assessments of cardiac function, or surgical removal of the left ventricle. The left ventricle was immediately utilized for bioenergetics assessment, fixed for histochemistry or immediately frozen in liquid nitrogen for Western blotting. RESULTS: In chow-fed animals, TBC1D1 ablation increased plasma membrane GLUT4 content and glucose uptake, as well as plasma membrane FABPpm content and palmitate oxidation, consistent with activating cellular trafficking through the ablation of TBC1D1. While echocardiograms suggested indices of cardiac function were unaltered in chow fed KO animals, when challenged with a 7 week high-fat diet, TBC1D1 KO rats displayed a 4-fold increase in fibrosis in association with attenuated stroke volume, cardiac output and end diastolic volume, suggesting a predisposition to diet-induced cardiomyopathy. Mitochondrial respiratory capacity and substrate sensitivity to pyruvate and ADP were not altered by diet or TBC1D1 ablation, nor were rates of mitochondrial hydrogen peroxide emission, or markers of oxidative stress. CONCLUSIONS: Altogether, ablation of TBC1D1 improves indices of cardiovascular function in rats fed a standard diet, but increases fibrosis and compromises indices of cardiac function in rats consuming a high-fat diet. Therefore, TBC1D1 may exert cardioprotective effects in the development of diabetic cardiomyopathy. This research is supported by NSERC funding.
Pneumotachographs typically display highly nonlinear “pressure-flow” behavior. As such, a constant calculation factor (K) is inadequate for these devices, and a nonlinear K curve is preferred. Two methods have been described to produce nonlinear K curves for pneumotachographs: the weighted averaging method described by Yeh et al. (J Appl Physiol, 53: p280, 1982); and the polynomial approach forwarded by Tang et al. (J Appl Physiol, 95: p571, 2003). These methods, however, do not incorporate measurements of a flow “reference” and, subsequently, a direct measure of their flow accuracy and precision has not yet been provided.

**METHODS:** The aim of this study was to evaluate the effects of moderate inspiration muscle strength and diaphragm thickness in elderly women.

**RESULTS:** There were no significant differences in Tdi at FRC (elderly women: 2.8±0.3 mm, young women: 2.5±0.1 mm) and TLC (elderly women: 4.9±0.2 mm, young women: 4.5±0.2 mm) between the two groups. Additionally, no significant correlation was found between Pmax and Tdi.

**CONCLUSIONS:** These results suggest that inspiratory muscle strength in women reduces with advancing age, which is not accompanied by a decrease in diaphragm thickness.

**PURPOSE:** Previous research indicates the importance of cysteinyl leukotrienes (cyst-LTs) in the pathogenesis of exercise-induced bronchoconstriction (EIB) and asthma. As a result of airway hyperresponsiveness, mast cells, airway epithelial cells, and other inflammatory cells produce cyst-LTs which leads to airway inflammation and subsequent bronchoconstriction. Urine analysis of cyst-LTs is a common noninvasive technique but has poor repeatability among studies. Exhaled breath condensate (EBC) has been suggested as an alternative, more reliable measurement of cyst-LTs. Therefore, the aim of this study was to determine if EBC is an accurate methodology for detecting changes in cyst-LT production following a eucapnic voluntary hyperventilation (Evh) challenge.

**RESULTS:** Twenty-two subjects (age [mean ± SD] = 20.1 ± 2 yrs, 6 men, 16 women) with physician diagnosed asthma (mild- to moderate-) and established EIB participated in this study. All subjects experienced a > 10% drop in FEV, following an evh challenge. Subjects then completed baseline pulmonary function tests at rest followed by 10 mins of baseline EBC collection. Subjects then performed an EVH challenge and pulmonary function was administered at 5, 10, 15, and 20min post-EVH. EBC was collected from 0-10 mins post-EVH and urine samples were collected pre- and 60 min post-EVH challenge. RESULTS: The concentration of cyst-LTs in EBC increased significantly (p=0.01) post-EVH challenge, resulting in a 97% increase from baseline. In addition, urinary cyst-LT concentrations were significantly different pre- and post-EVH challenge (p=0.04) increasing 21% from baseline. A significant correlation was found between EBC and urine concentrations of cyst-LTs both pre- and post-EVH. However, no significant correlation was discovered between the change in cyst-LT concentration pre- to post-EBC and urine. CONCLUSIONS: The present study suggests that EBC is a sensitive, non-invasive method for assessing changes in cyst-LTs and the inflammation status of the airways following an EVH challenge.

**RESULTS:饪**

Ultraendurance events induce prolonged physiological stress that can cause perturbations in heart and lung function due to the elevated workloads. Variations in race distance and environmental conditions alter the length of time this stress is experienced, which when long enough, can also result in sleep deprivation. Beyond spirometry, whether the duration of this stress affects the degree of change in lung health remains somewhat unknown. **Purpose:** To evaluate the effects of moderate altitude (course range: 1000-2000m) ultraendurance trail running and the influence of distance on pulmonary function, lung mechanics and respiratory muscle strength.

**METHODS:** Spirometry, force oscillation and maximal inspiratory and expiratory pressures (MIP/MEP) assessments were performed 24-72hrs prior and 1-3hrs post-completion of either a 100km (CCC: n=9, 2 females, age= 43±12, finishing time= 21±6h) or 171.5km (UTMB, n=9, 2 females, age= 40±8y, finishing time= 38±9h) trail running race. **Results:** Pulmonary function was significantly reduced from baseline after both CCC and UTMB, but the magnitude of decline was not different between races (CCC vs. UTMB: AFVC= -158±331 vs. -257±463mL; AEFE= -245±240 vs. -302±398mL; AEF= -981±976 vs. -803L/min; AEF<sub>50</sub>= -493±1140 vs. -484±693mL/s; AEF<sub>20</sub>= 204±478 vs. -500±910mL/s; p<0.05 different from zero for all, p<0.05 CCC vs. UTMB respectively for all). Efficiency of ventilation (recovery–Xr) decreased at all frequencies (5-15Hz), whereas as obstruction (resistance–Rrs) in...
CONCLUSIONS: Neither MIP nor MEP was reduced relative to baseline following CCC and UTMB. Neither MIP nor MEP was reduced relative to baseline following CCC and UTMB. A significant group difference for handgrip strength (ZZ 38±10 vs MM 29±7 p=0.014), and Total (ZZ 35.6±18.2 vs MM 25.2±17.4 p=0.009). SF-36 Vitality score was higher in ZZ than MM (58.2±21.5 vs 43.2±20.8 p=0.014), and Total (ZZ 35.6±18.2 vs MM 25.2±17.4 p=0.009). SF-36 Vitality score was higher in ZZ than MM (58.2±21.5 vs 43.2±20.8 p=0.014). No clear diagnosis or medication was common among these patients. No clear diagnosis or medication was common among these patients. Additional research is required to elucidate the specific mechanisms contributing to late-onset EOV.

PURPOSE: Alpha-1 antitrypsin deficiency (AATD) is the most common genetic disorder affecting people of European descent. The condition often results in the development of emphysema, leading to chronic obstructive pulmonary disease (COPD) in the third/fourth decade of life. Breathlessness, resultant deconditioning and exercise intolerance are often the most troublesome symptoms reported by patients with COPD and are linked to poor quality of life (QoL). Typically, patients with AATD COPD are assessed by pulmonary function test (PFT). However, exercise capacity (EC) cannot be reliably predicted from PFTs. Deconditioning is associated with reduced EC and QoL. The current study examines differences in PFTs, body composition, muscular strength, EC and QoL between AATD COPD patients (ZZ) and alpha-1 antitrypsin replete COPD patients (MM).

METHODS: 29 ZZ patients, (m/f 20/9, age 60±9yrs, FEV1/FVC: 0.47±0.12, FEV1%pred. 51±22, DLCO%pred. 73±21) were recruited from the National Centre of Expertise for AATD in Beaumont Hospital, Ireland. Patients performed spiroometry and diffusing capacity for carbon monoxide (DLCO), which was assessed. Body mass index (BMI) and waist:hip (W:H) ratio were calculated. QoL and symptom perception were examined using the SF-36 questionnaire (SF-36) and St. George’s Respiratory Questionnaire (SGRQ), respectively. EC was assessed via minute walk test (6MWT), upper body strength via handgrip dynamometer (HG) and lower body strength via 30 sec sit to stand test (30STS). 9 MM patients (m/f 2/7, age 65±5yrs, FEV1/FVC: 0.47±0.15, FEV1%pred. 58±12, DLCO%pred. 72±17) completed the same protocol. Continuous data are presented as mean ± SD.

RESULTS: There was a significant group difference for handgrip strength (ZZ 38±10 vs MM 29±7 p = 0.009) and SGRQ scores for Symptoms (ZZ 41.2±20.9 vs MM 60.0±13.8 p = 0.023), Impacts (ZZ 24.4±17.4 vs MM 43.2±20.8 p = 0.014), and Total (ZZ 35.6±18.2 vs MM 54.5±14.5 p = 0.011). SF-36 Vitality score was higher in ZZ than MM (58.2±21.5 vs 43.2±20.8 p = 0.009). The relative V̇O2MAX (mL·kg⁻¹·min⁻¹; mean ± 95% CI) was 48.9 ± 1.3 for women and 54.9 ± 1.5 for men. Our VO2MAX data (4 women; 10 men) agree with the literature regarding sexual differences in VO2MAX. There was a strong positive correlation (r = 0.75; p < 0.01) between breathing frequency (f, breaths·min⁻¹) at max and relative VO2MAX in the men smokers that was not evident in the running cohort (r = -0.41; p = 0.34). Relative VO2MAX minute ventilation (VE, L·min⁻¹) and f, at max were significantly different (p < 0.01; p < 0.01) between men smokers (VE max = 135.7 ± 16.1; f, = 47 ± 1.9) and runners (VE max = 73.9 ± 3.5; f, = 169.7 ± 16.6; f, = 58.6 ± 7.6).

CONCLUSIONS: The relationship between f, and VO2MAX in smokers suggests that VO2MAX for competitive smokers could be compromised at least in part by f, and presumably Ve, by extension. The absence of this same relationship in runners suggests that this could be due to constraints specific to swimming, such as phase-locked breathing.

The Effects of Cold Water and Cold Sports Drink Consumption on Resting Lung Function

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Abstracts were prepared by the authors and printed as submitted.
Central chemosensitivity to hypoxia is attenuated in symptomatic concussed athletes (CA) compared to healthy controls (HC). Activation of the peripheral chemoreceptors is needed to elicit the full ventilatory response to hypoxia. However, it is unknown if peripheral chemosensitivity (PCS) is attenuated in CA.

**Purpose:** We tested the hypothesis that PCS is lower in symptomatic CA versus HC.

**Methods:** PCSO2 and PCS1 were measured via Hypercapnic exercise test (HET) in symptomatic CA (n=7) and healthy controls (HC, n=10). The apnea test was used to standardize the period of no ventilation prior to the HET. **P**-values are reported with significance set at p<0.05.

**Results:** Baseline HR (59 ± 14 vs. 66 ± 7 bpm; **p** = 0.10), MAP (97 ± 15 vs. 89 ± 10 mmHg; **p** = 0.09), DBP (74 ± 13 vs. 69 ± 4 mmHg; **p** = 0.16), PETCO2 (44 ± 2 vs. 45 ± 2 mmHg; **p** = 0.11), and %SpO2 (98 ± 3 vs. 97 ± 1%; **p** = 0.27) did not differ between CA and HC, respectively. Baseline SBP was higher in CA (129 ± 19 vs. 117 ± 8 mmHg; **p** = 0.05). There were no differences in PCS02 (0.40 ± 0.21 vs. 0.38 ± 0.36 L/min/mmHg; **p** = 0.45), PCS1 (0.58 ± 0.38 vs. 0.67 ± 0.52 mmHg/SSO2; **p** = 0.35), PCS10 (0.88 ± 0.73 vs. 1.34 ± 1.53 bpm/SSO2; **p** = 0.24), or PCS100 (0.07 ± 0.11 vs. 0.07 ± 0.04 L/min/mmHg; **p** = 0.44) between CA and HC, respectively. **Conclusions:** These data indicate that PCS is not lower in symptomatic CA vs. HC. It is unlikely that the peripheral chemoreceptors contribute to the reduced ventilatory response to hypoxia in CA.

**E-33 Free Communication/Poster - Translational Research**

**May 31 9:30 AM - 11:00 AM**

**Room: CC-Hall WA2**

**Board #67**

**The Effects of Single versus Multiple Sets of Leg Presses on Myocardial Energy Expenditure**

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(No relevant relationships reported)

A popular trend in exercise regimes is to maximize the amount of work done in a minimal amount of time or maximize work by minimizing rest intervals. It is hoped that reduced rest time will result in dramatic fitness gains. To date, however, no differences in total energy expenditures have been found between high and low rest interval protocols. Unfortunately, total energy expenditures do not reflect the metabolic strain experienced by the cardiac tissue. Rather, the rate pressure product [RPP = Systolic blood pressure × heart rate] has been recommended as a good index to assess cardiovascular metabolic stress, and to help determine the intensity and duration of exercise in developing fitness. **Purpose:** To determine if cardiac energy expenditure (RPP) differs between high rest (multiple sets) and low rest (single set) exercise protocols. **METHODS:** 14 untrained college students (5 male, 9 female; Age: 21.1 ± 0.2 years) participated in the study. Exercise intervention consisted of 2 days of multiple sets (4 sets, 10 reps @ 150% body weight, 3 min interset rest) and 2 days of single set (40 reps @ 150% body weight) leg presses, randomly assigned in a balanced crossover order. At least 2 days separated each session and all sets were completed as fast as possible. HR and SBP were obtained on the right arm with an automated blood pressure machine at both pre-exercise and immediate post set completion. A paired T-test was used to compare the difference between the average final post set RPP of two trials of each exercise type. **RESULTS:** Multiple sets RPP (13.7 ± 0.8) was significantly less (9.6 ± 1.0, *p* < 0.05) than the single set RPP (17.5 ± 0.8). **CONCLUSION:** Contrary to total body energy expenditure research, a single set of exercise exerts more metabolic stress on the cardiovascular system than doing the same work with several rest intervals. Thus, single set of exercise could be used to train when attempting to train cardiac tissue, but multiple sets of exercise is recommended for people with compromised cardiovascular systems.

**Board #68**

**May 31 9:30 AM - 11:00 AM**

**Room: CC-Hall WA2**

**The Associations between Time Spent in Sedentary Behaviors and Cardiometabolic Disease Risk Factors in Young Adults**

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(No relevant relationships reported)

Research suggests that sedentary behavior is associated with cardiometabolic disease (CMD) risk factors but much of this research has relied on self-report measures of sedentary time. **PURPOSE:** To determine the associations between sedentary time and CMD risk factors in young adults. **METHODS:** Undergraduate students (n=95; age 20.4±1.3 y; BMI 23.9±2.9 kg/m²) wore an accelerometer during waking hours for 7 consecutive days to measure sedentary time (<150 counts/min) and moderate-to-vigorous physical activity (MVPA) separately. **RESULTS:** After controlling for age, sex, race/ethnicity, smoking, family history of diabetes, study time, and MVPA. Analysis of covariance was used to compare CMD risk factors across tertiles of sedentary time. **RESULTS:** On average, FEV1, -2.8±0.5L) compared to the slower runners (FCV=5.2±1.1L, FYE=4.1±0.8L), and did not differ from normative values, with overall percent predicted FCV and FEV1 at 105% and 92%, respectively. DLCO and DLNO did not differ between groups (fast, DLCO=33.2±6.0mmHg, DLNO=160.2±26.0mmHg; slow, DLCO=30.2±5.5mmHg, DLNO=155.2±27.6mmHg). However, the ratio of DLNO/DLCO was lower in the faster group at rest (4.9 vs. 5.2, *p*<0.018) and during exercise (stage3: 4.9±0.2 vs.5.3±0.4, *p*<0.04). **Conclusions:** Resting lung function was not enhanced in faster runners, however the altered DLNO/DLCO ratio with light exercise suggests a greater relative contribution of capillary blood volume to membrane conductance might be associated with ultraendurance performance.
students spent 8.4±1.5 h d⁻¹ in sedentary behaviors. Sedentary time was associated with diastolic BP (R²=0.22, p<0.05, r=0.001), fat mass (R²=0.39, p=0.02), triglycerides (R²=0.11, p=0.24, p=0.04), waist circumference (R²=0.15, p=0.23, p=0.04), and LAP (R²=0.17, p=0.30, p=0.008) independent of all covariates. There were no associations between sedentary time and systolic BP, glucose, HDL, or LDL (p≥0.05). Waist circumference was different across tertiles of sedentary time (tertile 1: 79.8±14.3 cm vs. tertile 3: 85.2±14.5 cm, p=0.02). Further, diastolic BP (p=0.007), LDL (p=0.002), fat mass (p=0.04) and LAP (p=0.01) were significantly different across tertiles of sedentary time with less favorable outcomes as sedentary time increased.

CONCLUSIONS: Our findings suggest that sedentary time is independently associated with markers of CMD in young adults. Further, those who engage in 8 hours or more of sedentary behavior per day have significantly less favorable outcomes across a range of CMD risk factors. These findings support the need to develop public health recommendations regarding targeting sedentary behaviors, particularly in young adults. Supported by CTR-IN Clinical Translational Research Infrastructure Network.

Exercise training improves cardiorespiratory capacity (peak or pVO₂) in healthy and cardiac disease states. High Intensity Interval Training (HIIT) is a prominent strategy in cardiac rehab to do superior to pVO₂ improvements. Reduced pVO₂ in patients w/hypertrophic cardiomyopathy (HCM) powerfully predicts adverse outcomes, including mortality and heart transplant. Participation in vigorous exercise, however, reduces mortality and heart transplant. Recent data suggests risks are much lower than previously thought.

Including mortality and heart transplant. Participation in vigorous exercise, however, w/hypertrophic cardiomyopathy (HCM) powerfully predicts adverse outcomes, p<0.01; post: 120.89 mL/kg/min ± 4.19 vs 140.03 mL/kg/min ± 4.18, p<0.01). Paired in TG mice than NTG (pre: 102.36 mL/kg/min ± 2.04 vs. 119.20 mL/kg/min ± 5.57, p<0.01). Participation in a preclinical transgenic cardiac troponin T delta160E (TG) HCM mouse model. METHODS: C57Bl/6 non-transgenic (NTG) (n=6 F, n=5 M) and TG (n=4 F, n=8 M) mice (13-16mos) underwent a translationally parallel cardiac rehab HIIT protocol. One treadmill training bout included 4-4min high intensity exercise (31±6% VO₂max) and 1min low intensity exercise (5±4% VO₂max) for 31 total mins. Bouts were repeated 3 times/wk for 10wks. Compliance was measured as % of total training time completed. Randomized pre and post pVO₂ (metabolic treadmill testing) and body composition (NMR) were measured by a blinded technician. Unpaired and paired t-tests were used for data analysis. RESULTS: Training compliance b/w TG and NTG did not differ (921.99±4.24, 99.13% ± 928.95±1.05, 95.99%; p=0.14). Pre and post HIIT pVO₂ were significantly lower in TG mice than NTG (pre: 102.36 mL/kg/min ± 2.04 vs. 119.20 mL/kg/min ± 5.57, p<0.01; post: 120.89 mL/kg/min ± 4.19 vs 140.03 mL/kg/min ± 4.18, p=0.01). Paired analysis detected a significant increase in pVO₂ following HIIT training in both TG and NTG groups (p<0.01). TG mice had significantly greater pre and post % lean mass (pre: 69.96% ± 1.11 vs 66.46% ± 1.09, p=0.05; post: 70.73% ± 0.56 vs 68.47% ± 0.79, p=0.05), and significantly less pre and post % fat mass (pre: 11.89% ± 0.12 vs 15.22 ± 0.08, p=0.05; post: 11.74% ± 0.52 vs 13.86% ± 0.76, p<0.05). Post-HIIT 24hr ambulatory activity did not differ b/w groups (TG: 334.5 beam crosses ± 33.3 vs. NTG: 534.8 beam crosses ± 101.8, p=0.070).

CONCLUSION: HIIT training increased pVO₂ in a HCM mouse model without adverse consequences, providing the rationale to explore exercise as a positive disease modifier in HCM patients.

Vascular conductance is increased to a similar extent following low load (30% of one repetition maximum (1RM)) resistance training with and without blood flow restriction (BFR). It is unclear, however, if very low force (<30% 1RM) contractions require BFR to produce this effect. It is also relatively unknown if or how the venous system changes following chronic BFR as this type of training causes blood to dam up in the veins during BFR.

PURPOSE: To examine the vascular responses to lifting a very low-load (15% 1RM) with and without different pressures (40 and 80% arterial occlusion pressure) and how it compares to high load (70% 1RM) training in the lower body.

METHODS: Forty non-resistance trained individuals performed two of four conditions (one in each leg): 1) 15% 1RM, no BFR (15/0), 2) 15% 1RM, 40% arterial occlusion pressure (15/40), 3) 15% 1RM, 80% arterial occlusion pressure (15/80), and 4) 70% 1RM, no BFR (70/0). Participants performed 4 sets of unilateral knee extension to failure (up to 90 repetitions) with 30 (15% 1RM) or 70% 1RM) seconds of rest between sets, twice a week for 8 weeks. Before and after the training protocol, vascular conductance and venous compliance were measured. Data displayed as mean change (95% CI).

RESULTS: There was a significant time by condition interaction for vascular conductance (p=.004). Conditions 15/80 [7.9 (3.4, 12.3) flow ∙10⁻⁶ mmHg] and 70/0 [7.2 (2.7, 11.7)] flow ∙10⁻⁶ mmHg] increased vascular conductance while conditions 15/0 [-1.2 (-5.7, 3.3) flow ∙10⁻⁶ mmHg] and 15/40 [-0.864 (-5.6, 3.9) flow ∙10⁻⁶ mmHg] did not change. There was no interaction (p=.335), nor were there main effects of condition (p=.684) or time [0.001 (-0.001, 0.004)/ml/100 ml/mmHg, p=.204] for venous compliance. Conclusion: A high BFR pressure (40% arterial occlusion pressure) combined with a very low-load produces similar vascular responses to that of high load resistance training. It may be that lifting a load of 15% 1RM without BFR and that the application of a moderate pressure (40% arterial occlusion pressure) does not disrupt blood flow enough to induce vascular conductance. These results add to the hypothesis that a higher restriction pressure is necessary to induce certain peripheral adaptations when utilizing a load less than 30% 1RM.
using 15% IRM combined with either no BFR [150], 40% of arterial occlusion pressure (AOP) [15/40], or 80% of AOP [15/80] and were compared to high load, lending support to the conclusion that circumferential strain on arterioles can lead to vascular adaptation. The lack of difference in the FC response implies that even very slow loads affect compliance. Future research should examine the possibility of capillarization occurring following repeated exposure to high pressure BFR.

2408 Board #72 May 31 11:00 AM - 12:30 PM Effects of Jump Rope Exercise on Adiposity & Vascular Function in Prehypertensive Adolescent Girls Liz Pekas1, Ki-Dong Sung2, Won-Mok Son3, Kook-Eun Seo4, Jung-Jun Park5, Song-Yong Park6. 1The University of Nebraska at Omaha, Omaha, NE. 2Pusan National University, Busan, Korea, Republic of.

Childhood obesity is strongly associated with cardiovascular disease (CVD) development. It is necessary to combat unfavorable outcomes of obesity at a young age by utilizing effective interventions, such as exercise. PURPOSE: To examine the effects of a jump rope exercise program on CVD risk factors, including body composition, vasoactive substances, inflammation, and vascular function in prehypertensive adolescent girls. METHODS: Forty girls (age 14-16) were recruited and randomly assigned to a jump rope exercise group (EX, n=20) or control group (CON, n=20). Body composition, nitrate and nitrite levels, endothelin-1 (ET-1), c-reactive protein (CRP), systolic blood pressure and diastolic blood pressure (SBP, DBP), and arterial stiffness were measured before and after 12 weeks. RESULTS: There were significant group by time interactions following the 12-week program for body composition (from 33.8±3.6 to 30.2±3.1%), central adiposity (from 86.4±4.0 to 80.7±3.0%), body mass index (BMI) (from 25.7±3.9 to 23.5±3.6 kg/m2), nitrate levels (from 4.5±1.5 to 5.2±2.5 mmol/L) along a reduction in CRP levels (from 0.5±0.4 to 0.2±0.1 mg/L). There were no significant changes in ET-1 (P=0.22). CONCLUSIONS: These findings indicate that jump rope exercise may be an effective intervention to improve these CVD risk factors in prehypertensive adolescent girls. Jumping rope is an easily accessible exercise modality that may have important health implications for CVD prevention in younger populations.

2409 Board #73 May 31 11:00 AM - 12:30 PM Muscle Blood Flow is not Dependent upon Conduit Artery Diameter following Prior Vasodilatation Timothy R. Rotararius1, Jakob D. Lauver2, John R. Thistlethwaite3, Barry W. Scheuermann4. 1Adrian College, Adrian, MI. 2Coastal Carolina University, Conway, SC. 3Ohio Dominican University, Columbus, OH. 4University of Toledo, Toledo, OH.

At the onset of exercise in humans, muscle blood flow increases to a new steady-state that closely matches the metabolic demand of the exercise. This increase has been attributed to the skeletal muscle pump and rapid vasodilatory mechanisms. Yet, most research in this area has focused on using the conduit artery as the measurement site for blood flow. It is possible that the conduit artery does not reflect the same hyperemic response as the microvascular level during exercise. PURPOSE: Therefore, we attempted to dissociate the matching of oxygen delivery and oxygen demand by administering 0.4 mg glyceryl trinitrate (GTN) prior to handgrip exercise resulting in significant vasodilation at the level of the conduit artery. METHODS: 8 healthy males (29 ± 7 years) performed 2 trials of rhythmic handgrip exercise (50 contractions/min at 5% 1RM) for 6 minutes (control (CON) and GTN condition). Brachial artery (BA) diameter and blood velocity were measured using Doppler ultrasonography. Central hemodynamic variables (i.e. heart rate and mean arterial pressure) were measured using finger plethysmography. RESULTS: Administration of GTN resulted in a 12% increase in resting BA diameter that persisted throughout exercise (CON: 0.50 ± 0.07 cm; GTN: 0.56 ± 0.01 cm, p < 0.05). Resting forearm blood flow (FBF) was significantly higher following GTN administration compared to control (CON: 144.9 ± 62.4 ml/min; GTN: 211.2 ± 116.5 ml/min, p < 0.05); however, any differences in FBF disappeared after the onset of muscle contractions (End-exercise FBF: CON: 561.3 ± 173.1 ml/min; GTN: 525.0 ± 133.4 ml/min, p > 0.05). Vascular conductance was not significantly different between CON and GTN. Conclusion: Our results indicate that the matching of oxygen delivery and oxygen demand is unencumbered by prior vasodilation, as corrected at the onset of exercise. This could be attributed to a greater retrograde flow observed following GTN administration, indicating a greater resistance to blood flow downstream of the conduit artery. Thus, the results of this study provide evidence that the regulation of vascular tone within the microvasculature may be independent of that in the conduit artery and therefore, adaptations within the microcirculation function to match oxygen delivery to oxygen demand during exercise.

2410 Board #74 May 31 11:00 AM - 12:30 PM Lower Extremity Venous Compliance in Newly Injured Individuals with Spinal Cord Injury Matthew T. Maher, MS, CE1, James M. LiMonta, BS2, Andrew D. Delgado, MS3, Kristell Taylor, BS2, Thomas N. Bryce, MD2, Miguel Escalon, MD2, Vincent Huang, MD2, Jill M. Wecht, EdD2, James J. Peters VA Medical Center, Bronx, NY. 1Lancan School of Medicine at Mount Sinai, New York, NY.

Venous occlusion plethysmography (VOP) has been used as a non-invasive measure to compare lower extremity venous vascular function in individuals with chronic spinal cord injury (SCI) to healthy controls. Our group has previously reported significantly reduced lower extremity venous compliance (LEVC) in persons with SCI compared to healthy controls, which we speculate may relate to long standing paralysis and limited lower extremity orthostatic challenges. Therefore, we believe LEVC has not yet been reported in the newly injured SCI population.

PURPOSE: The purpose of this investigation was to evaluate changes in LEVC during acute in-patient rehabilitation following SCI.

METHODS: VOP was used to determine changes in LEVC, which was assessed shortly after admission to the inpatient unit and a few days prior to discharge. VOP was acquired in the supine position at the widest cuff circumference using a mercury strain gauge. Brachial blood pressure was monitored in the supine position during the VOP and a thigh cuff was inflated to 20 mmHg below the diastolic blood pressure (BP) and an ankle cuff was inflated to 100 mmHg above the systolic BP. Cuff inflation was maintained for 3 minutes and LEVC was estimated from changes in calf girth divided by thigh cuff occlusion pressure.

RESULTS: Eleven participants were enrolled, 35±11 years old (range: 19–52 years), 73% (n=8) male with acute SCI (34±17 days from injury; range 14–69 days). Injury levels ranged from C4 to T2 and 82% were motor complete. On average, participants were admitted 30±17 days after injury and the average length of stay (LOS) was 46±14 days. Neither calf circumference nor LEVC changed significantly over the LOS. However, the number of days between injury and the baseline VOP assessment was significantly associated with LEVC change (r=-0.57; p<0.01) and change in LEVC differed significantly between those admitted within 30 days of injury (-3.6±2.7 %) and those admitted 31 days or more from injury (7.8±8.7%; p<0.05).

CONCLUSION: These data suggest that LEVC continues to be lost 30 days after injury during inpatient rehabilitation hospitalization following SCI. However, capturing baseline VOP data more than 30 days after injury, likely underestimates this venous vascular adaptation to paralysis. Supported by NIDILRR Grant#90S0517-02-00 and the VA RR & D Grant #B-2020C.

2411 Board #75 May 31 11:00 AM - 12:30 PM Prolonged Sitting Increases Arterial Stiffness in Healthy Adults Lauren C. Bates1, William S. Evans1, Quentin Willey1, Daniel P. Credeur1, Lee Stoner, FACSMS1, Erik D. Hanson2, 1University of North Carolina Chapel Hill, Chapel Hill, NC. 2University of Southern Mississippi, Hattiesburg, MS.

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Chronic sedentary behavior increases risk for cardiovascular disease, which is the leading cause of death globally. Sitting impairs leg vascular health. Simple perturbations to increase leg blood flow prevent impairments, however, the effects on central cardiovascular health are unknown. Arterial stiffness (AS) is an indicator of CVD, and Pulse Wave Velocity (PWV) is a non-invasive measure of arterial compliance. Pulse Wave Analysis (PWA) measures augmentation indices (AIx) and central pressure provides additional information about AS. PURPOSE: To investigate the effects of prolonged sitting, with and without calf raises on aortic AS (carotid-femoral PWV) central blood pressure (CBP), and AIx. METHODS: After familiarization, sedentary participants (n=20, 21.7 yrs (2.9), BMI 25.7 m/kg) sat for 90 minutes (11±3) with and without performing 10 calf raises every 10 minutes in a random order. Following 20 min of supine rest, baseline vascular measures were collected. Measures of CBP and AIx were recorded at 10, 90, and 170 min of sitting. Near-infrared spectroscopy (NIRS) was used to assess total hemoglobin (tHB) concentration.
in the gastrocnemius muscle (index of blood pooling). Data were analyzed with a linear mixed model and are presented as mean difference (SE). RESULTS: PWV increased significantly (0.30 m/s (0.46), p < 0.001) while AIX significantly decreased (-9.2% (11.0), p < 0.001). IHb tended to increase with sitting (0.9 (1.0), p=0.082) and in the control condition (2.1 (1.0), p=0.084). CONCLUSIONS: Sitting increases aortic AS but decreases AIX, an effect which may be mediated by blood pooling in the lower leg. Intermittent calf raises are insufficient to alter AS, as PWV increased by 0.30 m/s. Despite being below the clinical threshold of 1.0 m/s with chronic inactivity, the acute increases in PWV in 3 hours may increase heart burden and become meaningful over time.

Adropin promotes nitric oxide (NO) production via increases in endothelial NO synthase (eNOS) in endothelial cells. In a recent study, we showed that circulating adropin levels, elevated by aerobic exercise training (AT), are related to reductions in arterial stiffness via increased NO production in middle-aged and older adults. However, it is unclear whether changes in arterial adropin levels by AT are related to vasodilation via increases in arterial NO production. PURPOSE: This study aimed to examine whether changes in arterial adropin levels by age and AT are related to vasodilation via arterial NO production.

METHODS: Male 38-week-old senescence-accelerated mouse prone 1 (SAMP1) mice were divided into 2 groups; aged-sedentary control and aged-AT. Additionally, male 13-week-old SAMP1 mice were used as a young-sedentary control group. AT consisted in voluntary wheel running for 12 weeks. Mouse aortic rings were isolated for the evaluation of vasodilatory responses to acetylcholine (ACh, endothelium-dependent), sodium nitroprusside (SNP, endothelium-independent), adropin, and the combination of adropin with the NOS inhibitor, L-NAME, using an organ bath system. Furthermore, serum and arterial adropin, arterial nitrite/nitrate (NOx), and eNOS phosphorylation levels were measured. The expression of arterial adropin mRNA was measured using real-time RT-PCR.

RESULTS: ACh-induced vasodilation, as well as that induced by adropin were significantly impaired with aging and AT restored them both (P<0.05). Moreover, adropin-induced vasodilation was significantly inhibited by the administration of L-NAME in all groups, while no significant differences in SNP-induced vasodilation between the three groups were observed. Aging was associated with reductions in serum and arterial levels of adropin, arterial adropin mRNA expression, arterial NOx level, and eNOS phosphorylation, whereas AT significantly increased these parameters (P<0.05).

CONCLUSIONS: These results suggest that the changes in arterial adropin mRNA and protein levels that occur with age and AT are related to vasodilation via arterial NO production. Supported by Grants-in-Aid for Scientific Research (#17H01282, #16K13059, M. Iemitsu; #18H01024, S. Fujie).
at average risk (p<0.05). CRP did not significantly decrease (p=0.05), however, after 6 months of AEXT the hypertensive group experienced a significantly greater decrease in CRP than the normotensive group (p<0.01).

CONCLUSIONS: Our results suggest that nighttime hypertensive status may correspond to cardiovascular disease risks predicted by the classic biomarker CRP. Nocturnal SBP may be a discriminating additive factor to consider for health by those at average risk for future events by CRP levels. For both hypertensives and normotensives, AEXT may alter CRP with hypertensives likely to see a greater effect. Supplementary studies are needed to examine the relationship between additional variables and nocturnal hypertension.

2416 Board #80 May 31 11:00 AM - 12:30 PM Integrated Effects of Sympathetic Vasocostriction and Local Vasodilation in Human Skeletal Muscle and Skin Microvasculature

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Both sympathetic vasoconstriction and locally-mediated vasodilation play important roles in regulation of blood flow to skeletal muscle and skin during exercise. However, the integrated effects of these two vascular regulatory mechanisms in microcirculation are unclear. Purpose: We aimed to investigate integration of sympathetic vasocostriction and local vasodilation in the skeletal muscle and skin microvasculature in humans. Methods: In 39 healthy volunteers, we measured blood flow index of flexor carpi radialis muscle using diffuse correlation spectroscopy and monitored skin blood flow at the proximal site by laser-Doppler flowmetry, simultaneously. We examined the effects of acute sympathoexcitation by forehead cooling on relatively weak or robust vasodilatory responses during post-occlusive reactive hyperemia (PORH) induced by 70 s or 10 min arterial occlusion at upper arm, respectively. To increase sympathetic tone during PORH, forehead cooling was begun 60 s before the occlusion release and ended 60 s after the release. Results: The acute sympathoexcitation diminished the peak and duration of vasodilation in both skeletal muscle and skin in 70 s occlusion trials [peak skeletal muscle vascular conductance (MVC): 5.6 ± 0.4 vs. 4.1 ± 0.3, peak cutaneous vascular conductance (CVC): 3.4 ± 0.2 vs. 2.9 ± 0.2 AU, 50 % decay time of MVC: 19 ± 0.8 vs. 13 ± 0.6, 50 % decay time of CVC: 17 ± 1.0 vs. 14 ± 1.0, p < 0.05]. The sympathetic inhibition of vasodilation was blunted under robust vasodilatory stimuli produced by 10 min occlusion. Bluntness of the sympathetic inhibition was greater in skeletal muscle than in skin, especially in those initial and peak vasodilation. Indeed, the sympathoexcitation reduced the peak vasodilation only in skin (peak MVC: 10.2 ± 0.9 vs. 9.7 ± 0.9, p < 0.05, peak CVC: 7.7 ± 0.5 vs. 6.5 ± 0.5 AU, p < 0.05) while it accelerated the initial vasodilation selectively in skeletal muscle (area of MVC during first 15 s of PORH: 75.2 ± 6.5 vs. 83.0 ± 6.9, p < 0.05, area of CVC: 51.6 ± 2.7 vs. 51.7 ± 3.4 AU, p > 0.05). Conclusion: We conclude that, in humans, the integration of sympathetic vasocostriction and local vasodilation has different effects in skeletal muscle and skin. Such different effects would be importantly involved in selective control of perfusion in microcirculation of different tissues.

2417 Board #81 May 31 11:00 AM - 12:30 PM Influence Of Arm Cranking Exercise With Electrical Stimulation On The Vascular Endothelial Function

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PURPOSE: Arm-cranking exercise may not result in reduction in ba-PWV. Electrical muscle stimulation (EMS) has been shown to be able to increase the blood flow and the peripheral circulation. Arm-cranking exercises with EMS may therefore be able to increase the arterial function. However, less is known about the effect of submaximal arm-cranking exercise with EMS on the vascular endothelial function. METHODS: Eight healthy adult men were studied under two experimental trials (arm-cranking exercise with EMS; A+E trial, arm-cranking exercise without EMS; A trial). In the A+E trial, submaximal arm-cranking exercise at 50%VO2peak with both lower leg and thigh muscles were sequentially stimulated at 4-Hz for 20 min. Before and after each trial, the brachial systolic and diastolic blood pressure (SBP / DBP) were measured in the supine position. The vascular endothelial function of the right brachial artery was also assessed by flow-mediated dilation (FMD). RESULTS: In the A+E trial, the FMD increased immediately after (9.7 ± 0.8%) and 30 min after (8.4 ± 0.7%) compared with rest (6.0 ± 0.7%). The FMD in the A trial, increased immediately after (8.0 ± 1.2%) compared with rest (6.4 ± 0.4%), however, no significant differences were found in 30 min after (6.4 ± 1.0%). Immediately after and 30 min after each trial, significant differences in the FMD were found between the A+E and A trials (p < 0.05). The SBP and DBP were not significantly different between the both trials.

CONCLUSIONS: Acute arm-cranking exercise with EMS increases the vascular endothelial function. These results suggest that chronic arm-cranking with EMS might be useful for reduction the risk of cardiovascular disease.

2418 Board #82 May 31 11:00 AM - 12:30 PM The Age-dependent Changes In Cardiovascular Risk Factors Associated With Endothelial Function In Women Of Han Nationality With Ache D/I Polymorphism In Beijing

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PURPOSE: Angiotensin converting enzyme (ACE) D/I polymorphism influences ACE activity, with the D allele associated with higher angiotensin II production, which can have adverse effects on endothelial function through the promotion of vasoconstriction. Age is an independent risk factor for endothelial dysfunction, and postmenopausal women because estrogen deficiency affects their endothelial function. The present study was to investigate the trend of cardiovascular risk factors for endothelial function with aging in Han nationality women with ACE D/I polymorphism in Beijing.

METHODS: A total of 391 females, age from 22 y to 75 y, were selected for analyzing the relationship between ACE D/I polymorphism and cardiovascular risk factors for endothelial function, (Ages 20-44: 120; Ages 45-59: 150; Ages 60-75: 121). Body composition, serum lipids metabolism, endothelial function, endothelium-derived relaxing factor and contractile function were measured.

RESULTS: The distribution characteristics of ACE I genotype and D genotype in han Chinese women in Beijing were as follows: Ages 20-44: 63.74% and 36.26%; Ages 45-59:67.33% and 32.67%; Ages 60-75:65.34% and 35.60%. There was no age associated with differential expression. Along with the women aging, DI/II genotype had higher TG level, higher chance of Hyperglycemia and lower HDL level. The percentage of body fat and visceral fat significantly increased than DD type did. FMD, blood pressure, baPWV and IMT increased earlier and DBP abnormality rate, IMT, IMT thickening rate had more severe increases than DD type. The decrease of NO and NO/ET-1 and the increase of ET-1 and AngII were more significant compared with DD type. The interaction between age and ACE gene D/I polymorphisms could remarkably affect vascular endothelial function.

CONCLUSIONS: There was no age associated with differential expression in ACE D/I polymorphism in Women of Han nationality in Beijing. The interaction between age and ACE D/I polymorphisms plays a key role in endothelial dysfunction, in which DI/II genotype is vulnerable to endothelial dysfunction and arteriosclerosis with aging.

2419 Board #83 May 31 11:00 AM - 12:30 PM The Effects Of Pilates Training On Vascular Function In Obese Premenopausal Women With Elevated Blood Pressure

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Obesity is associated with vascular dysfunction, including an increase in blood pressure (BP), arterial stiffness (pulse wave velocity, PWV) and pressure wave reflection [augmentation index (AIx)]. Therefore, effective interventions targeting improvements in arterial function for obese individuals are critical for the prevention of hypertension (HTN) and cardiovascular events at a young age. Previous studies have shown that pilates training (PT) decreases AIx and aortic BP in young normotensive individuals. However, the possibility of PT improving arterial function in obese women with elevated BP is currently unknown. PURPOSE: The purpose of this study was to examine the effects of PT on BP, PWV and AIx in obese women with elevated BP. METHODS: TWENTY-eight obese premenopausal women (age 23 ± 1 years), body mass index (34.1 ± 0.7 kg/m2), systolic BP (127 ± 2 mmHg) and diastolic BP (75 ± 2 mmHg) were randomized to either PT (n= 14) or no-exercise control group (n= 14) for 12 weeks. PT consisted of 12 exercises per session 3 x week (approx 60 mins duration per session). Two sets of 10 repetitions were performed for each exercise. Systolic BP, brachial to ankle PWV (baPWV), AIx, and heart rate (HR) were measured at baseline and after 12 weeks. RESULTS: There were significant group-by-time interactions (P < 0.05) for systolic PWV, diastolic BP, baPWV and AIx. There were significant decreases (P < 0.05) in systolic BP (5 ± 1 mmHg), diastolic BP (4 ± 1 mmHg), baPWV (0.6 ± 0.2 m/s), and AIx (4 ± 1%) in the PT group compared to
no changes after control. No significant changes were observed in HR after 12 weeks for both groups. CONCLUSIONS: Pilates exercise led to reductions in BF, arterial stiffness and wave reflection in obese premenopausal women with elevated blood pressure and may therefore be an effective intervention in the prevention of HTN and cardiovascular events at a young age in obese women.

2420 Board #84 May 31 11:00 AM - 12:30 PM
Effects Of Acute Cycling With Electric Muscle Stimulations Of Lower Limb On The Endothelial Function
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(No relevant relationships reported)

The combination of exercise and electrical muscle stimulation (EMS) has been shown to potentially improve energy expenditure or glycogen metabolism. However, few attempts have been made to identify the effects of exercise with EMS on the arterial function. PURPOSE: The aim of this study was to evaluate the effects of acute endurance cycling with EMS on the vascular endothelial function determined by flow-mediated vasodilation (FMD). METHODS: Nine healthy adult men performed 2 experimental trial: 20 min cycling at 50W with EMS (EMS+C), and the same exercise without EMS (C). In the EMS+C trial, both lower leg and thigh muscles were sequentially stimulated at 4 Hz for 20 min during exercise. The stimulation current was the highest intensity that did not cause discomfort. Before and after each trial, the brachial systolic and diastolic blood pressure (SBP and DBP, respectively) were measured. The FMD in the right brachial artery was obtained using a high-resolution ultrasound device, determining the percent change in the arterial diameter over the baseline value at maximum dilation during reactive hyperemia. RESULTS: In the EMS+C trial, the FMD was significantly elevated immediately after (12.1±0.7%) and at 30 min after EMS (11.0±0.6%) compared with rest (8.7±0.5%). However, there was no significant changes in the C trial (8.9±0.8% at rest, 9.9±1.7% immediately after the C trial, and 9.2±0.6% at 30min after the C trial). Immediately and 30min after each trial, significant differences in the FMD were found between the EMS+C and C trials (p<0.05). No significant changes were found in the SBP/DBP in either trial. CONCLUSIONS: Acute endurance cycling with EMS results in a larger improvement of the vascular endothelial function than the same exercise without EMS. These findings suggest that low-intensity cycling with EMS might be useful for reducing the risk of cardiovascular disease.

2421 Board #85 May 31 11:00 AM - 12:30 PM
Effect of Heating Duration on Brachial Artery Endothelial Function in Humans
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In humans local heat stress elicits arterial vasodilation through two known mechanisms: axon reflexes responsible for the initial rise in skin blood flow (SBF), and heat shock protein (HSP)-mediated release of nitric oxide (NO) responsible for the prolonged plateau in SBF. The effect of selective targeting of these mechanisms, through local heating protocols of varying durations, on endothelial function is unknown. PURPOSE: To determine the effect of 10 minutes (axon reflexes) vs. 30 minutes (axon reflexes + HSP-mediated NO release) of local forearm heating on brachial artery (BA) endothelial function. METHODS: Five young, apparently healthy, recreationally active males (21±2.2 years) were recruited. In separate visits, heating was applied to the left forearm using a commercially available heating pad set to high for either 10 minutes (HEAT10, 41.7±0.8°C) or 30 minutes (HEAT30, 43.5±2.0°C). Endothelial function was measured before and after each heating intervention through a BA flow-mediated dilation (FMD) test. RESULTS: Allometric scaling was performed on the entire data set to account for the increased arterial diameter observed after heating in the 30-minute condition. A generalized estimating equations analysis with an exchangeable correlation structure revealed a main effect of time on BA FMD (rest: 6.4±1.3 vs. HEAT: 7.7±2.2%, P = 0.027), suggesting that both 10-minute and 30-minute heating protocols improved endothelial function. CONCLUSION: These findings suggest that BA FMD is improved similarly with 10 minutes or 30 minutes of local heat stress applied to the forearm; and that the addition of local NO release to axon reflex-mediated vasodilation may not further enhance the acute endothelial function responses.

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2422 Board #86 May 31 11:00 AM - 12:30 PM
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(No relevant relationships reported)

PURPOSE: It has yet to be quantified how passive leg movement (PLM)-induced hyperemia, an index of vascular function, is distributed beyond the common femoral artery (CFA), into the deep femoral (DFA) and the superficial femoral (SFA) arteries, which supply blood to the thigh and lower leg, respectively. Furthermore, the impact of cuffing the lower leg, a common practice, especially with drug infusions during PLM, on the hyperemic response is, also, unknown. METHODS: Therefore, PLM was performed with and without cuff-induced blood flow (BF) occlusion to the lower leg in 10 healthy subjects, with BF assessed by Doppler ultrasound. RESULTS: In terms of BF distribution during EMG-supported PLM, 30 ml of BF that passed through the CFA, 266±45 ml (~70%) was directed to the DFA while only 114±18 ml (~30%) passed through the SFA. Cuff occlusion of the lower leg significantly attenuated the PLM-induced hyperemia through the SFA (~30%), which was reflected by a fall in BF through the CFA (~20%), but not through the DFA. Additionally, cuff occlusion significantly attenuated the PLM-induced peak change in BF (ABFPeak) in the SFA (324±50 to 214±36 ml/min), which was, again, reflected in the CFA (1019±138 to 833±150 ml/min), but not in the DFA. CONCLUSIONS: Thus, the PLM-induced hyperemia predominantly passes through the DFA. However, as a fraction of the PLM-induced hyperemia does pass through the SFA, cuffing the lower leg during PLM should be considered to emphasize the DFA specific hyperemia in the PLM assessment of vascular function.


2423 Board #87 May 31 11:00 AM - 12:30 PM
Vasodilatory And Metabolic Capacity With Advancing Age: Evidence Of Interdependence In The Human Vasculature
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(No relevant relationships reported)

PURPOSE: Vasodilatory capacity declines with advancing age, however, the role of vascular mitochondrial function in this process is unclear. Therefore, this study sought to examine the link between vascular and mitochondrial respiratory function with advancing age. METHODS: Skeletal muscle feed arteries (SMFAs) were harvested from young (35±6yrs, n=9) and old (71±15yrs, n=15) subjects. Using pressure myography, vasodilation in SMFAs was assessed in response to flow-induced shear stress, acetylcholine (ACH), and sodium nitroprusside, and mitochondrial respiration was measured by respirometry in permeabilized smooth muscle fibers. Free radical production was assessed by electron paramagnetic resonance spectroscopy. RESULTS: Endothelium-dependent vasodilation was significantly attenuated in the old, induced by both flow (young: 92±3, old: 45±4%), and ACh (young: 92±3, old: 54±5%), while endothelium-independent vasodilation was not altered by age. Complex I and I+II, state 3 respiration was significantly lower in the old (C1 young: 10.12±0.83, old: 7.02±0.37 pmol/s/mg; CI+II young: 12.34±0.64, old: 7.6±0.43 pmol/s/mg). Although state 4 respiration and mitochondrial-specific free radical production were not different between groups, both tended to be higher in the old. The respiratory control ratio (RCR), was also significantly attenuated in the old (young: 2.25±0.14, old: 1.11±0.06). State 3 (C1-II) and 4 respiration, as well as RCR, were significantly correlated (r=0.9±0.6) with endothelium-dependent, but not endothelium-independent capacity. Free radical levels were related to endothelium-dependent (r=0.4, p=0.06), but not endothelium-independent (r=0.06) vasodilation. CONCLUSION: The age-related decline in vasodilatory capacity is related to a concomitant attenuation in mitochondrial respiratory function and may be a consequence of augmented free radical production.

Supported by The National Heart, Lung, and Blood Institute at the National Institute of Health (PO1 HL091830) and Veteran’s Administration Rehabilitation Research and Development Service (E6910-R, E1697-R, E1433-P, E9275-L, and E1572-P).
Low-flow mediated constriction (L-FMC) provides important information about the acute effects of reduced shear stress on endothelial function. L-FMC has been mainly tested in upper-limb arteries, where an inverse association with VO2peak has been observed in younger adults. It is unclear if an L-FMC response exists in lower limb arteries, which are exposed to larger fluctuations in shear stress during traditional modes of aerobic exercise than the upper-limb. Furthermore, it is uncertain whether the same inverse relationship between L-FMC and VO2peak exists in older adults (OA).

**CONCLUSIONS**: Based on known differences in flow-mediated dilation (FMD) between upper- and lower-limbs, we tested the hypothesis that heterogeneous L-FMC responses exist between the brachial (BA) vs. popliteal (PO) arteries. We also expected that OA with greater aerobic fitness would have larger L-FMC responses in both arteries.

**METHODS**: FMD and L-FMC were assessed in 47 OA (67±5 yr; 30F) using high-resolution duplex ultrasonography with commercial edge-detection and wall-tracking software. L-FMC was defined as the % decrease in lumen diameter in response to 5-min of distal ischemia. FMD was calculated as the % increase in lumen diameter following a reactive hyperemia. **RESULTS**: Larger FMD responses were observed in the BA vs. POP (4.7±1.6 % vs. 3.3±2.0 %; P<0.001), which were moderately correlated to each other (r=0.58; P<0.001). When flow- and analytically skewed, the BA exhibited a greater L-FMC response than the POP (1.3±1.0 % vs. 0.4±1.6 %; P<0.003). L-FMC responses in the BA vs. POP were not correlated with each other (r=0.22; P=0.14). As expected, VO2peak was associated with both BA-FMD (r=0.59; P<0.001) and POP-FMD (r=0.48; P=0.001). VO2peak was moderately correlated to BA-L-FMC (r=0.52; P<0.001) but strongly correlated to POP-L-FMC (r=0.73; P=0.001). **CONCLUSION**: The heterogeneous L-FMC responses between the BA and POP indicates that upper limb L-FMC responses do not represent a systemic measure of vasoconstrictor capacity. The stronger association between VO2peak and POP-L-FMC suggests that larger local shear stress responses, induced by traditional lower-limb modes of aerobic exercise, may result in greater adaptations to low flow-mediated endothelial vasoconstrictor responsiveness.

**PURPOSE**: The NLR family, pyrin domain-containing 3 (NLRP3) regulates a release of pro-inflammatory cytokine interleukin (IL)-1β via caspase-1-mediated pyroptosis, thereby playing a role as a key mediator in chronic low-grade inflammation. L-FMC ameliorates the obesity-associated inflammation and vascular dysfunction. Thus, we examined the beneficial effect of physical activity on the NLRP3 inflammasome-associated signaling pathways in high fat diet-induced obese mice aorta and its potential underlying mechanisms.

**METHODS**: We had four groups of male mice, C57BL/6J: (1) wild-type control (WT-SED), (2) LF diet with free access to a voluntary running wheel (LF-RUN), (3) HF diet (HF-SED; 45% of calories from fat), and (4) HF-RUN. We determined the effects of voluntary running on the NLRP3, caspase-1, IL-1β, CD31+/KDR+ EPCs (high: 100.8 ± 0.1 vs. low: 79.4 ± 0.1 %; p=0.68), CD31+/CD42- EMPs (high: 486.9 ± 37.5 vs. low: 533.3 ± 41.6 counts/μl; p=0.44), CD34+/KDR+ EMPs (high: 108.8 ± 0.1 vs. low: 79.4 ± 0.1 %; p=0.37), and CD34+/CD133+/KDR+ surface markers, all collected under fasting conditions. Participants were categorized into high (≥9.8 h/day) or low SED (<9.8 h/day) groups by median split. **RESULTS**: No significant differences between high and low SED groups were detected for any of the endothelial cell markers including RHI (high: 2.38 ± 0.14 vs. low: 2.47 ± 0.14; p=0.68), CD62E+ EMPs (high: 699.9 ± 48.3 vs. low: 826.3 ± 57.0 counts/μl; p=0.12), CD31+/CD42- EMPs (high: 486.9 ± 37.5 vs. low: 533.3 ± 41.6 counts/μl; p=0.44), CD34+/KDR+ EMPs (high: 108.8 ± 0.1 vs. low: 79.4 ± 0.1 %; p=0.37), and CD34+/ CD133+/KDR+ EMPs (high: 2.4 ± 0.0 vs. low: 2.0 ± 0.0 %; p=0.75) after adjustment for age, sex, race, ethnicity, education, and MVPA. **CONCLUSION**: Among healthy adults, habitual SED was not associated with markers of endothelial cell health. Mechanisms other than endothelial dysfunction should be explored as a potential link between prolonged SED and CVD.

**ACSM May 28 – June 1, 2019 Orlando, Florida**
Dietary nitrate ([NO]₃) supplementation increases nitric oxide (NO) availability and can reduce blood pressure and improve exercise performance. While plasma nitrate ([NO]₃) provides the best marker of NO availability, the use of a tourniquet during blood collection may be problematic due to the established effects of hypoxia on NO metabolism. PURPOSE: This study compared measurements of plasma NO₃ and NO₂, where blood was collected via venepuncture and from an indwelling intravenous cannula. METHODS: Fifteen participants (mean ± standard deviation: age 27 ± 4 years, body mass 71 ± 11 kg) completed two experimental trials in a randomized order. In one trial, participants ingested 140 ml of NO₃-rich beetroot juice (BR; ~8.4 mmol NO₃⁻/2.5 h prior to sample collection. No supplementation was given in the other (CON). In both trials, a blood sample was collected from the forearm vein using a venepuncture needle 40 s after the application of a tourniquet to the upper arm. Simultaneously, a blood sample was collected from the opposite arm using an indwelling intravenous cannula with no restriction to blood flow. A second blood sample was collected from the cannula 40 s after a tourniquet was attached to the upper arm. Near-infrared spectroscopy was used to assess deoxygenation of the flexor muscles through changes in total (tHb), deoxy- (HHb), and oxy- (HbO₂) haemoglobin. Samples of plasma were analyzed for [NO]₃ and [NO]₂ using gas-phase chemiluminescence. RESULTS: The application of a tourniquet increased tHb, HHb, and HbO₂, suggesting deoxygenation of the local forearm muscles (all P<0.05). Plasma [NO]₂ was significantly higher when sampled from the unrestricted cannula (CON: 179 ± 67 nM; BR: 473 ± 164 nM) in comparison to venepuncture (CON 112 ± 51 nM; P<0.05; BR 387 ± 136 nM; P<0.001) and the cannula during tourniquet application (CON 109 ± 43 nM; P<0.02; BR 384 ± 124 nM; P<0.001). Plasma [NO]₃ was not different between sample sites in either trial (all P>0.05). CONCLUSIONS: The application of a tourniquet for venous blood sampling causes ischemia, localized hypoxia, and reduces plasma [NO]₃, possibly due to an increased conversion to NO or greater uptake of NO by the tissue. Researchers should ensure consistency in blood collection methodologies and consider how the use of a tourniquet may influence NO metabolism.

Ischemic preconditioning can exert a powerful protection against a subsequent period of ischemia in a variety of organs, via repeated inflation and deflation of a blood pressure cuff. Most often, damages of ischemia reperfusion injury and benefits of preconditioning are evaluated via endothelial function. The ambulatory blood pressure device takes repeated blood pressure measurements and constitutes repeated bouts of ischemia for 24 hours. In practice, measurements of endothelial function and ambulatory (24-hour) blood pressure are often combined. PURPOSE: We determined whether repeated bouts of ischemia accumulated for 24 hours through 24-hour ambulatory blood pressure monitoring influence endothelial function. METHODS: Twenty-two apparently healthy non-medicated middle-aged subjects (41±8 years, 12 males and 10 females) participated in the study. Flow-mediated dilation (FMD; index of endothelium-dependent vasodilation) was measured twice 30 minutes apart at baseline to confirm test-retest reliability. Subsequently, subjects were fitted with an ambulatory (24-hour) blood pressure monitoring device. Blood pressure was measured every 15 minutes during the daytime and 20 minutes at nighttime. Upon returning after 24 hours, FMD was remeasured. Shear rate and reactive hyperemia were also measured simultaneously. RESULTS: The ambulatory blood pressure monitoring device went through an average of 110±13 inflation/deflation cycles, which resulted in 46±6 minutes of cumulative ischemic stimuli. Two measurements of FMD at baseline were not different, showing the measurement stability. Following 24-hours of ambulatory blood pressure monitoring, FMD did not change significantly (6.6±2 vs. 6.1±2 mm Hg, p=0.06). CONCLUSIONS: Ambulatory blood pressure monitoring and the associated ischemia remained for 24 hours, did not influence endothelium-dependent vasodilation acting via ischemic preconditioning.
THE IMPACT OF POSTTRAUMATIC STRESS DISORDER ON PERIPHERAL VASCULAR FUNCTION

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The physiological manifestations of posttraumatic stress disorder (PTSD) have been associated with an increase in risk of cardiovascular disease (CVD) independent of negative lifestyle factors. Peripheral vascular dysfunction may be a mechanism by which PTSD increases CVD risk via increases in oxidative stress, inflammation, and/or sympathetic nervous system activity. PURPOSE: This study sought to examine peripheral vascular function in those with PTSD compared to age-matched controls. METHODS: Eight individuals with PTSD (5 women, 3 men; age 22 ± 2 years), and sixteen healthy controls (CON; 10 women, 6 men, 23 ± 2 years), participated in the study. Leg vascular function was assessed via passive leg movement (PLM) technique and evaluated with Doppler ultrasonography. PLM-induced increases in leg blood flow were quantified as peak change in blood flow from baseline (ΔPEAK LBF) and blood flow area under the curve (LBF AUC). RESULTS: Significant differences in leg vascular function were revealed between groups. The PTSD group reported significantly lower ΔPEAK LBF (PTSD: 294.16 ± 54.16; CON: 594.78 ± 73.70 mL/min); \( P = 0.01 \) and LBF AUC (PTSD: 57.3 ± 24.37; CON: 169.92 ± 29.84 mL; \( p = 0.02 \)) when compared to the CON group. CONCLUSION: This study revealed that lower limb vascular function is impaired in individuals with PTSD when compared to healthy counterparts.

**Measurement of Peripheral Pulse Wave Velocity Responses to Prolonged Sitting: Influence of Posture**

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1University of Pittsburgh, Pittsburgh, PA. 2Texas A&M University-Kingsville, Kingsville, TX.

**PURPOSE:** To investigate the acute peripheral and central blood pressure, and arterial stiffness (augmentation index) responses following an aerobic, resistance, and integrated concurrent exercise sessions. METHODS: Ten resistance trained males (\( M = 20.8 \pm 1.69 \)) performed aerobic exercise (AER), resistance exercise (RES), and integrated concurrent exercise (ICE) sessions in random order following a familiarization session. The AER session consisted of 45 min of stationary cycling at 70% HR reserve (HRR) (\( M = 156.13 \pm 2.93 \) rpm), while the RES and ICE sessions consisted of the performance of 5 resistance exercises preceded by 2 min of seated rest or stationary cycling at 70% HR reserve. Cardiovascular parameters including central and peripheral systolic and diastolic blood pressures (cSBP, cDBP, pSBP, and pDBP respectively) and augmentation index (AIx) were collected prior to and 0, 15, 30, 45, and 60 minutes post exercise with pulse wave analysis using the Sphygmocor Xcel System. Five 3x6 Repeated Measures Factorial ANOVAs were used to examine the presence of an interaction effect or main effects with respect to exercise condition (AER, RES, ICE) and time for cSBP, cDBP, pSBP, and AIx. No significant interaction or main effect for condition was found for any of the dependent variables. Significant differences were found for time across the dependent variables cSBP, pSBP, and AIx (\( p < 0.05 \)). These differences represented significant physiological responses to exercise. AER was significantly elevated following RES 0 and 15 min post exercise (\( p \leq 0.05 \)) but was not found to significantly increase following AER or ICE. Regardless of exercise condition, acute cardiovascular responses in terms of peripheral and central blood pressures were similar. CONCLUSION: Integrated concurrent exercise resulted in similar acute cardiovascular responses compared to aerobic and resistance exercise; however, the aerobic component of ICE may possibly blunt the acute increase in arterial stiffness elicited by RES performed in isolation.
Acute inflammation is associated with an increased risk of cardiovascular events. Acute inflammation causes vasodilation and impairs vascular sensitivity to sympathetic stimuli, which could impact wave reflections and central blood pressure. **PURPOSE:** Determine the effect of acute inflammation on central hemodynamics during a mild sympathoexcitatory stimulus. **METHODS:** Central hemodynamics were assessed in 22 healthy young adults (12 males, 25 ± 4.4 years, 22.8 ± 3.2 kg/m²) before and during a mild sympathoexcitatory stimulus (20 mmHg lower body negative pressure [LBNP]) at baseline and 24h following a typhoid vaccination. Central pressure and augmentation index (AIx) were obtained via radial tonometry and a validated generalized transfer function. Aortic pulse wave velocity (PWV) and reflection index were also measured. Measures were calibrated to brachial mean and diastolic pressure measured via oscillometric cuff. C-reactive protein (CRP) and interleukin-6 (IL-6) were assessed via standard ELISA techniques. **RESULTS:** Acute inflammation was induced with significant increases in IL-6 (1.12 ± 0.53 to 2.38 ± 1.33 pg mL⁻¹; p < 0.001) and CRP (1.11 ± 2.03 to 2.81 ± 3.79 mg L⁻¹; p = 0.001). No changes were observed for heart rate or pulse wave velocity in response to inflammation. Acute inflammation resulted in reductions in diastolic and mean arterial pressure, and central augmentation index (AIx) (p < 0.05), while reflection index was not altered (p > 0.05). There were no effects of LBNP, and no effect of inflammation on LBNP responses (interactions > 0.05). **CONCLUSION:** Acute inflammation lowered mean arterial pressure as well as global wave reflections, suggesting peripheral vasodilation. Central hemodynamic control during a sympathoexcitatory stimulus is preserved during acute inflammation in young, apparently healthy adults.

**Table 1. Hemodynamic responses to LBNP and acute inflammation.**

<table>
<thead>
<tr>
<th>Variab e</th>
<th>Baseline Rest</th>
<th>Baseline LBNP</th>
<th>r - Rest</th>
<th>r - LBNP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brachial systolic blood pressure (mmHg)</td>
<td>117 ± 12</td>
<td>117 ± 11</td>
<td>116 ± 9</td>
<td>114 ± 11</td>
</tr>
<tr>
<td>Brachial diastolic blood pressure (mmHg)*</td>
<td>71 ± 8</td>
<td>73 ± 7</td>
<td>70 ± 7</td>
<td>70 ± 7</td>
</tr>
<tr>
<td>Central systolic blood pressure (mmHg)</td>
<td>103 ± 10</td>
<td>104 ± 9</td>
<td>103 ± 8</td>
<td>102 ± 9</td>
</tr>
<tr>
<td>Central diastolic blood pressure (mmHg)</td>
<td>86 ± 8</td>
<td>87 ± 8</td>
<td>84 ± 7</td>
<td>84 ± 7</td>
</tr>
<tr>
<td>Heart rate (bpm)</td>
<td>56 ± 11</td>
<td>57 ± 10</td>
<td>57 ± 10</td>
<td>56 ± 10</td>
</tr>
<tr>
<td>Augmentation index (%)*</td>
<td>3 ± 10</td>
<td>0 ± 11</td>
<td>0 ± 10</td>
<td>-2 ± 12</td>
</tr>
<tr>
<td>Pulse wave velocity (m/s)</td>
<td>6.7 ± 0.6</td>
<td>6.6 ± 0.6</td>
<td>6.8 ± 0.6</td>
<td>6.7 ± 0.8</td>
</tr>
<tr>
<td>Reflection index (%)</td>
<td>47 ± 8</td>
<td>47 ± 9</td>
<td>44 ± 9</td>
<td>45 ± 10</td>
</tr>
<tr>
<td>Forward pulse pressure height (mmHg)</td>
<td>30 ± 7</td>
<td>29 ± 7</td>
<td>31 ± 7</td>
<td>30 ± 7</td>
</tr>
<tr>
<td>Reflective pulse pressure height (mmHg)</td>
<td>14 ± 3</td>
<td>13 ± 4</td>
<td>13 ± 4</td>
<td>13 ± 4</td>
</tr>
</tbody>
</table>

All values are mean ± standard deviation. *r=21 participants*Effect of inflammation, p<0.05

Small muscle mass exercise allows for greater muscle specific blood flow and tissue perfusion. This increase in oxygen delivery should allow individuals to tolerate a greater muscle specific workload which potentially would result in greater reliance on oxidative metabolism. However, the metabolic consequences of manipulating active muscle mass is not fully understood. **PURPOSE:** To determine if there is a difference in carbohydrate and fat oxidation between single-leg and double-leg cycling at the same rate of whole body oxygen consumption. **METHODS:** Eight healthy college aged men (n=5) and women (n=3) completed the study, Participants arrived fasted and completed conditions two days apart (matching for oxygen consumption): 30-minute single leg cycling and 30-minutes double leg cycling. Oxygen consumption (VO₂), respiratory exchange ratio (RER), kilocalories (kcal), carbohydrate oxidation (CHO), fat oxidation (FTO), and power (PWR) were recorded throughout the entire bout of exercise. Paired t-tests were performed to find differences in all dependent variables across both conditions. **RESULTS:** Matching for oxygen consumption (1.6 ± 0.39 versus 1.58 ± 0.38 L/min) required slightly lower PWR (t=3.08, p=0.015) in SL (85.8 ± 25.26 W) than DL (94.23 ± 30.67 W) while still maintaining the same energy expenditure (239.38 ± 75.64 versus 232.19 ± 74.65 kcal). However, participants had a greater rate of carbohydrate oxidation (t=7.61, p<0.001) during SL (1.46 ± 0.45 g/min) compared to DL (1.01 ± 0.35 g/min). This observation was demonstrated with significantly greater RER values (t=5.28, p<0.001) in SL (0.92 ± 0.03) than DL (0.86 ± 0.05) and reduced FTO in SL (t=5.47, p<0.001; 0.22 ± 0.06 g/min) than DL (0.36 ± 0.09 g/min). **CONCLUSION:** Despite the same global intensity based on oxygen consumption and energy expenditure within both conditions, there was an increase in CHO and decrease in FTO during SL cycling. This suggests there is a potential for smaller muscle mass activities (i.e. single leg exercise training) to have greater impact on post-prandial blood glucose control compared to larger muscle mass activities. Future research should consider participants with metabolic disease.
CONCLUSIONS: the non-dynapenic group. In the dynapenic group, attenuated brachial and aortic PP (9 ± 2 vs 15 ± 2 mmHg, p < 0.05) and aortic PP (9 ± 2 vs 15 ± 2 mmHg, p < 0.05) response to PEMI without

METHODS: To examine orthostatic tolerance between leg lean mass (LegLM), PPA, and baPWV in postmenopausal women. METHODS: 93 postmenopausal women (aged 48 - 71 years; BMI: 30 ± 7) underwent vascular function and body composition testing. Aortic PP was determined using an oscilometric device with the extremitity cuffs placed on the lower extremities. LegLM was measured by dual-energy x-ray absorptiometry. Handgrip strength was measured as the maximal voluntary contraction (MVC). The relationships between these variables were analyzed using Pearson’s correlations. Significant correlations were subsequently analyzed using multiple linear regression.

RESULTS: LegLM was correlated with baPWV (r = -0.218, p = .034) and PPA (r = -0.218, p = .034). PPA was also negatively correlated with baPWV (r = -0.218, p = .034). LegLM was positively associated with PPA (β = 0.216, t = 2.320, p = .023) after adjusting for age, MVC, systolic pressure, and heart rate.

CONCLUSIONS: Low leg lean mass was related to vascular dysfunction measured as increased systemic arterial stiffness and reduced PPA associated with aging.

INTRODUCT: Aerobic exercise training reduces arterial stiffness via elevation of nitric oxide (NO) production in type 2 diabetes. Follistatin-like 1 (FSTL1) is a muscle-derived myokine and stimulates protein kinase B (Akt)/endothelial nitric oxide synthase (eNOS) signaling via binding to receptor (DIP2A) in endothelial cells. However, it is unclear whether FSTL1 secretion induced by aerobic exercise training is related to a reduction of arterial stiffness in type 2 diabetic rats. PURPOSE: This study aimed to investigate whether FSTL1 secretion induced by aerobic exercise training is related to a reduction of arterial stiffness with activation of eNOS phosphorylation in type 2 diabetic rats. METHODS: Twenty-week-old male type 2 diabetic (OLETF) rats were randomly divided into sedentary control (OLETF-Con: n=7) and aerobic exercise training (OLETF-Ex: treadmill running for 60min at 25m/min, 5days/week: n=7) groups. In addition, 7 male LETO rats were used as healthy sedentary control. After 8-week experiment, we measured carotid-femoral pulse wave velocity (cPWV; as an index of arterial stiffness), and thoracic aorta was isolated after collection of blood. RESULTS: Fasting blood glucose and cPWV significantly increased (p<0.05) and aortic Akt and eNOS phosphorylation levels increased (p<0.05). Plasma nitrite-nitrate (NOx) levels were higher in the OLETF-Con group compared to OLETF-Ex group. OLETF-Ex group showed significant decrease in fasting blood glucose levels and cPWV (p<0.05) and higher cGMP (8.17 ± 26.5 ± 1.3 g, p<0.001) and beta3 (48.5 ± 0.6 vs 39.1 ± 0.9, p<0.001) compared to the non-diabetic group. The dynamic group exhibited a blunted brachial PP (9 ± 2 vs 16 ± 2 mmHg, p<0.05) and aortic PP (9 ± 2 vs 15 ± 2 mmHg, p<0.05) response to PEMI without differences in heart rate response to PEMI (3 ± 1 vs 3 ± 1 beats/min) compared to the non-dynapenic group. In the dynapenic group, attenuated brachial and aortic PP responses to PEMI were related (all p<0.05) to MVC (r = -0.48, r = -0.47 and BF% (r = -0.51, r = -0.49). CONCLUSIONS: Pulsatile load responses to PEMI were blunted in dynapenic postmenopausal women. Excess adiposity contributes to the attenuated pulsatile response to metaboreflex activation in dynapenic postmenopausal women.

Sarcopenia, the age-related loss of skeletal muscle mass, has been associated with increased arterial stiffness (pulse wave velocity, PWV). Lower leg muscle mass has been associated with increased arterial stiffness (PWV) (heart rate (ECG; HR), mean arterial pressure (Penaz method; MAP), stroke volume (SV); and MAP decreased, while HR and calf circumference increased (all p<0.01). There were no differences in HR, SV, MAP, and calf circumference between groups over time or at pre-exercise (HR: RA: 108 ± 24 bpm; CT: 116 ± 20 bpm; p<0.05; SV: RA: 32 ± 20 mL; CT: 30 ± 22 mL; p<0.001; MAP: RA: 41 ± 18 mmHg; CT: 57 ± 21 mmHg, p<0.20; calf circumference- RA: 1.8 ± 1.8 cm; 3.7 ± 1.6 cm, p<0.08). CSI did not differ between groups (RA: 575 ± 383 mmHg*min; CT: 800 ± 530 mmHg*min, p<0.42). CONCLUSIONS: Orthostatic tolerance did not differ between combined high intensity endurance and resistance trained adults when compared to recreationally active adults. Combined endurance and resistance training does not improve nor hinder orthostatic tolerance compared to that of recreational exercise.
lower body negative pressure (LB-NP) stimulation (-30 mmHg and -50 mmHg) under the following two conditions: hanging up the body by a harness (leg-free) and bracing feet on the wood board in the LB-NP chamber with slight knee flexion (leg-resisted) against suction. These conditions were conducted in random order. Heat rate (HR), mean arterial pressure (MAP), cardiac output (CO), end-tidal CO₂ (EtCO₂), and cerebral blood flow velocity (CBFv) from the middle cerebral artery were continuously recorded. Dynamic cerebral autoregulation (dCA) was evaluated by transfer function analysis. RESULTS: HR was significantly higher, and CO and EtCO₂, were significantly lower during -50 mmHg of LB-NP stimulation than each baseline value irrespective of leg conditions, whereas MAP and mean CBFv remained at similar levels throughout the LB-NP stimulation under both leg conditions. Power spectral density of mean CBFv in the low-frequency range (0.07-0.2 Hz) significantly increased at -30- and -50 mmHg of LB-NP stimulation in the leg-resisted condition (from 1.41±0.62 to 5.42±3.27 and 5.19±3.46) but not in the leg-free condition. Likewise, transfer function gain in the low-frequency range were significantly augmented at -30- and -50 mmHg of LB-NP stimulations in the leg-resisted condition (from 1.22±0.34 to 1.58±0.39 and 1.56±0.43) but not in the leg-free condition. CONCLUSIONS: These results suggest that somatosensory afferent from lower extremities may modify cerebral hemodynamic regulation during orthostatic stimulation.

Arterial function and left ventricular (LV) function are inter-related. In fact, increased arterial stiffness increases afterload and causes decrease in LV diastolic function in elderly hypertensive patients. The high arterial stiffness causes increased myocardial workload for compensation. However, the relationship between arterial stiffness and cardiac function in athletes remain unknown.

PURPOSE: The present study aimed to determine the relationship between aortic stiffness and LV function in athletes.

METHODS: The participants in this study were 16 male college athletes (age 21.5±0.9 yrs). Carotid-femoral pulse wave velocity (cPWV), which reflects aortic stiffness, was measured using an automatic oscillometric device. In addition, cardiac function was measured using a ultrasound echocardiography. Color Doppler, Pulsed Doppler, and Tissue Doppler images were recorded and used to assess LV diastolic function, evaluated as the early and late mitral inflow velocity ratio (E/A ratio) and early septal mitral annulus movement velocity (e’). The “E/A ratio” is a classical method of assessing LV diastolic function and is influenced by afterload. On the other hand, “e’” is an index of myocardial stiffness, but is not influenced by afterload. We examined the correlation between cPWV and each indicator of LV diastolic function. Data analysis was performed using Spearman’s rank correlation coefficient.

RESULTS: A negative correlation between cPWV and E/A ratio (r=-0.557, p=0.02) was observed. However, there was no correlation between cPWV and e’ (r=-0.076, p=0.772).

CONCLUSION: These results suggested that higher aortic stiffness causes decreased LV diastolic function in athletes, regardless of LV myocardial stiffness.
POUR: To determine the effects of 3 hours of prolonged sitting, with and without a high fat meal on central and peripheral arterial stiffness.

METHODS: Five healthy young males (Age: 22±2.5 yrs, BMI: 25±4.4 kg/m²), from a target of 18, have been recruited. Following familiarization, participants visited the laboratory on two occasions and completed a 3 hour period of prolonged sitting following the consumption either a high-fat (HF) or low-fat (CON) meal, in a randomized order. Visits were separated by a minimum of 2, and maximum of 7 days. Before and after prolonged sitting, supine central (carotid-femoral pulse-wave velocity [cfPWV]) and peripheral (femoral-ankle pulse-wave velocity [faPWV]) arterial stiffness were measured. High (60g of fat) and CON (10 g of fat) meals were matched for macronutrient content and volume. Data was analyzed using two-way repeated measures analysis of variance. Alpha was set at P < 0.1 a priori for preliminary analyses.

RESULTS: A significant interaction effect was observed for cfPWV (Group x Time, P = 0.079); post hoc analysis revealed that cfPWV increased following HF (Pre = 5.7±0.6 m/s vs. Post = 6.1±0.6; p<0.05, \( \eta^2 = 0.71 \)) but was unchanged following CON (Pre = 6.2±0.8 m/s vs. Post = 6.2±0.6; p>0.05, \( \eta^2 = 0.016 \)). No interaction (P = 0.643) or group (P = 0.175) effect was observed for faPWV, but faPWV did significantly decrease following sitting (Pre = 9.7±0.4 m/s vs. Post = 8.9±0.5; p<0.05, \( \eta^2 = 0.641 \)).

CONCLUSIONS: The preliminary findings of this study suggest that, in young healthy adults, a high-fit, meal, in combination with prolonged sitting may lead to a greater increase in central arterial stiffness than sitting combined with a low fat meal. Further, prolonged sitting may differentially impact central and peripheral arterial stiffness.

2448 Board #112 May 31 11:00 AM - 12:30 PM Effect Of Isometric Handgrip Exercise On Hypertension-Induced Shear-mediated Dilation In The Internal Carotid Artery
Takuro Washio1, Kazuya Suzuki1, Takashi Yamagata2, Soichi Ando1, Shigehiko Ogo1, FACS1. 1Touyo university, kawagoe, Japan. 2Japan Women’s University, Tokyo, Japan. 3The University of Electro-Communications, Tokyo, Japan. Email: t.wasshie@gmail.com (No relevant relationships reported)

The previous study reported that flow-mediated dilation in peripheral conduit arteries decreased following an acute bout of isometric exercise. On the other hand, it remains unknown whether an acute isometric exercise affects cerebrovascular endothelial function. PURPOSE: The purpose of the present study was to examine the effect of acute isometric handgrip (IHG) exercise on hypertension-induced shear-mediated dilation in the internal carotid artery (ICA). METHODS: Four subjects participated in the present study and performed four 2-min IHG exercises at 25% of maximum voluntary contraction. Shear-mediated dilation in the ICA as an index of cerebrovascular endothelial function was measured by using Doppler ultrasound before and immediately after the IHG exercise protocol. Shear-mediated dilation in the ICA was induced by hypercapnia (target end-tidal carbon dioxide; +10mmHg from individual baseline value) and was calculated as the percent rise in peak diameter from baseline value.

RESULTS: ICA blood velocity and diameter did not change after acute IHG exercise protocol compared with resting value. Also, shear-mediated dilation in the ICA was unchanged by IHG exercise protocol (4.4±2.0 vs. resting value, 4.5±1.9, P=0.84). CONCLUSIONS: In the present study, the IHG exercise trials did not change cerebrovascular endothelial function. These findings suggest that the response of cerebral endothelial function to IHG exercise is different from that of the peripheral endothelial function.

2449 Board #113 May 31 11:00 AM - 12:30 PM The Impact Of Pulsed Electromagnetic Field Therapy On Blood Pressure And Circulating Nitric Oxide Levels: A Double-blind, Randomized Study In Subjects With Metabolic Syndrome.
Dongwook Yeo1, Courtney Wisley1, Glenn Stewart1, Win-Kung Shen2, Jesse Schwartz1, Bruce Johnson1, Chul-Ho Kim1. 1Mayo Clinic, Rochester, MN. 2Mayo Clinic, Phoenix, AZ. (No relevant relationships reported)

Regulation of blood pressure (BP) is important in reducing the risk for cardiovascular disease. There is growing interest in non-pharmacological methods to treat BP including a novel approach using pulsed electromagnetic field therapy (PEMF). PEMF therapy has been proposed to impact physiological function at the cellular and tissue level and one possible mechanism is through an impact on endothelial function and nitric oxide (NO) related pathways.

PURPOSE: The purpose of this study was to evaluate the therapeutic effect of PEMF on BP and NO in subjects with metabolic syndrome.

METHODS: 23 subjects (PEMF group, Age: 58±12yrs, Ht: 169.7±11.9cm, Wt: 93.2±17.7kg) underwent PEMF therapy (Biomobie Inc., Shanghai, China) and 21 subjects (SHAM group, Age: 59±10yrs, Ht: 167.3±10.7cm, Wt: 87.5±18.1kg) underwent sham therapy. The protocol for therapy included 16-min sessions, 3 sessions/day for 12 wk using both hands and feet. BP was measured at rest and near the end of each submaximal exercise pre and 12 wk post therapy. Moreover, NO was measured at similar time points.

RESULTS: There were no changes in Hb in either group over the 12 wk of therapy. The PEMF demonstrated a trend toward increases in NO after therapy but SHAM did not (p=0.09). For resting BP, there were no differences in systolic BP (SBP), diastolic BP (DBP) or mean arterial pressure (MAP) between groups (p=0.05). During exercise, the PEMF had a reduction in pk SBP (p=0.04), but not SHAM (p=0.57). However the PEMF demonstrated a significant relationship between baseline SBP and change in SBP following therapy (r = -0.71, p<0.01) and between MAP and change in MAP following therapy (r = -0.60, p<0.01), but there were no such relationships found in SHAM (r=-0.04, p>0.05 and r=-0.043, p>0.05 respectively). Subjects with resting hypertension (defined as BP>140 SBP) in the PEMF (n=11) had significant reductions in SBP, DBP and MAP when compared to SHAM with HTN (n=9) (p<0.05). In this sub-group analysis, PEMF demonstrated lowered pk SBP (p=0.04) at a given exercise load (p=0.40) but SHAM did not (p>0.05)

CONCLUSIONS: PEMF may increase plasma NO availability and improve BP at rest and during exercise. This indicates that PEMF may be a therapeutic technique to regulate BP in metabolic syndrome. However, this beneficial effect appears to be limited to subjects with existing high blood pressure.

2450 Board #114 May 31 11:00 AM - 12:30 PM Sleep Metrics are Associated with Markers of Cardiovascular Disease Risk in Youth
Elissa K. Katulka, Alexandra E. Hirt, Michele N. D’Agata, Felicia R. Berube, Melissa A. H. Wittman. University of Delaware, Newark, DE. Email: e.katulka@udel.edu (No relevant relationships reported)

There is accumulating evidence identifying relationships between insufficient sleep in children and adolescents and negative cognitive, psychosocial, and metabolic health consequences. However, the relationship between childhood sleep metrics and cardiovascular (CV) risk profile is less clearly defined.

PURPOSE: To characterize the relationship between sleep and CV health in young, healthy children through traditional risk factor assessment and vascular function assessments.

METHODS: Sleep metrics and habitual physical activity assessments were performed on 12 young, healthy boys and girls (12.3 ±1 years) using wrist-worn accelerometry for 7 days and nights. Sleep onset latency (SL) was calculated as the mean time of transition from wakefulness to sleep, while sleep efficiency (SE) was calculated as the mean percentage of time spent asleep between sleep onset and wake onset. Central blood pressures and markers of wave reflection were assessed using pulse wave analysis (PWA) with an oscillometric device. Arterial stiffness was assessed through pulse wave velocity (PWV) measurements obtained using applanation tonometry and volumetric displacement. Vascular function was assessed using Doppler ultrasound measurements of femoral artery hemodynamics and diameter during passive leg movement (PLM).

RESULTS: SL was significantly associated with body mass index (r=0.66, p<0.05) and PWV (r=0.64, p<0.05) and tended to show moderate relationships with leg blood flow (LBF) responses during PLM (ALBF from baseline to peak, r=−0.45; LBF area under the curve, r=−0.50). SE was significantly associated with systolic blood pressure (SBP) (r=0.58, p<0.05) and aortic SBP (r=0.57, p<0.05). Subjects whose SE was >85% had lower aortic SBP (86.9 ±1 vs. 93.7 ±2, p<0.05) and tended to have lower percent body fat, more steps per day, and better blood flow responses during PLM compared to those whose SE was <85%.

CONCLUSIONS: Preliminary findings suggest that metrics indicative of better sleep quality, such as greater SE and reduced SL, are associated with more favorable CV profiles in children. These results support the usefulness of assessing sleep as a potential approach for early prevention of CV disease risk during youth.
Prolonged periods of sitting have been shown to reduce cerebral blood flow and autoregulation, which may subsequently impair executive function. Similarly, the consumption of a high-fat diet can negatively impact cerebral perfusion. However, whether prolonged sitting combined with a high fat meal additionally impairs both executive function and cerebral perfusion is unknown.

PURPOSE: To investigate the effects of consuming a high-fat meal followed by 3 hours of prolonged sitting on executive function and cerebral perfusion.

METHODS: Ten (M:4, F:6) recreationally aerobically trained college students. The unilateral improvements in vasoreactivity, once again, confirm the concept of specificity of training.

RESULTS: After training, handgrip strength increased significantly (p = 0.078, d = 2.2) faster in the low-fat condition compared to HF condition (16.4 ± 4 vs. 21.5 ± 0.7 s). There were no significant differences in cerebral perfusion between or within groups (p = 0.201).

CONCLUSIONS: These preliminary findings suggest that the consumption of a high-fat meal may negatively impact core executive functions measured by TMT Part B, namely working memory and task-switching ability. However, cerebral perfusion, as measured by cw-NIRS, failed to identify a mechanism. This may be a consequence of limited statistical power given the sample size, or uncertainties regarding the sensitivity of cw-NIRS when measuring cerebral perfusion.
Prolonged periods of uninterrupted sitting (i.e., 3 hours) can negatively affect markers of central vascular health, including aortic arterial stiffness. It is unclear whether individual differences, particularly biological sex, can modify the central vascular health response to prolonged periods of sitting. PURPOSE: To test the hypothesis that prolonged sitting will increase (worsen) central arterial stiffness, a response that will be greater in men as compared to women. METHODS: Twelve relatively healthy participants (i.e., free of diagnosed disease; women=6) completed a 3-hour bout of uninterrupted sitting. Before and after sitting (supine), assessments of heart rate (HR), MAP, and aortic pulse wave velocity (aPWV) were measured via surface electrocardiography, cuff oscillometry, and applanation tonometry, respectively. RESULTS: Participants were similar in age (men=25.1±2 vs. women=25.3 yrs; \( p=0.93 \)) and BMI (men=29±2 vs. women=25±2 kg/m²; \( p=0.17 \)). Prior to sitting, HR and MAP were similar, but men had a higher aPWV (\( p=0.021 \)). Following sitting, there was a significant reduction in HR (5.2±2 bpm; \( p=0.027 \)), with no change occurring in MAP (\( p=0.916 \)). In response to sitting, there was a time (sex \( p=0.010 \)) effect for aPWV; aPWV increased in men (pre-sit=6.2±0.4 vs. post-sit=6.7±0.3; \( p=0.011 \)) but not in women (pre-sit=4.9±0.3 vs. post-sit=5.0±0.4 m/s; \( p=0.55 \)). CONCLUSIONS: These preliminary findings suggest that prolonged periods of uninterrupted sitting augment central arterial stiffness, a response that appears to be apparent in men, but not in women.
the impact of acute hyperglycemia on arterial stiffness in premenopausal women in the early and late follicular phases of the menstrual cycle. METHODS: Seventeen healthy, naturally menstruating women (21±1 years) participated in three experimental visits. During two visits (EF<sub>pre</sub>, LF<sub>pre</sub>), arterial stiffness was assessed via central and peripheral (arm and leg) pulse wave velocity (PWV) before and 15, 45, 75, and 105-minutes after consuming an oral glucose challenge (75g glucose/300mL solution). Blood samples were taken to assess blood glucose (BG), insulin (BI), estrogen, progesterone and blood viscosity levels. During a third visit in the EF phase, participants ingested 300mL of water to act as a time-control for PWV (EF<sub>post</sub>).

RESULTS: BG and BI levels increased 30 minutes post-glucose ingestion (p < 0.001), with no difference between visits (p = 1.00, p = 0.577, respectively). Both central and peripheral PWV measurements were unchanged across visits and time.

CONCLUSION: These results suggest that acute hyperglycemia and menstrual phase do not impact central and peripheral PWV. Pre-exercise protection from acute hyperglycemia-induced increases in arterial stiffness previously observed in men and postmenopausal women. Research supported by: NSERC Discovery Grant & Canadian Graduate Scholarship - Master’s

2459 Board #123 May 31 11:00 AM - 12:30 PM Effects of Resistance Training with Blood Restriction on Flow-Mediated Dilatation of Brachial Artery in Elderly

RAFAEL DURANS PEREIRA, Leandro Mones Pinto, Antonio Woodson Santos Maciel, Jeridanny Silva Serejo, José Ribamar Pereira Beckman, Beatriz Ferreira de Souza, Antonio de Paula Pereira, Alessandra de Magalhães Campos Garcia, Ana Eugenia Furtado, Janaína de Oliveira Brito-Monzani, Cristiano Teixeira Mostarda. UNIVERSIDADE FEDERAL DO MARANHAO, SAO LUIS, Brazil. Email: rafaelduranssp@gmail.com

Endothelial function is one of the early markers of atherosclerosis and thus consecutively of cardiovascular diseases risk. Brachial Artery Flow-Mediated Dilatation (DILA) is an indicator of endothelial function that can be obtained by a non-invasive technique. Physical exercise is a non-pharmacological therapy that has the benefit of improving endothelial function.

PURPOSE: To evaluate the effects of resistance training with restriction of blood flow on endothelial function and total occlusion pressure in elderly. METHODS: The elderly were invited to participate of the study in the written informed consent term. We selected 37 elderly women who were divided into 3 groups (placebo control (C), 60% restriction of blood flow (R60) and 80% restriction of blood flow (R80)), and were submitted to the DILA protocol, which is a test that verifies the total artery occlusion pressure through an ultrasound and an inflatable cuff, with endothelial control function and the total vascular occlusion pressure, so that the training pressure restriction is determined. All were submitted to a maximum load protocol (1RM), to determine the training load (20% of 1RM) with blood flow duration of 8 weeks. Comparison of data was done through two-way ANOVA.

RESULTS: Significant differences were found only in the group that trained with 60% blood flow restriction when compared to all groups in the post-training (C: 0.0213±0.0160 cm vs. R60: 0.0503±0.0180 cm vs. R80: 0.0306±0.0200 cm, p<0.05) and with pre-training of group R60 (0.0190±0.0135 cm vs. R80: 0.0306±0.0200 cm, p<0.05). In occlusion pressure, the group which trained with 60% of flow restriction had a different significance before and after the training R60 (186.67±10.33 mmHg vs. 156.66±16.32* mmHg, p<0.05). CONCLUSION: Resistance training with blood flow restriction is able to increase brachial artery dilatation and reduce the pressure of occlusion in elderly women who trained with 60% blood flow restriction.

2460 Board #124 May 31 11:00 AM - 12:30 PM Effect Of A Two-week Exercise Intervention On Postprandial Extracellular Vesicles In Adults With Prediabetes

Natalie ZM Eichner, Nicole M. Gilbertson, Emily M. Heiston, Luca Musante, Sabrina LaSalvia, Arthur L. Weltman, FACSM, Uta Erdbrecher, Steven K. Malin, FACSM. University of Virginia, Charlottesville, VA. (Sponsor: Steven Malin, FACSM) Email: nze8bz@virginia.edu

PURPOSE: Postprandial hyperglycemia is a stronger predictor of cardiovascular disease (CVD) compared to fasting glucose, but the mechanism remains unclear. Extracellular vesicles (EVs) are potential bio-effectors that impact CVD, and exercise is known to modify fasting EVs. However, the effect of exercise on EVs in the postprandial state in relation to CVD risk is unknown. METHODS: Twelve older (64±7.2±3.5 yrs), obese (BMI: 31±11.7 kg/m2) and sedentary (19.3 ml/kg/min) adults were screened for prediabetes using ADA criteria (75 g OGGT and/or HbA1c). Subjects underwent 12 bouts of supervised cycle ergometer training at 70%HR<sub>max</sub> for 60 min/d. Annexin V-positive total EVs, platelet EVs (CD31+/CD41+), endothelial EVs (CD105, CD31+/CD41+) and leukocyte EVs (CD45+/CD41+) were collected at fasting and 2-hr during a 75g OGTT from fresh plasma. EVs were analyzed via imaging flow cytometry pre-/post-intervention. CVD risk factors including BMI, VO<sub>peak</sub>, glucose, systolic (SBP), diastolic (DBP), arterial pressure (AP), and arterial stiffness (augmentation index; AIx) were assessed at fasting and 2-hr during the 75g OGTT. RESULTS: Exercise training deceased BMI (P<0.001), and systolic and diastolic arterial stiffness (P<0.05). A V- EVs decreased 4 days post-training (P<0.01). However, when accounting for changes in fasted EVs following training, only A V-CD105 remained significantly elevated at 2-hr post-training (P<0.01). Increases in postprandial total A V- EVs correlated with reductions in postprandial AP (r=−0.73, P<0.03) and AIx (r=−0.75, P<0.02) with no change in HR. CONCLUSION: Although exercise training may modify the postprandial A V- EV response in adults with prediabetes, this response appears to be driven by alterations in fasted EVs. Future work should consider the physiological and clinical relevance of EVs in the fasted versus postprandial state to elucidate the physiologic underpinnings by which postprandial hyperglycemia confers CVD risk.

Karen Kayan women live in the deep forest of northern Thailand. They wear brass coils around their necks all their lives starting from 5-7 years of age. The coils are replaced by a longer one as they grow older. There is only scarce regarding the physiological and health impact of lifelong wearing of the neck brass coils in these women. PURPOSE: To determine the influence of wearing brass neck coils on cardiorespiratory function in long-neck Karen tribe.

METHODS: A total of 28 Karen women (23 – 66 years) living in Mae Hong Son Province (at high altitude) in the northern Thailand were studied. Fourteen Karen women who had been wearing brass neck coils were compared with 14 Karen women who had not been wearing brass neck coils. We also studied 14 age-matched women living at sea level. RESULTS: There were no significant group differences in body fat percentage, resting heart rate, and brachial-ankle pulse wave velocity (measure of arterial stiffness). Both systolic and diastolic blood pressure was greater and maximal oxygen consumption was lower in both Karen women than in the sea level controls (all p<0.05). Karen women wearing neck coils demonstrated lower flow-mediated dilatation (index of endothelium-dependent vasodilation), lung functions, including forced vital capacity and forced expiratory volume during the first second, and cerebral blood flow velocity than Karen women without neck brass (all p<0.05). CONCLUSIONS: Karen women wearing neck brass coils demonstrated reduced endothelial and lung functions as well as cerebral perfusion compared with age-matched Karen women without coils living in the same villages. Karen women wearing brass neck coils may be at elevated risks of developing cardiopulmonary and cerebrovascular diseases.

Supported by the 90th Anniversary of Chulalongkorn University, The Ratchaphakse Phomphit Fund and Faculty of Sports Science’s Scholarship for Research 2018.

2462 Board #126 May 31 11:00 AM - 12:30 PM Examination of Underlying Mechanisms Contributing to the Enhanced Post-Exercise Blood Pressure Response.

Gavin Power, Gavin Connolly, Lea Haverbeck, Brendan Farley, Roop Jayaraman, Naveen Sharma, Rachael K. Nelson. Central Michigan University, Mount pleasant, MI. Email: power3g@cmich.edu

Insulin resistance contributes to endothelial dysfunction establishing a causal link between type 2 diabetes and cardiovascular disease. An acute bout of exercise has been shown to enhance insulin sensitivity and endothelium function potentially contributing to a commonly observed reduction in blood pressure post-exercise. However, the underlying molecular mechanism(s) for these improvements in smooth muscle remains unclear. PURPOSE: To examine blood pressure response and key signaling proteins involved in insulin sensitivity and endothelial function following an acute session of exercise in aged rodents. METHODS: Based on body mass, aged (~12 months) female Sprague-Dawley rats (n=50) were assigned to one of four groups: 1) sedentary control group within women (23 – 66 years) living at sea level; 2) control group with insulin injection (EX-ins), 3) exercise group without insulin injection (EX-ins), and 4) exercise group with insulin injection (EX+INS). Insulin or saline injections were administered 5-min prior to sacrifice. Under isoflurane anesthesia, blood pressure was assessed and the descending aorta was harvested. Exercise cohorts

Abstracts were prepared by the authors and printed as submitted.
were sacrificed 3-hr after a 60-min swimming protocol. Western immunoblotting was used to determine phosphorylated Akt (p-Akt(Thr308)), phosphorylated AMPK (p-AMPK(Thr172)), and phosphorylated eNOS (p-eNOS(Ser1177)). RESULTS: Blood pressure was significantly lower following exercise compared to sedentary conditions (EX-ins and EX-outs vs. CON-ins and CON-outs, p<0.05). p-Akt(Thr308) was significantly (p<0.05) higher under insulin stimulated compared to non-insulin stimulated conditions, and this effect was also attenuated with exercise (CON-ins > EX-ins; p<0.05). Although not statistically significant, there was a trend for a difference between groups in p-eNOS(Ser1177) (CON-ins: 1.29, CON-outs: 0.80, EX-ins:1.31, EX-outs: 0.65, p=0.11). No significant differences were observed in p-AMPK.

CONCLUSION: The post-exercise improvement in blood pressure is at least partially mediated by enhanced insulin sensitivity via Akt signaling and potentially p-eNOS signaling in smooth muscle.

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**2465 Board #129** May 31 11:00 AM - 12:30 PM Differing Impact of Weight Cycling on Ambulatory Blood Pressure Versus Conventional Blood Pressure Assessment: A Possible Explanation to Controversy Zachary Zeigler, Daniella Akin, Trevor Nordin. Grand Canyon University, mesa, AZ.

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(No relevant relationships reported)

**BACKGROUND:** Weight Cycling (WC) is a widespread behavior associated with deleterious cardiovascular (CV) health, including elevated blood pressure (BP). Yet, a 2010 review analyzing the effects of WC on BP concluded there was not enough quality evidence to draw any sort of decisive conclusions. Ambulatory BP (ABP) monitoring is recognized as a superior method of measurement and predictor of the CV state when compared to traditional laboratory BP assessment. The impact that WC may have on ABP per se is unknown.

**METHODS:** Impact of self-reported WC history on ABP was assessed via a causal comparative non-experimental design. Sixty-five women completed the Weight and Lifestyle Inventory questionnaire (WALI). The WALI has been shown to be a reliable index of WC (r= 0.87). Subjects were classified as weight cyclers (WC) if they reported a weight loss of ≥ 4.5 kg at least 3 times followed by weight regain. Those who reported less than this were classified as non-weight cyclers (NWC). Main outcome was mean differences between groups on laboratory BP and ABP.

**RESULTS:** WC (n=31) were older (39.7±8.9 vs 33.1±11.3 yr), had a higher percent body fat (47.1±6.2 vs 41.4±7.8 (%)), and were less fit (21.2±5.4 vs 26.7±7.6 ml.kg⁻¹.min⁻¹) than NWC (n=34). No significant differences were found for laboratory BP values. WC women had higher systolic (130.1±13.6 vs 122.8±8.2 mmHg, P=0.006) and diastolic (76.2±8.9 vs 70.0±9.0 mmHg, P=0.001) ABP values than NWC women. Systolic (23% versus 17%, P<0.001) and diastolic (13% versus 9%, P<0.001) BP load was higher for WC compared to NWC women.

**CONCLUSION:** WC may deleteriously impact BP outcomes that might only be witnessed when ABP monitoring is used.

**2466 Board #130** May 31 11:00 AM - 12:30 PM Vascular Response to Submaximal Intensity Aerobic Exercise in Individuals with Down Syndrome Sang Ouk Wee, Elizabeth C. Schroeder, Georgios O. Grigoriadis, Alexander J. Rosenberg, Kanokwan Bunsawat, Tracy Baynard, FACSIM, Bo Fernhall, FACSIM. 1California State University San Bernardino, San Bernardino, CA. 2University of Illinois at Chicago, Chicago, IL. 3University of North Texas, Fort Worth, TX. 4University of Utah, Salt Lake City, UT.

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(No relevant relationships reported)

Individuals with Down syndrome (DS) exhibit autonomic dysfunction, which causes significant reductions in aerobic capacity (VO₂max). Autonomic dysfunction alters central regulation of the cardiovascular system in DS, demonstrated by reduced peak heart rate and cardiac contraction. Exercise (V̇O₂max or peak VO₂) in DS is inversely related to aerobic capacity and is a well-known cardiovascular disease risk factor. However, there is very limited information regarding vascular function in response to moderate intensity exercise in individuals with DS. **Purpose:** To investigate the hemodynamic and vascular response to moderate intensity exercise in individuals with and without DS (control). **Methods:** Thirty-eight volunteers (DS=19, age=24 yr for each groups) participated in this study. Central hemodynamic variables (aortic BP, aortic PWV) were measured with an ambulatory blood pressure monitor. Carotid ultrasonography was used to obtain arterial stiffness indices β-stiffness and elastic modulus (Ep). All measures were performed at baseline immediately and 30-min post moderate intensity treadmill exercise. **Results:** Individuals with DS had significantly lower VO₂max (DS: 28.3 ml.kg⁻¹.min⁻¹; Control: 40.8 ml.kg⁻¹.min⁻¹). There were no group differences in the hemodynamic response (aortic BP, aortic PWV, aortic PP). All measures were performed at baseline immediately and 30-min post moderate intensity treadmill exercise. **Conclusions:** Our results suggest that individuals with DS do not exhibit different arterial stiffness and altered hemodynamic responses to moderate intensity exercise when compared individuals without DS.
measured the carotid to femoral pulse wave velocity (cf-PWV) to evaluate arterial stiffness using a novel oscilometric device (Sphygmocor Acel). Dual energy X-ray absorptiometry was used to measure lean mass (kg) and percent body fat (%BF) for this study. RESULTS: Pearson’s correlation tests showed a significant inverse relationship between tBPAQ and cf-PWV (r=-0.338, p<0.011) in college-aged women; however, this relationship was not found in college-aged men (p>0.05). There were significant negative correlations between tBPAQ and %BF in both college-aged women (r=-0.265, p=0.048) and men (r=-0.306, p=0.036). No significant relationships were found between tBPAQ and lean mass in both groups (p>0.05). CONCLUSION: We found that bone-loading physical activity was negatively associated with arterial stiffness measured by the cf-PWV in college-aged women, but not in men. The %BF was inversely related to tBPAQ scores in both college-aged women and men. Thus, high impact bone-loading physical activity could be recommended to improve arterial stiffness and reduce %BF in young college-aged students.

Exaggerated blood pressure (BP) responses to exercise are prognostic of cardiovascular disease (CVD) in adults. There are no criteria to define exaggerated BP responses in children, yet higher exercise BPs have been shown to be associated with CVD risk factors. Therefore, exercise BPs may provide important prognostic information in children, especially those at higher risk for CVD. PURPOSE: The study sought to characterize the exercise BP responses in an “at-risk” sample of adolescents with a chronic inflammatory condition. METHODS: Twenty-one adolescent (7 males; 14.7±1.8 years) with a confirmed single diagnosis of chronic kidney disease, cystic fibrosis, inflammatory bowel disease, juvenile idiopathic arthritis or type 1 diabetes mellitus participated in this study. Brachial BP was assessed using a motion-tolerant automated auscultatory device every 2 minutes during the McMaster All-Out Progressive Continuous cycling test, using pediatric-specific criteria for test termination at “maximal” effort. Maximal BPs were compared to (1) sex-specific reference values for healthy adolescents, and (2) exaggerated BP criteria for adults. RESULTS: Maximal systolic BPs for males and females were 184±35 and 172±19 mmHg, respectively. Maximal diastolic BPs for males and females were 71±11 and 74±9 mmHg, respectively. Two males (29%) had a maximal BP above reference values with one having a higher systolic BP and the other having a higher diastolic BP. Nine females (64%) had a maximal BP above reference values with five exceeding the systolic BP reference, one exceeding the diastolic BP reference, and three exceeding both BP references. An exaggerated BP response occurred in two males and two females. CONCLUSION: Approximately half of our sample of adolescents with a chronic inflammatory condition reached higher exercise BPs compared to healthy adolescent reference values. Elevated exercise BPs were also more common in females compared to males, and 19% of our sample met the adult-criteria for exaggerated BP responses. Collectively our observations of elevated exercise BPs in an “at-risk” population highlight the importance of examining BP responses in children, including research on its potential prognostic value. Funding: Canadian Institutes of Health; Heart and Stroke Foundation

Alterations in rheological measures such as elevations in whole blood viscosity (WBV) and hematocrit (Hct), have been linked with increased risk of cardiovascular disease (CVD). Endurance training has been demonstrated to lower WBV and Hct; however, evidence supporting the efficacy of yoga in modulating WBC and Hct is sparse. PURPOSE: The purpose of this trial was to determine the effect of a regular yoga practice on WBV and Hct. METHODS: A cross-sectional study was conducted examining WBV at multiple shear rates and Hct levels among yoga practitioners with a minimum of 3 months of consistent practice and sedentary, healthy adults. Fasting blood samples were collected from an antecubital vein from a total of 42 participants: 23 sedentary adults and 19 regular yoga practitioners. Brachial arterial blood pressure (BP) was measured and the averages of 3 measures were recorded. RESULTS: Yoga practitioners had significantly lower WBV at 45 s⁻¹ (p<0.01), 90 s⁻¹ (p<0.01), 220 s⁻¹ (p<0.05), and 450 s⁻¹ (p<0.01) than sedentary participants. No significant group differences in Hct (p=0.38) were found. A tendency toward lower systolic BP (p=0.06)
was observed in the yoga practitioner group; however, no significant group differences in BP were exhibited. Conclusion: Although a consistent yoga practice was associated with lower WBV, a health indicator related to BMD risk, yoga was not associated with changes in Hct, a major determinant of WBV.

E-35 Free Communication/Poster - Bone and Bone Mineral Density
Friday, May 31, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

2471 Board #135 May 31 11:00 AM - 12:30 PM Bone Health in Elite Norwegian Endurance Cyclists and Runners: A Cross-Sectional Study Oddbjørn Kломstøn Andersen1, Benjamin Clarsen2, Ina Garthe1, Morten Morland1, Tine Strønsrud1. 1Norwegian School of Sport Sciences, Oslo, Norway; 2Norwegian Olympic Training Centre, Oslo, Norway.
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(Related relationships reported)

Athletes who compete in non-weight-bearing activities such as swimming and cycling are at risk of developing low bone mineral density (BMD). Athletes in long distance running are at risk of low BMD. Purpose: 1. To evaluate the bone health in Norwegian male and female national-elite road cyclists and middle- and long-distance runners, and to identify cases of low BMD, classified as having a Z-score ≤ -1, according to ACSM criteria. 2. To identify possible risk factors associated with low BMD. Methods: Twenty-one runners, 11 females and 10 males, and 19 road cyclists, 7 females and 12 males were enrolled in this cross-sectional study. DXA measurement of BMD in total body, femoral neck and lumbar spine was measured. Participants completed a questionnaire regarding training, injuries, calcium intake and health variables.

Results: The cyclists had lower BMD for all measured sites compared to the runners (p ≤ 0.05). Ten of 19 cyclists were classified as having low BMD, despite reporting to train heavy resistance training on the lower extremities. One male cyclist had a Z-score ≤ -2. Low BMD was site-specific, having occurred in the lumbar spine and the femoral neck, and was not confined to females. Type of sport was the only factor significantly associated with low BMD.

Conclusions: National elite Norwegian road cyclists had lower BMD compared to runners, and a large proportion was classified as having low BMD, despite having performed heavy resistance training. Interventions to increase BMD in this population should be considered.

2472 Board #136 May 31 11:00 AM - 12:30 PM Relationship of Bone Mineral Density and Body Composition in Student Athletes and College-aged Students Amanda Pinheiro1, Kelly Johnson1, Marissa Baranauskas1, Jordan T. Olson1, Michael Robinson1, Rachelle Kappler1, Rolando Ramirez1, Ronald Otterstetter, FACSM. 1The University of Akron, Akron, OH; 2Coastal Carolina University, Conway, SC; 3Indiana University, Bloomington, IN; 4Ohio University, Athens, OH.
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(Relative relationships reported)

Introduction: Bone health and body composition (BC) provide insights into the risk factors for fracture and obesity development. Peak bone development is thought to be achieved in the young adult years of an individual’s life and can be indicative of the risk of osteoporosis later in life. Regular physical activity can be a major factor in healthy bone development. Purpose: To elucidate the relationship between bone mineral density (BMD) and BC measurements between a college-aged student-athlete (NA) population and a student-athlete (ATH) population. Methods: Bone mineral density (BMD) and BC measurements from NA population (n = 61) and from ATH population (n = 39) were collected using the Dual Energy X-ray Absorptiometry (DEXA). Furthermore, sex-specific differences between and within the subgroups were evaluated. The variables compared between groups for the two-sample t-tests included BMD, weight (WT), fat mass (FM), lean mass (LM), and bone mineral content (BMC). Statistical analysis was performed using Minitab 18 software. Results: No statistical difference was found for BMD, WT, LM, and BMC between subgroups. However, sex-specific differences were present for all variables of interest (BMD Females; 1.170 ± 0.07 g/cm² vs. Males; 1.277 ± 0.105 g/cm²; WT Females; 132.0 ± 20.3 lbs vs. Males; 169.1 ± 25.7 lbs; FM Females; 36.1 ± 13.5 lbs vs. Males; 27.0 ± 16.0 lbs, LM Females: 9.31 ± 13.1 lbs vs. Males: 135.0 ± 18.0 lbs; BMC Females: 5.61 ± 0.87 lbs vs. Males: 7.3 ± 1.07 lbs). Pearson’s correlation coefficient results indicate that there was a moderate to strong relationship between BMD and lean mass for all groups. Conclusion: Activity may play a role in the relationship between BMD and BC. The results of this study can help direct future studies on bone health and BC. Data from this study could be utilized in the formation of a predictive model for the development and interactions of osteoporosis and obesity. Such a model would help in the identification of risk factors and early life in appropriate intervention can be put in place. Quantitative bone health and BC data can help coaches and medical professionals prescribe appropriate training and medical interventions if necessary for subjects who are at risk for developing bone or metabolic diseases. Small sample size and lack of activity data were limitations of this current study.

2473 Board #137 May 31 11:00 AM - 12:30 PM Regional Lumbar Bone Mineral Density Differs In Cricket Fast Bowlers With Lumbar Bone Stress Injury Peter Alway1, Nicholas Peirce2, Robert Kerslake2, Mark King1, Katherine Brooke-Wavell1, Loughborough University, Loughborough, United Kingdom, 1England and Wales Cricket Board, Loughborough, United Kingdom, 2Nottingham University Hospitals Trust, Nottingham, United Kingdom.
Email: P.Alway@lboro.ac.uk

(Relative relationships reported)

Lumbar stress injuries (LSIs) are among the most serious sustained by fast bowlers in cricket, with symptoms often indistinguishable from low back pain. They most often occur in the non-dominant lumbar spine in response to the unique lumbar loading characteristics of fast bowling. It is not known whether lumbar spine bone mass differs according to current or previous LSIs. Purpose: To determine differences in lumbar bone mineral density (BMD) between current LSIs, previous LSIs and never LB fast bowling groups. Methods: 58 fast bowlers (mean ± SD: age: 21.23 ± 4.21 years; height: 1.88 ± 0.06 m; body mass: 84.13 ± 9.14 kg) declared as fit to bowl received a LSI scan (3.0T Discovery MR750w, GE Healthcare, Milwaukee, WI), an AP lumbar LSI scan (Lunar iDXA, GE Healthcare, USA), and had their medical history and MRI scans reviewed for historical incidence of LSIs. MRI scans were analysed to determine current LSI. DXA scans were analysed to measure specific bone accrual of dominant (ipsilateral to bowling arm) and non-dominant sides of the lumbar spine. Rectangular custom regions of interest (Lumbar enCORE 17.0) were added to the lateral 33% of each lumbar vertebral body, to exclude the spinous process, and BMD of these regions were calculated. One-way ANOVA determined if groups differed in age, height, body mass, and whole vertebral BMD. Two-way mixed repeated measures ANOVA determined within and between group differences between sides. Results: MRI and medical history demonstrated 19 current, 23 never and 16 previous LSIs fast bowlers. Age was significantly greater (p < 0.05) in previous LSIs (23.71 ± 4.80) compared with current (19.52 ± 2.22) and never LSIs (20.90 ± 4.36). No significant differences were found between groups for height, body mass or whole vertebral BMD (p > 0.05). BMD was higher at the non-dominant side than the dominant side of the vertebral body (1.63 vs. 1.50 g/cm², p < 0.001) and this differed between vertebra (3.0 - 30.8%, p < 0.001) and groups (p = 0.03). BMD on the dominant side was higher in current (+4.4%) and previous (+3.7%) than never LSIs. BMD on the non-dominant side was lower in current (-2.3%) and previous (-0.8%) than never LSIs. Conclusion: Bone mineral accrual differs between current, never and previous LSIs groups possibly due to differences in bowling technique, workload and maturation, and may identify those at risk of LSIs.

2474 Board #138 May 31 11:00 AM - 12:30 PM Biometric, Dietary and Training Influences on Bone Mineral Content in Competitive Triathletes Barbara S. McClanahan1, Michelle B. Stockton1, Christopher M. Vukadinovich2. 1University of Memphis, Memphis, TN; 2St. John’s Children’s Research Hospital, Memphis, TN. (Sponsor: Lawrence Weiss, FACSM)
Email: bmcclhnm@memphis.edu

(Relative relationships reported)

Purpose: Physical activity is important for optimal bone development, however, biometric, training, and dietary practices may compromise bone health. The purpose of this study was to explore potential influences on bone mineral content (BMC) in competitive triathletes. Methods: Participants were 12 male and 13 female triathletes. Standard protocols were used to determine BMC (DXA), weight (digital scale), training volume (self-reported exercise duration X intensity) caloric intake (7 day dietary recall) and calcium intake (7-day dietary recall). Results: Participants were 25 adult triathletes. Males (n=12) had an average weight of 169 lbs (+ 18.9), BMC of 2.737g (+ 0.507.4), training volume of 44,948 (+ 18.433), total lean mass of 62,686 g (+ 6083.6), kcal of 2,776 (+ 774.4), and calcium intake of 999.5 (+ 577.2). Females (n=13) had an average weight of 127.8 lbs (+ 17.3),
Physical activity is beneficial to both the skeletal and muscular systems. The connection between muscular forces and bone strength is explained by the Mechanostat Theory (bone responds to forces applied to them). Therefore, muscle function tests may provide a non-invasive measure of bone strength. Recent studies report significant correlations between lower limb muscle power and bone strength (Jana, 2015, Yingling, 2017).

**PURPOSE:** To assess the relationship between lower limb power and bone strength in the cortical and trabecular bone of the radius and tibia in a healthy (non-athletic) population.

**METHODS:** 40 females (age yrs) 31.6 ± 12.5, height (cm) 160.7 ± 6) and 37 males (age yrs) 26.8 ± 7.7, height (cm) 172.8 ± 7.7) performed a vertical jump test. Peak Power (PP) was calculated from vertical jump height (Sayers, 1999).Peripheral Quantitative Computed Tomography (pQCT) was used to quantify bone strength at the radius and tibia for both cortical and trabecular sites. Cortical site measures included Moment of Inertia (J), Cortical Area (CL.Ar), cortical Bone Mineral Density (cBMD), Stress-Strain Index (SSI). Bone Strength Index (BSIc), Total Area (T.Ar.), trabecular volumetric Bone Mineral Density (vBMD.tb), and trabecular volumetric Bone Mineral Content (vBMC.tb) were measured. Pearson’s correlation analyses were run p<0.05.

**RESULTS:** Average daily sedentary time was 86.5 ± 84 minutes. Sedentary time was negatively associated with femur and tibia SSI, although the association was only significant for tibia SSI (p<0.029).

**CONCLUSION:** Higher levels of baseline sedentary time are associated with lower longitudinal (2-year follow-up) SSI in the tibia and femur. Interventions to decrease sedentary time in adolescent females may improve bone outcomes. 

Sponsored by: NIH Grant SGR01HDD74565-05

**Table 1: Coefficients for Linear Regression Models for Strength Strain Index at the Tibia and Femur**

<table>
<thead>
<tr>
<th>Predictors</th>
<th>β (SE)</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tibia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline Sedentary Time (min/day)</td>
<td>-0.40 (0.18)</td>
<td>(-0.77, -0.04)</td>
<td>0.029</td>
</tr>
<tr>
<td>Maturity Offset (years)</td>
<td>-93.42 (25.89)</td>
<td>(-144.76, -42.09)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Hispanic Ethnicity*</td>
<td>23.91 (33.58)</td>
<td>(-42.68, 90.50)</td>
<td>0.478</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>12.02 (3.33)</td>
<td>(5.42, 18.62)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Lean soft tissue mass (kg)</td>
<td>12.45 (4.10)</td>
<td>(4.33, 20.58)</td>
<td>0.003</td>
</tr>
<tr>
<td>Baseline Strength Index</td>
<td>0.32 (0.069)</td>
<td>(0.68, 0.95)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Constant</td>
<td>-1302.86 (472.46)</td>
<td>(-2239.67, -366.04)</td>
<td>0.007</td>
</tr>
<tr>
<td><strong>Femur</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline Sedentary Time (min/day)</td>
<td>-0.33 (0.27)</td>
<td>(-0.87, 0.20)</td>
<td>0.216</td>
</tr>
<tr>
<td>Maturity Offset (years)</td>
<td>-92.63 (38.63)</td>
<td>(-169.28, -15.98)</td>
<td>0.018</td>
</tr>
<tr>
<td>Hispanic Ethnicity*</td>
<td>81.42 (49.04)</td>
<td>(-15.88, 178.72)</td>
<td>0.100</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>16.06 (4.83)</td>
<td>(6.48, 25.64)</td>
<td>0.001</td>
</tr>
<tr>
<td>Lean soft tissue mass (kg)</td>
<td>22.38 (5.98)</td>
<td>(10.51, 34.25)</td>
<td>0.003</td>
</tr>
<tr>
<td>Baseline Strength Index</td>
<td>0.72 (0.09)</td>
<td>(0.55, 0.89)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Constant</td>
<td>-1965.63 (686.17)</td>
<td>(-3327.14, -604.11)</td>
<td>0.005</td>
</tr>
</tbody>
</table>
RESULTS: PP measures were associated with cortical and trabecular bone strength parameters in the radius andibia. Strong associations were found in cortical bone sites except for BV/TV that was indicated by the correlation coefficients (r) [ibia - 0.7 (0.7374), CLAR (0.7650), SSI (0.7344), radius - J (0.7028), CLAr (0.8730), SSI (0.6788)]. Similar results were found in the trabecular region for both the radius andibia respectively [BMC (0.6199), T.Ar.b (0.5204), VbMC.b (0.6016), BVMD.b (0.4415) and BSIb (0.7950), T.Ar.b (0.5943), VbMC.b (0.7731), BVMD.b (0.7189)].

CONCLUSIONS: Bone parameters in both sites are associated with cortical and trabecular bone geometry. There are differences in bone density, content, structure and strength in young people of both sexes according to sport. Further analysis is needed to better understand the factors associated with this relationship.

Abstract
Muscular fitness has been associated with several health-related outcomes including bone health. However, evidence on this relationship considering sport participation is scarce. PURPOSE: To examine associations between several expressions of muscular fitness and bone speed of sound (SoS) in young people of both sexes according to current sport participation (ATHL-athletes engaged in formal competition vs. Non-ATHL - non-athletes). Methods: Participants were 184 boys (11.1-18.9 yrs old; 90 athletes) and 198 girls (12.2-18.8 yrs old; 45 athletes) at and above the age of peak height velocity (PHV). Bone SoS evaluation was conducted by quantitative ultrasound (QUS) at the distal radius (R-SoS) and midshaft tibia (T-SoS) of the non-dominant limbs. Muscular fitness included the handgrip strength (HG), the vertical jump (VJ), agility (shuffle-run 4x10m), and speed (20-m sprint test). All statistical analyzes were performed separately for boys and girls and adjusted for maturity (yrs of age from the year of peak height velocity, PHV), body mass index (WHO z-BMI), and daily calcium intake. Results: The ANCOVA revealed superior muscular fitness in athletes compared to non-athletes (ATHL: 3743.78 ± 8.90m/s vs. Non-ATHL: 3775.33±8.71m/s, p<0.001). For both sexes, muscle fitness was a better marker of bone health in young people than the non-dominant hand-grip strength in college-aged men and women. Further analysis is needed to better understand the factors associated with this relationship.
seven consecutive days. Wear time was classified into sedentary, light, moderate, and vigorous activity based on Evenson cut points. Femoral and tibial bone density, content, strength, and architecture were assessed using peripheral quantitative computed tomography (pQCT). Whole body soft tissue composition was measured by DXA. Associations between each bone variable and average daily MVPA were determined using multivariate regression, adjusting for maturity offset, BMI, and ethnicity. RESULTS: Average height, weight, and percent fat were 145.8 ± 9.6 cm, 44.1 ± 14.7 kg, and 32.5 ± 9.8%, respectively. Multiple linear regression resulted in consistently significant (p<0.05) or trends toward significant associations between bone parameters and daily MVPA. Average daily MVPA was 22.3 ± 63.1 minutes. Femur 20% periosteal circumference, strain-stiffness index (SSI), 4% tibia average bone strength index, average periosteal circumference, average cortical thickness, and 66% tibia cortical content, periosteal circumference, and SSI all had significant associations with average daily minutes of MVPA, while other bone measures approached significance. The variance explained by MVPA ranged from approximately 0% to 4.8%. Together, BMI, maturity offset, and ethnicity explained 2.6% to 70.2% of the variance in the models. CONCLUSION: There is a significant positive relationship between average daily MVPA levels and bone content and strength in Hispanic girls. Physical activity intervention would lead to enhanced bone development and strength, as shown in non-Hispanic populations. Sponsored by: NIH Grant 5R01HD074565-05

Physical activity during adolescence promotes the development of skeletal strength and muscle function. Musculoskeletal adaptations result from mechanical forces common in sporting activities. Recent studies have reported strong positive correlations between muscle power and bone strength (Janz, 2015, Yingling, 2017). PURPOSE: To determine if participation in middle school sports (self-report questionnaire) resulted in greater muscle and bone strength later in life. METHODS: 79 participants, 41 female and 38 male age (years) 29.2 ± 10.8, height (cm) 166.5 ± 92, body fat (%) 24.6 ± 9.3 performed a Relative Grip Strength (RGS) test using a hand grip dynamometer, 1 Repetition Maximum leg extension test (1RM), and a vertical jump test. Peak Power (PP) was calculated from jump height (Sayers, 1999). Peripheral Quantitative Computed Tomography (pQCT) was used to measure bone strength (polar Strength-Strain Index (SSI)) in the cortical region of the tibia and radius. A questionnaire completed by participants stated “Did you participate in recreational sports during middle school (Grades 6-8)?” Welch’s t-test determined differences in the muscle function tests and bone strength measures based on middle-school sports participation. RESULTS: 55 individuals participated in recreational sports during middle school, 16 individuals did not. Those who participated in sports during middle school had an average relative PP of 55.1 W/kg, RGS of 6.46 N/kg, 1RM of 2.86 RW/BM, radial SSI of 279 ± 13 mm3, and tibial SSI of 306 ± 13 mm3. Individual test results that did not participate in recreational sports during middle school had an average PP of 49.1 W/kg, RGS of 5.58 N/kg, 1RM of 2.45 RW/BM, radial SSI of 268 ± 49 mm3, tibial SSI of 1957 ± 50 mm3. Middle school sports participation resulted in significantly greater PP (p = 0.008), RGS (p = 0.010) and 1RM (p = 0.018) but no differences were found for bone strength in either the radius or tibia. CONCLUSIONS: Adolescence is a key time for bone and muscle strength adaptation. However, the results suggest that self-report of middle school recreational sport involvement may not be an optimal way to predict muscle and bone strength in adulthood. Evaluating past activity by survey has limitations with self-reported activity including the inability to determine the intensity of activity.

The burden of osteoporosis and fracture incidence varies significantly with race/ethnicity. Caucasians are reported to have a lower bone mineral density (BMD) than African-Americans, and a higher, lower, or similar BMD than Asians. However, majority of these studies are focused on East-Asians, with few well-defined studies focusing on South-Asians, who are culturally and geographically different from East-Asians. PURPOSE: The purpose of the current study is to evaluate bone mineral density/content, bone free lean mass (BFLM) and strength, and fat mass in young women belonging to Caucasian, East-Asian and South-Asian descent. METHODS: Twenty-nine young women aged 18-30 years self-identified themselves as Caucasian (Cau; n=13), South-Asian (SA; n=11), and East-Asian (EA; n=5). Quadriceps (Q) angle was measured using a hand-held goniometer. Body composition (fat, BFLM, and bone mineral content) and total and regional BMD were measured using Dual Energy X-Ray Absorptionmetry (DEXA), while handgrip, jump test, and 1Repetition-Maximum (1-RM) leg press were used to quantify lower limb muscle strength and power. Ethnic differences in each outcome variable were determined using one-way ANOVA, and Pearson correlation coefficients quantified relationships between variables. Statistical significance was set at p<0.05. RESULTS: Q-angle was significantly higher in CA in comparison to Cau (p=0.05). Muscle strength tests revealed that Cau had considerably higher values for 1-RM leg press than SA (p=0.027). Jump height (p=0.002) and time in air (p=0.003) were considerably higher for Cau and EA compared to SA. Additionally, SA had a significantly higher percent body fat and fat mass at the total body and in the lower limbs (p<0.001). Though non-significant, BFLM was highest in Cau, followed by EA, and least in SA (p=0.068). CONCLUSION: Our preliminary data indicates an increased adiposity in SA, without a concurrent increase in muscle mass. Such a phenotype is deteriorative for bone, and suggestive of an early, sub-clinical form of osteosarcopenic obesity. We also see differences in percent body fat and muscle strength between CA and SA, emphasizing the need to consider these two groups separately while assessing the bone-muscle-fat unit.
Oral contraceptives (OC) contain different formulations of the synthetic estrogen, ethinyl estradiol (EE), and progestin; these sex steroids can exert metabolic effects on bone, muscle, and fat tissues. OC use affects body composition and bone density; however, its effects on muscle quality are not clear. Increased fat infiltration within the muscle associated with OC use could negatively impact muscle quality and performance. **PURPOSE:** To compare twin bone and soft tissue variables assessed by pQCT in OC users and Non-users. **METHODS:** Women ages 20-30 were divided into low dose OC users (<20 μg EE, n=18), high dose OC users (>20 μg EE, n=15) and Non-users (n=22). Bone variables (vBMD, geometry, strength) were measured at 3% and 38% of the non-dominant tibia by pQCT. Muscle and fat densities and areas were analyzed by BonJ software at the 66% site. **RESULTS:** There were no significant differences between low dose and high dose OC users for any variables. Low dose and high dose OC groups did not differ from Non-users in age, height, BMI, or fat scores. Weight-adjusted comparisons determined low dose OC users had lower total BMC (p=0.046), total area (p=0.003), Peri C (p=0.003), cortical area (p=0.048), and SSI (p=0.022) than Non-users at the 38% site. High dose OC users had lower muscle area (p=0.041), total fat density (p=0.039), and subcutaneous fat density (p=0.030) than Non-users at the 66% site. **CONCLUSION:** Our findings suggest that OC formulated with EE concentrations > 20 μg affect tibia soft tissue characteristics while OC pills containing < 20 μg affect bone variables. Further investigations are needed examining multiphasic combined OC to provide a more comprehensive picture of OC effects on soft tissue and bone characteristics.

**Table 1. Bone and Soft Tissue Characteristics in OC Users and Non-Users (Mean ± SD)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Non-Users (n=22)</th>
<th>Low Dose OC Users (n=18)</th>
<th>High Dose OC Users (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle Density (mg/cm³)</td>
<td>79.79 ± 1.74</td>
<td>77.92 ± 1.24</td>
<td>79.85 ± 0.78</td>
</tr>
<tr>
<td>Muscle Area (cm²)</td>
<td>69.38 ± 11.73</td>
<td>60.10 ± 10.86</td>
<td>59.91 ± 6.7</td>
</tr>
<tr>
<td>Total Fat Density (mg/cm³)</td>
<td>1.70 ± 2.99</td>
<td>1.46 ± 3.51</td>
<td>-0.40 ± 2.59</td>
</tr>
<tr>
<td>Total Fat Area (cm²)</td>
<td>29.80 ± 10.97</td>
<td>27.84 ± 12.27</td>
<td>30.20 ± 6.97</td>
</tr>
<tr>
<td>Subcut Fat Density (mg/cm³)</td>
<td>1.11 ± 3.01</td>
<td>0.99 ± 3.55</td>
<td>-1.11 ± 2.57</td>
</tr>
<tr>
<td>Subcut Fat Area (cm²)</td>
<td>27.13 ± 10.79</td>
<td>25.37 ± 12.08</td>
<td>27.70 ± 6.90</td>
</tr>
<tr>
<td>38% Total BMC (mg/mm)</td>
<td>356.02 ± 55.79</td>
<td>305.02 ± 38.86</td>
<td>320.16 ± 52.0</td>
</tr>
<tr>
<td>38% Total Area (mm²)</td>
<td>384.47 ± 50.54</td>
<td>320.24 ± 44.11</td>
<td>353.09 ± 54.75</td>
</tr>
<tr>
<td>38% Peri C (mm)</td>
<td>69.37 ± 4.56</td>
<td>63.29 ± 4.46</td>
<td>65.89 ± 4.80</td>
</tr>
<tr>
<td>38% Cortical Area (mm²)</td>
<td>286.58 ± 46.61</td>
<td>243.99 ± 32.06</td>
<td>257.86 ± 40.52</td>
</tr>
<tr>
<td>38% SSI (mm²)</td>
<td>1657.75 ± 346.47</td>
<td>1300.15 ± 249.10</td>
<td>1481.84 ± 323.40</td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01 significantly different than Non-Users, Subcut = Subcutaneous, Peri C = Periosteal Circumference, SSI = Strength-strain Index

**2487**

**Board #151**

May 31 11:00 AM - 12:30 PM

**Six-month Assessment Of Biomarkers, Skeletal Attributes, Body Composition, And Performance In Collegiate ROTC Members**

Bremme B. Baker, Samuel R. Buchanan, Alison Balderas, Hoang Van M. Nguyen, Cameron S. Combs, Christopher D. Black, FACSM, Michael G. Bemben, FACSM, Debra A. Bemben, FACSM. University of Oklahoma, Norman, OK. (Sponsor: Dr. Debra Bemben, FACSM)

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(No relevant relationships reported)

**Physical activity has been shown to positively impact muscle quality and bone density and quality. Over time ROTC participants engaged in an exercise training intervention from pre to post testing periods. Total body, lumbar spine, dual hip aBMD and BMC, and body composition were measured by DXA, while volumetric BMD (vBMD) was measured by pQCT. ELISA kits were used to measure PTH and sclerostin. RESULTS: At baseline no significant group differences existed (all p>0.052). Significant (group × time) interactions were found in the dominant hip (Table 1). Significant interactions were also found at the 4% and 66% tibia. From fall to post controls decreased mean total vBMD 4.221 mg/cm³ and increased mean total area and mean periosteal circumference 18.30 mm² and 1.0 mm respectively (all p<0.018). Mean 66% muscle cross-sectional area significantly increased from pre to post 645.1 mm² in ROTC only (p<0.001). PTH did not change but sclerostin significantly increased from fall to pre (p=0.001) and then leveled off from pre to post in both groups (p>0.278). CONCLUSIONS: Over time ROTC measures of bone density and quality either improved or did not change, while controls lost aBMD at the dominant hip. Additionally, sclerostin, but not PTH, significantly changed throughout the study.**

**Table 1. Significant (group × time) interactions in dominant hip aBMD (mg/cm²) variables (mean±SD)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>January (pre)</th>
<th>January (post)</th>
<th>Controls (n=15)</th>
<th>Controls (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femoral Neck</td>
<td>1.235 ± 0.135</td>
<td>1.240 ± 0.141</td>
<td>1.276 ± 0.136</td>
<td>1.283 ± 0.138</td>
</tr>
<tr>
<td>Trochanter</td>
<td>0.993 ± 0.120</td>
<td>1.093 ± 0.125</td>
<td>0.987 ± 0.144</td>
<td>0.976 ± 0.144</td>
</tr>
<tr>
<td>Total Hip</td>
<td>1.216 ± 0.136</td>
<td>1.224 ± 0.134</td>
<td>1.231 ± 0.144</td>
<td>1.227 ± 0.144</td>
</tr>
</tbody>
</table>

* Significant age effect p<0.05; † Significant PA levels p<0.01; ‡ Right; †‡ Left

**2488**

**Board #150**

May 31 11:00 AM - 12:30 PM

**Hip Structural Analyses Characteristics Based on Physical Activity Status in Young and Middle-aged Premenopausal Women**

Pragya Sharma Ghimire1, Michael Bemben, FACSM2, Debra Bemben, FACSM2. 1University of Oklahoma, Norman, OK; 2The University of Florida, Gainesville, FL. (Sponsor: Dr. Debra Bemben, FACSM)

Email: psharnaghimire@lander.edu

(No relevant relationships reported)

**Mechanical loading associated with physical activity (PA) is important for optimizing hip bone health. Bone cells are inherently mechanosensitive and adapt to the mechanical environment. Bone adaptation to loading is regulated by the Wnt signaling pathway, which is inhibited by several glycoproteins including sclerostin (Scl) and Dickkopf-1 (DKK-1). Elevated Scl levels are associated with low bone mineral density and increased risk for hip fracture. **PURPOSE:** This study compared age and PA level differences in hip structural analyses (HSA) variables (SI strength index);**
Muscle-bone interactions are important for bone health as mechanical forces from muscular contraction place large stresses on bone. Little is known about sex differences in bone and muscle characteristics in Asians. **PURPOSE:** To examine sex differences in bone characteristics, grip strength, and lower body strength and power in Chinese adults (n=53). **METHODS:** Chinese males (n=28) and females (n=25) had body composition and aBMD (total body, lumbar spine, dual femur) assessed by DXA, and bone geometry (4%, 38%, 66%) of the non-dominant tibia measured by pQCT. Leg strength (two-leg press) and power (jump mat) and maximal grip strength (handgrip dynamometer) were measured. **RESULTS:** There were no sex differences in physical activity or calcium intake. After adjusting for height and weight, males significantly had greater leg press 1RM, grip strength, jump height, jump time, lumbar spine aBMD, 4% total BMC, 4% total area, and 4% bone strength index (BSI) (p=0.05) than females. In males, leg 1RM was positively correlated with total body aBMD (r=0.427), and left femoral neck aBMD (r=0.445), and jump power and BSI were positively related to all aBMD variables (r=0.432 to 0.819). Jump power and BSI were positively correlated (r=0.378, p=0.045) in males, whereas jump power and leg 1RM showed moderate to strong correlations with 4% total BMC, total area, and total BSI (r=0.460 to 0.836, p<0.05) in females. **CONCLUSION:** Based on our findings, Chinese males had greater bone size, bone strength, and muscle strength than females; however, females exhibited more and stronger relationships between muscle and bone variables than males.

### Table 1. Sex Differences in Muscle and Bone Variables (unadjusted Means ± SD)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Females (n=25)</th>
<th>Males (n=28)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leg Press 1RM (kg)</td>
<td>110.2 ± 17.3</td>
<td>187.2 ± 15.9&quot;</td>
</tr>
<tr>
<td>Maximal Grip Strength (kg)</td>
<td>27.8 ± 1.2</td>
<td>42.1 ± 1.1</td>
</tr>
<tr>
<td>Jump Height (in)</td>
<td>13.2 ± 0.6</td>
<td>18.6 ± 0.6</td>
</tr>
<tr>
<td>Jump Time (s)</td>
<td>0.51 ± 0.01</td>
<td>0.62 ± 0.01</td>
</tr>
<tr>
<td>4% Tibia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total BMC (g)</td>
<td>330.2 ± 10.2</td>
<td>384.4 ± 9.4&quot;</td>
</tr>
<tr>
<td>Total Area (mm²)</td>
<td>1047.0 ± 29.8</td>
<td>1165.6 ± 27.4</td>
</tr>
<tr>
<td>BSI (mg/mm²)</td>
<td>104.9 ± 6.4</td>
<td>128.6 ± 5.9&quot;</td>
</tr>
</tbody>
</table>

*p<0.05 vs. females, *p<0.01 vs. females

---

**INTRODUCTION:** Sex differences in muscle and bone variables unadjusted Means " SD

**Table 1. Mean ankle, knee and hip joint moments during stair ascent in the control and added load conditions. P-value represents omnibus findings of the univariate ANOVA.**

<table>
<thead>
<tr>
<th>Variable</th>
<th>BW</th>
<th>BW+5%</th>
<th>BW+10%</th>
<th>BW+15%</th>
<th>BW+20%</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle</td>
<td>-1.4 (0.4)</td>
<td>-1.5 (0.4)</td>
<td>-1.6 (0.4)</td>
<td>-1.6 (0.4)</td>
<td>-1.7 (0.4)</td>
<td>0.002</td>
</tr>
<tr>
<td>Knee</td>
<td>1.1 (0.4)</td>
<td>1.2 (0.5)</td>
<td>1.2 (0.4)</td>
<td>1.3 (0.3)</td>
<td>1.3 (0.3)</td>
<td>0.024</td>
</tr>
<tr>
<td>Hip</td>
<td>-0.6 (0.2)</td>
<td>-0.7 (0.2)</td>
<td>-0.7 (0.3)</td>
<td>-0.7 (0.3)</td>
<td>-0.7 (0.3)</td>
<td>0.620</td>
</tr>
</tbody>
</table>

*p denotes significantly different than BW | BW+5% denotes significantly different than BW+5% | BW+10% denotes significantly different than BW+10% | BW+15% denotes significantly different than BW+15% | BW+20% denotes significantly different than BW+20%

---

**INTRODUCTION:** Adding load alters ankle and knee joint moments during stair ascent. **PURPOSE:** To examine lead leg slip recovery corrective responses between falls and recoveries following an induced slip perturbation. **METHODS:** One hundred participants were recruited for this study. Participant’s lower extremity gait kinematics and kinetics were collected during normal gait and an unexpected slip. The variables of interest were mean sagittal moments about the ankle, knee, and hip, during stance phase. Peak moments, and time to peak moments. The slip was classified as either a fall or a recovery. Once classified, corrective responses were examined between groups using independent t-tests. Additional trials and prediction equations for slip outcomes were created using a binary logistic regression model. **RESULTS:** After exclusions, the final analysis included 64 participants, this included 39 trials classified as recoveries, and 25 trials classified as falls. The results from the logistic regression model suggest that increased time to peak hip extension (OR = 1.006, CI: 1.00-1.01) and ankle dorsiflexion (OR = 1.005, CI: 1.00-1.01) moments increased the odds of falling. While the average ankle moment was negatively associated with falling (OR = 0.001, CI: 0.001-0.005). **CONCLUSIONS:** After analyzing lower extremity gait during unexpected slip perturbations the results suggest that the slipping hip’s recovery

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**INTRODUCTION:** Approximately 66% of the United States is overweight or obese. Obesity is associated with many negative health conditions including osteoarthritis. Research has investigated the effects of increased mass on gait biomechanics, however weight-related changes in stair locomotion biomechanics are less understood.
response is a key factor in preventing falls. Future work focused on slip training may benefit from targeting this primary hip response of the slipping leg in order to mitigate fall risk.

2491 May 31 9:30 AM - 11:00 AM Lead Leg Corrective Responses to Varying Slip Severity
Joshua Pascal. Georgia Southern University, Statesboro, GA.
(Sponsor: Dr. Li Li, FACSM)
Email: jpp26238@georgiasouthern.edu
(No relevant relationships reported)

Slips and falls account for large rates of injury and mortality in multiple populations. While previous research has examined the corrective responses elicited, it is still unclear which responses may break down during more severe slips. PURPOSE: To examine lead leg slip recovery corrective responses across slip severity following an induced slip. METHODS: One hundred participants were recruited for this study. Participant’s lower extremity gait kinematics and kinetics were collected during normal gait and an unexpected slip. The variables of interest were mean sagittal moments about the ankle, knee, and hip, during stance phase. Peak moments, and time to peak moments. The slip was classified based on slip severity, using heel slip distance, and velocity. Once classified, corrective responses were examined between groups using independent t-tests. Additionally, prediction equations for slip severity were created using a binary logistic regression model. RESULTS: After exclusions, the final sample included 64 participants for analyses, consisting of 37 non-hazardous slips, and 27 hazardous slips. The results from the logistic regression model suggest that as the average ankle moment increases in the slip period, the odds of experiencing a hazardous slip decrease (OR = 0.997, CI: 0.997-1.004) increase, the odds of experiencing a hazardous slip increase. CONCLUSIONS: Rapid lower extremity corrective responses appear critical in arresting the slip. While there are various strategies for slip recovery, our findings suggest that the primary recovery mechanism at the slipping hip may play a vital role in preventing the severe slip.

2492 May 31 9:30 AM - 11:00 AM Added Load Alters Ankle And Knee Joint Moments During Stair Descent
Jake A. Melar<sup>1</sup>, Alexis K. Nelson<sup>1</sup>, William G. Robinson<sup>1</sup>, Alex M. Carnall<sup>1</sup>, Rachael A. Ard<sup>1</sup>, Rachael A. Arnowine<sup>1</sup>, Victoria White<sup>1</sup>, Derek Beecher<sup>2</sup>, Spring Glover<sup>2</sup>, Cris Stickley<sup>1</sup>, Douglas W. Powell, FACSM<sup>1</sup>. <sup>1</sup>University of Memphis, Memphis, TN. <sup>2</sup>University of Hawaii at Manoa, Honolulu, HI.
(Sponsor: Douglas W Powell, FACSM)
(No relevant relationships reported)

INTRODUCTION: Combat forces perform a number of tasks with a rigid load added to the trunk including walking, running and stair ascent and descent. Although a number of studies have investigated the effect of added loads on joint biomechanics during over ground and treadmill walking, less focus has been applied to negotiating stairs. Changes in lower extremity biomechanics during stair descent may be associated with excessive joint loading. PURPOSE: to quantify changes in joint kinetics when descending stairs with increasing loads. METHODS: Ten healthy adults (age: 18 - 30) performed 5 stair descent trials in each of 5 loading conditions: body weight (BW), BW+5%, BW+10%, BW+15%, and BW+20%. Mass was added using a modular vest and metal plates. An 18-camera motion capture system (240 Hz) and embedded force platform (1200 Hz) was used to collect kinematics and ground reaction forces simultaneously. Commercial biomechanical software was used to calculate ankle, knee and hip joint moments during the stance phase of second step of a five-step stairway. Univariate ANOVAs with Tukey’s post-hoc tests were used to compare peak ankle, knee and hip joint moments from each loaded condition. RESULTS: Ankle plantarflexion moments increased at BW+15% and BW+20% (Table 1). Hip and knee extension moments were not altered with added load. DISCUSSIONS/ CONCLUSION: The ankle joint is the primary contributor to increased lower extremity joint moments only in response to added load or at exceeding +15% BW during stair descent. Interestingly, no changes in peak joint moments were observed at the knee and hip joint, suggesting that neither joint is responsible for increased energy absorption in response to added load during stair descent. Further research may seek to investigate the effects of fatigue on joint kinetics during stair descent.

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Table 1. Mean ankle, knee and hip joint moments during stair descent in the control and added load conditions. P-value represents omnibus findings of the univariate ANOVA.

<table>
<thead>
<tr>
<th></th>
<th>BW</th>
<th>BW+5%</th>
<th>BW+10%</th>
<th>BW+15%</th>
<th>BW+20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle</td>
<td>-0.90(0.1)</td>
<td>-1.00(0.1)</td>
<td>-1.00(0.1)</td>
<td>-1.00(0.1)</td>
<td>-1.10(0.1)</td>
</tr>
<tr>
<td>Knee</td>
<td>1.40(0.3)</td>
<td>1.50(0.3)</td>
<td>1.50(0.3)</td>
<td>1.50(0.3)</td>
<td>1.60(0.4)</td>
</tr>
<tr>
<td>Hip</td>
<td>-0.20(0.1)</td>
<td>-0.10(0.1)</td>
<td>-0.20(0.1)</td>
<td>-0.10(0.1)</td>
<td>-0.10(0.1)</td>
</tr>
</tbody>
</table>

Note: *a* denotes significantly different than BW, *b* - *e* denotes significantly different than BW+5%, *f* - *g* denotes significantly different than BW+10%, *h* - *i* denotes significantly different than BW+15%.

2493 May 31 9:30 AM - 11:00 AM Dual Tasking Using a Treadmill Desk Affects Middle-Aged but Not Young Adults
Rebecca R. Rogers, Mallory R. Marshall. Samford University, Birmingham, AL.
(No relevant relationships reported)

PURPOSE: Young adults have the capacity to manage dual task conditions with minimal impairment to either the cognitive or the motor task; however, this ability decreases with age. Previous research on dual tasking has primarily examined over ground walking and minimal information is available on dual tasking on a treadmill. The purpose of this study was to examine the effect of dual tasking using a treadmill desk on changes in cognitive performance and gait parameters in young adults (YA) and middle-aged adults (MA). METHODS: YA (n=24; mean age 21.1±1.6 yrs) and MA (n=25; mean age 53.0±3.3 yrs) were recruited to participate in this study. Participants completed five cognitive tests (Stroop Word Color Test, phoneme monitoring, typing test, Sternberg working memory test, and serial 7 subtractions) in a single task (ST) and dual task (DT) condition in a randomized and counterbalanced order. Participants were seated at a desk for ST and walked on a treadmill desk at self-selected speed (mean speed YA=1.5±0.4 mph; MA=1.4±0.5 mph) during ST. An OptoGait system recorded gait parameters of step length, stride length, and coefficient of variation. RESULTS: There were no significant differences in gait parameters or test scores in YA when comparing ST and DT conditions (p>0.05). MA performed worse on word recall score (89.7±11.3 vs 96.6±7.5%, p=0.03), typing speed (44.9±11.2 vs 49.9±13.3 wpm, p<0.00), and Sternberg reaction time (1.5±2.0 vs 1.0±1.9 s, p=0.00) during the DT compared to the ST condition. MA stride length decreased during DT in the Sternberg test (37.7±5.9 vs 36.5±5.3 in, p<0.01) and serial 7 subtractions (37.2±5.7 vs 36.5±5.3 in, p<0.01). MA showed detrimental changes in reaction times on the Stroop test (0.8±1.2 vs 0.6±0.9 s, p<0.00) and Sternberg test (1.5±2.0 vs 0.9±1.5 s, p<0.02) and decreased word recall score (89.7±11.3 vs 97.5±7.0%, p=0.04) compared to YA during the DT condition. CONCLUSION: The impairments in gait and cognitive test scores in MA but not YA suggest that the ability to simultaneously process cognitive demands and treadmill walking requirements decreases with age. Using a treadmill desk might affect work-related performance or gait parameters in middle-aged adults.

2494 May 31 9:30 AM - 11:00 AM The Effects of Postural Control Measures on Induced Slip Outcomes
Ariana Haynes<sup>1</sup>, Tyler Donahue<sup>2</sup>, Chris Hill<sup>1</sup>, Caleb Williams<sup>1</sup>, Jeff Simpson<sup>1</sup>, Harish Chander<sup>1</sup>, Chip Wade<sup>1</sup>, Abigail Johnson<sup>1</sup>, Tyler Donahue<sup>2</sup>, Sam Wilson<sup>3</sup>. <sup>1</sup>Georgia Southern University, Statesboro, GA. <sup>2</sup>University of Mississippi, University, MS. <sup>3</sup>LaGrange College, LaGrange, GA. <sup>4</sup>University of West Florida, Pensacola, FL. <sup>5</sup>Mississippi State University, Mississippi State, MS. <sup>6</sup>Auburn University, Auburn, AL. <sup>7</sup>Troy University, Troy, AL.
Email: ah07573@georgiasouthern.edu
(No relevant relationships reported)

Slips and falls are a major health concern in the United States. Injury incidence rates have increased in recent years and now the leading cause of non-fatal injuries and the third leading cause of fatal injuries in the U.S. are due to falls. During an unexpected slip, sensory information is used to elicit an appropriate recovery. Therefore, increased...
fall risk has been associated with declines in sensory system integrity. Previous research has suggested that decreased balance scores were associated with more hazardous slips yet measures of postural control between individuals who fall or recover after an induced slip have not been investigated. PURPOSE: To examine differences in slip detection using postural control measures between individuals who fall or recover after an induced slip. METHODS: One hundred participants were recruited for this study. Standing postural control measures were recorded under six different sensory conditions: eyes open, eyes closed, eyes open with sway referenced vision, eyes open with sway referenced support, and eyes open with sway referenced vision and support. Variables of interest were sway velocity components and the root mean square of the center of pressure (CoP) in the medio-lateral and anterior-posterior directions. After postural control testing, participants completed testing involving a normal gait and an unexpected slip trial. The slip was classified as either a fall or a recovery. Once classified, standing postural control measures were examined between groups using independent t-tests. Additionally, prediction equations for slip outcome were created using a binary logistic regression model. RESULTS: The final analysis sample included 73 participants, with 48 trials classified as recoveries and 25 trials as falls. Postural sway when the proprioceptive (OR = 0.02, 95% CI: 0.01-1.39) and vestibular (OR = 0.60, 95% CI: 0.26-1.39) systems were relied on were negatively associated with odds of falling while visual system reliance resulted in a positive association (OR = 3.18, 95% CI: 0.887-11.445). CONCLUSIONS: The data suggests that visual sensory information may have a greater influence on dynamic stability and slip outcomes. Additional, postural control measures may provide insight into task selection during recovery.

Slips and falls are a major cause of injury and death in the United States. During a human slip response, an ensemble of muscular activations appear in an attempt to maintain balance and prevent a fall. The slip response has several key events that appear reflexive in nature. Though, the temporal nature of these responses may suggest cortical involvement as well. Indeed, some other forms of postural perturbations have provided evidence of cortical control in the recovery response. However, there is little information regarding cortical contribution to the slip response. PURPOSE: To examine corticospinal activity in lower extremity slip recovery corrective responses across slip severity. METHODS: One hundred participants were recruited for this study, and after exclusions the final analysis included 73 participants. The slip was classified as either a fall or a recovery. Once classified, standing postural control measures were examined between groups using independent t-tests. Additionally, prediction equations for slip outcome were created using a binary logistic regression model. RESULTS: The final analysis sample included 73 participants, with 48 trials classified as recoveries and 25 trials as falls. Postural sway when the proprioceptive (OR = 0.02, 95% CI: 0.01-1.39) and vestibular (OR = 0.60, 95% CI: 0.26-1.39) systems were relied on were negatively associated with odds of falling while visual system reliance resulted in a positive association (OR = 3.18, 95% CI: 0.887-11.445). CONCLUSIONS: The data suggests that visual sensory information may have a greater influence on dynamic stability and slip outcomes. Additional, postural control measures may provide insight into task selection during recovery.

The sit-to-stand movement (STS) has been used as a tool to evaluate both lower extremity power and function in elderly individuals. Field tests of lower extremity power specific to the STS provide practitioners with clinically meaningful insight into functional capacity across the lifespan. For these field tests to be a useful tool, normative values must be established across the age continuum. PURPOSE: To compare the mechanical power produced during a field-based STS test in young adults utilizing two different methods of analysis. METHODS: Eighteen participants (20.7 ± 3.0 yrs, 72.3 ± 14.7 kg, 1.70 ± 0.1 m) between 18 and 30 years performed three sets of five self-paced STS repetitions on two side-by-side force platforms, one for each lower extremity. Hip and knee angles were set at 90° with the feet positioned on the two force platforms; foot width was standardized based on the distance between the individual’s right and left anterior superior iliac spines. Power was analyzed during the rising phase of the force-time curve using an established power equation (E1, P = FxS/T; P = mechanical power, F = bodyweight, S = standing minus seated height, T = femur length). RESULTS: Differences in mechanical power calculated by E1 and E2 were determined using a dependent t-test. A Pearson product moment coefficient of correlation (r) was used to examine the relationship between power calculated by E1 and E2. The level of significance was set at p < 0.05. RESULTS: The calculated power during the rising phase of the STS was significantly greater using E1 compared to E2 (350.96 ± 138.93 W vs. 344.28 ± 138.79 W, p < 0.001). The two methods for calculating power demonstrated a strong correlation (r = 0.99). CONCLUSION: The two methods used to calculate power were shown to be highly related, demonstrating both are clinically appropriate for use in a field-based setting. This relationship showed that although the two methods provided different values of power, the power differences across all participants changed in the same manner independent of the method used. The difference in calculated power can be explained by the variation in determination. The results of this study demonstrate that both equations allow for the accurate determination of mechanical power during the rising phase of a field-based STS test.

Malposition of the cervical vertebra caused by poor sitting postures could lead to the development of cervical musculoskeletal disorders. It has been well documented that there is a positive correlation between over-titled angles and abnormal load-carrying on the cervical vertebrae. However, intrinsic cervical angles are difficult to measure without computed tomography or magnetic resonance imaging. PURPOSE: This study aimed to assess the cervical tilt angle at the C5C4 level based on upper body position in both upright and slump sitting postures. METHODS. Eight participants (Male: n = 4, 35%; Age: 26 ± 2.9 yr.; Height: 171.9 ± 10.3 cm; Weight: 60.1 ± 11.8 kg) with no history of documented cervical injuries were recruited for this study. An eight-camera, infrared motion analysis system and two force platforms were used to capture the three-dimensional posture and ground reaction forces of a seated human. A musculoskeletal model with detailed neck constructed in the AnyBody Modelling System was used to calculate cervical tilt angles. The correlations between cervical tilt angle at the C5C4 level and sternocervical elevation and glenohumeral abduction were examined by sitting postures separately and combined. RESULTS. Correlations between C5C4 tilt angle and sternocervical elevation and glenohumeral abduction in upright and slump sitting are summarized below:

<table>
<thead>
<tr>
<th></th>
<th>Sternocervical Elevation</th>
<th>Glenohumeral Abduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>C5C4 Tilt Angle</td>
<td>0.587</td>
<td>-0.340</td>
</tr>
<tr>
<td>CE 4 Tilt Angle</td>
<td>0.660</td>
<td>-0.432</td>
</tr>
<tr>
<td>Combined</td>
<td>0.516</td>
<td>-0.215</td>
</tr>
</tbody>
</table>
Functional demand (FD) is the ratio of the muscular force required by a physical task to the maximal force capacity of the muscle, which is greater in older individuals. Measuring FD in older adult cancer survivors can determine whether functional activities, such as a chair rise, are more exhaustive than for healthy older adults without history of cancer diagnosis. PURPOSE: To quantify the differences in hip (HE) and knee extension (KE) strength, the primary muscles used to complete a chair rise, and FD during chair rise, between older female cancer survivors (CS) and older females with no history of cancer (NC). METHODS: Eleven NC (65.9±6 yr, 75.4±26.9 kg, 1.68±0.7 m, 27.0±9.2 kg·m⁻¹) and eleven CS (57.1±6.6 yr, 75.2±23.1 kg, 1.68±0.07 m, 27.0±9.2 kg·m⁻¹) performed three maximal isokinetic contractions on a dynamometer at 30 deg·s⁻¹ to measure HE and KE strength. Retroreflective markers were placed on the lower extremity using the Helen Hayes model and a 3D video motion capture system and an in-ground force plate were used to record kinetic and kinematic data during chair rise. The HE and KE moments during chair rise were calculated by inverse dynamics using Visual3D software; FD was calculated as the ratio of joint moment during chair rise to available strength and expressed as a percentage. Analysis of Covariance was used to compare NC and CS with age and BMI as covariates. Data are reported as estimated population means (95% CI) adjusted for age and BMI. RESULTS: KE strength was similar in CS, 1.20 Nm·kg⁻¹ (0.84-1.56 Nm·kg⁻¹), and NC, 1.17 Nm·kg⁻¹ (1.36-1.99 Nm·kg⁻¹), p=0.082). HE strength was lower in CS, 2.12 Nm·kg⁻¹ (1.59-2.64 Nm·kg⁻¹) than in NC, 3.01 Nm·kg⁻¹ (2.55-3.46 Nm·kg⁻¹), p=0.029. Peak knee FD was greater in CS, 131% (92-171%), than in NC, 51% (17-86%), p=0.012. Peak hip FD was similar in CS, 78% (28-128%), and NC, 41% (-2, 85%), p=0.31. CONCLUSIONS: Compared to NC, older female CS had significantly lower HE strength and greater knee FD during chair rise, and had a trend for lower KE strength and greater hip FD, which may help explain the greater fall risk and mobility limitation observed in this at-risk clinical population. Resistance training should be incorporated in cancer rehabilitation programs to increase strength and functional reserve capacity.

**Table 1: Reliability and minimum detectable difference for peak axial and peak resultant tibial acceleration during laboratory and treadmill running**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD)</th>
<th>ICC (95% CI)</th>
<th>Standard error of measurement (g)</th>
<th>Minimum detectable difference (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak axial acceleration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lab 5 trails</td>
<td>6.1 (2.0)</td>
<td>0.988 (0.964-0.995)</td>
<td>0.7</td>
<td>2.0</td>
</tr>
<tr>
<td>Treadmill 5 trials</td>
<td>6.1 (2.4)</td>
<td>0.949 (0.833-0.982)</td>
<td>0.7</td>
<td>2.0</td>
</tr>
<tr>
<td>Treadmill 10 trials</td>
<td>6.1 (2.4)</td>
<td>0.963 (0.841-0.988)</td>
<td>0.6</td>
<td>1.7</td>
</tr>
<tr>
<td>Peak resultant acceleration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lab 5 trials</td>
<td>8.3 (3.2)</td>
<td>0.945 (0.859-0.958)</td>
<td>0.2</td>
<td>0.6</td>
</tr>
<tr>
<td>Treadmill 5 trials</td>
<td>8.3 (3.3)</td>
<td>0.949 (0.833-0.982)</td>
<td>0.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Treadmill 10 trials</td>
<td>8.6 (3.3)</td>
<td>0.963 (0.841-0.988)</td>
<td>0.5</td>
<td>1.4</td>
</tr>
</tbody>
</table>

CONCLUSION: A difference of at least 1.5g for peak resultant acceleration and 2g for peak axial acceleration is needed to be sure that the difference exceeds measurement error. Smaller differences may simply be due to measurement error and may not reflect meaningful change. Study funded by College of Nursing and Health Professions Research Award.
capture system while the participant performed five self-selected velocity trials over a force platform embedded walkway. RESULTS: Mean values were calculated for each variable of interest (Table 1). Pelvic motion changes from the second to third trimester were visually pronounced (Figure 1a-c). CONCLUSION: Changes in biomechanical variables were seen throughout pregnancy, but were pronounced from the second to third trimester. Altered movement patterns may be acquired to improve gait safety, dynamic stability, and counter pregnancy related anatomical changes.

METHODS
ISO speeds.

CONCLUSIONS: The results support that running power is positively related to VO₂, which may indicate a strong relationship with running intensity.

2504
May 31 9:30 AM - 11:00 AM
Comparison of Running Power to Metabolic Cost at Various Submaximal Running Speeds and Inclinations
Randolph E. Hutchison, Scott Murr, Mason J. Coppi, Jake T. Ogden, Frank Lara, Lee F. Shearer. Furman University, Greenville, SC. (Sponsor: Anthony Casterisano, FACSFM) Email: Randolph.Hutchison@furman.edu (No relevant relationships reported)

Running pace is one of the primary measures of running intensity, however, variations in grade limit quantifying intensity solely based on pace. With the advent of wearable running power meters, runners can address the external work stimulus inclusive of pace and grade. PURPOSE: The purpose was to compare running power measured by a Running Power Meter to the metabolic cost of running at different speeds and inclinations. METHODS: 5 collegiate cross country runners (male n=2, age=21±1.1 yrs, weight=69.8±3.960 kg, height=180±4.243 cm; female n=3, age=19.67±0.577 yrs, weight=54.07±2.290 kg, height=164.33±1.0263 cm) participated in 10 trials of submaximal running at different speeds and inclinations. Subjects first completed an LT test to determine submaximal running speed with lactate collected and analyzed (Lactate Pro) via blood samples taken by finger prick. During subsequent submaximal running trials, metabolic and ventilatory measures were collected with a portable breath-by-breath analyzer (COSMED K5). Speed was controlled by a rider on a bicycle that was equipped with a speedometer. The annual injury rate among competitive distance runners is over 50%. The vertical loading rate (vLR) and posterior ground reaction force (GRF) are associated with running-related injuries. Knee and lower limb injuries are the most commonly reported sites of injury. Greater forward trunk lean during running contributes to lower knee joint loading. However, it is unclear if trunk lean is associated with GRF characteristics. PURPOSE: The purpose of this study was to determine the association between forward trunk lean, GRF, and knee joint loading characteristics in competitive distance runners. METHODS: Thirty-six competitive distance runners were recruited for this study (72% male, age=20±1.5 years, height=1.74 ±0.02 m, mass=61.6 ±1.4 kg, forefoot strike=59.5%, 1500m personal best=33.3 ±3.5% world record). 3-Dimensional biomechanics were recorded during 5 running trials at self-selected speed (±5%) over a force plate. Forward trunk lean was calculated as the angle of the trunk segment relative to the vertical axis of the global coordinate system. GRF characteristics included instantaneous vLR, and peak vertical and posterior GRF. Knee joint kinetics included the peak internal knee extensor moment and sagittal plane knee joint stiffness. Partial correlation, controlling for speed and foot strike angle, was used to assess the association between trunk lean and gait kinetics. RESULTS: Trunk lean at foot contact (r=−0.45, p<0.01), Peak trunk lean (r=−0.38, p=0.03), and average trunk lean (r=−0.50, p<0.01) were negatively associated with vLR. Peak trunk lean was positively associated with vertical GRF (r=0.34, p<0.05). Trunk lean angles were not associated with posterior GRF, knee extensor moment, or knee joint stiffness. CONCLUSIONS: Runners with a lesser forward trunk lean angle had a greater vLR. Forward trunk lean may allow runners to position their foot under their center of mass to assist in attenuating vLR. Greater forward trunk lean was also associated with larger vertical GRF, which may allow runners to increase the total force imparted into the ground to propel themselves. Forward trunk lean is a modifiable gait characteristic that may be useful for injury prevention and performance enhancement of competitive distance runners.

2503
May 31 9:30 AM - 11:00 AM
The Association Between Trunk Lean and Running Kinetics in Competitive Distance Runners
Tyler J. Moffitt¹, Derek N. Pamukoff², ¹California State University, Bakersfield, Bakersfield, CA. ²California State University, Fullerton, Fullerton, CA. Email: tmoffitt@csub.edu (No relevant relationships reported)

The annual injury rate among competitive distance runners is over 50%. The vertical loading rate (vLR) and posterior ground reaction force (GRF) are associated with running-related injuries. Knee and lower limb injuries are the most commonly reported sites of injury. Greater forward trunk lean during running contributes to lower knee joint loading. However, it is unclear if trunk lean is associated with GRF characteristics. PURPOSE: The purpose of this study was to determine the association between forward trunk lean, GRF, and knee joint loading characteristics in competitive distance runners. METHODS: Thirty-six competitive distance runners were recruited for this study (72% male, age=20±1.5 years, height=1.74 ±0.02 m, mass=61.6 ±1.4 kg, forefoot strike=59.5%, 1500m personal best=33.3 ±3.5% world record). 3-Dimensional biomechanics were recorded during 5 running trials at self-selected speed (±5%) over a force plate. Forward trunk lean was calculated as the angle of the trunk segment relative to the vertical axis of the global coordinate system. GRF characteristics included instantaneous vLR, and peak vertical and posterior GRF. Knee joint kinetics included the peak internal knee extensor moment and sagittal plane knee joint stiffness. Partial correlation, controlling for speed and foot strike angle, was used to assess the association between trunk lean and gait kinetics. RESULTS: Trunk lean at foot contact (r=−0.45, p<0.01), Peak trunk lean (r=−0.38, p=0.03), and average trunk lean (r=−0.50, p<0.01) were negatively associated with vLR. Peak trunk lean was positively associated with vertical GRF (r=0.34, p<0.05). Trunk lean angles were not associated with posterior GRF, knee extensor moment, or knee joint stiffness. CONCLUSIONS: Runners with a lesser forward trunk lean angle had a greater vLR. Forward trunk lean may allow runners to position their foot under their center of mass to assist in attenuating vLR. Greater forward trunk lean was also associated with larger vertical GRF, which may allow runners to increase the total force imparted into the ground to propel themselves. Forward trunk lean is a modifiable gait characteristic that may be useful for injury prevention and performance enhancement of competitive distance runners.
A recent study found that 70% of elite female runners ran during their pregnancy. Most resumed running within 2 months after childbirth. Despite the increased prevalence of running in women before and after childbirth, there is very little research on the physical changes and impairments experienced by these runners. Pregnancy and childbirth lead to well-established unique anatomical and physiological changes that more than likely influence running kinematics (joint excursion) and kinetics (landing forces). No studies have investigated running gait in this population; however, a few studies have reported the presence of pain in this population. PURPOSE: To identify differences in running kinematics and kinetics between postpartum (PP) women and controls.

METHODS: Four PP and 4 age-matched women without children (CON) ran on a treadmill at their self-selected speed. All participants were pain-free. Five 5 s trials were collected after warm-up. A 3D motion capture system was used to determine hip and knee joint angles. Participants also performed 6 overground running trials. Impact peak and vertical loading rates were calculated from the ground reaction forces during overground running. An independent samples t-test was used to compare the 2 groups.

RESULTS: Hip range of motion (CON: 48.63±7.68°; PP: 52.67±8.91°), knee range of motion (CON: 70.26±10.57°; PP: 78.74±16.70°), peak knee flexion during stance (CON: 43.48±6.40°; PP: 38.47±8.91°), and peak horizontal gait speed normalized to bodyweight (CON: 1.90±0.47; PP: 2.04±0.50), average vertical loading rate (CON: 55.85±15.69 s⁻¹; PP: 55.47±15.60 s⁻¹) were not significantly different between the groups. CONCLUSION: Though there were no significant differences, postpartum runners had greater hip and knee range of motion but lesser peak knee flexion during stance compared to age-matched controls. Further, the PP group had similar vertical loading rates but greater variability in their rate of loading when compared to their age-matched controls. These preliminary findings could indicate that runners two months into postpartum show similar running biomechanics compared to age-matched women who did not have a child. These results could have implications on guidelines for postpartum women returning to running. A larger sample size is required to confirm these findings.
which may be accounted for the significant changes in kinematic and kinetic running parameters observed. The present findings introduce music listening during exercise as a new potential risk factor for injury.

Running is a complex motion producing many muscle and joint forces that cannot be directly measured. Using a new method of dynamic modeling and simulation muscle and joint forces, but to have confidence these simulations and processes must be biodeficit. Most models include a rigid spine, but prescribing motion with a coupled spine model may allow more accurate inverse kinematics tracking of experimental data and allow truer resulting intervertebral force and muscle activation estimations. PURPOSE: To determine the effects of spinal coupling and the quantity of experimental data available on the tracking of experimental running data through use of a rigid and a coupled lumbar spine model. METHODS: Two subjects ran on a treadmill and 3 motion capture trials at different speeds were collected with 13 markers placed on the spine and 46 other markers placed over the rest of the body. The Full Body Lumbar Spine model has 30 degrees of freedom and simulating a lumbar spine with coupling constraints resulting in a net of 3 DoF among those 5 vertebral bodies. Two iterations of this model were used, one with the coupling of the lumbar spine enabled (CS), and the other where the coupling was locked resulting in a rigid lumbar spine (RS). Inverse Kinematics (IK) was executed using six different combinations of spinal markers as tracking inputs for both models. The marker error after IK was computed at each frame, and the root-mean-square (RMS) error computed for the full trial. Effects of the model, subset of tracking markers used as input, and subject were analyzed with multiple regression and differences between tracking subsets were analyzed with Tukey pairwise comparisons. RESULTS: Choice of model (CS or RS) had a significant effect on the RMS error of the markers (p < 0.001). The average RMS error across all spinal markers was 1.35 ± 0.30 cm for the CS vs. 1.64 ± 0.29 cm for the RS. The multiple regression showed a significant effect of tracking subsets, and subject (p < 0.001). Tukey pairwise comparisons showed that the two best tracking subsets were one weighting all 13 spinal markers and one weighting two lumbar markers (L2, L4), two thoracic markers (T10, T4), and the C7. CONCLUSION: The CS model exhibits lower RMS errors than the RS model, and this error can be further minimized by the inclusion of thoracic and lumbar spine markers.

PURPOSE: The primary aim of our study was to observe preferred step rate in military runners and observe injury incidence over one calendar year. METHODS: Subjects were recruited prior to the Army Physical Fitness Test (APFT) at West Point, NY and asked to run at their self-selected pace for a timed 2-mile event. Two-dimensional frontal plane video was collected during over ground running from two stationary high-speed cameras sampling at 30 Hz to assess preferred step rate. One-year clinical injury surveillance was conducted among all runners with a full medical record review using the Armed Forces Health Longitudinal Technology Application (AHLTA), an electronic medical record system. Sub-clinical injuries for which medical treatment was not sought were collected via semi-monthly email surveys over one year. Forced flexion and injured ankles were assessed among runners who completed all email surveys over the course of one year. RESULTS: Overall, 372 runners (mean age 22.6 ± 6 years, height 163.8 ± 36.8 centimeters, weight 78.5 ± 30.4 kilograms) participated in this study. Out of 372 runners, 16 sustained a clinical injury. Mean step rate for healthy runners was 173.6 steps/min. An independent t-test comparing step rate of injured and non-injured ankles yielded a non-significant p-value: p = 0.773. 95 out of 372 runners completed all 4 sub-clinical injury surveys (95/372 = 26%). Out of 95 runners, 19 sustained a clinical or sub-clinical injury. An independent t-test comparing step rate of injured and non-injured runners yielded a non-significant p-value = 0.08, with a mean of 174.5 ± 12.3 for the uninjured group and a mean step rate of 173.6 ± 10.2 for those in the combined injury group. These results demonstrate no clinically meaningful or statistically significant difference in step rate with clinical or sub-clinical injury risk in our population.

CONCLUSIONS: In this study, self-selected step rate during a timed 2-mile APFT in Department of Defense runners did not influence lower extremity injury rates. Future studies are needed to further investigate the relationship between step rate and lower extremity injuries, and whether step rate can be a useful screening tool to prevent running related injury.
While previous investigations have extensively examined running biomechanics in different types of footwear, there is a paucity of work examining these differences in an older habitual running population. **PURPOSE:** The purpose of this study was to examine the effects of maximalist and conventional footwear on running mechanics in older runners. **METHODS:** Five participants (Age: 58 ± 6.72 years; BMI: 25.14 ± 2.18; Miles/week: 24.3 ± 16.7) participated in this preliminary investigation. Participants were provided with a neutral laboratory shoe and a maximal cushioning laboratory shoe in their self-reported size. In addition, participants were asked to bring a pair of their own running shoes to represent a third footwear condition. Shoe characteristics are shown in Table 1. Running kinematics were captured using a 10-camera motion capture system while participants ran at a controlled pace of 4.0 m/s (± 5%) over a 10-m runway with force platforms collecting kinetic data. Participants ran in each of the three footwear conditions, the order of which was randomized. Five successful trials from each condition were chosen for analysis. A one-way repeated measures ANOVA assessed differences in mean kinematic and kinetic variables of interest between shoe conditions(p<0.05). **RESULTS:** Mean values for shoe characteristics and gait variables are shown in Table 1. **CONCLUSION:** Preliminary data shows no differences between footwear conditions, suggesting that participants maintain their preferred movement patterns in all three shoes. As the study continues we will be able to ascertain whether this lack of difference is a result of our small current sample size or reflective of the participant’s adaptations while running.

### Table 1: Mean (± standard deviation) of shoe characteristics, and kinematic and kinetic variables during the stance phase of gait. **Note:** AHI = arch height index; MA = maximal arch; RBC = range of motion; DI = dorsiflexion; AR = anterolateral; CRF = corrected rearfoot force; PF = plantarflexion; KE = knee extension; Nt = neutral position

<table>
<thead>
<tr>
<th>Variable</th>
<th>Neutral Shoe</th>
<th>Maximal Shoe</th>
<th>Own Shoe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoe Characteristics</td>
<td></td>
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<tr>
<td>Material Thickness (mm)</td>
<td>32.38 ± 0.94</td>
<td>41.51 ± 1.09</td>
<td>29.4 ± 7.73</td>
</tr>
<tr>
<td>Peak</td>
<td>10.33 ± 0.22</td>
<td>8.52 ± 0.21</td>
<td>11.48 ± 3.34</td>
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<td>Peak Force (N)</td>
<td>844.57 ± 2.47</td>
<td>710.70 ± 1.73</td>
<td>918.89 ± 201.04</td>
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<tr>
<td>Time to Peak Force (ms)</td>
<td>19.87 ± 0.48</td>
<td>23.51 ± 0.72</td>
<td>17.73 ± 4.86</td>
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<tr>
<td>Kinematics</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Ankle ROM</td>
<td>46.65 ± 8.69</td>
<td>41.63 ± 7.34</td>
<td>44.57 ± 8.62</td>
</tr>
<tr>
<td>Knee ROM</td>
<td>39.90 ± 6.99</td>
<td>29.88 ± 4.81</td>
<td>30.13 ± 5.26</td>
</tr>
<tr>
<td>Hip ROM</td>
<td>25.95 ± 6.78</td>
<td>27.09 ± 6.87</td>
<td>25.96 ± 8.06</td>
</tr>
<tr>
<td>Ankle angle at IC</td>
<td>1.13 ± 8.26</td>
<td>4.17 ± 10.87</td>
<td>3.67 ± 7.23</td>
</tr>
<tr>
<td>Knee angle at IC</td>
<td>23.41 ± 4.41</td>
<td>19.31 ± 5.34</td>
<td>23.21 ± 5.97</td>
</tr>
<tr>
<td>Hip angle at IC</td>
<td>16.74 ± 9.19</td>
<td>12.57 ± 8.93</td>
<td>13.61 ± 7.41</td>
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<tr>
<td>Kinetics</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Peak GRF</td>
<td>1738.26 ± 283.18</td>
<td>1744.17 ± 312.38</td>
<td>1742.29 ± 286.55</td>
</tr>
<tr>
<td>Peak PF moment (Nm)</td>
<td>-184.43 ± 45.15</td>
<td>-172.1 ± 48.15</td>
<td>-182.22 ± 47.95</td>
</tr>
<tr>
<td>Peak KE moment (Nm)</td>
<td>186.21 ± 40.00</td>
<td>181.83 ± 45.06</td>
<td>179.01 ± 36.73</td>
</tr>
</tbody>
</table>

Injury rates for NCAA cross country runners between 2009 and 2014 were 4.7-5.9/1000 athlete exposures. Prevalence of running-related injuries in the general population has been shown to be between 18-92%. Injury could lead to impaired stability in collegiate cross country runners. **PURPOSE:** The purpose of this study was to examine the effects of maximalist and conventional footwear on running mechanics in collegiate runners. **METHODS:** Eleven asymptomatic (5 females, 6 males) NCAA Division II cross country runners (age, 19.1 ± 1.1 yrs; height, 174.2 ± 1.12 cm; mass 62.2 ± 6.2 kg; 38.3 ± 15.9 miles/wk, treadmill speed, 3.6 ± 0.5 m/s) underwent 3D motion analysis during a 7 minute steady state run on an instrumented treadmill. vGRF, REV and CPD were evaluated bilaterally for association via Pearson Correlation coefficients, p<0.05. **RESULTS:** Mean (±SD) peak angles of REV and CPD, and vGRF during left stance were 3.6 ± 6.5°, -5.4 ± 3.8°, and 1.8 ± 0.6 body weights (BW), respectively. Mean peak angles of REV and CPD, and vGRF during right stance were 2.51 ± 2.5°, -4.9 ± 4.9°, and 1.6 ± 0.4 BW, respectively. Significant high negative correlation was found for REV and vGRF during left stance. |
is not as clear as the results varied between the different AHI/ARI, shoe type, and site specific pain combinations. CONCLUSIONS: Generalizations about site specific pain in minimally or traditionally shod runners with high/low or flexible rigid arches are difficult because the results are combination specific. Runners with a rigid arch may not be able to absorb ground reaction forces as well when wearing minimal shoes and may fare better in a traditional shoe that offers more support during ground contact.

2516 Board #180 May 31 9:30 AM - 11:00 AM Impact of Progression Run on Sagittal Plane Stance Phase Kinematics Jordon Garman1, Jeff T. Wight1, Jaclyn A. O’Loughlin1, David R. Hooper2, Michelle C. Boling1, Ryan S. Sloan1. Jacksonvile University, Jacksonville, FL. University of North Florida, Jacksonville, FL. Email: runjordunrun@gmail.com (No relevant relationships reported)

The impact of fatigue on distance running kinematics is commonly studied by having runners complete exhaustive runs that alter joint kinematics quite dramatically. In this study, we attempt to assess minor changes that occur during a non-exhaustive progression run, by comparing sagittal plane joint-angle plots for the entire stance phase. PURPOSE: Compare baseline and final stance phase kinematics for a 16-minute treadmill progression run to determine if there are significant differences among the hip, knee and ankle. METHODS: Nineteen runners participated (18-45 years). Kinematic data were collected using 6 Vicon motion-analysis cameras. During testing, baseline data were collected during a 4-minute run at self-selected marathon pace. Then, a 16 minute progression run was completed, that ended at marathon pace. The first 10 clean strides were analyzed during the last minute of the 4-minute run and the last minute of the 16 minute progression run. Stance phase data for each stride was normalized to 101 points. Average joint angle curves for the baseline run were compared to those from the end of the progressive run (for all 101 points). The mean difference score was calculated to quantify kinematic change for the entire phase. Parvo metabolic testing was completed simultaneously to confirm that the progression run cause the heart rate to increase significantly. A one-way ANOVA was used to test for joint differences. RESULTS: Kinematic change was calculated for the hip (1.9±1.0°), knee (3.4±2.7°) and ankle (1.8±0.8°). There was a significant joint difference (p < 0.05). Post-hoc analysis revealed the knee kinematic change to be significantly greater than the hip and ankle. CONCLUSIONS: The submaximal progression run appeared to alter knee kinematics the most. Overall, the kinematic changes were minor, but it is important to note that the knee changes were approximately 80-85% greater than the hip and ankle. This analysis may help to better understand performance and/or injury.

2517 Board #181 May 31 9:30 AM - 11:00 AM Effects Of Assistance And Resistance Elastic Bands On Short Distance Sprinting In Women Kailey Goins, Bryan Riemann. Georgia Southern University, Savannah, GA. Email: krgoins@gsu.edu (No relevant relationships reported)

Despite the prevalence using resistance bands to add resistance or assistance to sprinting, there is little research to evaluate the use as a training modality. PURPOSE: To determine the effects of elastic resistance and assistance on forward and backward sprinting velocity, stride time and stride length. METHODS: Eight high-school and college (19.9±3.5 years) women soccer players voluntarily ran six maximal effort 10m forward and backward sprints under three conditions, resistance and stride weight. During the resistance/assistance conditions, 3m elastic bands (Super Bungie Cordz, West Warwick, RI), marketed as providing 333N of force when fully stretched, were secured to a pelvic belt. During the sprints, bilateral lower extremity kinematic data was recorded with custom footswitches embedded in standardized laboratory shoes (Asics T2F9N) indicating ground contact/off. Sprinting velocity, stride time and stride length were computed for each sprint in the same 1.5m space relative to the start position. Separate direction by condition repeated measures analysis of variance for each outcome measure were followed by simple main effect post hoc tests. RESULTS: Sprint direction had significantly different effects on sprint velocity (P<.001, η²=.0746), stride time (P<.007, η²=.504), and stride length (P<.001, η²=.7607) between the three conditions. Post hoc results are provided in Table 1. CONCLUSIONS: When sprinting with only body weight, similar characteristics exist in each direction, whereas the effects of sprinting with resistance and assistance were different between the directions. By quantifying the changes in sprinting velocity and stride time/length with elastic resistance and assistance, these results provide practitioners with insight regarding training specificity.

2518 Board #182 May 31 9:30 AM - 11:00 AM Physiological and Biomechanical Differences Between a Traditional Treadmill and a 360 Degree Virtual Reality Treadmill Jessica L. Kutz, Alyssa Carter, Austin McCarron, Andrew Sartain. Shenandoah University, Winchester, VA. (Sponsor: Jody Greaney, FACSM) Email: jessica.kutz21@gmail.com (No relevant relationships reported)

Virtual reality opportunities are booming as technology has advanced to provide a truly immersive experience. Soon virtual reality exercise experiences may be readily available to the public; thus, the exercise equipment that companies produce need to be assessed for use and safety. PURPOSE: Fifteen college students (8 women, 8 men; 20 &177; 1 year old) walked for 5 minutes on a traditional treadmill (TT) and a 360-degree virtual reality treadmill (VR) with no head set to determine the physiological [heart rate (HR), oxygen consumption (VO2), rate of perceived exertion (RPE), respiratory exchange ratio (REX)] and biomechanical [step rate (SR), step length (SL), knee angle (KA), tilt] differences at self-selected paces as well as to a pace of 97 steps per minute set by a metronome (TTM vs VRM). RESULTS: VO2: (TT:11.6 &177; 2.2 vs VR:16.8 &177; 3.5 ml/kg/min, p &lt; 0.005), RER (TT:0.81 &177; 0.5 vs VR:0.89 &177; 0.5, p &lt; 0.005), HR (TT:91.3 &177; 17.6 vs VR:113.1 &177; 22.3 bpm, p &lt; 0.005) and RPE (TT:2.1 &177; 1.5 vs VR:4.7 &177; 1.5, p &lt; 0.005) were all significantly lower while walking on a traditional treadmill (TT) compared with a VR360 treadmill (VR) at a self-selected pace. This same pattern was observed when walk at a specific cadence (97 steps/min) except RER was not different between the traditional treadmill and the VR360 treadmill (TT: 0.89 &177; 0.05 vs VRM: 0.94 &177; 0.06, p=0.146). SR was significantly higher on the traditional treadmill (TT:107.1 &177; 16.0 vs VR:76.9 &177; 14.8 steps/min, p &lt; 0.005), as well as SL (TT:42.2 &177; 1.7 vs VR:22.7 &177; 0.4 m, p &lt; 0.005). KA was significantly lower on the VR360 treadmill, forcing a more knock-knee walking position (TT:174.2 &177; 3.9 vs VR:139.9 degrees, p &lt; 0.005) The 360 treadmill induced a bent over position, causing a significantly greater tilt (TT:175.8 &177; 3.2 vs VR:156.5, p &lt; 0.005). CONCLUSION: Walking on a virtual reality treadmill is more strenuous from a physiological and biomechanical perspective than a traditional treadmill, at a self-selected and forced pace. Shorter exercise bouts using virtual reality treadmills may be a more practical use of this exercise modality.

2519 Board #183 May 31 9:30 AM - 11:00 AM Not All Forefoot Striking Is Equal Alessandra Matias1, Jerome outerley1, Isabel Sacco2, Irene Davis, FACSM1. Spaulding Running National Center, Cambridge, MA. Faculdade de Medicina FMUSP, Universidade de Sao Paulo, Sao Paulo, Brazil. (Sponsor: Irene Davis, FACSM) Email: alessandra.matias@usp.br (No relevant relationships reported)

Rearfoot strike (RFS) runners typically exhibit an impact peak in their vertical ground reaction force caused by heel impact. This impact is associated with high load rates that have been linked to lower extremity injuries. The vast majority of forensic strike (FFS) runners do not exhibit this impact peak and have significantly lower load rates compared with RFS runners. However, some FFS runners do exhibit an impact peak and load rates similar to RFS. The heel descent after initial contact in FFS could help further explain this phenomenon.

PURPOSE: To investigate the relationship between heel kinematics and vertical average loading rate (VALR) in FFS runners.

METHODS: 30 habitual FFS runners from an ongoing study were included (5F, 25M; age: 35.6±9.3). Ground reaction forces and heel kinematics were collected on an instrumented treadmill at 2.6±0.4m/s. Pearson correlations between VALR and heel height at initial contact (IHC), time to heel contact (THC), heel descent acceleration

Abstracts were prepared by the authors and printed as submitted.
Approximately 50% of runners sustain an injury each year that requires a cessation of training. Lower extremity stiffness has been identified as a potential contributor to lower extremity injury. However, recent research has suggested that the skeletal and muscular contributions to stiffness may be more indicative of injury mechanisms [1]. Research has also suggested that both footwear and foot strike pattern may also play a role in injury rates. PURPOSE: to assess the effect of footwear and strike pattern on skeletal and muscular contributions to leg stiffness. METHODS: Thirteen runners aged 18 to 30 participated in over-ground running trials at preferred running velocity in each of four experimental conditions: barefoot (BF-BF), barefoot rearfoot (BF-RF), shod forefoot (S-FF) and shod rearfoot (S-RF). Kinematics (20 Hz, Qualisys Inc.) and ground reaction forces (GRFs, 960 Hz, AMTI Inc.) were collected simultaneously. Leg stiffness (kLeg) was calculated as the ratio of peak GRF magnitude divided by the shortening of the limb. Skeletal (kSkel) and muscular contributions (kMusc) were calculated as previously described [1]. Three 2x2 repeated measures ANOVAs with Tukey’s post-hoc tests were conducted to determine the effect of footwear and strike pattern on kLeg, kSkel and kMusc. RESULTS: Significant footwear by strike pattern interactions were observed for kLeg, kSkel and kMusc (Table 1). Post-hoc comparisons of kLeg, kSkel and kMusc revealed significant differences between S-RF and BF-BF, BF-RF, S-FF. CONCLUSIONS: These data demonstrate that both footwear and strike pattern alter leg stiffness as well as muscular and skeletal contributions to stiffness. Though previous research has identified that stiffness may contribute to lower extremity injury, no clear relationship has been identified. Further research is necessary to determine how the components of leg stiffness may be related to injury mechanisms. [1] Powell, Pasquette & Williams 2017.

### Table 1. Mean stiffness values for leg stiffness (kLeg) as well as skeletal (kSkel) and muscular (kMusc) components of stiffness.

<table>
<thead>
<tr>
<th></th>
<th>BF-BF</th>
<th>BF-RF</th>
<th>S-FF</th>
<th>S-RF</th>
<th>Footwear</th>
<th>Strike Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>kLeg</td>
<td>18.93±3.7</td>
<td>18.3±6.4</td>
<td>17.8±5.1</td>
<td>23.8±7.3</td>
<td>brk</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>kSkel</td>
<td>15.4±3.6</td>
<td>14.8±3.1</td>
<td>14.2±4.4</td>
<td>19.2±6.6</td>
<td>brk</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>kMusc</td>
<td>3.5±0.8</td>
<td>3.5±1.0</td>
<td>3.5±1.0</td>
<td>4.6±1.0</td>
<td>brk</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Note: a = denotes significantly different than BF-BF, b = denotes significantly different than BF-RF, c = denotes significantly different than S-RF.
The ability to ambulate within one’s environment is an important skill for everyday life, however, traditional methods of assessing gait involve walking in controlled settings that may not represent performance in real-world environments. Laboratory and clinically-based quantitative gait assessments are often conducted in a sterile and uniform environment and treadmill walking assessments, used to collect a large amount of walking data, are conducted with an externally driven speed and fixed environment. As such, gait demonstrated in these assessments may not reflect gait performance in the real-world environment. PURPOSE: To compare gait behavior among overground indoor, outdoor, and treadmill walking in healthy adults. METHODS: 16 healthy young adults (5M, 11F, 21±2yrs) performed three walking trials (500m each) at a self-selected pace: indoors around a gymnasium (IN), outdoors along a sidewalk (OUT), and on a treadmill (TM). Data were collected using wearable sensors and the following variables were calculated for each trial: cadence, gait velocity, double support %, step time, stride length. Two repeated-measures MANOVAs were used to compare mean values and variability (standard deviation (SD)) across conditions. RESULTS: Significant differences were found across the conditions for both mean values (A’=0.08, F(10,6)=15.18, p<0.002) and variability (A’=-0.03, F(10,6)=15.41, p<0.002). Univariate tests showed differences in mean values between all conditions for cadence, gait velocity, step time, and stride length (p<0.003), and greater double support time in the TM condition compared to the IN or OUT conditions (p<0.006). Univariate tests for variability measures failed to detect statistically significant differences (p>0.05). The TM condition had a lower gait velocity SD than IN or OUT (p<0.001). CONCLUSION: Healthy young adults adopt different walking strategies while walking indoors, outdoors, and on a treadmill.
RESULTS: Gait speed while wearing the wearable crutch was reduced 44% compared to normal gait and 33% compared to crutch ambulation (P < 0.001). Frontal and sagittal plane hip range of motion were both significantly reduced during both crutch conditions compared to normal gait (P < 0.001). Trunk range of motion in both planes was greatest during wearable crutch walking compared to both normal gait and crutch ambulation (P < 0.001). Peak vGRF while wearing the hands-free crutch was 12% lower than normal gait (P < 0.001) and 30% lower than crutch ambulation (P < 0.001). Peak compressive hip force during wearable crutch walking was 11% lower than during normal gait (P = 0.026) and 30% lower than during axillary crutch walking (P < 0.001). Low back compressive force during wearable crutch walking was 18% higher than during normal walking (P = 0.03) but not different than during axillary crutch walking (1.4% difference P > 0.05).

CONCLUSIONS: Despite a reduction in the shock-absorbing ability of the lower extremity, vGRF and compressive hip forces were not increased during wearable crutch walking. Although low back compressive force did increase with this device, it did not exceed the forces during axillary crutch walking. Therefore, the wearable crutch seems to be safe for patients who are required to be non-weight-bearing.

**Effect Of New Walking Exercise With Two Poles For Upright Posture In Back-knee Case**


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(No relevant relationships reported)

Back-knee is knee deformity with hyperextension, and observed leaning forward, and adduction and internal rotation of hip joint during walking instead of hip and knee flexion. Therefore, we have adopted exercise with new walking style using two poles to avoid leaning forward. PURPOSE: To study the effect of the walking exercise using two poles on posture and gait in a back-knee case. METHODS: Subject: 70's female, with back-knee on both legs, using two T-canes in everyday life. Intervention: The walking exercise was conducted using two poles for 15 to 30 minutes once a week for 10 months. Same exercise was done every day at home. Equipment: A set of poles with the grips bending towards the thumb side (radial deviation), setting the length 10 cm or longer than the general Nordic walking pole. Walking style: (i) Stick the pole vertically at about 10 cm or more from the toe of the foot you stepped. (ii) Put the legs shoulder-width forward, land the step from the heel, kick out with a toe and walk. MEASUREMENT: The joint angles were measured during the walking using two T-canes before intervention and with this walking style after 45-week exercise.

RESULTS: At the leading response, the trunk bending against a vertical axis were decreased from 20° (before intervention) to 8° (after 45 weeks). The hyperextension of the knee joint were decreased from 42° to 30°. Posterior hip joint extension was not observed before intervention, but it showed 17° extension after 45 weeks. Also, when raising the legs, the hip flexion angle against a vertical axis were 35° before intervention and 50° after 45 weeks, showing the motion range for hip flexion-extension extended. CONCLUSION: This walking style with two poles is thought to have the effect to gain the upright posture, making it easier to put forward the legs.

**The Effect Of Stride Length Training On Muscular Activity And Energy Cost During Walking**

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(No relevant relationships reported)

Human bipedalism is the most unique locomotive form in the terrestrial environment and can be performed for a prolonged period of time. To maintain this form of locomotion humans have adopted physiological and mechanical strategies to minimize and conserve their stored energy. The self-selected locomotive pace in humans is that at which the most efficient energy cost can be maintained. PURPOSE: To study the effects of stride length alteration training on the electromyographic (EMG) activity of the quadriceps muscle group and hamstring muscle group and oxygen consumption. METHODS: Male (n=8) subjects (age ~21 years) recruited for this study. Heart rate, and oxygen consumption (VO\textsubscript{2}) and EMG activity (quadriceps and hamstring) were continuously measured during walking at self-selected speed at the following stride length: (1) self-selected (s-s) (2) 10% below s-s, (3) 20% below s-s, (4) 10% above s-s, (5) 20% above s-s, and (6) 30% above s-s stride-length. Subjects then trained 3 days per week for 8 weeks on a treadmill starting at 20% above their s-s speed. Each week, speed was increased by 0.1 miles per hour (mph) until the subject was unable to maintain a walking gait (one foot must remain on the treadmill). Post-testing was conducted after completion of the training sessions. Repeated measures ANOVA were used to determine differences between sessions. RESULTS: Post s-s speed and length and VO\textsubscript{2}max were significantly higher than pre-test (p < 0.05 for all). Both pre- and post- heart rate, VO\textsubscript{2}, and EMG activity were significantly lower at s-s stride-length than all below and above s-s stride-lengths (p < 0.05 for all). Post- VO\textsubscript{2} and EMG activity at s-s stride-length were significantly higher than pre-test (p < 0.05).

CONCLUSIONS: Oxygen consumption and EMG activity levels showed a U-shaped curve with the lowest at s-s stride lengths and higher at below and above s-s speed before and after 8 weeks of stride length alteration training. This indicates walking energy cost is optimal at s-s stride lengths regardless of the training-induced change in s-s stride length. Stride length alteration training shifted the U-shaped curve for oxygen consumption and EMG to the right indicating increased overall walking energy cost that is related to increased s-s stride length.

**Effects Of Percent Body Fat on Foot Pressure Characteristics during Walking in Weight-Matched Male Adults**

Hyejung Choi, Jongil Lim, Sukho Lee. Texas A&M University - San Antonio, San Antonio, TX.

(No relevant relationships reported)

Increased body weight is associated with increased magnitude of pressures under the feet in obese population. Although body mass index (BMI) has been used in the assessment of overweight/obesity, BMI does not differentiate between muscle and adipose tissue, which may play a role in characterizing walking patterns. PURPOSE: To compare foot pressure characteristics during walking between obese and weight-
matched controls. METHODS: Sixty male adults were assigned to normal group (NG; n=30, age: 48.64 ± 6.24 years, percent body fat (%BF): 21.18 ± 3.51 %) and obese group (OG; n=30, age: 47.71 ± 6.45 years, %BF: 29.81 ± 4.12 %) based on %BF. Body compositions including %BF, fat mass, muscle mass, and BMI were measured by bioelectrical impedance method. Foot pressure and gait parameters were recorded with a force-distribution-measure treadmill system during walking at the preferred speed. An independent t-test was performed to compare the differences of dependent variables between the groups. A p < .05 was considered statistically significant. RESULTS: No differences were observed between the groups in weight (NG: 72.21 ± 9.04 kg, OG: 75.03 ± 8.52 kg, p=.254) and BMI (NG: 24.54 ± 2.17 kg/m², OG: 25.65 ± 2.59 kg/m², p=.073). OG showed significantly greater %BF (NG: 21.18 ± 3.51 % fat, OG: 29.81 ± 4.12 %, p < .001) and fat mass (NG: 14.18 ± 3.74 kg, OG: 21.64 ± 3.52 kg, p < .001), but lower muscle mass (NG: 31.64 ± 4.81 kg, OG: 28.56 ± 2.70 kg, p < .05) despite the same weight. The speed of walking did not differ between the groups (NG: 2.62 ± 0.86 km/h, OG: 3.20 ± 1.02 km/h, p = .261), but OG walked with a wider step width (NG: 14.29 ± 4.07 cm, OG: 16.66 ± 3.73 cm, p < .05). The line of the force application point was longer in NG for both stance-phase (NG: 250.88 ± 63.62 mm, OG: 213.13 ± 55.41 mm, p < .05) and single-limb support phase (NG: 130.38 ± 41.03 mm, OG: 106.42 ± 37.75 mm, p < .05). Maximum pressure at the heel was also greater in NG (24.64 ± 6.29 N/cm²) than OG (20.93 ± 5.66 N/cm²) (p < .05). CONCLUSION: The results demonstrated substantially different force application patterns during walking between obese and weight-matched control group, indicating a potential influence of %BF on foot pressure characteristics in walking. The comprehensive evaluation of obesity including %BF, therefore, should be administered for the prescription of safe physical activity.

2530 Board #194 May 31 9:30 AM - 11:00 AM
Response of Femoral Articular Cartilage Throughout a 5,000 Step Walking Protocol Using Ultrasound
Steven J. Pfiffner, Hope C. Davis, Brett Pexa, Jessica Szymczak, Catherine Wistreich, Rachel Sorensen, Erik A. Wikstrom, FACSM, Troy Blackburn, Brian Petrisomone, FACSM. University of North Carolina at Chapel Hill, Chapel Hill, NC. Email: stevenjp@email.unc.edu

Femoral cartilage cross-sectional area (CSA) demonstrates changes following a standardized walking protocol of varying durations when assessed using ultrasonography (US). However, it is unclear if a certain step threshold exists beyond which no further changes in CSA are observed. Similarly, it is unclear how changes in cartilage CSA progress with an increasing number of steps.

PURPOSE: To evaluate changes in femoral cartilage CSA between baseline and 1,000, 2,000, 3,000, 4,000, and 5,000 steps, respectively using US.

METHODS: Thirty-two healthy individuals (63% female, age = 22 ± 3 yr, BMI = 24 ± 3 kg/m³) completed a single testing session. Habitual walking speed was assessed over a 6-meter walkway using infrared timing gates. Participants rested with their knees extended on an examination table for 45-minutes to unload their knee cartilage prior to the walking protocol. US was used to acquire images of the femoral cartilage prior to the walking protocol. Immediately following US acquisition, participants walked on a treadmill at their average, over ground walking speed for 1,000 steps, after which additional US images of the femoral cartilage were acquired. This process was repeated at 2,000, 3,000, 4,000, and 5,000 step time points. A one-way repeated-measures analysis of variance was used to compare femoral cartilage CSA across the 6 time points. Multiple Bonferroni corrected planned comparisons (0.05/5) were used to evaluate pairwise comparisons if a statistically significant ANOVA model was identified.

RESULTS: Significant differences in femoral cartilage CSA were observed across time points (F' = 30.60, p<0.001). Femoral cartilage CSA was significantly greater at the 2,000 (Mean Difference [MD] = +1.25mm, p=0.01), 4,000 (MD = +0.95mm, p=0.001), and 5,000 (MD = +2.14mm, p<0.001) step points compared to baseline.

Conversely, femoral cartilage CSA was significantly lesser at the 3,000 step point (MD = +1.12, p=0.001) compared to baseline.

CONCLUSIONS: Changes in femoral cartilage CSA following walking may be dependent on the number of steps taken during a session of physical activity. Future research should determine mechanisms related to the increase and decrease in femoral cartilage CSA found in response to walking, as these mechanisms may be linked to the number of steps taken.

2532 Board #196 May 31 9:30 AM - 11:00 AM
Gait Analysis Of Patients With Distal Radius Fracture Using A Novel Laser-tug System
Koji Fujita1, Hirotaka Iijima2, Atushi Okumura3, Yosuke Yao4, Akimoto Nimura2, Ryuichi Kato1, Atsushi Okawa1, Masaki Takahashi1, 2, Tokyo Medical and Dental University, Tokyo, Japan. 3Kawaguchi General Hospital, Saitama, Japan. 4JA Kyosai Research Institute, Tokyo, Japan. Email: fujirth@tmd.ac.jp

BACKGROUND: Patients with distal radius fracture (DRF) are at risk of consequent fragility fracture. Gait analysis of patients with DRF can provide useful information to prevent a fall and resultant fracture. The timed up and go test (TUG) is a clinical test, most often used to evaluate functional mobility; however, the detailed information of steps during the test is not well assessed. PURPOSE: To analyze the gait characteristics of patients with DRF during TUG using a newly developed Laser-TUG system.

METHODS: We developed the Laser-TUG system, which enables us to assess the detailed gait information during TUG without using any instruments on patients. The system uses a single laser range sensor, and can track both legs and measure the foot contact positions to obtain the walking parameters, such as stride length and step length. The Laser-TUG system, we compared the gait of 20 patients with DRF who had surgery up to 2 weeks prior (the fracture group), and 40 age-matched healthy non-fractured volunteers (the non-fracture group). RESULTS: The total time of TUG in the fracture group was lesser (3.74 ± 0.74 s) than in the non-fracture group (4.03 ± 0.74 s). The total distance of stride was smaller (0.51 vs. 0.62 meter, P<0.01), and the number of steps in total was greater (14.3 vs. 11.7, P<0.001), especially at the turning around phase (3.2 vs. 2.3, P=0.04) in the fracture group. The distance from the turning point (0.53 vs. 0.46 meter, P=0.02) was also farther in the fracture group.

CONCLUSION: With this system, gait can be visualized without the use of a sensor on the patients. The distance of stride in the fracture group was less than 10 seconds, which implies normal gait speed; however, they walked with more steps and experienced difficulty turning around during TUG. These results suggest the cause underlying the tendency to fall in patients with DRF.
Table 1. Means ± SD for dependent measures. Kinetic and kinematic variables were likely more beneficial to reduce KAM.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group Main Effect</th>
<th>Gait Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>P</td>
</tr>
<tr>
<td>KAM (Nm/kgm)</td>
<td>1.2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Foot Angle (°)</td>
<td>2.04</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Knee Angle (°)</td>
<td>8.31</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Trunk Angle (°)</td>
<td>40.37 &lt;0.001</td>
<td>1.48 (3.01)</td>
</tr>
<tr>
<td>Stride Width (m)</td>
<td>1.69</td>
<td>0.02</td>
</tr>
<tr>
<td>Stride Length (m)</td>
<td>3.4</td>
<td>0.18</td>
</tr>
</tbody>
</table>

*Indicates statistically significant difference from baseline (p<0.05). Reduced foot angle and trunk lean towards the dominant limb is positive while knee abduction is negative.

## 2533 Board #197 May 31 9:30 AM - 11:00 AM
**Single-Parameter Gait Modifications Cause Involuntary Secondary Gait Changes**
Bryndan Lindsey, Oladipo Eddo, Matthew Prebble, Shane V. Caswell, Ana M. Azevedo, Nelson Cortes. George Mason University, Manassas, VA.
Email: ncortes@gmu.edu
(No relevant relationships reported)

Gait modification (GM) using real-time biofeedback (RTB) has shown success reducing 1st peak knee abduction moment (KAM) which is associated with knee osteoarthritis. Most studies have used single parameter GMs; though, evidence suggests that GMs can induce additional involuntary gait changes. **PURPOSE:** To compare the effects of 3 single parameter GMs (foot progression (FP), medial knee thrust (MKT), and trunk lean (TL)) designed to reduce KAM on secondary gait variables. **METHODS:** 10 healthy individuals volunteered for this study (26.7 ± 4.7 years, 1.75 ± 0.1 m, 73.4 ± 12.4 kg) with the dominant limb being used for analyses. Mean and standard deviation (SD) for KAM and frontal plane trunk, knee, and stride width during FP, MKT, and TL, respectively. Hence, a modification scheme that employs multiple GMs at once is likely more beneficial to reduce KAM. **Table 1.** Means ± SD for dependent measures. Kinetic and kinematic variables were measured at KAM.

## 2534 Board #198 May 31 9:30 AM - 11:00 AM
**Case-Control Investigation Of Speed And Gait After An Incomplete Spinal Cord Injury**
(No relevant relationships reported)

Individuals with an incomplete spinal cord injury (iSCI) present with an array of compensatory gait mechanisms. Appraising these changes may help clinicians better prescribe treatment plans to improve quality of movement. **PURPOSE:** The primary purpose of this investigation was to compare gait measures between someone with an iSCI and an age-, sex-, and height-matched non-limited control (CON). A secondary purpose was to quantify changes in movement when walking at different speeds. **METHODS:** This case-control study included a participant with iSCI and a CON. Three-dimensional motion analysis was used to determine gait speed and lateral deviation (LD) for preferred normal walking (NW) and fast walking (FW) tests. LD was determined by movement of 7th cervical spinal process (C7) marker along the frontal plane. **RESULTS:** Case-control differences were observed: gait speed NW (iSCI: 0.20m/s; CON: 1.37m/s), gait speed FW (iSCI: 0.33m/s; CON: 1.91m/s), LD NW (iSCI: 0.43m; CON: 0.09m), and LD FW (iSCI: 0.39m; CON: 0.10m). **CONCLUSIONS:** In the clinical setting, LD is often indicative of an abnormal walking pattern, but is not typically quantified for objective reassessments. The participant with iSCI and CON increased gait speed from a NW to FW 26.92% and 38.72%, respectively. LD did not change as expected, with iSCI decreasing (-7.85%) and CON increasing (4.99%) when increasing speed. These preliminary data may reflect the need to evaluate more segmental responses in addition to C7 abnormal walking pattern, but is not typically quantified for objective reassessments. The participant with iSCI and CON increased gait speed from a NW to FW 26.92% and 38.72%, respectively. LD did not change as expected, with iSCI decreasing (-7.85%) and CON increasing (4.99%) when increasing speed. These preliminary data may reflect the need to evaluate more segmental responses in addition to C7 abnormal walking pattern, but is not typically quantified for objective reassessments.

## 2535 Board #199 May 31 9:30 AM - 11:00 AM
**Hip Mechanics during Gait in Sedentary Adults**
Devin K. Kelly, Kristynie Wiegand, Janet S. Dufek, FACSM, Julia Freedman Silvernail. UNLV, Las Vegas, NV. (Sponsor: Janet S. Dufek, FACSM)
Email: devin.kelly@unlv.edu
(No relevant relationships reported)

Obesity is a known risk factor for osteoarthritis (OA). Studies investigating how gait changes that are associated with obesity lead to the development of OA often lack a measure of level of physical activity. It is well established that sedentary behavior leads to obesity and therefore it may also influence the progression of OA. Investigating hip mechanics during gait in sedentary obese and sedentary normal weight adults may offer insight into the effect of physical activity behavior on
biomechanical factors associated with the development of hip OA. PURPOSE: To assess hip biomechanics during gait in normal weight and obese adults to explore the effect of a sedentary lifestyle on the progression of hip OA. METHODS: Gait analyses were performed on 18 sedentary young adults. Participants were separated into two groups based on body mass index. Group 1 consisted of sedentary normal weight adults (n=9) and group 2 consisted of sedentary obese adults (n=9). Three-dimensional kinematic and kinetic data were collected at 200 Hz and 1000 Hz respectively as participants walked at their preferred velocity. Hip joint angles and moments were calculated. Average range of motion and peak moments were determined and assessed for statistically significant differences between groups using independent t-tests with the alpha level set at 0.05. RESULTS: The two groups walked at similar preferred velocities (3.15 ± 0.30 m/s; 3.16 ± 0.25 m/s; p = 0.96). Range of motion in the sagittal (40.31 ± 4.08°; 41° ± 6.05°; p = 0.48) and transverse planes (13.48 ± 3.29°; 13.27 ± 4.15°; p = 0.78) were similar between groups. Coronal plane range of motion was significantly greater in 1 group than 2 (13.94 ± 2.68°; 12.63 ± 2.60°; p = 0.02). Average peak hip extension moments were also similar between groups (50.60 ± 13.72 Nm/kg; 51.44 ± 14.63 Nm/kg; p = 0.78). CONCLUSIONS: Sedentary normal weight and sedentary obese individuals had similar sagittal range of motion and peak extension moment at the hip. The literature shows that individuals with hip OA experience limited sagittal range of motion and reduced extension moment. Taken together, current results suggest that sedentary behavior, regardless of body weight, may contribute to the development of hip OA.

**RESULTS**

A 2x4 repeated measure ANOVA and Intra-class correlations and MT were recorded with the PSS at each stage of the test with each stage lasting 15 seconds. Lower Body Positive Pressure Treadmills (LBPPT) allow for unweighted running, while regular treadmills (TM) provide real-time gait analysis data including weight bearing symmetry, step length, sagittal and transverse plane angles. PURPOSE: To validate the LBPPT GAS compared to an in-shoe pressure sensor system (PSS). METHODS: 8 subjects (mean age: 30.80 ± 6.98, mean weight: 69.54 ± 15.53 lb) donned the PSS and were set-up in the LBPPT. The subjects performed a running protocol which had stages from 3 mph to 6 mph at 1 mph increments from 80% bodyweight to 20% bodyweight (20% increments) at each speed setting. Weight bearing symmetry, stance time, and cadence were recorded with the PSS and GAS at each stage of the test with each stage lasting 15 seconds. RESULTS: Pearson correlations and Intra-class correlations were used on weight bearing symmetry, stance time on both the left and right leg, and cadence acquired from the GAS and PSS. Weight bearing symmetry was not correlated between devices, r = -.06, p = .53, r = -.01, ICC = -.13. Right stance time was found to have a small significant correlation, r = -.37, p ≤ .01, ICC = -.40. Left stance time was found to have a small similar significant correlation, r = .43, p < .001, r = -.19, ICC = -.37. Cadence was found to have a small significant correlation, r = -.37, p < .001, r = .14, ICC = .18. CONCLUSIONS: These findings are unable to support the use of the LBPPT GAS as a valid gait analysis tool related to weight bearing symmetry, stance time and cadence due to relatively poor agreement and correlations when compared to direct measures from an in-shoe pressure sensor system.

**METHODS**

7 participants (mean age: 31.14 ± 6.03, mean weight: 83.89 ± 10.61) were divided into two groups. Group 1 consisted of healthy adults (n=9) and group 2 consisted of sedentary obese adults (n=9). Three-dimensional kinematic and kinetic data were collected at 200 Hz and 1000 Hz respectively as participants walked at their preferred velocity. Hip joint angles and moments were calculated. Average range of motion and peak moments were determined and assessed for statistically significant differences between groups using independent t-tests with the alpha level set at 0.05. RESULTS: The two groups walked at similar preferred velocities (3.15 ± 0.30 m/s; 3.16 ± 0.25 m/s; p = 0.96). Range of motion in the sagittal (40.31 ± 4.08°; 41° ± 6.05°; p = 0.48) and transverse planes (13.48 ± 3.29°; 13.27 ± 4.15°; p = 0.78) were similar between groups. Coronal plane range of motion was significantly greater in 1 group than 2 (13.94 ± 2.68°; 12.63 ± 2.60°; p = 0.02). Average peak hip extension moments were also similar between groups (50.60 ± 13.72 Nm/kg; 51.44 ± 14.63 Nm/kg; p = 0.78). CONCLUSIONS: Sedentary normal weight and sedentary obese individuals had similar sagittal range of motion and peak extension moment at the hip. The literature shows that individuals with hip OA experience limited sagittal range of motion and reduced extension moment. Taken together, current results suggest that sedentary behavior, regardless of body weight, may contribute to the development of hip OA.
wave rectified. cFRR (Table 1) was measured pre-walk and post-walk and outcomes were submitted to repeated measures ANOVA based on load conditions, side of body and time. RESULTS: The average pressure measured at the shoulders for the baseline load (3.76 ± 0.90 kPa) was significantly higher than the two load distribution conditions (1.55 ± 1.68 kPa, p < .001; 1.72 ± 1.12 kPa, p < .0005, respectively). There were no main effects due to load condition or body side (p > .074). However, there was a significant main effect of time (p = .033).

CONCLUSION: The load distribution equipment successfully shifted pressure from the shoulders to the hips, however this did not correlate with an improvement in cFRR. Changes in cFRR were observed pre- vs. post-walk indicating that the cFRR measure is sensitive to load carriage over time.

Table 1. cFRR.

<table>
<thead>
<tr>
<th>FRR</th>
<th>Baseline Load</th>
<th>Load Distribution 1</th>
<th>Load Distribution 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Side</td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
</tr>
<tr>
<td></td>
<td>1.74 ± .6</td>
<td>1.55 ± .6</td>
<td>1.49 ± .36</td>
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<tr>
<td>Left Side</td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
</tr>
<tr>
<td></td>
<td>1.7 ± 1</td>
<td>1.57 ± .71</td>
<td>1.35 ± .37</td>
</tr>
</tbody>
</table>

2540 Board #204 May 31 9:30 AM - 11:00 AM

Functional Sarcopenia Biomarkers In 56 To 80 -Yr Old Men And Women
Jhon F. Ramírez-Villalda1, Leonardo Rodriguez-Perdomo2, Annie Tibaduiza-Romero3, Jorge-Jaime Márquez-Arabia1, Jaime Ortiz-Silva1, Nery C. Molina-Restrepo1, Carlos Mario Arango-Paterna1.
1University of Antioquia, Medellin, Colombia. 2SENAT, Bogotá, Colombia.
Email: jhonramirezvillalda@gmail.com

PURPOSE: Age-associated loss of skeletal muscle mass and function has considerable importance for those activities related with disease prevention, health promotion, and care planning. The aim of the study was to examine several biomarkers of sarcopenia in older women, and its relation to functional deterioration

METHODS: Body composition, muscle strength, and gait performance indicators were measured in 179 healthy women (56 to 76 yr-old) to examine the relationship among those parameters as biomarkers of functional sarcopenia. All subjects were measured in 179 healthy women (56 to 76 -yr-old) to examine the relationship among those parameters as biomarkers of functional sarcopenia. All subjects were carefully familiarized with the evaluation tests. First, morphological variables such as lean height (kg/m²), appendicular lean height (kg/m²), lean body mass (% LBM), and others were estimated by Dual-energy X-ray absorptiometry (DXA). Second, functional indicators related to explosive force (power, take-off time, flight time, and maximum height achieved) were evaluated using a contact equipment. Third, isometric strength test was conducted by handgrip dynamometer. Finally, fast gait performance was evaluated using different indicators (distance, velocity, stride length, double support, contact phase, propulsion phase, velocity displacement) by photocell system.

RESULTS: Using two criteria, prevalences of sarcopenia were 57% (Lean/height² (kg/m²); 95%-CI: 0.48-0.65), and 42% (Appendicular Lean/height² (kg/m²); 95%-IC: 0.34-0.51). Nevertheless, a low prevalence to handgrip strength (16%, 95%-CI: 0.10-0.24) and gait performance (8.72%; 95%-CI: 0.05-0.14) were observed, contrary to power deterioration of lower limbs (31%, 95% CI: 0.22-0.41). Also, those subjects with lower levels of explosive strength (odds ratio (OR): 4.66 (95% CI: 1.098 to 12.561; P=0.05) had risk of having a higher adiposity level (≥25%), and lower results of fast gait performance.

CONCLUSIONS: Despite a wide variety of tests and tools is now available for characterization of sarcopenia in practice and in research, health professionals must be careful to avoid an inadequate clinical and functional diagnosis.

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

E-39 Free Communication/Poster - Sports Injury

Friday, May 31, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

2541 Board #205 May 31 11:00 AM - 12:30 PM

Comparison of Injury in Male and Female Amateur Rugby Union
Ian C. Kenny, Cathirionna Yeomans, Rosoin Cahalan, Giles Warrington, FACSM, Liam G. Glynn, Mark J. Campbell, Mark Lyons, Andrew J. Harrison, Kevin Hayes, Thomas M. Comyns.
University of Limerick, Limerick, Ireland. (Sponsor: Giles Warrington, FACSM)
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PURPOSE: Despite recent growth in game popularity worldwide, Women’s Rugby Union is currently lacking rigorous, comprehensive injury surveillance programs (World Rugby). This long-term study aimed to monitor injury trends, that may emerge, which will aid future implementation of evidence-based injury prevention strategies to minimize injury risk and enhance player welfare, for the female and male game.

METHODS: Using a bespoke web-based injury recording system (IRISweb), 15 male and 4 female national league clubs were recruited for a full season of monitoring in Ireland, representing 479 male and 129 female players. Each club nominated an ‘injury recorder’, who was a team physician or physiotherapist trained in use of the IRISweb system. In 10% of the clubs the head coach, qualified in first aid, recorded injuries. In all cases the team physician reviewed all injuries for ‘return to play’ ensuring classification validity. Measures included injury incidence, type, timing, severity, and playing position.

RESULTS: The most commonly reported match injuries for men’s clubs were concussion (12%), followed by ankle ligament sprains (11%); for women, it was ankle ligament sprains (11%) and concussion (11%). Concussion injuries resulted in an average of 30 days absence from Rugby match or training activities for men and 23 days for women. Timing of all injuries showed incidence rate (per 1000 player hours) for men of 7.1/10.6/19.1/11.5 for 1/2/3/4-striker match quarter respectively, and 7.1/12.8/12.8/11.5 for women, showing an early 2nd quarter peak for women. The position with the highest proportion of injury was openside flanker forward (no.7) for men and inside centre back (no.12) for women. The majority of injuries for both sexes were moderate or severe (greater than eight days absence). Women presented with a significantly lower rate (13.5 Vs 18.5; p<0.05) of severe injuries.

CONCLUSIONS: The amateur women’s game in Ireland has presented with both similarities and differences in injury occurrence compared to the men’s game. Marked differences surround an earlier match timing of women’s injury, and less severe occurrence of women’s injury. Practitioners should note the most common injuries occurring and the playing positions most frequently injured and develop welfare and prevention strategies around this knowledge.

2542 Board #206 May 31 11:00 AM - 12:30 PM

The Prevalence of Sickle Cell Trait in a Division I University Athletic Program
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RESULTS: In all 2542 NCAA athletes must be tested for the presence of hemoglobin (Hb) S but the prevalence with positive sickle cell trait (SCT) status at Division I institutions and their prior knowledge of status is unknown. PURPOSE: Determine the prevalence of athletes with SCT at a Division I university and describe their demographics, prior knowledge of status, and Hb profile. METHODS: A retrospective chart review of the 2010/11-18/19 academic years at one university. Main outcome measures included: actual and expected prevalence of SCT positive athletes, sex, race, sport, prior knowledge of SCT status and family history, and Hb profile (HbA, HbA2, Hbs, HBF, and Hbc) proportions. Expected prevalence was calculated from CDC statistics and applied to the known athlete racial breakdown per year with Fisher’s Exact test utilized for comparison. RESULTS: Twenty-six SCT positive athletes (6±1 per academic year) were identified, accounting for ~1% of the athlete population each year. Conclusions: Women presented with a significantly lower rate (13.5 V 18.5; p<0.05) of severe injuries.
their own status. One athlete provided a newborn screen. Results of Hb electrophoresis testing were available for 25 (96.15%) athletes. Average values for HbA, HbA2, HbS, HbF and HbC were 75.7±9.2%, 3.13±0.47%, 39.72±2.84%, 0.23±0.83% and 0.00±0.00%, respectively, excluding one unique case with 0.00% HbA, 1.40% HbA2, 59.70% HbS, 38.90% HbF and 0.00% HbC. CONCLUSIONS: Athletes with SCT accounted for a small proportion of the athlete population at a Division I university and were lower than expected prevalence. The majority had no prior knowledge of personal or family history. Obtaining Hb profiles beyond solubility testing can provide health care providers with information that may affect clinical manifestation and management.

2545 Board #207 May 31 11:00 AM - 12:30 PM Seasonal Incidence of Game-Related High School Football Trauma on Artificial Turf and Natural Grass
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Reported Relationships: M. C. Meyers: Industry contracted research; Partial funding by FieldTurf USA.

It is commonly surmised that environmental conditions and concomitant sport use dictate the quality and degree of natural grass over a season of competitive football. Although artificial turf infill systems have been purported to duplicate the playing characteristics of natural grass while maintaining surface quality throughout a season of play, no long-term studies have specifically compared injury incidence rates between the two surfaces at the high school level of competition. PURPOSE: To quantify seasonal incidence of game-related high school football trauma on artificial turf versus natural grass. METHODS: 77 high schools (4A-6A) from six states (CA, GA, MI, MT, PA, TX) were evaluated from August to December over 8 competitive seasons (2010-2017). Injury incidence rates (lIR) were calculated using injuries per 10 games = (number of injuries ÷ number of games) x 10. RESULTS: Of the 665 games documented, 343 games (51.6%) were played on artificial turf versus 322 games (48.4%) played on natural grass. A total of 1,241 injuries were documented with 514 (41.4%) occurring on artificial turf, and 727 (58.6%) on natural grass. Analyses per 10 games indicated a significant main effect (Wilks’ Lambda F = 18.925; p<0.0001) between surfaces by month. Subsequent post hoc analyses indicated a lower incidence of injury while competing on artificial turf (p<0.05) during August [5.6 (95% CI, 2.7-8.1) vs 23.1 (19.9-24.8)], September [11.8 (95% CI, 10.4-12.9) vs 29.3 (27.8-29.7)], October [6.0 (95% CI, 4.9-7.0) vs 26.6 (24.5-27.6)], November/December [9.0 (95% CI, 6.8-11.2) vs 36.0 (31.4-31.9)], and by total seasonal trauma [26.6 (95% CI, 25.5-27.3) vs 31.3 (30.4-31.8)] when compared to injuries reported on natural grass, respectively. CONCLUSION: A significantly lower incidence of trauma was documented on artificial turf when compared to natural grass throughout all months of the competitive high school season. Further investigation is warranted to quantify seasonal surface influence across severity of injury, surface impact trauma, shoe surface-contact and noncontact trauma, specific extremity joints/muscles, and elective medical procedures in high school football. The findings of this study may be generalizable only to this level of football competition and this specific artificial surface.

2546 Board #208 May 31 11:00 AM - 12:30 PM Injury Surveillance in Amateur Rugby Union in Ireland
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Rugby Union is a physically demanding, full-contact team sport that has grown in popularity. To reduce injury risk a comprehensive understanding of the incidence and nature of injuries is required. Injury surveillance systems are currently lacking in the amateur rugby game worldwide. The use of consistent injury definitions and methods of data collection are needed to provide robust epidemiological information for this cohort. PURPOSE: To assess the match injury incidence, nature, location and burden amongst male amateur adult players in amateur players. This information can inform practice so that appropriate injury prevention strategies and policies can be derived to reduce injury risk in male amateur rugby and thus enhance player welfare.

There is an inherent risk of injury in Rugby, due to the physical demands and exposure to collisions. While injuries in professional Rugby are widely reported, little is known about the amateur game. Investigating relationships between physical and wellness screening measures may identify injury causal factors and aid the development of targeted injury prevention strategies.

PURPOSE: To investigate the relationship between physical and wellness screening measures, and seasonal injury in Irish amateur Rugby.

METHODS: One hundred and thirty-seven amateur Rugby players [male n=113 (mean age=22.7±3.9), female n=24 (mean age=25.6±4.9)] were screened in pre-season and monitored throughout the season for injury. Questionnaires included: player background history and wellness; Pittsburgh Sleep Quality Index (PSQI); Athletic Coping Skills Inventory (ACSI-28) and Perceived Available Support in Sport (PASS-Q). Physical tests included; anthropometric measurements, knee-to-ankle test, straight leg raise test and adductor squeeze test. Injury incidence data were gathered using a comprehensive Rugby-specific web-based surveillance system. Data were collected and analyzed in SPSS (Version 22, IBM Corp., Armonk, N.Y., USA). Logistic regression were used to estimate odds of sustaining an injury. Baseline measurements were compared between males and females and ‘Forwards’ (position 1-8) and ‘Backs’ (position 9-15) using Student’s t-tests. Significance was set a-priori at P = 0.05. RESULTS: Males had a higher incidence of injury than females with respective incidence rates of 51.2/1,000 player hours and 42.9/1,000 player hours (P<0.05). In the ‘Backs’, an inverse relationship between adductor strength at 0° knee flexion and groin injury was found (r=-0.307, P<0.05). No correlations between questionnaires and other physical measurements and injury were found.

CONCLUSIONS: The Irish Rugby Injury Surveillance (IRIS) project is the first long-term injury surveillance system monitoring injury trends in Irish amateur Rugby. Reduced groin strength at pre-season was associated with more groin injuries during the season for ‘Backs’. Further investigation of groin strength and injuries in Rugby may inform future injury prevention strategies.

Funding: The IRIS Project is funded by the Irish Rugby Football Union.

2547 Board #209 May 31 11:00 AM - 12:30 PM Relationship between Physical and Wellness Baseline Screening Measures and Seasonal Amateur Rugby Injury
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(no relevant relationships reported)
resiliency significantly differed across year (χ²=20.2, p=0.001), type of school (public/private, χ²= 17.4, p=0.002) and type of sport (team/individual, χ²=12.5, p=0.002), but not across gender (χ²=4.9, p=0.08). Levels of resiliency did not differ by race, irrespective of gender. Among female athletes, resiliency level differed by type of sport played (χ²= 9.1, p=0.01), however, this relationship was not observed among male athletes (χ²=3.5, p=0.2). Resiliency level did differ significantly by type of institution attended, for both female athletes (χ²=8.1, p=0.002) and male athletes (χ²=13.2, p=0.001). Resiliency differed by year in school for female athletes, with freshman female athletes reporting low levels of resiliency more frequently as compared to senior female athletes (14.2% vs. 6.2%, respectively; χ²=16.5, p<0.001). There was no statistically significant difference in resiliency levels when analyzed by previous sports-related injuries or surgeries in the overall cohort or when stratified by gender.

CONCLUSIONS: Resiliency levels differed by type of sport, type of school and year in school. Further research is needed to investigate how resiliency may impact the injury risk of collegiate athletes.

2547
Board #211
May 31 11:00 AM - 12:30 PM
Developing a Rugby-Specific Injury Surveillance System
Giles D. Warrington, FACSM, Caihtriona Yeomans, Thomas M. Comyns, Roisin Cahalan, Liam G. Glynn, Andrew J. Harrison, Kevin Hayes, Mark Lyots, Mark J. Campbell, Ian C. Kenny. University of Limerick, Limerick, Ireland.

(Risk related relationships reported)

Rugby Union is one of the most played and watched team sports worldwide. Despite high injury incidence rates widely reported in the literature, no long-term injury surveillance system monitoring the incidence of injury in both male and female rugby currently exists. Unlike the professional code, amateur cohorts often have limited resources and infrequent access to medical professionals, thus the effective implementation of such systems present additional challenges.

PURPOSE: To describe the design, development, implementation and evaluation of a comprehensive Rugby-specific injury surveillance system. This paper serves to inform the international community to help develop uniform high quality approaches to injury surveillance.

METHODS: The four phases involved in the Irish Rugby Injury Surveillance (IRIS) Project:i) A survey establishing the current injury monitoring practices in operation in the top 58 amateur Irish clubs. These 58 clubs represent 26% of all amateur clubs in Ireland.ii) The design of a comprehensive web-based surveillance system (IRISweb) to monitor injury incidence, nature and severity. iii) Recruitment of 15 male and 5 female teams out of the top 58 amateur clubs to participate in the IRIS project. iv) A survey to evaluate the usefulness of the IRISweb system, after one season. RESULTS: Twenty-one clubs agreed to participate, however 2 clubs failed to provide a full season of injury data and therefore were excluded from the final analysis, giving 90% compliance. Nineteen clubs completed the evaluation survey (response rate = 95%). The overall rating and usefulness of IRISweb was rated ‘good’ or ‘very good’ by 82% of clubs. The main facilitators to injury surveillance were; increased player adherence (65%) and notifications to update the system (5%). In contrast, poor player adherence (71%) and medical staff availability (24%) were the main barriers to injury surveillance. CONCLUSIONS: The IRIS project is the first prospective long-term injury surveillance system in Irish amateur Rugby, effectively tracking injuries to guide evidence-based injury prevention strategies. This study outlines the development of the surveillance system, highlighting facilitators and barriers to injury surveillance within amateur sport.

Funding: The IRIS Project is funded by the Irish Rugby Football Union.

2548
Board #212
May 31 11:00 AM - 12:30 PM
A Systematic Review And Meta-analysis Of The Incidence Of Injury In Professional Female Soccer Lawrence Mayhew1, Jamie McPhee2, Peter Francis1, Gareth Jones1, Leeds Beckett University, Leeds, United Kingdom. 2Manchester Metropolitan University, Manchester, United Kingdom. Email: l.mayhew@leedsbeckett.ac.uk

(Risk related relationships reported)

The epidemiology of injury in male professional football is well documented and has been used as a benchmark in which to trend and implement injury prevention strategies. There are no systematic reviews that have investigated injury incidence in women’s professional football. Therefore, the extent of injury burden in women’s professional football remains unknown. PURPOSE: The primary aim of this study was to calculate an overall incidence rate of injury in senior female professional soccer. The secondary aims were to provide an incidence rate for training and match play. METHODS: PubMed, Discover, EBSCO, Embase and ScienceDirect electronic databases were searched from inception to September 2018. Two reviewers independently assessed study quality using the Strengthening the Reporting of Observational Studies in Epidemiology statement using a 22-item STROBE checklist.

Seven prospective studies (n=1137 professional players) were combined in a pooled analysis of injury incidence using a mixed effects model. Heterogeneity was evaluated using the Cochrane Q statistic and I² test. RESULTS: The epidemiological incidence proportion over one season was 0.62 (95% CI 0.59 – 0.64). Mean total incidence of injury was 3.15 (95% CI 1.54 - 4.75) injuries per 1000 hours. The mean incidence of injury during match play was 10.72 (95% CI 9.11 - 12.33) and during training was 2.21 (95% CI 0.96 - 3.34). Data analysis found a significant level of heterogeneity (total Incidence, I² = 81%; training Incidence, I² = 63.8%) and during subsequent sub group analyses in those studies reviewed (match incidence, I² = 74.6 (d.f. = 7), P < 0.05; I² = 90.8%, training incidence, I² = 16.97 (d.f. = 7), P < 0.05; I² = 58.8%). Appraisal of the study methodologies revealed inconsistency in the use of injury terminology, data collection procedures and calculation of exposure by researchers. Such inconsistencies likely contribute to the large variance in the incidence and prevalence of injury reported.

CONCLUSIONS: The estimated risk of sustaining at least one injury over one football season is 62%. Continued reporting of heterogeneous results in population samples limits meaningful comparison of studies. Standardising the criteria used to attribute injury and activity coupled with more accurate methods of calculating exposure will overcome such limitations.
ability of eyes to move/fixate in-sync (positive fusional vergence [PFV]) and negative fusional vergence [NFV] at 30cm and 3, near point of convergence [NPC], and near point of convergence - break [i.e. double vision, (NPCb)].

RESULTS: There were 8 males and 9 females with a mean age of 22.4 (SD = 6.4) years. The intraclass correlations (ICC) suggest good reliability for PFV (0.94) and NFV (0.72) at 30cm. There was moderate reliability for NPCb (0.58), saccade (0.57), and PFV at 3m (0.58). There was poor reliability for AD 30cm (0.34) and NPC (0.45). Reliability was essentially 0 for NFV at 3m, and GPA (0.00). Limits of agreement (LoA) were best for saccade (±25%) and worst for AD 30 cm (±172%), and ranged from ±40% to ±114% for the 7 other tests. For AD 3m, the distribution was highly skewed leading LoA to be uninformative.

CONCLUSIONS: The results indicate one-year test-retest reliability of the BVTs ranged from poor to good, with the majority being moderate. The effect of concussion measures can be designed and implemented to protect the health of these Super Rugby players.

The Epidemiology of Sports Related Dislocations among Collegiate and High School Athletes

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(No relevant relationships reported)

Athletes are at risk of sustaining a dislocation, ranging from relatively minor with minimal loss from play to more severe with long recovery times and costly treatments. Previous studies have examined dislocations; however, most focused on specific sports or joints.

PURPOSE: To describe dislocations sustained by collegiate and high school athletes.

METHODS: Athletic trainers (ATs) participating in the National Collegiate Athletic Association (NCAA) Injury Surveillance Program reported athlete-exposure (AE) and injury data for 25 sports during the 2009/2010-2016/17 academic years. ATs participating in the National Athletic Treatment Injury and Outcomes Network (NATION) reported AE and injury data for 27 sports during 2011/2012-2013/14. Dislocations occurring during a school-sanctioned practice or competition and required medical attention. Along with dislocation characteristics, injury rates per 10,000 AE were reported with 95% confidence intervals (CIs).

RESULTS: From 2009/2010-2017, ATs reported 542 dislocations among NCAA athletes for an injury rate of 0.81/10,000 AE (95% CI:1.04-0.87). Men’s football (1.74; 95% CI:1.53-1.94), men’s wrestling (1.53; 95% CI:0.91-2.16), and women’s gymnastics (1.31; 95% CI:0.54-2.09) had the highest rate of dislocations. From 2011/2012-2013/14, ATs reported 149 dislocations among high school athletes for an injury rate of 0.29/10,000 AE (95% CI:0.24-0.34). Boys’ football (0.79; 95% CI:0.62-0.95), girls’ basketball (0.52; 95% CI:0.26-0.78), and boys’ wrestling (0.50; 95% CI:0.22-0.79) had the highest rate of dislocations. For NCAA and high school athletes, the most commonly dislocated body parts were the hand/ fingers (40.2% and 25.8%) and shoulder/clavicle (36.7% and 40.3%). A greater proportion of dislocations resulted from player contact (55.8%) and were non-time loss (40.9%) in NCAA athletes than high school athletes (39.6% and 25.9%). A similar proportion of NCAA and high school dislocations were recurrent (20.6% and 18.8%) and required surgery (21.4% and 15.8%).

CONCLUSION: Some characteristics of dislocations vary across collegiate and high school athletes including mechanism of injury and time loss. More research is needed to determine how to effectively reduce the incidence of dislocations among all collegiate and high school athletes.

Evaluation Of Rule Modifications On The Reduction Of Injuries In High School Boys’ Lacrosse

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The National Federation of State High School Associations previously modified two lacrosse rules: Rule 5.4 in the 2012/13 academic year to heighten the penalty for any hits to the head/face/neck (HFN); and Rule 5.3.5 in the 2013/14 academic year to minimize body checking.

Purpose: To determine if the rate of overall injury, HFN injuries, and concussions due to intentional contact (checking) differed for boys’ high school lacrosse players after two rule modifications were enacted.

Methods: Data were collected from the High School RIO (Reporting Information Online) sports injury surveillance system. During the 2008/2009-2017 seasons, athletic trainers collected injury and athlete-exposure (AE) data for high school boys’ lacrosse teams. Overall and checking-related injury rates were calculated and stratified by competition and practice settings. Overall, HFN, and concussion injury rates were further analyzed by checking mechanism (e.g., being body/stick checked or delivering body/stick check). Incidence rate ratios (IRR) with 95% confidence intervals (CI) compared rates prior to and after the enactment of the rule modifications (Rule 5.4 – 2012/13 vs. 2008/09-2011/12; Rules 5.4 and 5.3.5 – 2013/14-2016/17 vs 2008/09-2011/12).

Results: There was a significant decrease in checking-related HFN injuries (IRR, 0.29; 95% CI, 0.17-0.50) and checking-related concussions (IRR, 0.29; 95% CI, 0.12-0.70) during practice in the seasons after both rule modifications were imposed, but there were no significant decreases in any checking-related injuries during competition. When both rules were enacted together, concussion risk due to delivering body check (IRR, 0.51; 95% CI:0.29-0.91) and overall injury risk due to being body checked (IRR, 0.72; 95% CI, 0.53-0.97) decreased. By injury mechanism, there were no significant decreases after only the Rule 5.4 modification took place.

Conclusion: When both the Rule 5.4 and 5.3.5 modifications were in effect, concussion and overall injury risk decreased for the player initiating the body check and the player being body checked, respectively. However, concussion risk due to being body checked during games was not affected.

The Prevalence of Obesity and its Association with Previous Musculoskeletal Injury in Probation Officers


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(No relevant relationships reported)

Probation officers are responsible for the supervision of criminal offenders released into the community with the high risk of violent and physically demanding interactions. Despite obesity reaching epidemic levels in many public safety occupations, probation officers remain understudied. PURPOSE: The purpose of the current study was to examine the prevalence of obesity and its association with previous musculoskeletal injury in probation officers. METHODS: The current study used data from a survey administered to all North Carolina probation officers in 2015, with 1,323 completions. The survey included questions on demographics, injury history, physical activity, geographical location of work, and years of employment. Body mass index (BMI) was calculated and classified per the National Heart, Lung, and Blood Institute’s guidelines. A logistic regression model
estimated the odds ratios (OR) of musculoskeletal injury history within the past year. Predictor variables were age, sex, employment history, geographical location, physical activity within the past month, and BMI classification. RESULTS: The majority (80.8%) of the respondents were classified as overweight or obese (BMI > 25.0 kg/m²), with 49.9% classified as obese (BMI > 30 kg/m²) and 9.5% classified as severely obese (BMI > 40 kg/m²). Multivariable logistic regression modeling suggested that workers categorized as being severely obese (BMI > 40 kg/m²) were 2.5 times more likely (OR=2.56; 95% CI=1.19-5.51) to sustain a musculoskeletal injury within the past year than their normal weight colleagues. CONCLUSION: Given the prevalence of obesity in our sample of probation officers, and its association with previous musculoskeletal injury, public safety administrators may wish to consider workplace interventions designed to combat obesity.

2555 Board #219 May 31 11:00 AM - 12:30 PM
Graft Type And Previous ACL Injury Influence Re-ruption Rates In 1478 ACL Reconstructions With 95% 2 Year Follow-up
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Purpose
The aim of this study was to report outcomes relating to the patient reported outcome measure International Knee Documentation Committee questionnaire (IKDC), return to play and second ACL injury rates at 2 year follow up, while examining differences in second ACL injury rate relating to gender, graft type and previous ACL reconstruction (ACLR).

Results
Prospective data was collected on 1478 consecutive ACL reconstructions for a single surgeon in a single centre. The aim of this study was to report outcomes relating to the patient reported outcome measure International Knee Documentation Committee questionnaire (IKDC), return to play and second ACL injury rates at 2 year follow up, while examining differences in second ACL injury rate relating to gender, graft type and previous ACL reconstruction (ACLR).

Conclusion
This study reports excellent re-injury, RTP and IKDC scores for a single surgeon in a single centre. The aim of this study was to report outcomes relating to the patient reported outcome measure International Knee Documentation Committee questionnaire (IKDC), return to play and second ACL injury rates at 2 year follow up, while examining differences in second ACL injury rate relating to gender, graft type and previous ACL reconstruction (ACLR).

2556 Board #220 May 31 11:00 AM - 12:30 PM
Frequency, Magnitude, And Location of Head Impacts In Collegiate Water Polo
Jenna J. Phreaner1, Derek C. Monroe2, Nicholas J. Cecchi3, Steven L. Small, James W. Hicks.

Water polo is a contact sport that carries a risk of head injury, well documented in epidemiological surveys of USA Water Polo members and physician reports from international competition. However, a growing body of evidence suggests that head impacts—even those that are asymptomatic and go unreported—can produce brain injury. We know from both survey data and prospective monitoring of NCAA Division I athletes that the risk for head impacts is dependent on player position. It is unknown if these patterns extend to other levels of competition. PURPOSE To describe patterns of head impacts in collegiate club water polo (ICWP) competition.

METHODS ICWP players (9 Men; 14 Women) were monitored during competition for head impacts using cap-worn inertial sensors to record impact time, head locations, peak linear acceleration (PLA), and peak rotational acceleration (PRA). Video recordings of competitions were reviewed to rule out false positives. The null hypotheses that impact frequencies were equally distributed among (i) player positions, (ii) game scenarios, and (iii) head locations were tested using Chi-square ‘goodness-of-fit’ tests. Significant differences were decomposed by chi-square tests. T-tests were used to test for differences in PLA and PRA between men and women.

RESULTS: Men sustained 52 head impacts and women sustained 43 head impacts over 12 games, mostly on offense [71.2%, 62.8%; p<.001] and mostly at the center position relative to perimeter positions [p=.0001]. Impacts were most often sustained at the back of the head among men and women [p>.03]. Impacts ranged from low to high magnitude for men [means(range): PLA=9.7 (7.5-94.1); PRA=1.0 (0.1-74.0)] and women [means(range): PLA=33.7 (16.2-72.6); PRA=4.0 (2.0-14.00) krad/s/sec]. Magnitudes did not differ between men and women [t(93)=1.98; p>.05]. CONCLUSION: We observed a pattern of risk among male and female ICWP players similar to a pattern previously reported in Division I men’s water polo players. Considering the growing body of evidence suggesting adverse effects of repeated head impacts, our data suggest that players, particularly at the center position, might benefit from wearing protective headgear that attenuates the forces of these head impacts.
The HSs were mostly located in Region 3 (43.8%), with 16.0% in states with
mandates. Overall, 4.0% reported compliance with all 17 NATA-IATF guidelines; 74.2% complied with ≥10. Controlling for age, the prevalence of reporting compliance with all 17 guidelines was higher in states with versus without mandates (PR=2.89, 95%CI: 1.53-5.45), and in Region 3 versus Region 1 (PR=4.86, 95%CI: 1.48-16.01). Similar results were found when examining compliance with ≥10 guidelines (states with versus without mandates PR=1.21, 95%CI: 1.11-1.30; Region 3 versus Region 1 PR=1.31, 95%CI: 1.19-1.44). CONCLUSIONS: Compliance with all 17 NATA-IATF guidelines was low, though many HSs complied with ≥10. Findings highlight the need to identify facilitators of proper implementation, particularly in relatively cooler areas (i.e., Region 1) where there may be less concern for EHI. State-level mandated NATA-IATF guidelines may help increase compliance.

PURPOSE: To characterize physical function level two weeks postoperative from
performance in healthy adult subjects. Methods: Eight adult subjects (50% female; Age:
31±6.0 yr, Ht: 175.3±6.8 cm, Wt: 77.2±7.5 kg, BMI: 25.3±2.2 kg/m²) provided their informed consent for participation. All subjects had at least a 3-month history of regular running (at least 30 min, 3 times per week) and were typical consumers of caffeine (at least weekly). Subjects first completed a progressive treadmill running protocol to determine VO2peak, with continuous measurement of VO2 (indirect calorimetry) and HR (wireless heart monitor). Blood pressure ( auscultation) and RPE ( Borg ratio scale) were assessed at each workload. Subjects

Effects of Pre-exercise Caffeinated Energy Drink Consumption on Running Performance.
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Purpose: The purpose of this study was to examine the effects of pre-exercise consumption of a commercially available caffeinated energy drink on running performance in healthy adult subjects. Methods: Eight adult subjects (50% female; Age: 31±6.0 yr, Ht: 175.3±6.8 cm, Wt: 77.2±7.5 kg, BMI: 25.3±2.2 kg/m²) provided their informed consent for participation. All subjects had at least a 3-month history of regular running (at least 30 min, 3 times per week) and were typical consumers of caffeine (at least weekly). Subjects first completed a progressive treadmill running protocol to determine VO2peak, with continuous measurement of VO2 (indirect calorimetry) and HR (wireless heart monitor). Blood pressure (auscultation) and RPE ( Borg ratio scale) were assessed at each workload. Subjects...
Caffeine ingestion is a common practice for individuals seeking to feel more awake or to improve performance. Rather than consuming caffeine all day long, a more recent trend is that of chewing caffeinated gum. Published research in this area, particularly in support of benefits to fine motor performance, is limited.

Caffeine ingestion is a common practice for individuals seeking to feel more awake or to improve performance. Rather than consuming caffeine all day long, a more recent trend is that of chewing caffeinated gum. Published research in this area, particularly in support of benefits to fine motor performance, is limited.
5 mg/kg of caffeine (CAFF) or placebo (PLB). Rating of perceived exertion (RPE) and heart rate (HR) were taken every two minutes during the trial. RESULTS: There was no detectable statistical difference between 5k performance between trials (p = .67) for CAFF (1036.2 ± 92.6 sec) vs. PLB (1043.4 ± 91.9 sec). Alomer readings were similar between CAFF and PLB trials for rectus femoris (RF) muscle soreness (p = .216) and vastus medialis oblique (VMO) muscle soreness (p = .679). There was no difference detected between CAFF and PLB trials for muscle weakness or tenderness (p = .824); there were also no differences between trials for RPE (p = .18).

CONCLUSIONS: The present study does not suggest that caffeine is effective at reducing muscle soreness, RPE or improving performance during exercise when DOMS is present.

2566 Board #230 May 31 11:00 AM - 12:30 PM Effects of 8 Weeks of Caffeine Supplementation on Protein Metabolism Markers in Resistance-Trained Men

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(No relevant relationships reported)

The use of caffeinated beverages and supplements is common among collegiate and recreational athletes, with 85% of people aged 18-24 consuming caffeine. The use of caffeine may influence the adaptations to resistance training by altering pathways in protein metabolism. PURPOSE: The purpose of this study was to determine if caffeine intake alters markers of protein metabolism, changes in strength gains, or body composition in response to an 8-week resistance training protocol. METHODS: Resistance-trained men (n=20; 22.1±2.4 y; 178.1±7.5 cm; 73.8±18.3 kg) were randomly assigned into a caffeine (CAFF; n=10) or placebo supplementation group (PLA; n=10). Participants were instructed to consume three caffeine (200 mg per capsule; 7.7±1.3 mg·kg⁻¹·d⁻¹) or placebo capsules daily. Both groups followed 4-day meat-free meal plans before study commencement, the 4th week of the protocol, and the 6th week of the protocol. Skinfold and 10-repetition max test (10RM) were performed to test body composition and strength, respectively, at each time point. Urine collection (24-hr) was performed to determine urinary 3-methylhistidine (3MH), urinary creatinine (Cr), and 3MH:creatinine (3MH:Cr). A 2x3 repeated measures MANOVA with a Bonferroni post-hoc test was used to test significance (p<0.05). RESULTS: After 8 weeks of supplementation and resistance training, urinary 3MH:Cr was significantly lower in CAFF than PLA (0.137±0.49 vs 0.178±0.48 μmol·mmol⁻¹·d⁻¹; p=0.016). There were no significant differences between groups in strength or body composition. CONCLUSION: From this study demonstrated consuming caffeine does not negatively affect common adaptations to resistance training, and may improve the metabolic environment to promote muscle protein synthesis. Young, resistance-training men who habitually consume ergogenic doses of caffeine may impart proteolytic suppression that can benefit a hypertrophic training program.

2567 Board #231 May 31 11:00 AM - 12:30 PM The Effect of Ingestion of Caffeine, Creatine, and Amino Acids On Anaerobic Performance

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(No relevant relationships reported)

Introduction: Pre-workout supplementation has become a growing interest in the sports nutrition industry. Specifically, caffeine, creatine, and beta alanine have been combined in an effort to enhance performance. Purpose: The purpose of this study was to examine the effect of the consumption of the combination of caffeine (150mg), creatine (1g), and amino acids (1.6g) in habitual and non-habitual caffeine users in anaerobic performance. Methods: 24 recreationally active college-age students (age 21.6±2 yr, ht. 176.8±16 cm, body mass 73.8±18.3 kg, 15% body fat) volunteered to participate in a randomized, double-blind crossover study. Two Wingate Anaerobic Power Test (WAPT) familiarization trials were conducted prior to entry into the study. Subjects refrained from vigorous activity 24 hours before testing, maintained their normal diet, and habitual caffeine users continued their habit, while non-habitual caffeine users did not ingest caffeine for 2 weeks prior to testing. Fasted subjects ingested either the supplement (SUP) or a taste, texture and color matched placebo (P). 30 minutes prior to a WAPT trial, subjects ingested 50g blood lactate was consumed 3 minutes post all trials. Results: Mean for Peak Power (PP) was 1082.1 ± 326.1 and 1085.3 ± 357.3 watts, Mean Power (MP) was 545.2 ± 226 and 579.9 ± 190.6 watts, Fatigue Index (FI) was 77.4 ± 16 and 74.8 ± 7.2% and Total Work (TW) was 1722.7 ± 621.3 vs 1738.7 ± 671.5 joules for P and SUP trials, respectively. Statistical analysis by factorial ANOVA (p<0.05) revealed no significant difference between habitual and non-habitual caffeine users across both conditions. Conclusion: SUP ingestion does not improve anaerobic performance regardless of previous caffeine ingestion history at the commercially available levels evaluated in this study.

2568 Board #232 May 31 11:00 AM - 12:30 PM The Physiological Responses of Caffeine Supplementation During Repeated-Sprint Activity

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(No relevant relationships reported)

Caffeine is one of the most widely used drugs in the world due to its benefits of increasing mental and physical capabilities. Caffeine also is commonly used as an ergogenic aid when performing repeated-sprint activity (RSA). PURPOSE: The purpose of this study is to examine the effects of 200 mg of caffeine during RSA on heart rate (HR), rating of perceived exertion (RPE), blood lactate concentration (BLa), and sprint time (ST). METHODS: Thirty-two students (Age: 22.19 ± 2.29 years) participated in the study. The study followed a randomized crossover design, in which each participant ingested either 200 mg of caffeine or placebo 45 minutes prior to sprinting. The sprinting protocol consisted of three sets of six maximal-effort 30-meter sprints. Each sprint covered a 15-meter distance between the starting and the secondary marker, such that each subject sprinted down to the secondary and back to the starting. Each of the sprints in a set were separated by a total of 20 seconds of active recovery. Following each set, HR, BLA, ST, and RPE were recorded. RESULTS: The caffeine trials were not significantly different than the placebo for HR and RPE. However, for RPE, there was a main effect for time (F(3, 93) = 292.811, p < 0.001). The caffeine trials (Resting: 1.39 ± 0.28 mmol/L; Set 1: 11.36 ± 2.38 mmol/L; Set 2: 12.36 ± 3.82 mmol/L; Set 3: 13.67 ± 2.49 mmol/L) elicited increased BLa compared to the placebo (Resting: 1.37 ± 0.53 mmol/L; Set 1: 2.94 ± 2.43 mmol/L; Set 2: 11.46 ± 2.87 mmol/L; Set 3: 11.83 ± 2.55 mmol/L). The caffeine trials (Set 1: 6.78 ± 0.58 secs; Set 2: 6.81 ± 0.55 secs; Set 3: 6.85 ± 0.57 secs) also produced a decreased average ST compared to the placebo (Set 1: 7.90 ± 0.64 secs; Set 2: 7.92 ± 0.62 secs; Set 3: 7.12 ± 0.63 secs). For the average ST, there were significant main effects for condition (F[1,31] = 36.839, p < 0.001) and time (F[2,62] = 5.806, p = 0.006). CONCLUSION: Caffeine supplementation of 200 mg elicits an increase in RSA in college-aged non-athletes.
Higher rate of force/development (RTD) and peak torque (PT) are associated with sports performance, lower risk of injuries and better recovery from injury. For elderly individuals, a higher RTD and PT are often associated with independence, quality of life, and reduced risk of falls. Evidence has shown that caffeine may enhance RTD in younger adults, but no information are available for elderly.

**PURPOSE:** This study investigated the effect of a low dose of caffeine on PT and RTD of older (OG) and younger adults (YG).

**METHODS:** Fifteen older (69±6 years; 70±12 kg; 169±6 cm) and 15 younger men (27±4 years; 78±9 kg; 176±7 cm) were tested for PT and RTD of the plantar flexors using a Biodes 2 dynamometer. They were familiarized with testing conditions and were tested in the first visit to the laboratory. The two experimental (3 mg/kg of caffeine or placebo) conditions were tested in two days, separated by at least 48 h. Subjects performed four maximal isometric voluntary contractions (MIVC) before and after supplementation. PT, RTD 0 to 50 ms (RTD0-50) and RTD 100 to 200 ms (RTD100-200) were normalized by body mass for comparisons. The Shapiro-Wilk test was used to check data normality and the mixed-model ANOVA was used to investigate and PT were normalized by body mass for comparison.

**RESULTS:**: No difference (p>0.05) time and group interaction was found for PT (OG: -0.6%; YG: +1.2%); RTD0-50 (OG: +3.5%; YG: +4.8%); and RTD100-200 (OG: -3.1%; YG: -2.3%). As expected, placebo did not show any significant difference.

**CONCLUSION:** A low dose of caffeine did not affect PT and RTD in older and young adults. It could be hypothesized that a greater dose of caffeine may be required to improve muscle function in young and older subjects.

**Keywords:** Caffeine, carbohydrate, rinsing, ergogenic, CAF rinsing on strength and muscular endurance performance.

**Discussion:** Previous studies have shown that combined or separated CHO and CAF mouth rinsing can improve sprint performance. However, our results are consistent across both sexes as well as determine whether the same ergogenic effect can be seen following similar dosages to those who are not habitual caffeine users. Further, future investigations should establish the efficacy of caffeine during varying-duration HIFT sessions and among female HIFT athletes.

**METHODS:**: A low dose of caffeine did not affect PT and RTD in older and young adults. It could be hypothesized that a greater dose of caffeine may be required to improve strength and endurance performance.
Cytochrome P450 1A2 (CYP1A2) is a liver enzyme that is responsible for 95% of caffeine metabolism, while adenosine A1 receptors (ADORA2A) are antagonized by caffeine. Functional single nucleotide polymorphisms (SNP) in CYP1A2 (−163 C>A; rs762551) and ADORA2A (1083 T>C; rs5751876) have been reported to influence various physiological responses to caffeine. PURPOSE: To examine if SNPs in CYP1A2 or ADORA2A influence the effect of caffeine on the postprandial glucose (GLU) response to a carbohydrate feeding (CHO). METHODS: Sixteen healthy males (mean ± SD, 25 ± 4 y, 94 ± 15 kg, 178 ± 6 cm) were genotyped for rs762551 (AA; n=9, AC/CC; n=7) and rs5751876 (CC; n=6, CT/TT; n=10). During two separate visits, blood draws were performed prior to and 30- and 60-min after the subject consumed either a liquid CHO meal (0.75g CHO/kg) or the same liquid CHO meal with 4 mg/kg of pharmaceutical grade caffeine (CHO + CAFF) in random order. Trapezoidal areas under the GLU curve (AUCs) were calculated for each participant in each condition and subsequently analyzed with separate two-way mixed factorial ANOVAs. RESULTS: Areas under the GLU curve (AUCs) were calculated for each participant in each condition. For CYP1A2, there was no significant genotype x condition interaction (p=0.87), nor main effects for genotype (p=0.20) or condition (p=0.22). For ADORA2A, however, there was a genotype x condition interaction (p=0.03) (Fig 1). In the CC allele-carriers, the GLU AUC was greater during the CHO + CAFF than CHO condition (p=0.026, 95% CI of difference [−842.9, 701.9]). CONCLUSION: The caffeine-induced impairment in postprandial glycaemia is influenced by ADORA2A 1083 T>C, but not CYP1A2 -163 C>A genotype.
uncoupling protein 3 (UCP3), and cytochrome c oxidase (COX) did not change to ES treatments during and after C2C12 cell differentiation. However, the expression of phosphorylated AMP-activated protein kinase (AMPK), a metabolism-associated protein, was increased in response to 1.0 mg/ml ES (p<0.05) in both during and after cell differentiation. CONCLUSION: The findings suggest that ES may enhance skeletal muscle energy metabolism by means of augmented AMPK activity, and may relate to elevated endurance exercise capacity. Supported by Bizen Chemical Co., LTD

2577 Board #241 May 31 11:00 AM - 12:30 PM The Effect Of Eleutherococcus Senticosus On Adipocyte Differentiation And Lipid Accumulation In 3T3-L1 Cells
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(No relevant relationships reported)

PURPOSE: Eleutherococcus senticosus (ES) is a kind of Araliaceae and used as a medical plant. The principal component of ES is a glycoside such as triterpenoid and more than 16 kinds of components exist (e.g. sesamin, eleutheroside B, isoflavind, chlorogenic acid). Given the finding that an intake of ES for 8 weeks enhances fat utilization and endurance exercise capacity in human study (Kuo et al., 2010), it is hypothesized that fat mobilization from adipocytes is increased. However, the effect of ES on fat metabolism as well as lipolysis and lipogenesis in adipocytes is unknown. The aim of this study was to investigate the effect of ES on cell differentiation, lipolytic and lipogenic activities, and those related protein expressions in differentiating 3T3-L1 adipocytes. METHODS: 3T3-L1 adipocytes were treated with 0.2mg/ml, 0.5 or 1.0mg/ml ES for 72 hours. Triacylglycerol (TAG) content was biochemically measured. The expressions of adipocyte differentiation- lipolytic-, and lipogenic-associated proteins were analyzed by Western blotting. RESULTS: ES treatment (1.0mg/ml ES) significantly decreased intercellular lipid accumulation (TAG content) compared with control (P<0.01). The expressions of lipolysis-associated proteins such as adipase triglyceride lysase (ATGL), perilipin 1 and CGI-58 were significantly lower in the ES compared with control (p<0.01). On the other hand, ES significantly decreased the expression of protein-potentiator-activated receptor γ (PPARγ) (p<0.01), while enhanced AMP-activated protein kinase (AMPK), acetyl-CoA carbohydrate (ACC) and Akt phosphorylation (P<0.05). Furthermore, the expression of lipogenesis-associated protein (e.g. Phosphoprenylpyruvate carboxykinase (PEPCK)) was lower in ES treated cells than in control (p<0.05). CONCLUSION: These results suggested that ES suppressed intracellular lipid accumulation during adipose differentiation in 3T3-L1 adipocytes. The mechanisms underlying this effect of ES might be inhibition of adipocyte differentiation by down-regulation of PPARγ, and suppression of fatty acid synthesis by decreased expression of PEPCK as well as augmented phosphorylation of AMPK and ACC. Funding This study was supported by grants from the Bizen Chemical Co., LTD.

2578 Board #242 May 31 11:00 AM - 12:30 PM Effect of Aerobic and Resistance Exercise on Fatty Liver in Mice Model
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(No relevant relationships reported)
The role of exercise in treatment of fatty liver has been recognized clinically, but the underlying molecular mechanism still unclear. PPARα is a hormone activated nuclear receptor and transcription factor, which is important for lipid metabolism, adipogenesis and insulin regulation.

PURPOSE: This research aimed to explore the effect of aerobic exercise combined with resistance training on fatty liver induced by high fat diet in mice, and the potential mechanism related with PPARα pathway.

Methods: Thirty male 8 weeks old C57BL6 mice were randomly divided into sedentary control group (CON), high-fat diet intervention group (HF) and high fat diet with exercise intervention group (HFE). After 16 weeks of high fat diet, HFE mice were subjected to 1 hour treadmill running at 15 m/min and 9° incline or 1--vertical ladder with an 85° incline climbing for 16 times. Aerobic treadmill running and resistance climbing were alternated for six days for 8 weeks. Blood samples were collected to measure the liver function. The liver tissues were stained with oil red O. PGC-1α and PPARα expression in liver tissue was detected by Western-blot. Blood samples were collected to measure the liver function. The liver tissues were stained with oil red O. PGC-1α and PPARα expression in liver tissue was detected by Western-blot.

RESULTS: The study found that high fat diet significantly increased body weight, liver index (32.93±0.59g vs 46.88±1.27g, P<0.001 vs 0.051±0.003 vs 0.05) and serum transaminase AST and ALT (249.63±17.59u/L vs 244.25±39.89 u/L, 297.25±8.81 u/L vs 169.88±38.87 u/L, P < 0.05) in HFE mice as compared with HF mice. Expression of PPARα in HFE was increased as compared with HF mice (p < 0.05), while the expression of PGC-1α was found decreased (p < 0.05) at the mean time. CONCLUSION: These results indicated that combined exercise for eight weeks might ameliorate high fat diet induced hepatic lipid metabolism disorder by regulating the expression of PGC-1α and PPARα.

2579 Board #243 May 31 11:00 AM - 12:30 PM Aerobic Interval Training Improve Effect of Liraglutide on Hepatic Lipid Steatosis in Diabetic Rats with NASH
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(No relevant relationships reported)

PURPOSE: The nonalcoholic steatohepatitis (NASH) that is usually accompanied by type 2 diabetes, which characterized by hepatic steatosis, is roaring in the worldwide. It is clear that aerobic interval training (AIT) is an effective means to reduce visceral fat and protect liver. The liraglutide has also antiadipic effect. Here, we are trying to explore whether AIT combined with liraglutide have a better effects on reducing hepatic lipid steatosis in diabetic rats.

METHODS: 60 Wistar male rats were divided into control group (CON), diabetes group (DM), DM+AIT group (DE), DM+Liraglutide group (DL) and DM+AIT+Liraglutide group (DLE). The diabetes model was induced by high fat diet and STZ. Liraglutide (subcutaneous injection, 0.2mg/kg/day) and AIT (treadmill, 7 min 85%-95%VO2 max interspersed with 3 min intervals at 50-60%VO2 max, 4 times/d, 5d/week) were maintained for 8 weeks. The fasting blood glucose (FBG), triglyceride (TG), was measured by enzymatic method; the serum insulin, ALT, AST, FFA and DAG in liver were analyzed by ELISA. The CD36, CPT-1A, and PPARα expression in liver were analyzed by western blotting.

RESULTS: Compared with CON, the FFA and DAG in DM increased by 89% and 67.6% (P<0.01), and with increased serum ALT and AST (174% and 78.9 %, P<0.01). The ALT, AST, FFA and DAG decreased 39.33%, 19.05%, 43.02%, and 33.08%, respectively, in DLE compared to DM. There is a significant interaction between liraglutide and AIT on decreased parameters. In addition, the CD36 expression were 64%, 77% and 75% lower in DE, DL and DLE than DM (P<0.01), and the CPT-1A expression was higher 120%, 141% and 86% in DE, DL and DLE than DM (P<0.01). The PPARα expression were increased 228%, 116% and 124% in DE, DL and DLE, compared to DM (P<0.01).

CONCLUSIONS: Aerobic interval training combined with liraglutide have a better effect on lipid steatosis in diabetic rats with NASH than separate AIT or liraglutide intervention.

Comparison of liver function and lipid steatosis

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<th>DE</th>
<th>DL</th>
<th>DLE</th>
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<tr>
<td>ALT(U/L)</td>
<td>8.87±1.8</td>
<td>24.28±8.99</td>
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<td>FFA (μmol/mL)</td>
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<td>419.55±6.55</td>
<td>257.60±3.45</td>
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<td>239.04±18.18</td>
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<tr>
<td>DAG (ng/mL)</td>
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<td>5.23±0.45</td>
<td>3.70±0.16</td>
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#P<0.01 compared with CON. *P<0.05,**P<0.01 compared with DM

2580 Board #244 May 31 11:00 AM - 12:30 PM The Effect Of Exercise On Hypothalamic Kiss-1 Of Rats With Post-weaning High Fat Diet
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(No relevant relationships reported)
Kisspeptins, encoded by the Kiss1 gene, is unanimously recognised as essential regulators of gonadotropin secretion. It is mainly expressed in the arcuate nucleus in the hypothalamus, and have a direct role in regulating energy balance.

PURPOSE: To explore high fat diet(HFD) and moderate-intensity treadmill training (MIT) in modulating the hypothalamic expression of kiss-1 mRNA relative expression and kisspeptin-immunoreactivity in 3 weeks post-weaning rats.

METHODS: 3 weeks SD rats (weight=58.5±2.6g) after 5 weeks high fat feeding, 30 HFD 8-weeks SD rats were randomly assigned to sedentary (HS, n=15), MIT (n=15), and 15 normal diet 8-weeks SD rats were assigned as sedentary (SS, n=15) group. During the following five weeks, HS group rats were continued expose to HFD. MIT group did the 60%-70%×VO2max treadmill training (5 days/week, 1 hour/day). RT-qPCR and
immunohistochemistry were used to test the expression of hypothalamic Kiss1mRNA and the number of kisspeptin neurones in each group. RESULTS: After 5-weeks high fat feeding, the HFD rats were heavier than normal diet group (308.96±28.38 g vs. 324.52±37.52 g, P=0.139), and had more expression of kiss-1 mRNA (1.55±0.59 vs. 2.47±0.81, P=0.05) in the hypothalamus. The number of kisspeptin neurones in the ARC HFD group were also significantly higher than SS group (8.23±3.17 vs. 15.46±4.15, P=0.05). After 5-weeks training, MT group weighted less than HS group (309.83±21.05 vs. 324.52±37.52, P=0.05). In the same conditions of HFD intervention, compared with HS group, MT group had lower hypothalamic expression of kiss-1 mRNA (2.47±0.81 vs. 1.61±0.22, P=0.05), and the number of kisspeptin neurones in ARC were also significantly lower than HS group (15.46±4.15 vs. 12.08±2.56, P=0.05). CONCLUSIONS: High fat diet could increase the expression of kiss-1 mRNA and the number of kisspeptin neurones in ARC while increasing body weight, though moderate-intensity treadmill training could reduce the stimulating effect of high fat diet induced weight gain and changes hypothalamic expression of kiss-1 and kisspeptin.

RESULTS: IMTG content (% area stained) was greater when using bodipy compared to ORO (P=0.006), and bodipy detected more LDs (P=0.03) with a greater mean LD diameter (P=0.03) than ORO. Region distribution was also different for the two dyes with IMTG content with bodipy being greater in the central vs. peripheral region (5μm from plasma membrane) in both type I (central: 3.1±0.5% vs. peripheral:2.8±0.5%) and type IIa fibres (central:1.4±0.3% vs. peripheral:1.3±0.2%, P=0.036). The opposite was true when using ORO, with a greater IMTG content observed in the peripheral vs. the central region for all fibre types (P=0.013). These regional differences in IMTG content for bodipy and ORO were attributed to differences in LD number (P=0.039). Following exercise, using bodipy, IMTG content was decreased in both the peripheral (P<0.01) vs. (P=0.04) and central regions (-63±21%, P=0.016) of type I fibres. However, using ORO only a significant decrease in IMTG content in the peripheral region of type I fibres was observed (-85±19%, P<0.021). CONCLUSION: Bodipy is preferable to investigate IMTG in skeletal muscle due to its superior LD detection capabilities and specificity for detecting IMTG avoiding labelling of membrane structures, compared to ORO. We demonstrate the importance of this in the context of regional distribution of IMTG detected using ORO and bodipy and differences in regions-specific IMTG utilisation during exercise. Therefore, it is possible that the choice of lipid dye could impact the conclusions drawn in studies in which subcellular IMTG distribution is considered.

Purpose: The study aims to investigate the effect of 8 weeks of moderate intensity exercise on the level of autophagy in skeletal muscle of obese rats. Based on this, further explore the effective exercise load for promoting the skeletal muscle autophagy and the possible mechanism of enhanced autophagy in skeletal muscle of exercise-trained rats. Methods: 40 11-week-old male SD rats were selected after 8 weeks adaptive feeding and divided into normal control group and high-fat group. These groups then further subdivided into exercise group(control trained group(CT), obese trained group(OT)) and sedentary groups(control sedentary group(CS), obesity sedentary group(OS)). CT

**Isomaltulose**, which is a disaccharide composed of glucose and fructose, is known for suppressing rapid elevation of blood glucose level and excess secretion of insulin. However, it is unclear how pre-exercise isomaltulose ingestion alters energy metabolism during subsequent exercise in young adults. PURPOSE: In this study, we investigated the effects of pre-exercise isomaltulose ingestion on carbohydrate, fat and energy metabolism during subsequent exercise of young adult. METHODS: Twelve young healthy participants (6 females and 6 males, 23.1±1.3 yrs) performed three experimental trials in a randomized counterbalanced design, which consisted of 60 min of pre-exercise resting with ingesting a isomaltulose drink (ISO), a sucrose drink (SUC), or plain water (WAT), 30-min of treadmill running at an individually pre-determined speed (50–60%VO2max), and 60-min of post-exercise resting. During the trials, we continuously recorded heart rate (HR), blood pressure (BP), VO2, and VCO2. We also calculated energy expenditure (EE), respiratory quotient (RQ), carbohydrate oxidation (CHO) and fat oxidation (FO) during exercise. RESULTS: There were no significant effect of trial in HR and BP during exercise. Nevertheless, EE during exercise had a significant effect of trial (ISO: 377.3±26.2 kcal, SUC: 258.1±28.6 kcal, WAT: 258.1±28.6 kcal, P<0.05). CONCLUSION: These results indicate that EE increases in the SUC trials might be attributed mainly to facilitation of carbohydrate oxidation and that EE increases in the ISO trials might be mainly due to facilitation of carbohydrate and fat oxidation. CONCLUSION: These results suggest that pre-exercise isomaltulose ingestion facilitated fat oxidation and energy metabolism during subsequent exercise on healthy young adults.
and OT did the 60%-70% × V02max treadmill training (5 days/week, 60 min/day). After the 48th at the end of the training, the Lc3b,Beclin1 mRNA expression were tested in metabolic group.

Results: After 8 weeks high fat diet intervention, the body weight of OS group was significantly higher than CS group (546.98 ± 72.07 gvs. 667.96 ± 46.97 g, p < 0.01). After 8 weeks training, OS group were heavier than OT group (667.96g ± 46.97 vs. 586.03 ± 32.77g, p < 0.01) and OT group has more expression of Lc3b mRNA (0.93 ± 0.06 vs. 0.75 ± 0.11, p < 0.05), Beclin1 mRNA (0.86 ± 0.03 vs. 1.33 ± 0.11, p < 0.01).

Conclusions: 8 weeks high fat diet can significantly reduce the skeletal muscle autophagy activity in obese rats, while 8 weeks of moderate-intensity exercise intervention can improve the obese rats the skeletal muscle autophagy activity.

Objective: To investigate the possible underlying mechanisms of why high-intensity interval training can significantly reduce the weight of visceral fat: differences in HSL (Hormone Sensitive Lipase) phosphorylation at different Sites (subcutaneous and visceral).

Methods: Female c57BL/6 mice were fed a high-fat diet to produce a diet-induced obesity animal model. After successful modeling, 36 obese mice were randomly divided into high-fat diet control group (HFD group), moderate-intensity continuous training group (MICT group) and high-intensity interval training group (HIIT group). The HFD group was fed a high-fat diet for 12 weeks without exercise. The MICT group continued to exercise on a treadmill of approximately 60% VO2max with high-fat diet while the HIIT group were given a high-intensity interval training of approximately 100% VO2max peak intensity with high-fat diet. At the end of the 12 weeks training, mouse body weight, Lee’s index, subcutaneous (subcutaneous) and peri-uterine (visceral) fat weights were measured. Hepatocyte fat infiltration was observed by HE staining. Serum lipids (TC, TG, HDL-C, and LDL-C) were measured by colorimetry. HSL protein expression and phosphorylation of Ser563, Ser660 were measured by Westernblot.

Results: Compared with the HFD group as the baseline, there was a significant body weight decrease in the MICT group and HIIT group (p < 0.01). HIIT and MICT showed no significant difference in subcutaneous fat reduction, but compared with MICT, HIIT could significantly reduce the periumbilical visceral fat (p < 0.01). Liver droplet infiltration of HIIT group was lower than HFD and MICT, and LDL-C of HIIT significantly decreased (P < 0.05); Phosphorylation of Ser563 in peri-uterine fat of HIIT was significantly higher than HFD and MICT (p < 0.05). Ser660 of ingunal fat was significantly higher in MICT than in HFD HIIT groups (p < 0.05). Conclusion: HIIT could reduce visceral fat, relieve hepatic fat lesions, and reduce LDL more than moderate-intensity continuous training. This is related to the fact that HIIT can specifically increase the phosphorylation of HSL-ser563 in visceral adipose tissue and promote fat hydrolysis.

Walking represents a popular, convenient and relatively safe form of activity that can easily be incorporated into weight management programs. The energy expenditure associated with walking has been reported to be either linearly or slightly exponentially related to speed. Thus, interval walking training has been developed as a novel free-linear training modality that improves physical fitness and cardiovascular risk factors in humans. Purpose: To determine the effect of interval walking exercise (INT) and constant speed walking exercise (CON) on whole body energy expenditure and fat utilization in healthy sedentary adults. We hypothesized that interval walking exercise increases whole body fat utilization and energy expenditure to a greater extent, compared with the constant speed walking exercise. Methods: This study was set as randomized crossover design. Nine healthy sedentary individuals (BMI ≥ 25 kg/m² and 18-50 yrs) were recruited. Initially nine subjects were randomly assigned into CON or INT group. Then, CON became INT and INT became CON. The constant speed walking consists of a single bout of 60 min walking exercise at 45% of VO2max on a treadmill. The interval walking consists of a single bout of 60 min walking exercise with cycles of alternating 3-min slow (30% of VO2max), 3-min moderate (45% of VO2max), and 3-min fast (60% of VO2max) walking. Energy expenditure and fat usage were determined via indirect calorimetry during rest and walking exercise. Two-way ANOVA was used to determine differences in energy expenditure and fat utilization between the groups. Results: The rate of fat utilization (g/min) was higher in INT group, compared with CON (2.996 ± 0.13 kcal/min vs. 2.564 ± 0.13 kcal/min, respectively, P = 0.046) during 60 min walking. The rate of total calorie expenditure (kcal/min) from body fat was also higher in INT group, compared with CON (2.996 ± 0.13 kcal/min vs. 2.564 ± 0.13 kcal/min, respectively, P = 0.028) during 60 min walking. Conclusion: Our data show that an interval type of walking pattern compared to walking at a constant speed, could be better to expend more energy from body fat. Thus, these findings may provide a better exercise strategy to maintain a healthy body weight in sedentary individuals and to reduce body weight/fat potentially in obese people.

TEXT: The lipodystrophy syndrome affects several people living with HIV under antiretroviral therapy (ART) being characterized by visceral adipose tissue accumulation and atrophy of subcutaneous adipose tissue (SAT) associated to metabolic disturbances and connective matrix (ECM) protein deposition and tissue fibrosis. On the other hand, concurrent training (CT) has been adopted as an efficient therapy to reduce severities caused by ART.

Purpose: Hence, we aim to determine the effects of twelve weeks of CT in remodeling of adipose tissue, ECM proteins and gene expression of SAT in people with HIV.

Hence, we aim to determine the effects of twelve weeks of CT in remodeling of adipose tissue, ECM proteins and gene expression of SAT in people with HIV.

Methods: The MICT group continued to exercise on a treadmill of approximately 60% VO2max and visceral fat (p < 0.01). Liver lipid droplet infiltration of HIIT group was significantly higher than HFD and MICT, and LDL-C of HIIT significantly decreased (P < 0.05); Phosphorylation of Ser563 in peri-uterine fat of HIIT was significantly higher than HFD and MICT (p < 0.05). Ser660 of ingunal fat was significantly higher in MICT than in HFD HIIT groups (p < 0.05). Conclusion: HIIT could reduce visceral fat, relieve hepatic fat lesions, and reduce LDL more than moderate-intensity continuous training. This is related to the fact that HIIT can specifically increase the phosphorylation of HSL-ser563 in visceral adipose tissue and promote fat hydrolysis.

Background: Exercise following a high-fat meal can ameliorate lipid peroxidation but the effects on DNA single strand breaks and base oxidation currently remain unknown.

Purpose: To determine the effects of moderate intensity postprandial exercise on biomarkers of DNA damage and oxidation and inflammation.

Methods: Twelve apparently healthy, recreationally active, male participants (21.8 ± 3.7 years; 178.6 ± 6.2 cm; 83.6 ± 14.9 kg; 51.2 ± 8.6 ml kg⁻¹ min⁻¹) completed a randomized, crossover study consisting of two trials: (1) a high-fat meal alone (resting control) or (2) a high-fat meal 2 h before 60 mins of moderate intensity exercise (65% maximal heart rate). Venous blood was collected at baseline, prior to exercise (2 h after meal ingestion), immediately post-exercise, and at 2 and 4 h post-exercise. Biomarkers of oxidative damage (DNA single-strand breaks - comet assay); DNA base oxidation (formamidopyrimidine DNA glycosylase [FPG] - comet assay); lipid peroxidation; ascorbyl free radical metabolism and inflammation (retinol-binding protein-4 and erythrocyte sedimentation rate) were determined using conventional biochemical techniques.
RESULTS: DNA percentage tail intensity increased following the test meal, remaining elevated at 4 h post-exercise (p=0.05; main effect for time). Similarly, FPG increased postprandially and remained elevated at 4 h (p=0.05; main effect for time). Likewise, a persistent increase in lipid hydroperoxides and in ascorbyl radical metabolism was observed (p=0.05; main effect for time). Erythrocyte sedimentation rate increased postprandially and remained elevated at 2 h (p=0.05; main effect for time) while no changes were detected in retinol-binding protein-4.

CONCLUSIONS: Ingesting a high-fat meal induced a state of postprandial oxidative stress, including DNA damage and base oxidation, that remained unaltered by one hour of postprandial exercise.

E-42 Free Communication/Poster - Behavioral Aspects of Exercise
Friday, May 31, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

2599 Board #253 May 31 9:30 AM - 11:00 AM
Correlates Of Workout Adherence: Golf Skill, Exercise Enjoyment, Life Satisfaction, And Mood Of Senior Golfers
Lynn A. Darby, FACSM1, Bonnie G. Berger1, David R. Owen2. 1Bowling Green State University, Bowling Green, OH. 2Brooklyn College of the City University of New York, Brooklyn, NY.
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No relevant relationships reported

Many senior golfers (>50 yrs of age) desire to improve their golf scores, however, they may, or may not participate in workout programs to achieve their golf goals.

PURPOSE: To investigate whether individualized, “take-home”, golf-specific fitness and exercise skills would motivate golfers to work out, and to explore the relationships between workout adherence, golf fitness and skill, life satisfaction, exercise enjoyment, and mood before and after a pre-season, golf-specific training program. METHODS: Before and after eight weeks of golf-specific training programs, senior golfers (Age ≈ 63 ± 6.8 yrs; N=10; 1 male, 9 females) completed assessments. These included the Teller Performance Institute (TPI) (17 tests; one score) and Big12 (golf swing analyses and error scores), golf histories, Life Satisfaction Scale (LS), Physical Activity Enjoyment Scale (PACES), Profile of Mood States (POMS), and 6-min walk tests (6MWT). Pearson correlations and repeated measures ANOVAs were calculated (pilot study: α = 0.10). RESULTS: Before and after training, TPI-fit scores were 18.1 ± 4.3, 14.4 ± 6.9 (M ± SD), and the Big12 scores were 12.7 ± 9.4, 8.0 ± 3.7. These scores changed in desirable directions (lower is better). The number of workouts completed by the golfers was 14 ± 9 (M ± SD), or 43% of 32 workouts. After eight weeks, the number of workouts completed was positively correlated with PACES Trait (r = −55, p = 0.05) and Age of Beginning Golf (r = −85, p = 0.01), and negatively correlated with LS (r = −51, p = 0.07). Those who enjoyed exercise and started golf later in life adhered to the workouts. In contrast, those who had high life satisfaction and started golf at younger ages did not adhere to the prescribed golf workouts. When measured after the eight-week training program, golfers who reported more exercise enjoyment had more desirable mood changes after the 6MWT (r = −72, p = 0.01), began golf at a later age (r = −50, p = 0.07), but had higher h-9 hole scores (r = 47, p = 0.01). CONCLUSION: Senior golfers who wanted to improve their golf scores adhered to less than half of the prescribed golf-specific workouts when working out alone. Therefore, future studies of senior golfers should investigate group training for golf workouts, and examine the possible contributions of peer support and social interactions to enhance workout adherence.

2590 Board #254 May 31 9:30 AM - 11:00 AM
Physical Activity Is Associated With Grit And Resilience In College Students: Is Intensity The Answer?
Emily R. Dunston, Martin Waldrip, Shelby Christe, Amber Skillingsstad, Amnina Vahk, Katrina Taylor, Eastern Washington University, Cheney, WA. (Sponsor: Chantal A. Vella, FACSM)

No relevant relationships reported

Physical activity (PA) has been positively associated with academic performance; however, as students transition from high school to tertiary education their PA levels often decrease. The transition to tertiary education is a substantial life event, requiring a combination of academic and social determinants to succeed. Little research has investigated the associations between PA and determinants of academic success, such as grit and resilience. PURPOSE: To determine the associations among PA, grit and resilience in undergraduate students.

METHODS: Undergraduate students (n=244; 165 females, age 21.1±2.9 years) participated in an online survey. Self-reported PA was collected using the International Physical Activity Questionnaire. Grit was measured using the Short Grit Scale and resilience was determined with the Connor-Davidson Resilience Scale. Linear regression analyses were used to determine associations among grit, resilience, and PA. One-way ANOVAs were used to determine differences in grit and resilience across tertiles of PA.

RESULTS: Vigorous PA was positively associated with resilience (β=0.17, p=0.01) and the perseverance of effort grit domain (β=0.19, p=0.004), while being negatively associated with the consistency of interest grit domain (β=−0.22, p=0.001).

CONCLUSIONS: Vigorous PA was associated with both grit domains (p<0.03) but not resilience (p=0.38). Further, resilience (tertile 1: 34.1±5.3 vs. tertile 2: 36.8±4.9, p=0.005) and the perseverance of effort grit domain (tertile 1: 4.1±0.7 vs. tertile 3: 4.4±0.5, p<0.01) were significantly higher with increased vigorous PA. Consistency of interest grit domains (tertile 1: 2.9±0.9 vs. tertile 3: 2.6±0.8, p=0.04) were lower with higher levels of vigorous PA. There were no differences in grit and resilience across tertiles of moderate PA (p>0.05).

CONCLUSIONS: Vigorous PA was positively associated with the perseverance of effort grit domain and resilience but negatively associated with the consistency of interest grit domain. Moderate PA was also associated with grit but not resilience in this cohort. The findings suggest that intensity of PA may play a role in grit and resilience levels in students. Future research may be beneficial to determine if participation in vigorous PA can increase grit or resilience in college students.

2591 Board #255 May 31 9:30 AM - 11:00 AM
Examining Intra-Individual Variability of Perceived Physical Discomfort In Young Adults: A Potential Exercise Antecedent
Cory Thomas Beaumont, Kelley Strohacker, FACSM. The University of Tennessee, Knoxville, Knoxville, TN.
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No relevant relationships reported

Eccological Momentary Assessment (EMA) allows the observation of intra-individual variance in cognitive, perceptual, psychological, and contextual variables that may impact recurrent health behaviors such as exercise. Perceptions of physiological states (e.g. pain, illness) likely influence behaviors, but most assessments are cross-sectional. PURPOSE: To determine preliminary estimates of intra-individual variability in perceived physiological states. METHODS: A secondary analysis was conducted using data from young, healthy adults (N=29) undergoing EMA of exercise antecedents. Participants were sent four surveys per day across 14 days (56 total surveys). The extracted variables pain, stiff, and achy were scored on a seven-point Likert scale; 0 = not at all, 3 = moderately, 6 = extremely. Individual item scores were summed to create a “physical discomfort” score (Cronbach’s α=.847). Data were retained from compliers who completed ≥75% of EMA surveys. Compliers (n=20, 23±3 yrs, BMI=25.6±3.1 kg/m², 60% female) completed 89±5% of surveys. Missing data were imputed with the participant’s daily means for that respective variable. Two-way mixed intra-class correlation coefficients (ICC) were calculated with 95% confidence intervals (CI) for pain, stiffness, achiness, and physical discomfort across all 56 time blocks and across 14 daily means. ICC=0.5±0.75, between 0.75-0.9, ≥0.9 indicate poor, moderate, good, or excellent consistency. RESULTS: Indices of physical discomfort were generally low (M(SD) pain 0.9±1.2, achy=1.3±1.4; stiff=1.5±1.5). Poor consistency was observed across time points for pain (ICC=0.32; CI=0.21-0.51), achy (0.44; 0.31-0.63), stiff (0.48; 0.34-0.67), and physical discomfort (0.49; 0.35-0.67). Poor-to-moderate consistency was observed across daily means for pain (0.46; 0.31-0.66), achy (0.57; 0.31-0.75), stiff (0.60; 0.45-0.77), and physical discomfort (0.59; 0.43-0.76). CONCLUSION: Due to the inconsistent nature of perceived pain, achiness, stiffness, and physical discomfort, more frequent assessment of physical discomfort may be necessary within EMA to capture important fluctuations. Understanding the timing, magnitude, and direction of fluctuations could expose points of vulnerability relating to exercise behavior.

2592 Board #256 May 31 9:30 AM - 11:00 AM
Association Of Asian/Asian-American Immigrants' Physical Activity Behavior And Time Spent Living In The U.S.
Zi Yan1, Bradley J. Cardinal, FACSM1. 1Merrick College, Long Island University, Great Neck, NY. 2Oregon State University, Corvallis, OR. (Sponsor: Brad Cardinal, FACSM)
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No relevant relationships reported

The Asian/Asian-American population comprises one of the largest ethnic/racial cohorts in the U.S. They also are reported to be among the most inactive. PURPOSE: To examine the potential relationship between Asian/Asian-American immigrants’ leisure-time physical activity behavior and their length of time spent living in the U.S. (i.e., temporality).

Abstracts were prepared by the authors and printed as submitted.
METHODS: Data were obtained from the 2013-2014 National Health and Nutrition Examination Survey. Among 1,074 Non-Hispanic Asian/Asian-American participants, 541 (Female = 287, Male = 254) were aged ≥ 20 yr. (Mage = 48.5, SD = 15.2), not born in the U.S., and they reported their physical activity data. Those responding “yes” to either of the following two questions were classified into the moderate-to-vigorous physical activity (MVPA) group: (1) “In a typical week, do you do any vigorous-intensity sports, fitness, or recreational activities that cause large increases in breathing or heart rate like running or basketball for at least 10 minutes continuously?” and (2) “In a typical week do you do any vigorous-intensity sports, fitness, or recreational activities that cause large increases in breathing or heart rate like running or basketball for at least 10 minutes continuously?” Temporality groupings were as follows: <1, 1-5 years, 5-9, 10-20, and ≥20 years.

RESULTS: All total, 306 study participants (56.56%) reported engaging in MVPA. Binary logistic regression was used to estimate the odds ratios and 95% confidence intervals of reporting participation in MVPA. After adjusting for age, gender, income, and education level, those living in the U.S. increased their odds of participating in MVPA. Specifically, compared to those who had been in the U.S. for ≤1 year, those who had been in the U.S. for 1-5 years, 5-9 years, 10-20 years, and ≥20 increased their odds of MVPA participation by 145%, 139%, 189% (p = 0.06), and 297% (p = 0.02), respectively. CONCLUSIONS: Notwithstanding the evidence of a generally inactive nation, the findings of the current study suggest that there are some positive features in American culture that facilitate and support MVPA among Asian/Asian-American adults who have immigrated and resided in the U.S. for one or especially two or more decades. Gaining deeper insight into precisely what those features are should be the focus of future research.

2593 Board #257
May 31 9:30 AM - 11:00 AM
Mental Toughness As A Moderator Of The Physical Exercise - Esports Performance Relationship: A Pilot Study.
Andreas Stamatis1, Thomas Leif Andre2, Robert Noah Padgett3, Silvio Polly Valladao4. SUNY Plattsburgh, Plattsburgh, NY.1University of Mississippi, University, MS. 2Baylor University, Waco, TX. ( Sponsor: Peter W. Grandjean, FACSM )
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(No relevant relationships reported)

Esports popularity has been growing faster than any sport in history (global audience, money prizes, NCAA scholarships, part of 2022 Asian Games). Preliminary data show a positive relationship between physical exercise (PEX) and esports performance (eSP). To date, there has been no effort to explore the effect of the player’s level of mental toughness (MT) on esports key performance indicators (KPI), such as placement in a contest.

PURPOSE: (a) To explore the perceptions of players concerning the relationship between PEX and eSP; (b) To confirm the positive aforementioned relationship; (c) to investigate the moderation effect of MT in that relationship; (d) and provide evidence for larger-scale efforts.

METHODS: Data were collected on 23 male recreational eSport competitors (>6-hours per week) (Mage = 20.7, SD = 2.1). The eight-item Mental Toughness Index (MTI) was used to measure MT, one question with five scales (0=significantly negatively, 5=significantly positively) was used to collect information on their mental toughness. The number of days of exercise per week was used as an indicator of PEX, and average place on Fortnite: Solo matches over 3 hours was used as KPI. We investigated the moderating role of MT using regression analysis in P Predictors were mean-centered. The interaction was probed looking at simple slopes.

RESULTS: The majority of players tended to perceive PEX as having no significant or negative effect on eSP (65%). The estimated regression model without an interaction is KPI = 27.6 + 3.13(PEx) + 1.07(MTI), where β = 296. The estimated regression model with an interaction is KPI = 26.7 + 3.36(PEx) + 0.85(MTI) + 0.4(PEx x MTI), where β = 310. Simple slopes of PEx conditional on MT scores +1SD, Mean, and -1SD are: 4.72, 3.29, and 1.86, respectively.

CONCLUSIONS: Contrary to the players’ belief, PEX was found to be positively correlated with eSP. Furthermore, we identified a potentially enhancing moderating effect of MT on the relationship between frequency of exercise and eSP. Therefore, not only PEX but also psychological skill training (PST), such as MT training, may be beneficial for the players on their effort to place higher and win larger prizes. This pilot study offers preliminary evidence for the need for larger-scale similar projects. Future studies should recruit professional eSports players, as well.

2594 Board #258
May 31 9:30 AM - 11:00 AM
The Effects Of Aerobic, Resistance, And Combination Training On Satisfaction With Physical Function And Appearance
Liezel Mac B. Fors1, Leanna M. Ross2, Cris A. Sletz2, Lucy W. Piner3, Leslie H. Willis3, Lori A. Bateman3, Joseph A. Houmard4, FACSM5, William E. Kraus, FACSM6. The University of North Carolina at Greensboro, Greensboro, NC. 2Duke University Medical Center, Durham, NC. 3East Carolina University, Greenville, NC.
(No relevant relationships reported)

Purpose To determine the effects of aerobic training (AT), resistance training (RT), and combination training (AT/RT) on personal satisfaction with physical function (SPF) and appearance (SPA). We also examined the sex-specific relationships between objective measures of body habitus and cardiorespiratory fitness with changes in these satisfaction scores.

Methods Participants (n=130 from the STRRIDE AT/RT randomized trial) completed one of four 8-month exercise programs: 1) AT: 14 kcal exercise expenditure per kg per week (KKG) at 75% VO2peak; 2) RT: 3 days per week, 8 exercises, 3 sets per exercise, 8-12 repetitions per set; 3) AT/RT: full combination of the AT and RT programs; 4) AT-High Amount (AT-H): 21 KKG at 75% VO2peak. The Satisfaction with Physical Function and Appearance Questionnaire [7-point integer scale ranging from -3 (very dissatisfied) to +3 (very satisfied)] was administered at baseline and post-intervention. We also assessed measures of body composition (weight, lean and fat mass, and minimal waist and hip circumferences) and cardiorespiratory fitness (VO2peak). Paired t-tests determined post- minus pre-intervention change score significance within training groups (p<0.05). Sex-specific correlations examined the relationship between changes in SPF and SPA with changes in body habitus and fitness.

Results After 8 months of training, all groups significantly improved their SPF scores, ranging from 1.8 (AT) to 2.8 points (AT-H), and their SPA scores, ranging from 0.8 (RT) to 2.4 points (AT-H). Change in SPF was significantly correlated with change in fat mass (r = -0.34) in women and change in VO2peak (r = 0.29) in men. Change in SPA was significantly correlated with change in fat mass (r = -0.39), waist circumference (r = -0.25), and weight (r = -0.30) in women and change in hip circumference (r = -0.28), weight (r = -0.32), and lean mass (r = -0.45) in men.

Conclusions On average, all of the STRRIDE AT/RT training groups improved their self-reported satisfaction with physical function and appearance. We observed sex-specific differences in the relationships between changes in SPF and SPA with changes in body habitus and fitness. These correlative results can help inform future research targeting the mediating effects of exercise on self-perception of body image and function.

2595 Board #259
May 31 9:30 AM - 11:00 AM
Exercise-Induced Upregulation of M1 Excitability Following Motor Practice Does Not Predict Procedural Consolidation
Jing Chen1, Jiling Liu2, David L. Wright2. 1Texas A&M University, Texarkana, TX. 2Texas A&M University, College Station, TX.
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(No relevant relationships reported)

A brief bout of moderate intensity cardiovascular exercise immediately after procedural learning can protect a newly acquired motor memory from interference. The present experiment examined the possibility that exercise after practice increases motor cortex (MCE) which has been argued to be a biomarker for procedural skill consolidation. PURPOSE: Examine if (a) offline gain in procedural skill is associated with elevated MCE following practice and (b) the MCE following practice can be modified via exercise. METHODS: 35 sighted young adults were assigned to an Interference (INT), Interference + Exercise (INT+EX), or no interference, no exercise (NO) condition. All participants practiced a target motor sequence and some (INT, INT+EX) performed additional training with an alternative motor sequence 2 hr after practice with the target. The INT+EX also included cardiovascular exercise the target sequence practice. Test performance of the target sequence occurred 6 hr after practice. MCE was assessed using transcranial magnetic stimulation prior to training and after training (every 3 min for a total of 11 post training assessments of MCE). RESULTS: One way ANOVA (Condition: INT, INT+EX, NO) was used to analyze the mean response time for the target sequence offline learning effect and revealed a main effect of Condition F (1,32)=17.01, p<0.01. The extra practice in INT led to significant forgetting (-3±7ms) compared to the NO condition (NO, +21±7ms). Introducing exercise, despite the presence of interference, eliminated the forgetting observed for the INT condition (INT+EXEN, 30±1ms). A3 (Condition: INT, INT+EX, NO) x 11(Time: 1-11) ANOVA was used to collect information on their perceptions, number of days of exercise per week was used as an indicator of PEX, and average place on Fortnite: Solo matches over 3 hours was used as KPI. We investigated the moderating role of MT using regression analysis in P Predictors were mean-centered. The interaction was probed looking at simple slopes.

The majority of players tended to perceive PEX as having no significant or negative effect on eSP (65%). The estimated regression model without an interaction is KPI = 27.6 + 3.13(PEx) + 1.07(MTI), where β = 296. The estimated regression model with an interaction is KPI = 26.7 + 3.36(PEx) + 0.85(MTI) + 0.4(PEx x MTI), where β = 310. Simple slopes of PEx conditional on MT scores +1SD, Mean, and -1SD are: 4.72, 3.29, and 1.86, respectively.

Contrary to the players’ belief, PEX was found to be positively correlated with eSP. Furthermore, we identified a potentially enhancing moderating effect of MT on the relationship between frequency of exercise and eSP. Therefore, not only PEX but also psychological skill training (PST), such as MT training, may be beneficial for the players on their effort to place higher and win larger prizes. This pilot study offers preliminary evidence for the need for larger-scale similar projects. Future studies should recruit professional eSports players, as well.
but this increase was not significant. Moreover, relative increase in M1 excitability did not predict the extent of procedural learning at the time of test. These data question the claim that an upregulation of excitability at M1 is a biomarker for procedural skill consolidation.
increased significantly during treadmill running (4.7 ± 1.3 to 6.2 ± 1.0). HR increased similarly during both exercise sessions, yet exercise time was significantly less for trail compared to treadmill running (17.8 ± 3.5 min vs 22.1 ± 4.5 min).

**CONCLUSIONS:** For indoor treadmill running, RPE increased with HR as expected, yet AR declined. Outdoor trail running, although with similar increasing HR, produced stable RPE and increased AR. These results indicate that self-paced running immersed in nature can have more positive effects on mood while providing the same physiological benefit as indoor treadmill running.

**2600**
**Board #264**  May 31 9:30 AM - 11:00 AM

**Aerobic Fitness and Cardiac Autonomic Control Related to Better Cognitive Performance in Young Adults**

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No relevant relationships reported

Aerobic fitness has a positively relation to cognitive function, including attention. In addition, an increased aerobic fitness has been related to better cardiac autonomic control, verified by heart rate variability (HRV), a simple and non-invasive tool for verification of autonomic nervous system activity. Previous studies have shown that higher levels of HRV is related to better attention. **PURPOSE:** To compare the cognitive performance and cardiac autonomic control of young adults with different levels of aerobic fitness (high vs low). **METHODS:** 260 young adults (aged 21.2 ± 2.1 years) participated. The criteria for participation were: not consuming tobacco, supplements, or any drug that could interfere the evaluations; being free of cardiovascular diseases and attention disorders and do not consumed alcohol or coffee several hours before the tests. The attention components were evaluated through the Attention Network Test (ANT). The aerobic capacity (VO2max) was estimated according to the Astrand nomogram. Body mass and stature was used to calculate body mass index (BMI) and skin folds were performed. Cardiac autonomic control was assessed by means of the HRV time domains (RMSSD and SDNN) at rest in the sitting position for 10 minutes prior to the ANT. Participants were divided into high and low fitness groups according to VO2max (46.6 vs 31.2). Results of HRV and the components of ANT: alertness, orientation and conflict were verified and compared between groups. **RESULTS:** The high fitness group compared to low fitness group demonstrated greater cardiac autonomic control (SDNN: 74.1 ± 36.3 vs. 47.9 ± 12.4; RMSSD (55.4 ± 32.4 vs. 33.9 ± 13)) and better executive control of attention, verified by the Conflict component of the ANT (1.0 ± 3.3 vs 18.1 ± 4.62, respectively). The high fitness group compared to low fitness group had a moderate and negative correlation with the Conflict (r = -0.50, p = 0.04). Correlation between Conflict and SDNN and RMSSD appear (r = -0.56, p = 0.01), and r = -0.46, p = 0.05, respectively. In addition, there was no difference in the sum of skinfolds and BMI between groups. **CONCLUSIONS:** Participants of high fitness groups demonstrated greater cardiac autonomic control and executive control of attention compared to the low fitness group. Still, the greater autonomic control seems to favor the greater executive control of attention.

**2601**
**Board #265**  May 31 9:30 AM - 11:00 AM

**Principles Of Fractal Geometry As Method Of Research Of The Self-organization Of The Human Movement**


No relevant relationships reported

**PURPOSE:** The research method applied in the studies in the practice of physical exercise has predominantly used direct and/or invasive techniques, and may cause discomfort in the participants. However, it seems appropriate to apply non-invasive methods evaluating synergies during the execution of exercises. To apply the principles of fractal geometry in the kinematic analysis of the vertical jump in the mini trampoline to demonstrate the complex process of self-organization of the jump identifying individual “pattern” of synergies in the lower limbs of female undergraduate students. **METHODS:** Five Physical Education students were submitted to consecutive vertical jump with against motion and without the aid of their arms on the mini trampoline for 120 seconds. The joints angles of the lower limbs were recorded using the Bonita camera during the sign of the markers. Twelve markers were placed on the right and left sides of the body (anterior iliac crest, major femur trochanter, lateral femoral epicondyle, lateral malleolus, calcaneus, and the fifth metatarsal head). The position of the markers was recorded by a motion capture system (Porefex240, Qualisys) with an individual 100 Hz sampling rate (12000 frames). For the kinematic analysis of the articular angles (Ankle, knee, hip) the Cantor Ternary Set was applied, considering two stages of iteration (I = [0,1]; f = [0,1/3] U [2/3, 1]; I = [0.9] U [2/3, 3/9] U [6/9, 7/9] U [8/9, 1]), which were demonstrated by Radar geometric method.

**RESULTS:** The first iteration demonstrated consistency in the “standard” for ankle, knee and hip, right and left side. In the second, a recursion process was verified, since the graphs showed self-similar patterns. **CONCLUSIONS:** The application of fractal geometry principles proved to be an adequate method to verify the individual “pattern” of jump behavior in the mini trampoline, through iterativity and recursivity, indicating a synergetic behavior in the system and characterizing itself as a process of self-organization.

**2602**
**Board #266**  May 31 9:30 AM - 11:00 AM

**Association Between Binge Watching TV and Physical Activity in College Students**

Julie M. Cousins, Heather B. Betz. Albion College, Albion, MI. (Sponsor: Helen Alessio, FACSM)

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No relevant relationships reported

Binge television (TV) watching is a relatively new phenomenon that involves watching more than two TV episodes or multiple movies in one sitting. TV watching is a form of sedentary activity. Prolonged sedentary time has been shown to be independently associated with deleterious health outcomes regardless of physical activity (PA). The influence of binge TV watching on PA has not been studied in college students. **PURPOSE:** The purpose of this study was to examine the associations between PA with binge TV watching in male and female college students. **METHODS:** A total of 46 Albion College students (25 males age = 20.0 (1.0) years; 21 females age = 20.5 (1.0) years) participated in this study. Height (female: 167.9 (6.1) cm; males = 182.4 (6.9) cm) and weight (females = 65.5 (15.7) kg; males = 86.9 (17.6) kg) were measured. The International Physical Activity Questionnaire was used to assess PA. Binge TV watching was assessed by self-report. Statistical analysis was performed using t-test and Pearson product-moment correlations. Significant level was set to p < 0.05. **RESULTS:** 47.6% of female and 48.0% of male college students met the ACSM minimum recommendations for 30 min of moderate intensity PA 5 days per week or 20 min 3 days per week of vigorous intensity PA. 76.2% of females and 56.0% of males reported binge watching TV at least 1 time per week. 100% of females and males reported binge watching TV in the past year. Students that met the PA requirements binge TV watched on average 2.5 (2.7) times per week, while students that did not meet the PA requirements binge TV watched on average 3.2 (2.3) times per week (p=0.20). A significant difference (p=0.026) was found in the number of times males reported binge watching TV (2.1(2.3) times per week) compared to the number of times females reported binge watching TV (3.7(2.5) times per week). Physical activity was not found to be significantly correlated with binge TV watching in college students (p=0.10). **CONCLUSIONS:** Binge TV watching and PA were not found to be significantly associated in college students. Females binge watch TV significantly more than males. Since binge TV watching does not appear to be stopping the students from doing PA, future research should be done to determine what binge TV watching may be stopping them from doing, possibly sleeping.

**2603**
**Board #267**  May 31 9:30 AM - 11:00 AM

**Exploring the Relationship Between Planned and Performed Physical Activity: The Utility of a Smartphone App**

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No relevant relationships reported

**PURPOSE:** Few studies have examined day-level plans to be physically active and subsequent physical activity behavior, likely due to the feasibility of collecting this data. The purpose of this study was to test the feasibility and acceptability of a new mobile phone application (Life in a Day App: LIAD) for collecting real-time time-use data among college-aged students and to examine whether plans to be physically active (recorded in advance on an electronic calendar for the protocol period) were associated with physical activity during the study protocol (measured through the LIAD app). **METHODS:** Forty-eight participants were randomly assigned to one of three protocols defined by the number of days of data collection (1, 3 or 5 days). Participants were asked to record their planned activities for the protocol period in a Gmail calendar and provided smartphones (Samsung Galaxy S5) to complete time-use entries in real-time (e.g., exercise/sports, eating/cooking, school/personal care). Participants were instructed to wear an accelerometer (Actigraph wGT3X+) on their wrist during the protocol period (i.e., 24 hours a day) in order to objectively measure physical activity. **RESULTS:** Overall compliance with the protocol was very high with all participants utilizing the LIAD app. However, not all completed the data entry in real time, which was desired. Three of the 48 participants did not complete the calendar component. Six of the 48 participants did not have sufficient accelerometer data, defined as at least 10 hours of data on each day of the protocol. The most common participant-reported feasibility issue was the difficulty in carrying two smartphones. Within the full sample, the number of days when exercise was planned in the Gmail
Physical inactivity is the greatest public health concern of the 21st century (Blair 2009; Kohl et al., 2012). Lack of motivation for behavior change as well as a low sense of self-efficacy for exercise are amongst the greatest contributors of the problem (Lux, 2017). While evidence suggests the effectiveness of select physical activity (PA) interventions for improving PA levels, whether these interventions can also help prolong long term PA behaviors is unknown (Prince et al., 2014). PURPOSE: The purpose of this study was two-fold 1) to investigate the effectiveness of a six-week boot camp interventions for this at-risk population. METHODS: Twenty-seven sedentary adults (M=30.04, SD=10.33) participated in a vigorous boot camp program for a minimum of five days per week for fifty minutes a day throughout a six-week period responding to questionnaires measuring their motivation for behavior change, self-efficacy for exercise and, perceptions of general health as well as 2) to gauge participants’ motives for adhering to the program. METHODS: Twenty-seven sedentary adults (M=30.04, SD=10.33) participated in a vigorous boot camp program for a minimum of five days per week for fifty minutes a day throughout a six-week period responding to questionnaires measuring their motivation for behavior change, self-efficacy for exercise and, perceptions of general health at the onset and the completion of the program. At the completion of the program, participants also responded to a single qualitative prompt for identifying motives for continued adherence to the program. RESULTS: Paired sample t tests indicated a significant improvement in participants’ mean scores for self-efficacy for exercise (M=7.21 ± 2.2 pre vs. 8.1 ± 1.65 post; t= -2.38, p < 0.05) and the perception of their general health (M=3.17 ± 1.01 pre vs. 3.92 ± 0.7 post; t= -4.21, p < 0.05). Results from the qualitative prompt revealed three main themes for continued adherence: (1) structured aspect of the program, (2) accountability between the participants and exercise leaders, and (3) the sense of community within the program. CONCLUSIONS: These findings suggest that alternative boot camp interventions can prove effective means for improving important precursors of PA behaviors. From a practical standpoint, structured approaches that can provide a supportive community as well as a sense of accountability may present critical initiatives in promoting long term PA and solving the problem of inactivity. Although most fitness facilities have a mirror on at least one of four walls, not all exercisers may benefit from exercising in a mirrored-environment. While studies suggest that certain antecedents, such as body image concerns, may undermine people’s avoidance from mirrored-exercise settings, the reasons that motivate people to exercise in a mirrored-setting, remained unclear. PURPOSE: Through a qualitative investigation, we explored in-depth the reasons that drive people to, or prevent people from, exercising in a mirrored-setting, and the consequence of exercising with versus without a mirror, among exercisers with distinct exercise-settings preferences. METHODS: Semi-structured interviews were conducted with 8 mirror-prefering exercisers (MPEs; 22.75±2 yrs) and 8 mirror-avoiding exercisers (MAEs; 21.9±2.2 yrs) and analyzed through a thematic analysis. RESULTS: Themes of enjoyment and gratification from the “exerciser-look,” a desire to track fitness progress, and a high reliance on mirrors’ feedback to monitor ‘form’ emerged as reasons to prefer a mirrored-exercise environment. Themes of body shame and a desire to avoid self-disgust emerged as reasons to avoid mirrored-exercise settings among female MAEs. Mastery and contents of self-confidence underlined male MAEs’ preference to avoid the mirror during exercise. Among both MPEs and MAEs, themes of decline in enjoyment, motivation and performance level emerged in relation to exercising in a non-preferred mode. CONCLUSION: Adhering to one’s preferred mode of exercise is crucial for positive exercise-related outcomes. While a mirrored-exercise environment can serve as a confidence-booster for people who derive their exercise-motivation from the visual feedback of their appearance, it may lead to mood, motivation, and performance decrements among people, specifically females, who are less satisfied with their physical appearance. Understanding people’s exercise-environment preferences in initial stages of the fitness progress may aid professionals in tailoring personalized exercise programs, which in turn, may increase exercise motivation. A further empirical investigation must target the consequences of mirrors for exercisers with different needs is necessary.
the following predictor variables: child age, child sex, child average daily sedentary time, and child physical activity. Criterion variables included (a) child portable device use (Model 1), (b) parent total screen use (Model 2), (c) parent portable device use (Model 3), and (d) parent total screen use (Model 4).

**RESULTS:** Child sedentary time was significantly (β = 0.47, t = 3.30, p < 0.002) and positively associated with child portable device use. Child sedentary time was also significantly (β = 0.45, t = 2.91, p = 0.006) and positively associated with parent total screen use. Child age and physical activity were not significantly (p > 0.05) related to either parent or child portable or total device use.

**CONCLUSION:** As found in similar studies examining young adults, child sedentary behavior was related to portable device use while physical activity was not. This suggests that children who are heavy users of portable screen-based devices allocate more time to sitting than their peers who are lower portable screen users. Furthermore, results also suggest that total screen use in parents was predictive of sitting in their children.

**2608**

**Board #272**

**May 31 9:30 AM - 11:00 AM**

**Exercise Intensity as a Predictor of Mood States During a Group Cycling Class**

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**CONCLUSION**

Increases in positive mood states after exercise has been well documented. Group cycling classes are a popular mode of exercise in the fitness industry. There is limited research on the effect of group fitness classes on mood states and whether intensity level will have an impact on the mood enhancing benefits. **PURPOSE:** The purpose of this study was to determine if exercise intensity predicts changes in mood states during a group cycling class. **METHODS:** A total of 99 subjects, ages 18 to 25 years old, volunteered for the study. No previous experience with group cycling classes was required. The subjects participated in one group cycling class instructed by a certified cycling instructor. Prior to the cycling session the subjects filled out an informed consent, medical history, and Subjective Exercise Experience Scale (SEES). Subjects were then given a heart rate monitor, instructed on proper bike set up and how to operate the bike during class. The cycling class consisted of a 5 min warm up, a 30 min conditioning phase with a mix of sprints, hills and jumps typically performed in a cycling class. The class ended with a 5 minute cool down and 5 minute stretch off the bike. Heart rate and percent heart rate reserve (%HRR) was continuously tracked during class. After the class, subjects filled out a second (post) SEES. A hierarchical regression analysis was used to examine whether intensity measured by %HRR predicted changes in each of the 3 mood state categories on the SEES (positive well-being, psychological distress, fatigue). Three related sample t-tests were run examining changes in mood following the cycling class. **RESULTS:** %HRR was negatively related to positive well-being (β = - .30, p < .005) and positively related to fatigue (β = -.30, p = .003). There were no significant differences in fatigue after the cycling class (p > .05), however positive well-being increased (p = .001) and psychological distress decreased (p = .021) after the class. **CONCLUSION:** The intensity level of an acute exercise session may affect the mood enhancing benefits of exercise. The group cycling class did increase positive well-being and decrease psychological distress. However, individuals who exercised at higher intensity levels had increased levels of perceived fatigue and decreased feelings of positive well-being.

**2609**

**Board #273**

**May 31 9:30 AM - 11:00 AM**

**What Parental Correlates Predict Children’s Active Transportation to School in the Southeast USA?**

Eugene C. Fitzhugh 1, Jerry Everett 2, Linda Daugherty 2.

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**CONCLUSION**

School-aged children in the Southeast have been found to have significantly lower levels of active transportation to school (ATS) via walking or biking. Parents, the main gatekeeper of children’s ATS behaviors, usually weigh their perceptions of the sociocultural and the neighborhood-built environments when making their ATS decision. **PURPOSE:** To contrast the correlates of ATS decision-making behavior between parents living in the Southeast with other parents across the USA. **METHODS:** This study utilized data from 2,952 households from across the USA (50.6% from the Southeast USA) that had school-aged children (K-8th grade) who were located within a 20-minute walk to a school. Parents were surveyed during 2012-13 using a mixed-mode approach that involved telephone and web surveys. Parents self-reported their child’s ATS behavior and their own attitudes, beliefs, and perceptions in five areas related to ATS - safety and convenience concerns, perceived ATS benefits, desired neighborhood active transportation characteristics, and perceived ATS social norms. In addition, parents reported the demographics and the geographical characteristics of their home. PROC LOGISTIC in SAS was utilized to contrast correlates between the Southeast and the USA. **RESULTS:** Parents in the Southeast, compared to parents across the USA, were significantly less likely to allow their child to take ATS (12.9% vs. 33.3%, respectively) (OR=0.46, 95% CI=0.36-0.59). ATS correlates, regardless of USA region, included decreases in ATS with increasing age (OR=0.97, 95% CI=0.96-0.99), and increases in ATS if parents perceived ATS to be the norm (OR=2.35, 95% CI=2.23-2.36). Correlates linked to increases in ATS, which were limited to only parents living in the Southeast, were being black (OR=1.68, 95% CI=1.31-2.60) and being single, (OR=1.71, 95% CI=1.52-2.54). The only correlate association related to a decrease in ATS specific to the Southeast was heightened safety concerns (OR=0.44, 95% CI=0.33-0.84). **CONCLUSIONS:** Among households located near schools in the Southeast, interventions that ally parental ATS safety concerns might lead to increased ATS. In addition, programs that promote physical activity among adults in the Southeast might indirectly lead to increases in ATS among households with children.

**2610**

**Board #274**

**May 31 9:30 AM - 11:00 AM**

**Determinants of Change in Sedentary Behaviour In Young Children: a Systematic Review**

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**CONCLUSION**

High levels of sedentary behaviour have been suggested to be harmful in young children and appear to track from early to middle childhood years, suggesting the need to intervene before the behaviour becomes embedded. **PURPOSE:** To identify determinants of change in sedentary behaviour in young children (<6 years old). **METHODS:** Eleven databases were searched up to March 2018. Duplicate paper selection focused on the inclusion of longitudinal and intervention studies which include; a) targeted sedentary behaviour in young children (<5 years old); b) assessed a within-child change in objectively-measured sedentary behaviour; and c) reported on at least one determinant of sedentary behaviour. Intervention components were coded according to the cluster of behaviour change technique (BCT). Data synthesis was guided by the socio-ecological model and Harvest plots and included duplicate quality assessment. **RESULTS:** Sixteen studies (4 longitudinal and 12 intervention studies) met the inclusion criteria out of 14,966 papers identified in searches. Five determinants were identified from four longitudinal studies and 21 determinants (i.e. BCT components) were identified from 12 intervention studies. Studies were considered to be high (n=9) or intermediate (n=7) quality. Interventions targeted a mean of 3.6 (SD 2.4) BCT clusters. The BCT cluster “shaping knowledge” and “antececedents” were targeted in 11 and 8 out of the 12 studies respectively. The following determinants were strongly associated with change in sedentary behaviour: goals and planning (i.e. behavioural contract), repetition and substitution (i.e. graded tasks) and reward and treat (i.e. incentives). In single studies, two environmental-level determinants were associated with an increase in sedentary behaviour: afereschool period and transition from childcare to school. **CONCLUSION:** A limited range of determinants of change in young children’s sedentary behaviour have been studied. Of these, only a few were associated with objectively measured change in sedentary behaviour. There is a need for more evidence, particularly from interventions targeting sedentary behaviour only to provide more robust evidence and to support the development of future interventions.

**2611**

**Board #275**

**May 31 9:30 AM - 11:00 AM**

**Exercise Dependence, Eating Disorder Symptoms and Biomarkers of Relative Energy Deficiency among Male Endurance Athletes**

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**CONCLUSION**

Exercise dependence (ED) is characterized by a craving for physical training, uncontrollable excessive exercise behavior with inability to reduce exercise amounts, and potential harmful consequences, such as injuries, impaired social relations and depression. The condition is often associated with eating disorder pathology and perfectionism among women. Whether an association between ED and eating disorder symptoms among male endurance athletes exists, is less known. **PURPOSE:** The aim of this study was to explore possible associations between ED, eating disorder symptoms, and biomarkers of Relative Energy Deficiency in Sports (RED-S) among male athletes. **METHODS:** Fifty-three healthy well-trained male cyclists,
School-based intervention studies have used rewards to promote physical activity (PA) in children. However, little research has examined parental incentivization of children's PA in terms of prevalence, type, and motivation to incentivize

RESULTS: Subjects with higher EDS score displayed a higher energy balance compared to subjects with lower EDS score (p < 0.01). EDS total score was positively correlated with fasting blood glucose (r = 0.31 and r = 0.32, p < 0.05, respectively), while Intention factor and Reward factor were negatively correlated with testosterone/cortisol (r = -0.29, p < 0.05) and Reward factor was positively correlated with cortisol/insulin ratio (r = 0.33, p < 0.05). CONCLUSION: In this sample of healthy male athletes we found positive associations between higher EDS scores, eating disorder symptoms and biomarkers of RED-S, such as a more pronounced negative energy balance and higher cortisol levels. More studies are needed to elucidate ED as a possible contributor to the syndrome of RED-S.

CONCLUSION: School network of friends affects sedentary behavior and physical activity levels of women university students. Social dynamics are important correlates for sedentary behavior and physical activity in university students.
activity. No other significant relationships were observed. CONCLUSION: Glycemic control was a significant predictor of SB level. Understanding these relationships is important in designing T1-1.70 h compared to T3. Alternatives are needed to explore this relationship further, as both glycemic control and SB are modifiable factors and could be used as main target for interventions aimed to improve health outcomes in people with T2D.

Purpose: To develop and perform initial psychometric testing of a specially designed scale: Physical Activity Appraisal Inventory—Adolescence and Young Adult Version (PAAI-AYA).

Methods: The PAAI was validated in two separate studies: study one, elderly female patients with cancer (n=219); study two, elderly female with cancer (n=73) or without cancer (n=55). The PAAI-AYA was developed using the PAAI with the addition of nine-items pertaining specifically to young adults via content-expert validation. Following survey instrument finalization, it was distributed to students at three universities in the United States. Two hundred and sixty-eight students completed the survey. Survey data from 226 students (55 male and 165 female) who met age qualifications (16-25 yrs; x age = 23.5 years) were used for data analysis. Exploratory factor analysis was conducted with principal-axis factoring, parallel analysis, and promax rotation.

Results: A one-factor, 21-item solution, physical activity self-efficacy was decided on for the scale (loadings range = .63-81, 55.4% of total variance). The scale had high reliability (Cronbach alpha = .96), acceptable item-total and inter-item correlations (-.62-.79, .3-.78, respectively), and high concurrent validity with the Exercise Self-Efficacy Scale (rs = -.80, p < .001), and with self-reported physical-activity levels (rs = -40.4, p < .001).

Conclusions: Although the scale developed in this study needs further confirmatory factor analysis, it is a reliable and promising tool. As such, it can be effectively utilized by clinicians to better understand and promote physical activity self-efficacy in late-adolescent and young-adult college populations.

Purpose: The Effects Of A Low-dose Mindfulness-based Intervention On Psychological/physiological Health And Acute Food Choices.

Methods: Participants (n= 161) were a sample of adults (18-65) recruited across nine gym and recreation centers in a large metropolitan city and were averaging 3.24 days/week of BMI classification. Data were collected at baseline and post-camp. Measures will be repeated at three-month follow-up, following randomly assigned eHealth post-camp; results were not statistically significant.

Conclusion: Preliminary findings indicate that psychological underpinnings of healthy behavior (such as identity or enjoyment) are positively impacted in pre-teen girls following participation in a 1-week health camp. Follow-up data will elucidate upon long-term effects, dependent upon assignment to eHealth intervention or usual care condition.

Preteen girls are disproportionately affected by obesity, and experience reductions in positive self-regard; physical activity (PA) participation, and healthy eating habits as they age. Previous literature demonstrates that health identity developed in youth drives adult behavior. Engagement in brief interventions has enhanced psychological underpinnings (i.e., exercise identity: EI; healthy eater identity: HEI) of healthy behavior in samples of obese and normal-weight girls. However, previous studies have not examined results from a mixed BMI weight-status sample, following participation in an innovative intervention designed to develop salient health identity in the critical pre-teen years. Purpose: To determine if participation in a multicomponent intervention (1-week health camp plus randomly assigned 10-week eHealth program) will increase HEI, EI, and health behavior in pre-teen girls. Preliminary post-camp results are presented. Methods: Three-two participants (age=10.6±0.80 years, BMI percentile=76.7±25.83, overweight/obese=53.1%) attended a camp designed to enhance health identity. Programming focused upon improving the girls’ EI by teaching three modalities of PA: swimming (aerobic), strength exercises (resistance-training), and yoga (flexibility). Nutrition/culinary lessons were included to enhance HEI. The curriculum promoted positive perceptions of self, regardless of BMI classification. Data were collected at baseline and post-camp. Measures will be repeated at three-month follow-up, following randomly assigned eHealth intervention. Results: Participants experienced a significant increase in EI role-identity (p<.001), and moderately increased enjoyment of PA (p=.061) at post-camp. Additionally, participation in mild PA significantly improved (p=.020). Small increases in HEI, moderate-vigorous PA, and fruit/vegetable intake were reported post-camp; results were not statistically significant. Conclusion: Preliminary findings indicate that psychological underpinnings of healthy behavior (such as identity or enjoyment) are positively impacted in pre-teen girls following participation in a 1-week health camp. Follow-up data will elucidate upon long-term effects, dependent upon assignment to eHealth intervention or usual care condition.

Purpose: Implicit Theories about Willpower (ITW) propose that the beliefs of an individual’s willpower as either abundant/rejuvenating or a limited resource predicts repetition of self-regulated behaviors, such as exercise. It is also theorized that willpower could be a determining factor for long-term behavioral adherence. While the ITW has demonstrated predictive validity for various health behaviors, its role in the context of exercise is limited. The purpose of the study was to test how the ITW predicts behavior among regular exercisers using an extended dual-process model.

Methods: Participants (n=161) were a sample of adults (18-65) recruited across nine gym and recreation centers in a large metropolitan city and were averaging 257 min/week (SD = 171) of moderate-to-vigorous physical activity. Participants completed online surveys that were assessed monthly for six months. Multi-level structural equation modeling was used to analyze the results.

Results: The model found Intention X planning interaction to predict behavior (β = -.29, p < .001), while controlling for intention (β = -.08, p < .14) and planning (β = -.01, p = .85). Specifically, high intensiders with specific plans predicted behavior. Habit was also found to predict behavior (β = .11, p < .005). Intrinsic motivation predicted both habit (β = .17, p < .01), and the interaction construct (β= .18, p<.001) directly and behavior (β = -.17, 95% CI [.070, .278]) from total direct and indirect pathways. Rejuvenating willpower predicted habit (β = -.11, p < .020) and intrinsic motivation (β = .11, p = .008) directly in addition to the interaction construct (β = .10, 95% CI [.019, .184]) and behavior (β=.09, 95% CI [.001, .193]) via total pathways. The model did not find limiting willpower predict any paths. Time did not predict changes in the observed model.

Conclusion: Findings add support to previous work on proposed maintenance constructs by testing them longitudinally in post-intenders. The model further advances
these findings by identifying how willpower, particularly, perceived rejuvenating willpower played a pivotal role as a proximal predictor of habit and intrinsic motivation and a distal predictor to behavior. Exercise-focused interventions that help participants cultivate rejuvenating willpower could benefit for behavioral maintenance.

2620 Board #284 May 31 9:30 AM - 11:00 AM Correlates of Light Physical Activity Among Cancer Survivors Elizabeth Fallon,1 Rakiyah Johnson,2 Carla Berg.1 1American Cancer Society, Atlanta, GA. 2Emory University, Atlanta, GA. (Sponsor: Melissa Bopp, FACSM) Email: Elizabeth.Fallon@cancer.org (No relevant relationships reported)

Emerging evidence demonstrates positive health benefits of light physical activity (LPA) for cancer survivors. Yet, little research has explored modifiable factors that facilitate or hinder LPA behavior in this population. Furthermore, studies are often underpowered for conducting sub-group analyses. PURPOSE: To explore modifiable correlates of LPA among cancer survivors using a social cognitive framework, and how these correlates may differ among those engaging/not engaging in moderate-to-vigorous physical activity (MVPA).

METHODS: Self-report data from the third survey of the American Cancer Society’s Studies of Cancer Survivors I (N = 1720) were analyzed. Social cognitive variables of interest reflect cognitive determinants (i.e. perceived health competence and perceived susceptibility to cancer recurrence) and environmental determinants (i.e. healthcare provider support, perceived social capital, and unsupportive partner behaviors). The Leisure Time Exercise Questionnaire was used to create four LPA categories (0, <15, 60-119, and 120+ minutes/week). Ordinal regressions using forced entry were conducted, stratified by MVPA status (0 minutes of MVPA, ≥ 1 min MVPA). Models were adjusted for relevant covariates (i.e., demographic, cancer-related, health-related variables), missing data bias was examined, and sensitivity analyses were conducted to examine the robustness of the results.

RESULTS: Among cancer survivors reporting no MVPA (n = 747), greater provider support for PA (adjusted OR [aOR] = 1.49, p = .03), greater perceived health competence (aOR = 1.48, p = .01), and greater unsupportive partner behaviors (aOR = 1.06, p = .03) were significantly correlated with higher LPA. No constructs were correlated with LPA among cancer survivors already engaging in MVPA (n = 973). Missing data bias was small (Cramer’s V/Pi < 0.1). Results were similar in unadjusted analyses, and when stratifying by insufficient and meeting MVPA recommendations.

CONCLUSIONS: The utility of a social cognitive framework in explaining LPA among cancer survivors who do not engage in any MVPA was supported. Interventions should be more efficacious by incorporating healthcare provider support, improving health competence, and improving interpersonal skills that address unsupportive behaviors.

E-43 Free Communication/Poster - Correlates and Behavioral Aspects of Sport

Friday, May 31, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

2621 Board #285 May 31 9:30 AM - 11:00 AM Investigating the Effect of Competition Level on Penalties and Injuries in Youth Soccer Nicole C. Walden, Stephanie D. Walsh, Christopher P. Tomczyk, Tamerah N. Hunt, FACSM. Georgia Southern University, Statesboro, GA. (Sponsor: Tamerah Hunt, FACSM) Email: nw06347@georgiasouthern.edu (No relevant relationships reported)

There is an estimated 2.3 million youth soccer participants in the United States. As concern rises for the safety of youth athletes, organizations are changing the rules to make the game safer, potentially resulting in more penalized behaviors. Differences in competition levels may contribute to varying behavioral outcomes, such as foul and injury rates.

PURPOSE: To explore the horse rider relationship through the effect of a rider’s mood on the horse’s behavior in practice and competition.

METHODS: A total of 18 Female amateur dressage riders participated in this study. The participants completed five surveys and two observations. Surveys included a demographic survey, Rotter’s I-E Scale, Orientation to Life Questionnaire, and the Profile of Mood States (POMS). Observations took place at a scheduled practice and during one competition per participant. RESULTS: The POMS results showed increased mood disturbance from the riders (N=16, M=9.94), p =.003 between practice and competition. Observation data revealed no significance in horse conflict behavior between practice and competition (M=1.18) p=.95. The differences between rider TMD and horse conflict behavior pre and post competition, the results demonstrated a strong, positive, and significant correlation (r=0.688), p=0.000.

CONCLUSIONS: The results of this study can be considered at best preliminary, but highlight a potential moderator of the horse rider relationship.
Assessing self-determination to play a sport (motivation) and the strength of character or resolve (grit) in athletes is a useful tool for coaches and sports psychologists; however, gender, individual vs. team sports, and time of season differences in motivation and grit are not well documented. Whether an athlete is motivated intrinsically (more self-determined) or has sufficient grit may be the difference between athletic success or failure. Recognizing variations in motivational and grit characteristics in athletes can provide guidance towards improving individual performance and team dynamics. PURPOSE: To compare motivation and grit in NCAA collegiate athletes. METHODS: The Sports Motivation Scale II (SMS-II) and 12-Item Grit Scale were administered to 151 (87 females; 64 males; 19.2 ± 2.1 yrs) athletes spread among NCAA male on athletes (6, 32.0 vs. 23.3, p = .01) and NE (66.1 ± 16.7 vs. 12.9, p < .05). Due to the gender difference for SH, correlations and regression analyses were done separately for each gender. For females, SH was correlated with NE (r = .79, p < .001), C (r = .46, p = .08), and OM (r = .51, p < .05). The regression analysis revealed that NE was the only significant predictor of SH (R² = .63, p < .001). For males, SH was correlated with NE (r = .53, p < .005), C (r = .62, p < .001), and A (r = .51, p < .005). The regression analysis revealed that C was the only significant predictor of SH (R² = .38, p < .001). CONCLUSION: Higher self-handicapping in female athletes was an unexpected finding. Since negative emotionality was strongly related to SH in all athletes, but more for females, higher NE scores for females may partially explain their higher SH scores. Conscientiousness also was related to SH in all athletes, but more for males. Thus, athletes prone to experiencing distress and being less vigilant may self-handicap if they fear failure in an upcoming event. Sport psychologists should consider assessing personality, especially negative emotionality and conscientiousness, and monitoring emotions to minimize SH behaviors and potentially improve performance and well-being in athletes.

Conclusions:
The possible differences in affective responses to moderate and intense exercise in exercise addiction subjects are not reported in the literature and this work can help elucidate the reasons for the deployment exercise dependence. Purpose: Investigate the affective responses of exercise addiction subjects and controls in moderate and intense exercise. Methods: 17 male subjects (34.35±5.70yrs; 73.15±9.36kg; 1.75±0.07m; 24.76±2.51kg/m²; 13.17±4.73%FatMass), were distributed into a control group (n = 10) composed of runners without exercise addiction symptoms and an exercise addiction group (n=7) composed of runners with exercise addiction symptoms. The subjects were submitted to two treadmill tests separated by 7 days: 1) 60%Vpeak; 2) 85%Vpeak. For these conditions, the subjects answered a Subjective Exercise Experiences Scale (SEES) in the following time-courses: baseline (B), immediately after (IA) and 30 minutes after finishing of the exercise (R). To evaluate the affect during effort, a Feeling Scale was recorded at last minutes of exercise in both intensities. The data were compared by two-way ANOVA with post hoc Duncan test, with significance p<0.05. The protocol was approved by Unifesp Ethics Committee (02.096.523). Results: At 60%Vpeak, we not observed differences in SEES scale. At 85%Vpeak, the Fatigue subscale show similar responses between the groups, were an increased in 19.0 (p<0.01) to both. The feeling Scale results show that to control group, when 60%Vpeak was compared with 85%Vpeak intensity, the first one was pleasurable, while the second one was unpleasurable (3.10±2.33 vs. 1.90±3.51; p<0.002 respectively). To the exercise addiction group, both intensities was classified as pleasurable (3.00±1.82 vs 1.00±4.43; p<0.13). Conclusion: The data suggest that both exercise intensities moderate and intense (independent of fatigue state) are capable to promote well-being and pleasure in exercise addiction subjects, while to the controls group, feeling pleasure was observed only in moderate intensity.

Financial Support: AFIP, CAPES (001 financial code), CNPq (400129/2016-7).
Migration across borders in the European Union (EU) can promote beneficial career ideals of EU, the financial contribution from parents indicates that DC migration relocation. Institutions in both fields should be aware and supportive in DC migration, particularly in comparison to other sports. RESULTS: 52% of the sample (age=23±5.3; yrs, 80.5±4.0% men, 19.5±3.5% women) between 22 and 25 years of age were participating in the study (age: 43.2±12.4 yrs, Elo score: 1903±341.5), competing in a 9-round chess tournament (Swiss pairing system). Unstimulated mixed saliva samples were collected in saliva swabs at 3 time points: baseline, 2 days after, and 7 days after a match. The cortisol and testosterone levels were determined by chemiluminescence immunoassay. CONCLUSIONS: The high percentage of relocating student-athletes confirms the relevance of mobility in DC. Academics and sports can equally be the reason for relocation. Institutions in both fields should be aware and supportive in DC migration, particularly in comparison to other sports.
suffering Burnout Syndrome in college athletes could be a good way to predict the possibility of having depression problems. Similar studies are suggested to corroborate these results.

<table>
<thead>
<tr>
<th>Anxiety</th>
<th>Depression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk</td>
<td>Medium risk</td>
</tr>
<tr>
<td>EE (Reference)</td>
<td>1.13 (0.71 - 1.80)</td>
</tr>
<tr>
<td>S</td>
<td>-0.04</td>
</tr>
</tbody>
</table>

**RESULTS:**

The analysis consisted of 7 stages lasting 2 min each (BASELINE, exposed to a PHYSIOLOGICAL stressor [unpleasant sounds], 1st REST, exposed to a COGNITIVE stressor [mathematical task], 2nd REST, exposed to an EMOTIONAL stressor [talk about a stressful memory] and 3rd REST). A statistical analysis was carried out with X², Phi coefficient, and Cochran’s Q test.

**RESULTS**: Significant changes were found in the proportion of “stressed” subjects in the physiological responses of HR and SC, and a trend towards significance in EMG throughout the evaluation. The indicators that most approached the expected response (increase with stressor and decrease at rest) during the evaluation were HR and SC; EMG tended to approach. The significant differences observed in the proportion of subjects “stressed” by stages and by indicators were in BASELINE, 1st REST and 2nd REST, and with a trend towards significance in COGNITIVE, being Resp the indicator that showed the highest proportion. The effect size for significant differences was moderate to high (Table).

**CONCLUSIONS:** The subjects obtained expected responses (increase/decrease) over time in most of the indicators, except in Resp, so in our sample, it was not an indicator related to stress. The proportion of subjects “stressed” during stressing stages were not significant but were different during rests, which may mean that the greater proportion of subjects increased their physiological responses in a similar way to stressors but could recover differently during rests.

**Table.** Proportion of “Stressed” subjects by physiological response and stage.

<table>
<thead>
<tr>
<th>Baseline</th>
<th>Physiological</th>
<th>1st rest</th>
<th>Cognitive</th>
<th>2nd rest</th>
<th>Emotional</th>
<th>3rd rest</th>
<th>p-value (Cochran’s Q)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR</td>
<td>2 (10%)</td>
<td>a</td>
<td>7 (35%)</td>
<td>18 (90%)</td>
<td>3 (15%)</td>
<td>9 (45%)</td>
<td>6 (30%)</td>
</tr>
<tr>
<td>EMG</td>
<td>10 (50%)</td>
<td>b</td>
<td>7 (35%)</td>
<td>13 (65%)</td>
<td>8 (40%)</td>
<td>12 (60%)</td>
<td>10 (50%)</td>
</tr>
<tr>
<td>SC</td>
<td>3 (15%)</td>
<td>ac</td>
<td>5 (25%)</td>
<td>12 (60%)</td>
<td>11 (55%)</td>
<td>13 (65%)</td>
<td>12 (60%)</td>
</tr>
<tr>
<td>RESP</td>
<td>11 (55%)</td>
<td>b</td>
<td>10 (50%)</td>
<td>10 (50%)</td>
<td>15 (75%)</td>
<td>10 (50%)</td>
<td>6.32</td>
</tr>
</tbody>
</table>

| p-value  | 0.002         | 0.430    | 0.004     | 0.082    | 0.048     | 0.287    | 0.218                 |
| Phi      | 0.430         | 0.186    | 0.406     | 0.289    | 0.315     | 0.222    | 0.218                 |

**DATA expressed as frequencies (%), unless otherwise stated. Different letters denote significant differences between physiological responses within each stage (p<0.05).**

**Table.** Association between Burnout Syndrome ranges and anxiety and depression presence.

<table>
<thead>
<tr>
<th>Anxiety</th>
<th>Depression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk</td>
<td>Medium risk</td>
</tr>
<tr>
<td>EE (Reference)</td>
<td>1.11 (0.71 - 1.80)</td>
</tr>
</tbody>
</table>

**RESULTS:**


**PURPOSE:** To investigate the relationship between perceived coaching behaviors, competitive anxiety, and athlete burnout

**METHODS:** A total of 376 collegiate athletes from 11 different sports, whose ages ranged from 20 to 25 years old (296 males and 80 females; Mage = 21.23yrs, SD = 1.09), completed a battery of questionnaires: a demographic questionnaire Sport Climate Questionnaire, Controlling Coach Behaviors Scale, Sport Anxiety Scale-2, and Athlete Burnout Questionnaire. Descriptive statistics were calculated, and structural equation modeling was conducted to test the hypothesized model. The bootstrap technique was used to test the mediation effect, and item and construct parceling techniques were utilized to increase the stability of the parameter estimates.

**RESULTS:** The hypothesized model presented an acceptable fit to the data. Specifically, χ²(48) = 137.15 (p = 0.001), CFI = .97, TLI = .96, SRMR = .04, and RMSEA = .06 with 90% CI [.05, .08]. Autonomy-supportive coaching was negatively related to athlete burnout (β = -.18), whereas controlling coaching and competitive anxiety were positively related to athlete burnout (β = 33 and 35, respectively). Intriguingly, only controlling coaching were significantly related to competitive anxiety (β = .35). The indirect path from controlling coaching to athlete burnout via competitive anxiety was significant (β = .12).

**CONCLUSION:** The magnitude of the direct effects indicated controlling coaching behaviors more influenced athlete burnout than autonomy-supportive coaching behaviors. The findings suggest that coaches should understand the importance of the athletes’ perception of their coaching behaviors and the effect of coaching behaviors on competitive anxiety and burnout.

2634 Board #298 May 31 9:30 AM - 11:00 AM The Effect Of Crossfit On Self-talk And Goal Setting In At-risk Youth: A Pilot Study Mia D. Hannah, Christina Gipson, Nicole Walden, Stephanie Walsh, Tamerah Hunt, FACSM. Georgia Southern University, Statesboro, GA. (Sponsor: Tamerah N. Hunt, FACSM)

**PURPOSE**

At-risk youth experience limited support, lack consistency, and depend on governmental programs and could benefit from structured programs. CrossFit participants are encouraged to discuss workout goals and strategies and are reminded about workout efficiency. **PURPOSE:** Examine the effects that CrossFit has on the use of self-talk and goal setting techniques. METHODS: Sixteen participants identified as at-risk (e.g. living in single-parent homes or in low-income environments) participated in a CrossFit program. Participants ranging from 11 to 14 years old completed 12 weeks of CrossFit for one hour, three days per week. Participants completed two Likert-type questionnaires (Goal Setting questionnaire and Self-talk questionnaire). Survey scores served as dependent variables. Paired samples t-tests were calculated to examine changes over time on both surveys. All statistical analyses were conducted using SPSS 25.0 (IBM, Armonk, NY). Significance level was set as a priori at 0.05. RESULTS: 16 participants (84%) completed both pre and post Goal Setting surveys, while 10 (52%) completed both pre and post Self-Talk questionnaire surveys. Significant differences were found between scores for total score (Mean Pre: 1.4±.2, Mean Post: 1.3±.2, p=0.007); question 2, “Once I set a goal, I don’t give up until I achieve it” (Mean Pre: 1.4±.3, Mean Post: 2.2±.4, t(15)=2.42, p = 0.029) and question 6 “When I set a goal, I think about what I need to do to achieve that goal” (Mean Pre: 2.9±.3, Mean Post: 3.7±.2, t(15)=2.82, p = 0.013) with scores improving after the intervention. No significant differences were found for the Self-Talk questionnaire (n=10), total score (p=0.05). CONCLUSION: This pilot study provides preliminary evidence that CrossFit for at-risk youth enhances goal setting skills. The introduction of CrossFit classes appears to create structure for goal setting as strategies/goals are discussed before workouts and accomplishments/results are recorded and reviewed. However, it does not appear that CrossFit increases...
self-talk which could be due to no formal instruction in the current format of CrossFit classes. Future investigations should include impacts of self-talk and goal setting with intentional training, a larger participant pool, and qualitative methods.

2635 Board #299 May 31 9:30 AM - 11:00 AM
Preliminary Evidence Of A Relationship Between Injury And Sport Camera Use In Winter Sliding Sports
Linda Paquette, Elie Truchon, Martin Lavallière, Daniel Lalande. Université du Québec à Chicoutimi, Saguenay, QC, Canada.
Email: linda_paquette@uqac.ca
(No relevant relationships reported)

PURPOSE: The accessibility of digital technologies has led to an increased use of video cameras in sliding winter sports. However, very little is known on the risks associated with the use of such equipment. In other contexts, camera use was associated with a social facilitation effect involving an increase in performance (Yu et al., 2015). In winter sliding sports like snowboard and alpine skiing, the culture is characterized by a valorization of risk taking (Anderson, 1999). This effect could translate in greater risk taking when a camera is around (Rodrique et al., 2012). The aim of this study was to explore the relationship between camera use and injury risk in winter sliding sports, while considering psychosocial factors associated with injuries including age, sex, perceived skill level, intentional risk taking and personality traits (impulsivity and sensation seeking).

METHODS: The study was a self-reported follow-up survey conducted online among Canadian winter sliding sports athletes before and after a winter ski season within an interval of 4 months. RESULTS: Among the 224 adolescents and adults (121 men and 103 women) who completed the surveys, 32.6% were aged 14-25 years, 32.3% aged 26-25 years and 36.2% aged 36 years +. Descriptive statistics indicate that 37.1% were filmed during sports practice at least once during past 12 months prior to the study an 42.0% were filmed at least once during the follow-up ski season. Among them, 25.7% reported that they take more risks when they are filmed “sometimes”, “often” or “always”. A logistic regression analysis predicting the occurrence of an injury by the end of the ski season indicates that camera use during the ski season is significantly associated with injury risk (OR = 0.25, p < 0.001) even after including psychosocial factors usually associated with injury risk in the model, including intentional risk taking, perceived skill level and sensation seeking also being significant predictors of injury. CONCLUSIONS: These results suggest a possible injury risk associated with the use of a camera on the slopes, partially explained by a social facilitation effect, but it is unclear at this moment if this risk could also involve the camera itself depending on the type of use (i.e. on a selfie stick). These results should be supported by objective data from an experimental design.

2636 Board #300 May 31 9:30 AM - 11:00 AM
Cross-cultural Invariance Of The Mental Toughness Index Among American And Mexican Athletes
Grant B. Morgan1, Andreas Stamatis2, Pedro Julian Flores Moreno3, Lenin Tlatmatini Barajas Pineda3, Adriana Isabel Andrade Sánchez3. 1Baylor University, Waco, TX. 2State University of New York at Plattsburgh, Plattsburgh, NY. 3Universidad de Colima, Colima, Mexico. (Sponsor: Peter Walter Grandjean, FACSM)
Email: grant_morgan@baylor.edu
(No relevant relationships reported)

The popularity of mental toughness (MT) in English-speaking countries is well recognized. However, its worldwide cultural relevance remains to be fully disclosed. Guacciardi et al. (2016) and Morgan et al. (2018), using the Mental Toughness Index (MTI), reported intra-cultural invariance of MT in Australia and in the U.S. and Greece, respectively. To date, there has been no effort to unearth the degree of the universality of the term between Mexico and USA via MTI.

PURPOSE: To examine the invariance of MT across two different cultural groups of athletes and to further validate MTI.

METHODS: The MTI was completed by 97 Mexican and 173 US athletes. The MTI consisted of eight items with a seven-point response scale. The U.S. samples consisted of roughly half male and half female athletes, whereas the Mexican was predominantly male (64%). The U.S. sample consisted of athletes from a number of sports, such as American football, basketball, baseball, and softball. Half of the Mexican sample reported playing soccer and almost all other sports had fewer than five athletes. Invariance testing was conducted using multiple group confirmatory factor analysis with increasingly restrictive models. We first fitted a unidimensional model within each sample to ensure good model-data fit. Then we estimated configural (equal number of dimensions), metric (configural + equal loadings), and scalar invariance models (metric + equal intercepts). Scalar invariance is the minimum type of invariance to infer cross cultural validity. To evaluate the model-data fit, the comparative fit index (CFI), root mean square error of approximation (RMSEA), and the differences between these indices for increasingly restrictive models.

RESULTS: The model-data fit in both samples was very good (CFI_{uncon} = 0.984; RMSEA_{uncon} = 0.08; CFI_{con} = 0.998; RMSEA_{con} = 0.03). The scalar invariance model was selected as the best fitting (CFI_{full} = 0.908; RMSEA_{full} = 0.08) but with a slightly different item intercept for two items (Item 4, < 4; Item 5 > 3).

CONCLUSION: These analyses support partial scalar invariance of MT. As such, the analysis establishes a common metric of MT across samples, which allows comparisons to be made on their MT scores.

2637 Board #301 May 31 9:30 AM - 11:00 AM
Relationships between Aggression and Head Impact Kinematics in Ice Hockey
Melissa S. DiFabio1, Katherine M. Breedlove2, Thomas A. Buckley1. 1University of Delaware, Newark, DE. 2University of Michigan, Ann Arbor, MI.
Email: m.s.difabio@gmail.com
(No relevant relationships reported)

Sustaining head impacts in sport regularly may be damaging to long-term neurological health. Further, some research has suggested a relationship between sports aggression and concussion, therefore, being able to identify players at-risk of sustaining these head impacts may be beneficial in monitoring their safety on ice.

PURPOSE: To examine relationships between player self-reported aggression in ice hockey and head impacts sustained in a collegiate league season.

METHODS: Nineteen collegiate male ice hockey (19.9±4.2 years old, 1.8±0.6 m, 78.5±5.7 kg, 7.4±2.3 players per team) completed the Anger and Aggression Scale (CAAS), a valid 12-item survey used to evaluate anger and aggression during sport competition. Penalty minutes (PM) and games played (GP) statistics were taken from the official game records. Head impact kinematics were recorded via tri-axial accelerometers (Triax, Nowalk, CT) that each player wore for games/practices. Spearman correlation was performed to examine relationships between CAAS scores, PM, GP, and head impact kinematic variables (number of impacts, mean linear and rotational acceleration, and cumulative linear acceleration).

RESULTS: Neither CAAS scores (mean age: 26.8±4.9, aggression: 22.2±7.3) nor PM (mean 20.9±22.7, range: 0-95) were significantly related to any other variables. GP was significantly correlated with number of impacts (r=0.606, p<0.006), and mean rotational acceleration (r=0.583, p=0.009), and cumulative acceleration (r=0.542, p<0.02). Mean number of impacts was 71.5±51.6 (range: 6-168); mean linear and rotational acceleration were 36.8±3.8 g and 3.5±0.7 krad/sec2.

CONCLUSIONS: The main finding is no relationship between self-reported anger and aggression during sport and/or sustaining penalty minutes and head impact kinematics, which suggests that hockey athletes who play with more intensity do not necessarily sustain more head impacts while playing. Unsurprisingly, GP was related to impacts, suggesting that more playing time is related to sustaining more and/or greater head impacts. CAAS and PM as markers of playing aggression may not be helpful in determining athletes who sustain more head impacts.

2638 Board #302 May 31 9:30 AM - 11:00 AM
Iron Supplementation and the Female Athlete Triad in High School Distance Runners
Paige Skorseth1, Aleksei Dingel2, Katie Hastings2, Nicole Segovia1, Emily Kraus1. 1University of Wisconsin, Madison, WI. 2Stanford University, Stanford, CA.
Email: skorseth@stanford.edu
(No relevant relationships reported)

PURPOSE: The female athlete triad, defined as decreased energy availability, menstrual changes, and low bone mineral density (BMD), is common in female high school distance runners. Previous research has shown that the Triad and iron deficiency are interrelated. However, there has been no data indicating how the relationship between female athlete triad, iron deficiency, and iron supplementation presents clinically in this population.

METHODS: 38 female, high-school aged middle and long-distance runners were recruited through social media, coach contact, or direct study outreach. Evaluation included: a validated survey examining components of disordered eating (DE) and menstrual irregularities, height and weight measurements, serum lab draws (ferritin, 25-hydroxy vitamin D, estradiol, IGF-1, free T3), and dual-energy x-ray absorptiometry (DXA) scan to evaluation BMD. The Female Athlete Triad Cumulative Risk Assessment tool was used to calculate a risk score on each athlete measured by DE, age of menarche, menstrual irregularities (amenorrhea or oligomenorrhea), DXA BMD, and number of bone stress injuries. Statistical method used was Mann-Whitney U tests. P-values less than 0.05 were considered statistically significant.

RESULTS: Participants had an average ferritin of 31.0 mg/L (SD=17.6). The average cumulative risk score was 2.76 (SD=1.79), i.e. moderate risk. Of the individual components of the triad, 76% of runners displayed disordered eating, eating disorder, 22% had delayed menarche, 19.4% oligomenorrhea, 25% amenorrhea, and 37% had lumbar spine z-scores of <1. Forty three percent of runners used iron supplementation, and serum ferritin was increased in the group when compared to
the non-supplementing athletes (p<0.067). The cumulative risk score in runners supplementing with iron was 3.5w while the non-supplementing group had a risk score of 2.5 (p<0.001).

**CONCLUSIONS:** Findings show that high school-aged female distance runners possess multiple components of the female athlete triad, putting them at greater risk for sustaining a bone stress injury. Runners supplementing with iron have an expected increase in ferritin iron levels compared to the non-supplementing group, however they also have increased female athlete triad risk scores compared to non-supplementing counterparts.

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**E-44 Free Communication/Poster - Immunology III**

**2639 Board #303 May 31 11:00 AM - 12:30 PM**

**Effect of Competitive Training on Antiviral Immune Activity in Collegiate Gymnasts**

Jessica Alley, Hilary Green, Lauren Smeins, Matt Jefferson, Ruth Litchfield, Marian Kohut. Iowa State University, Ames, IA. (Sponsor: Warren Franke, FACS/M)

(No relevant relationships reported)

Regular moderate exercise has numerous health benefits, including positive effects on immune function, although periods of intense training may increase susceptibility to respiratory tract pathogens such as influenza virus. **PURPOSE:** To determine the effect of intense athletic training on the antiviral immune response profile and to examine the effect of ingestion of eggs on this response. **METHODS:** Female participants from a Division I varsity gymnastics team were recruited and either consumed whole eggs daily (E; n=7) or maintained their normal diets (NE; n=6) for the duration of the study. Blood was collected at three time points: before the high intensity pre-season training began (T1), one month into pre-season (T2), and two months after T2 at the end of pre-season (T3). Peripheral blood mononuclear cells (PBMCs) were isolated from whole blood, cultured ex vivo, and challenged with influenza A/PR/8/34 for 24-hour s. Cell supernatants were analyzed using a multiplex cytokine array assay.

**RESULTS:** Statistical analyses revealed lower levels of cytokines involved in both innate (IL-1β, IL-10, TNFα) and T-cell mediated immunity (IFNγ, IL-2, IL-7) produced in response to virus stimulation at T2 (6.8, 87.3, 351, 731, 82.0, and 3.2 pg/mL, respectively) compared to T1 (12.1, 317, 534, 2469, 311, and 5.5 pg/mL, respectively) and T3 (17.4, 268, 712, 3018, 212, and 5.1 pg/mL, respectively; p<0.05, paired t-tests). PBMCs from gymnasts who became ill during the study period (n=3) produced less IFNγ (427 vs. 1442 pg/mL) at T2 and more sCD40L (11.6 vs. 5.8 pg/mL) at T3 than those who remained healthy (p<0.05, independent t-tests). When egg consumption was examined, a mixed ANOVA with repeated measures revealed a significant treatment by time interaction and follow-up post hoc tests identified differences in inflammatory cytokine production at T3 (12.3 vs. 23.9 and 469 vs. 963 pg/mL for IL-1β and IL-6, respectively, in E vs. NE; p<0.05). Cell supernatants were analyzed using a multiplex cytokine array assay. **CONCLUSION:** These preliminary data suggest that, during intense training, both innate and adaptive antiviral defenses are impaired but that egg consumption may attenuate training-associated inflammation. Increases in immunosuppressive proteins, such as sCD40L, may also increase susceptibility to illness in athletes.

Funding was provided by the Iowa Egg Council and Egg Nutrition Center.

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**2640 Board #304 May 31 11:00 AM - 12:30 PM**

**Treadmill Running Attenuates Experimental Colitis in Wild-Type Mice Fed High-Fat Diet and Dextran Sulfate Sodium**

Jinkyung Cho, Donghyun Kim, Inhwan Lee, Youngyun Jin, Minjung Kang, Kwonseok Han, Taewan Kim, Hyunsik Kang. Sungkyunkwan University, Suwon, Korea, Republic of.

(No relevant relationships reported)

**Purpose:** To investigate the therapeutic effect of treadmill running against ulcerative colitis induced by high-fat diet (HFD) and mild dextran sulfate sodium (DSS) in wild-type (WT) mice.

**Methods:** At age of 10 weeks, C57BL/6 male mice were assigned to either standard type (WT) mice.

**Conclusion:** The current findings suggest that exercise training alleviates the severity of HFD+DSS-induced ulcerative colitis by modulating proteins of hepatic inflammation and fibrosis and colon tight junction proteins in WT mice.

Supported by the National Research Foundation funded by the Korean Government (NRF-2017R1A2B4007357).

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**2641 Board #305 May 31 11:00 AM - 12:30 PM**

**Effect of MCT-1 Polymorphism on Lactic Acid Clearance in Resistance Trained Females**

Lauren M. Branion. University of Southern Indiana, Evansville, IN.

Email: Ibranion@eagles.usi.edu

(No relevant relationships reported)

The monocarboxylate transporter one (MCT-1) protein is a carrier protein that plays a vital role in cellular respiration. MCT-1 is known to aid in the transportation of carbohydrates, including lactic acid, out of the blood stream and back into muscle tissue. There is a common single-nucleotide polymorphism (SNP) in the MCT-1 gene (T1470A) that is believed to play a role in the clearance rate of lactic acid following intense exercise. **PURPOSE:** The purpose of this study was to investigate the role of the MCT-1 SNP on lactic acid production and clearance rates in resistance trained, females. **METHODS:** Twenty-one female participants (age = 20.81 ± 2.06 years) who resistance train three or more times per week were recruited for this study. Lactic acid measurements were taken pre-test and 0, 10, 20, 30, 40 minutes post-test. In order to induce lactic acid production, a standard thirty second Wingate test was used. The MCT-1 gene of each participant was isolated from saliva and amplified using Polymerase Chain Reactions (PCR). Once isolated and amplified, each participants MCT-1 gene was sequenced using Next Generation Sequencing. A two-way mixed factorial ANOVA [genotype (AA, TA, TT) x time (pre, 0, 10, 20, 30, 40)] was used to examine interactions between genotype and time. Three follow-up repeated measures ANOVA's (individual groups x time) were utilized to examine how each group contributed to this interaction. Alpha values were set .05 and Bonferroni corrections were used in all analyses. **RESULTS:** Further, a significant interaction (genotype x time) was observed (p<0.001). Follow-up ANOVA indicated that each had a main effect for time (p=0.001 for each group). Additionally, the AA group cleared lactic acid at a significantly faster rate (p=0.01) than the TT group for the 10-20 minute time period. **CONCLUSION:** These results indicate that the MCT-1 SNP likely plays a role in lactate clearance in resistance trained females.

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**2642 Board #306 May 31 11:00 AM - 12:30 PM**

**Exercise Preconditioning-Induced Modification of Gut Microbiota Increases Survival in Cecal Ligation and Perforation (CLP)-Induced Sepsis**

Hyun-Sik Kang, Donghyun Kim, Jinkyung Cho, Youngyun Jin, Minjung Kang, Inhwan Lee, Haeryun Hong. Sungkyunkwan University, Suwon, Korea, Republic of.

(No relevant relationships reported)

**Purpose:** To investigate whether exercise preconditioning-induced modification of gut microbiota increases survival in cecal ligation and puncture (CLP)-induced sepsis. **METHODS:** C57BL/6N male mice at age of 4 weeks were randomly assigned to either control (n=10) or exercise preconditioning (n=10). Mice in the exercise group were subjected to an 8-week-high-intensity treadmill running. Prior to sepsis, the effect of exercise preconditioning on gut microbiota was explored by 16S ribosomal RNA amplification sequencing. Survival probability, organ damage, and pro- and anti-inflammatory cytokines were assessed to investigate whether or not exercise preconditioning-induced changes in gut microbiota modulate host response to CLP-induced sepsis. **RESULTS:** Along with increased β diversity, exercise preconditioning induced the modification of gut microbiota at species level dominated by the phyla Bacteriodetes, Firmicutes, and Fervuscromicrobia and to a less extent by the phylum Cyanoacteria. Preconditioned mice had higher survival (p<0.05) and less organ damage in sepsis compared to control mice. At 8-hour post-sepsis, the preconditioned mice had lower peritoneal interleukin (IL)-1β (p=0.020) and IL-6 (p<0.001) but higher peritoneal interferon (IFN-γ) (p=0.002), IL-10 (p<0.001), and transforming
growth factor (TGF-β) [p < 0.001] compared to the control mice. In addition, the preconditioned mice had lower blood growth-regulated oncogene (GRO-α [p < 0.001]), monocytic chemotactic protein (MCP)-1 [p < 0.001], and tumor necrosis factor (TNF)-α [p < 0.003] compared to the control mice. At 20 h-post sepsis, the preconditioned mice had lower IL-1β [p < 0.001] and IL-6 [p < 0.001] but higher peritoneal TGF-β [p < 0.001] in conjunction with higher blood IL-17A [p < 0.002] and TGF-β [p < 0.009] compared to the control mice. CONCLUSIONS: The current findings suggested that exercise preconditioning-induced modification of gut microbiota might contribute to increased survival in sepsis by modulating host response toward the establishment of a balance between pro- and anti-inflammation. Supported by the National Research Foundation funded by the Korean Government (NRF-2018R1D1A1B07048135 and NRF-2016R1A6A3A1192432).

2644 Board #307 May 31 11:00 AM - 12:30 PM Impact of Fitness on Receptor Expression of Monocytes Cultured with Prolactin Following Acute Exercise

Lindsay M. LaFratta, Lauren N. Pedersen, Natalie J. Bohmke, Anson M. Blanks, Virginia L. Mihalick, Morgan B. Senter, R. Lee Franco. Virginia Commonwealth University, Richmond, VA. (No relevant relationships reported)

A high-fat meal elicits acute pro-inflammation noted by lipemia and an increased expression in monocyte adhesion molecules. Few studies have investigated the effect of exercise as a potential method to reduce the deleterious postprandial immune response. PURPOSE: Therefore, the purpose of this study was to investigate the effect of exercise on the expression of adhesion receptors on lipid-exposed pro-inflammatory monocytes in fit and unfit females. METHODS: 5 fit (VO2 peak ≥35 mL/kg/min) and 5 unfit (VO2 peak <30 mL/kg/min) females performed 30 min of moderate intensity (60% VO2 peak) cycling. Blood samples were obtained pre-, immediately, 1 hr, and 2 hr post-exercise. Whole blood was stimulated with prolactin (100 µg/mL) for 24 h and cultured for 2 and 4 h at each timepoint. Monocytes were stained with antibodies against CD14 and CD16 to identify pro-inflammatory subsets. Additionally, antibodies against CD11c, CD36, CD62L, and VLA4 were analyzed via flow cytometry. Post-exercise changes in monocyte receptor expression following incubation with prolactin were assessed by paired sample t-tests. RESULTS: Within intermediate monocytes, unfit females observed a significant change in VLA-4 with 4 h prolactin incubation at 1hr post-exercise (pre % change: -21.74 ± 20.53 vs. 1hr post % change: -6.98 ± 13.64, p = 0.04). In non-classical monocytes, unfit females observed a significant change in CD11c with 2 h prolactin incubation at 2hr post-exercise (pre % change: -25.04 ± 19.85 vs. 2hr post % change: -3.36 ± 23.14, p < 0.01). Fit females observed significant changes in non-classical monocyte receptor expression of both CD36 (pre % change: 2.20 ± 29.51 vs. post % change: -35.57 ± 27.23, p = 0.03) and CD62L (pre % change: -21.47 ± 18.71 vs. 4.66 ± 4.77, p = 0.034) incubated with prolactin for 4 h immediately post-exercise. CONCLUSION: The impact of fitness is highlighted by a decrease in CD36 and blunted decrease in CD62L in lipid-exposed non-classical monocytes following acute exercise in fit females. The VLA-4 and CD11c decrease observed in lipid-exposed pro-inflammatory monocytes of unfit females was blunted following acute exercise. Future research is warranted that investigates the impact of exercise and fitness on the monocyte adhesion cascade following consumption of a high-fat meal.

2645 Board #309 May 31 11:00 AM - 12:30 PM Differential Natural Killer Cell Cytotoxicity Response to Post-Exercise Autologous Serum Based On Cytomegalo virus Serostatus

Priti Gupta. University of Houston, Houston, TX. Email: tanug3110@gmail.com (No relevant relationships reported)

Cytomegalovirus (CMV) is a beta-herpes virus present latently in most people worldwide. CMV decreases the exercise-induced mobilization of Natural Killer (NK) cells and lowers the post-exercise-increase in NK cytotoxic activity (NKCA), perhaps due to alterations in NK subtypes. NKCA is also impacted by cytokines and stress hormones released into serum after exercise. Whether this effect is altered by CMV is not yet known.

PURPOSE: To determine the effect of exercise-induced changes in cell subsets, cytokines, and hormones on exercise-induced changes in NKCA in CMV+ and CMV- individuals.

METHODS: 13 physically active adults (7 women and 6 Men; age=31.9±7 years) cycled 30 min at 115% of their lactate threshold power. Peripheral blood was collected pre-, post-, and 1h post-exercise. Mononuclear cells isolated from pre-exercise blood were incubated with target cells (K562 or U266) in the presence of autologous serum pre-, post-, and 1h post-exercise. Mononuclear cells isolated from pre-exercise blood were incubated with target cells (K562 or U266) in the presence of autologous serum pre- exercise N K cells with post- exercise or 1h post- exercise serum did not impact survival. RESULTS: Post-exercise serum decreased the number of NK cells (CMV+) from pre to post and from pre to 1h post exercise. CONCLUSIONS: The current findings suggested that exercise preconditioning-induced modification of gut microbiota might contribute to increased survival in sepsis by modulating host response toward the establishment of a balance between pro- and anti-inflammation. Supported by the National Research Foundation funded by the Korean Government (NRF-2018R1D1A1B07048135 and NRF-2016R1A6A3A1192432).

2644 Board #308 May 31 11:00 AM - 12:30 PM Immunoregulatory Effects of Oat Avenanthramides during Downhill Running in Young Men and Women

Tianou Zhang1, Tong Zhao1, Yuzi Zhang1, Tao Liu2, Gilles Gagnon3, Jacqueline Ebrahim4, Edmond B. Canessa5, 1The University of Texas at San Antonio, San Antonio, TX. 2Dole Nutrition. 3Edmonond B. Canessa MD (Sponsor). 4Tianou Li Ji, FACSM. 5PepsiCo & Ceapro Inc., Canada. (No relevant relationships reported)

Avenanthramides (A V A) are a group of di-phenolic acids found only in oats, providing antioxidant protection and inhibiting inflammation. Downhill running (DR), an eccentric exercise, activates a series of peripheral immune cells and stimulates a series of inflammatory and anti-inflammatory responses in the skeletal muscle. The objective of the study is to evaluate the effects of oat A V A supplementation on eccentric exercise-induced leukocytes changes in the blood of human subjects.

METHODS: 12 male and 12 female subjects were randomly assigned to high-A V A (H-A V A) or low-A V A (control) groups. Two treadmill-based DR sessions were separated by an 8-week washout period followed by 8-weeks of oat A V A supplementation by receiving two cookies containing high (206 mg/kg) or low (0 mg/kg) A V A daily. Blood samples were collected before DR and at various time points (0, 4, 24, 48, and 72h) after DR. Granulocyte- and Granulocyte Macrophage-Colony Stimulating Factor (GM-CSF and G-CSF) were measured using multiplex immunoassay (R&D Systems). Peripheral blood leukocyte sub-populations were quantified using the flow cytometer (BD Accuri C6) and presented as percentage. Data were analyzed using repeated measures ANOVA.

RESULTS: DR increased plasma G-CSF at 0h and 4h post-DR (P<0.05), with a significant interaction between oat supplementation and AVA dosage (P<0.05). DR did not affect GM-CSF, but H-A V A showed a trend of lower GM-CSF at 24 post-DR (P<0.05). H-A V A decreased DR-induced CD11b/CD45− leukocytes by 15% at 0h and by 14% at 4h post-DR compared to control (P<0.05, time × A V A dosage). CD14/CD11b/CD45− leukocytes was elevated at 4h post-DR (P<0.01), but decreased by oat supplementation at pre- and 24h post-DR by 16% and 24% respectively (P<0.05, time × oat supplementation). H-A V A showed 52% higher CD36+ lymphocytes than control at 4h post-DR after supplementation (P<0.05). DR significantly reduced CD56+CD16+ lymphocytes at 4h post-DR (P<0.05) before oat supplementation, but increased by 36% in H-A V A compared to control pre-DR after supplementation (P=0.07). CONCLUSIONS: High A V A supplementation inhibited DR-induced colony stimulating factors (G-CSF and GM-CSF) expression. While both dietary groups decreased circulatory monocytes (CD14) activation after DR, H-A V A inhibited neutrophils (CD11b) and increased NK cells (CD56) activations.
and 0 h, 0.75 h, 1.5 h, 3 h, 4.5 h, 21 h, 45 h post-exercise. Oxylipins were measured using the Vanquish UHPLC coupled to a Quantiva triple quadrupole mass spectrometer (Thermo Fisher Scientific, Haverhill, MA) using reference standards. RESULTS: Significant and substantial fold-increases (immediately post-exercise/pre-exercise) were measured for plasma levels of arachidonic acid, eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA), and 43 of 45 oxylipins. Significant interaction effects (4 trials x 8 time points) were found for plasma arachidonic acid (P<0.001) and DHA (P<0.001), but not EPA (P>0.05), with higher post-exercise values found in the water trial compared to the carbohydrate trials. Significant interaction effects were measured for 12 of 45 oxylipins. The data supported a strong exercise-induced increase in plasma levels of these oxylipins during the water trial, with carbohydrate ingestion (both bananas types and the sugar beverage) attenuating oxylipin increases, especially those (9 of 12) generated from the cytochrome P-450 (CYP) enzyme system. These trials differences were especially apparent within the first three hours of recovery from the 75-km cycling bout. CONCLUSIONS: Prolonged and intensive exercise evoked a transient but robust increase in plasma levels of oxylipins, with a strong attenuation effect linked to acute carbohydrate ingestion, especially those generated through the CYP enzyme system. Supported by Dole Foods, Westlake Village, CA

Football has one of the highest incidence rates of mild traumatic brain injury (mTBI) compared to other contact sports, but on field identification relies on sub-optimal subjective assessments. Purpose: We aimed to characterize changes in blood biomarkers of mTBI in NCAA Division I football players in response to repeated head-impacts during a competitive season. Methods: We studied 30 collegiate football players (21 linemen; 9 non-linemen). Resting serum samples drawn prior to pre-season camp, at the end of pre-season camp, and at the end of the competitive season, were analyzed for biomarkers of mTBI including S100B, GFAP, NSE, UCHL1,NFL, and BDNF by ELISA. The frequency and magnitude of game and practice head-impacts were recorded using helmet- accelerometers. Changes in serum biomarkers of mTBI between linemen and non-linemen across the different timepoints were analyzed by repeated measures ANOVA. When significant differences were found, Pearson’s correlation coefficients were used to determine linear correlations between biomarkers of mTBI and the frequency and magnitude of head impacts. Results: All players had similar levels of S100B before the start of the season (pre-camp, p>0.05), however linemen exhibited higher levels of S100B than non-linemen after camp and at the end of the season (post-camp: 30.6%, post-season: 22.5%; p<0.05). While both linemen and non-linemen had greater levels of serum BDNF and NSE at the end of the season, when compared to pre- and post-camp levels (p<0.05), the largest increases were seen amongst linemen (p<0.05). In the linemen group, the average magnitude of head impacts across the 2 weeks of pre-season camp was positively correlated with serum BDNF (r=0.806, p=0.009). The increase in serum S100B observed in linemen at the end of the season was highly correlated with both maximum (r=0.794, p=0.011) and average gyrocopic forces (r=0.669, p=0.049) experienced by players between the post-camp and post-season timepoints. Conclusion: Linemen exhibited a greater increase in serum biomarkers of mTBI than non-linemen where repeated low-moderate head-impacts are less frequent. Furthermore, S100B was highly associated with the frequency and magnitude of head-impacts during a college football season, suggesting a potential role as diagnostic tool for mTBI in contact sports.

Concussed athletes are increasingly introduced into the medical care continuum via the primary care setting. As such, primary care physicians (PCPs) are expected to make more decisions regarding return-to-play, symptom management, and specialist referral than ever before. Concussion-specific history and physical examination is vital for this decision-making process. Purpose: To review clinic documentation and determine how PCPs are evaluating concussed athletes in clinic relative to published consensus and guidelines. Methods: We conducted a retrospective records review for all patients evaluated by PCPs with no formal sports medicine training at a large academic medical center. We restricted our review to pediatric patients (7-18 yrs) diagnosed with sport-related concussion between 2014-2017. Results: We included 490 patients (age=14.7 ± 2.2 years; 184 females). Patients presented most frequently to pediatricians (60%) at a median of 3 days from injury (range 0-64 days, IQR 1-6). Most patients participated in football (25.5%), soccer (19.8%), and basketball (15.1%). Prior concussion history was documented in 28.8% of visits. Providers documented headache presence or absence in 94% of patients, compared with nausea (52.2%), dizziness (51.8%), vision changes (45.7%), cognitive complaints (45.7%), emotional changes (17.1%), sleep difficulties (15.8%) and neck pain (13.5%).
neurologic examination was documented in 95.5% of visits compared to detailed neurologic assessment including strength, sensation, cranial nerves, and cerebellar function (26.9%), clinical cognitive assessment (13.5%), balance testing (41%), and neck exam (45.7%). Return-to-play was frequently discussed (94.5% of visits) and 13.1% of PCPs referred the patient to a dedicated sports medicine provider.

CONCLUSIONS: Symptom-based return-to-play algorithms cannot be effective if the signs and symptoms driving their decision-making aren’t being properly evaluated and documented. The PCPs caring for the patients in our retrospective study often omit important components of the history and physical examination for concussed athletes. New tools are needed to empower PCPs to more completely evaluate and manage these patients, and PCPs should be encouraged to thoroughly document the care provided.

### Table 1. Comparison of Single Task (ST) and Dual-Task (DT) Domain and Composite Scores for the SAC and TTG Performance. (µ ± SD)

<table>
<thead>
<tr>
<th>Domain</th>
<th>ST</th>
<th>DT</th>
<th>Mean Difference</th>
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<tr>
<td>SAC (points)</td>
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<tr>
<td>Immediate Recall</td>
<td>24.4 ± 2.46</td>
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<td>Concentration</td>
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<td>Digits</td>
<td>3.5 ± 0.72</td>
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</tr>
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<td>Months</td>
<td>1.0 ± 0.00</td>
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<td>Delayed Recall</td>
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*pAll DT TTG values were compared to the best (fastest) time achieved during ST performance.

PUPPOSE: The dual-task (DT) paradigm consists of concurrent performance of a cognitive and motor task. Varying DT methodologies have been used to observe subtle changes associated with sport concussion (SC). However, previously employed DT methodologies may not be translatable to the clinical setting. The purpose of the current study was to compare performance on commonly used cognitive and motor tasks administered separately and concurrently in a healthy collegiate sample.

METHODS: Participants consisted of 60 (32 female, 28 male) recreationally active adults (Age: 20.5 ± 1.34 years, Height: 171.7 ± 9.33 cm, Mass: 69.25 ± 12.23 kg). Participants completed the single task (ST) assessment which consisted of the Standardized Assessment of Concussion (SAC) and four trials of the timed tandem gait (TTG) test separately. Participants then completed the SAC and TTG concurrently for the DT assessment. For the SAC, paired t-tests were used to compare ST and DT performance for immediate recall (10-item list), concentration (digit span, months in reverse order), and delayed recall domains as well as the composite score. For the TTG test, paired t-tests compared the best (fastest) time of the ST trials to the average values for each SAC domain. All analyses were performed with α = 0.05.

RESULTS: SAC composite scores significantly improved by 2.3 ± 3.61 points from ST to DT performance (p < 0.001). Comparisons of all ST and DT domain and composite scores for the SAC and TTG are presented in Table 1. CONCLUSION: The DT assessment resulted in improved cognitive performance and decreased (slower) motor performance as compared to ST performance. Our findings align with related literature using more sophisticated assessment tools. The current measures of cognition and motor control prior to and following a SC. Future research should investigate the current DT methodology in concussed athletes.

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PUPPOSE: The purpose of this study is to examine the baseline performance of adolescent athletes on the King-Devick test (KD), modified Balance Error Scoring System (mBESS), and Post Concussive Symptom Inventory (PCSI) to determine whether age or sex significantly influence performance or reporting on these assessments. METHODS: A retrospective cohort study was conducted on athletes’ baseline concussion assessments as completed as part of their school or organizations’ concussion surveillance program. Testing was recommended prior to or at the start of each sports season and included a concussion history and risk factor questionnaire, KD, mBESS, and PCSI. The influence of age, sex, and correlations between tests were also examined. RESULTS: Data from eight schools and one sports organization was available for review. Data collected from 389 athletes (64% M, 36% F) were included in the analysis. The average age was 15.9 (+/- 1.5), range 12.1-19.2. The average KD score was 47.6 (+/- 9.7, range 28.0-88.6 s), mBESS 25.8 (+/- 3.2, range 12-30), and PCSI score was 5.2 (+/- 8.2, range 0-52). Gender did not influence test performance on any of the measures. Only KD was influenced by age with improved performance noted at older ages (p<0.01). Overall, the three test measures showed poor correlation among these athletes. CONCLUSIONS: KD, mBESS, and PCSI baseline performance is reported in a cohort of adolescent athletes. Test performance was not influenced by gender and only KD was associated with age. The poor correlation between tests supports the need for a comprehensive baseline concussion surveillance program. Further studies are necessary to examine the utility of these measures in managing recovery from injury in this population.
Concussion can negatively impact several physiological processes, one of which is the cardiovascular system. While autonomic nervous system (CV-ANS) tests are often used in concussed patients may appear similar to healthy controls at rest, physiological stressors such as exercise may expose cardiovascular autonomic dysfunction present after injury. **PURPOSE:** To compare cardiovascular autonomic modulation of sport-related concussion (SRC) participants with age- and sex-matched healthy controls (CON) during 10° rest, 20° of exercise and 20° of recovery. **METHODS:** Student-athletes (15.9 ± 1.3 years, N=12, 8 SRC + 4 CON) were assigned to a 20° exercise bout of treadmill walking at 40% age-predicted HRmax. SRC participants exercised between Day 3 and Day 7 following their concussion. HRV and blood pressure were collected throughout the testing session. Descriptive statistics, a series of two-way mixed ANOVAs, and post-hoc pairwise comparisons with Bonferroni correction were performed using SPSS 22. **RESULTS:** There was no significant interaction between injury and mean arterial pressure (MAP) (p = 0.07). The main effect of time showed recovery MAP was significantly lower than during exercise, F (2,844,28.442) = 6.412, p = 0.002, partial η² = 0.391 and the main effect of group showed that the SRC group had a significantly higher MAP than CON, F (1,110) = 18.18, p = 0.005, partial η² = 0.567. The main effect of time showed that low-frequency normalized units (LFnu) was significantly higher at seated rest and during exercise than recovery, F (2,852,28.522) = 11.485, p < 0.001, partial η² = 0.535 with no differences between SRC and CON (p = 0.578). There was no significant interaction between injury and time for LFnu (p = 0.797). **CONCLUSIONS:** SRC participants exhibit subtle differences in cardiovascular autonomic responses during a bout of treadmill walking. A greater MAP in SRC compared to CON suggests a blunted post-exercise hypotensive response. These data may indicate that, at least acutely, concussion impacts cardiovascular autonomic modulation responses to low-intensity aerobic exercise. The aforementioned findings could have clinical implications for the management of concussions in adolescent athletes.

Orthostasis causes a gravity-dependent redistribution of blood volume to the lower extremities. The baroreflex coordinates effector organs of the cardiovascular nervous system (CV-ANS) to produce a proportional response to mitigate lower extremities. The baroreflex coordinates effector organs of the cardiovascular system. While autonomic nervous system (CV-ANS) tests are often used for the evaluation of sports concussion. **METHODS:** A single blind randomized controlled trial of aerobic exercise with BFR and BC was conducted. Twenty-five adults with PCS were assigned to the experimental group (n=14, 8 females and 6 males, 38±11 yrs) or the control group (n=11, 9 females and 2 males, 33±10 yrs). Both groups rode a recumbent elliptical machine for 21 minutes at moderate intensity (60% of predicted maximum heart rate) twice a week for six weeks, but only the experimental group received BFR and BC while riding. PCS Symptom Checklist (26 items with a total score of 156) was used daily to track the number and severity of PCS symptoms during the 6-week intervention and the 6-week follow-up period. To examine the fluctuations of symptom number and severity, the variance of overall checklist scores and sub-domain scores for each individual during the 6-week intervention and the 6-week follow-up period was calculated. Mann-Whitney U test was used to test the group differences.

**RESULTS:** The fluctuation of overall symptom severity during the 6-week intervention was significantly less in the experimental group (p=0.03). Less variations of severity in cognition and mood domains were observed in the experimental group (p=0.02 respectively). During the 6-week follow-up period, the number of PCS symptoms remained more stable in the experimental group (p=0.02). There is a trend that after the intervention ended, less symptom severity fluctuation was observed in the experimental group (p=0.05). The number of PCS symptoms in the cognition and sleep domains reduced after the 6-week intervention ended and remained stable during the 6-week follow-up period (p=0.07 and p=0.02). Furthermore, the severity of mood and sleep symptoms remained more stable in the experimental group (p=0.04 for both domains).

**CONCLUSIONS:** Aerobic exercise with BFR and BC alleviated the post-concussive symptoms of people who suffered PCS less than a year. More stable recovery was found in individuals who exercised at 60% of predicted maximum heart rate under BFR and body cooling as compared to those who underwent the exercise without BFR and BC. Supported by Oak Foundation Grant OCA-16-310.
the OD condition (1.63 ± 0.04 vs. 5.85 ± 15.96 cm², P = 0.153). KD total time was significantly faster in Collegiate vs. Youth players (38.44 ± 6.18 vs. 51.47 ± 0.04 s, P < 0.001). Collegiate players had faster speed thresholds than six of seven (Core 1 & 2) of the three MOT tests (Core 1: 5.55 ± 0.84 vs. 4.90 ± 1.27 m/s, P = 0.020; Core 2: 3.29 ± 0.82 vs. 2.89 ± 0.75 m/s, P = 0.047). Speed trend was not different between the Collegiate and Youth players in Core 3 of MOT (2.21 ± 0.45 vs. 2.00 ± 0.63 m/s, P = 0.143). CONCLUSION: Collegiate players had better baseline scores on a majority of the clinical concussion tests. These findings highlight the importance of recurrent baseline testing and/or use of age-specific normative values in concussion evaluation. Moreover, youth players had greater variability in their test results, thus medical personnel should exercise caution when relying solely on normative scores to evaluate the neurologic function of youth suspected of having a concussion.

There are many forms of evaluating traumatic brain injury in sports medicine. This may include “paper and pen” neuropsychological tests, …which often lend themselves to the sports medicine environment. A reliable, and inexpensive test that can be used on the sideline without any additional devices is highly desirable. However, the chosen “length” (number of questions/tasks) of these instruments are rarely justified, if at all.

PURPOSE: The purpose of this experiment was to determine if duration of testing makes a difference in outcomes. From our experiences as clinicians, we have observed the frustration build in the injured athlete as the test continues. We hypothesize that there is an optimal duration for the test, and as such, with an extended and unnecessary duration, we contend that lower scores may be present due to other extrinsic variables including boredom and frustration. METHODS: A convenience sample of 55 subjects (mean height=175.8 cm, mass=88.2 kg) were each given a 30-question and a 70-question version of the Stroop test, and a 30-question and a 120-question version of the Symbol Digit Modalities Test (SDMT). Each had their mental status assessed by each version of the test. RESULTS: Fifty-five subjects completed the Stroop test long version (70 questions). The time for testing averaged 81 sec and number of missed questions averaged 1.5. With regard to the short version (30 question) Stroop test, 28 subjects took the test. Results averages 32 seconds to take the test, and number missed averaged 0.5 questions. As for the SDMT short versions (45 questions) 47 subjects completed the test in an average of 47.1 sec while missing an averaged 0.4 questions. The long version of the SDMT contained 120 questions. Twenty-five subjects completed the test with an average of 0.62 questions missed. Time was not obtained in this trial segment due to a technical error. CONCLUSIONS: This preliminary study suggests that the duration of testing time may in fact alter the performance of the subject. Further research on this topic is warranted.

The Kleiner Evaluation of Mental Status (KEMS) instrument was developed 8 years ago and has undergone continued evaluation and improvement. This instrument has previously been shown to be brief, reliable valid, and discriminating, as well as “practical for the sidelines”. For the past 8 years we have evaluated many instruments for validity, specificity, and discriminating qualities of each task. PURPOSE: The purpose of this study was to alter the sequence and content of the instrument without affecting it’s accuracy. We sought to produce a “Version B” of the KEMS instrument, and to evaluate it against our initial and well-studied counterpart, thus creating a second reliable instrument to be used in pre- and post-testing, and for serial assessments. Both versions are equally-weighted, 12-question, cognitive assessment tools that include; simple orientation (SO), complex orientation (CO), immediate recall (IR), delayed recall (DR), concentration (C), and staged commands (SC). METHODS: A convenience sample of 48 subjects (mean height=177.3 cm, mass=89.8 kg) were divided into two equal groups. Each had their mental status assessed by one version of KEMS before, and the other version after, competing in an amateur boxing bout. The sequence of KEMS-A vs. KEMS-B was determined a priori. Descriptive data are presented as percentage (% of responses). RESULTS: The mean percent of correct answers for Version A was 86.3%, vs. 87.5% for Version B. The number correct per category were the same for both versions (SC, IR, IR, SO, SO, SC, CO, C, DR, and DR), indicating an acceptable instrument. CONCLUSIONS: We conclude that this instrument, along with other modalities, should be part of the standard protocol to assess concussion in athletes.

eSports is a $1.5 billion industry with over 250 million viewers globally. Although there is controversy over its qualifications as a sport, the International Olympic Committee (IOC) has deemed esports a sporting activity and over 80 colleges and universities have varsity esports teams with 22 offering scholarships. Despite its success little is known on the health, injury concerns, and management, of esports players.

PURPOSE: To understand lifestyle behaviors, exercise habits, and common injuries of esports players in the collegiate setting. METHODS: A survey was developed based on a literature review assessing gaming habits. The survey was administered to collegiate varsity esports players between the ages of 18-22 years of age from 9 colleges and universities in various geographic settings across the United States. Facts were collected anonymously. Descriptive statistics were used to determine frequencies, averages, and standard deviations. RESULTS: 63 subjects completed the survey 94% (n=59) male and 6% (n=4) female. The most common complaints were eye fatigue 51% (n=32), back/neck pain 41% (n=26), wrist pain 35% (n=22) and hand pain 30% (n=19). The majority of individuals practiced between 3-6 hours/day 59% (n=37) and 16% (n=10) >7 hours/day. Time spent in game play before a standing break diverged from 1 hour in 38% (n=24), to 2-3 hours in 40% (n=25), and >4 hours 19% (n=12). The majority of participants report being conscientious about diet 68% (n=43) and exercise 64% (n=40) with 65% (n=41) exercising ≥30 minutes/day and averaging 3 (SD=1.7) days exercising/week. However, 23% (n=15) reported no exercise at all. Average cups of a caffeine beverage a day was 1 (SD=0.8).

CONCLUSION: The health and injury profiles of esports players are similar to sedentary workers as opposed to traditional athletes. The assessment and management
of eSports players must be reflective of their healthcare needs. Pre-participation examinations should evaluate vision and eye strain, assess social/addictive behavior, and evaluate physical activity and nutrition habits. Healthcare teams may include primary care Physicians, Physical/Occupational therapists, Athletic Trainers, Exercises Physiologists, Psychologists/Psychiatrists, Optometrist/Ophthalmologists and Registered Dieticians.

PURPOSE: To examine the difference between varsity swimming programs in two universities, one in China and one in US. METHODS: 14 varsity female swimmers, 1 physical therapist, 1 academic counselor, 2 coaches, and 1 athletic director from the University of Illinois at Urbana-Champaign (UIUC), U.S. and 14 varsity swimmers (female=7), 1 coach, and 1 athletic director from the Southeast University (SEU), China were voluntarily for a semi-structure interview each ranging from 30 to 50 minutes. The interview questions include recruitment procedures, training and competition, support system, budget, coaches’, training philosophy and swimmers’ motivation for training. All of interviews were tape-recorded, transcribed to transcript, coded and analyzed. RESULTS: Key features and difference between two programs are summarized below:

<table>
<thead>
<tr>
<th>Items</th>
<th>SEU</th>
<th>UIUC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment</td>
<td>Using one single swimming test to determine the selection</td>
<td>Long-term monitoring for selection; two-side communications available between coaches and swimmers</td>
</tr>
<tr>
<td>Training (Hours; Load)</td>
<td>10 hours per week; 20000-26000 yards per week</td>
<td>20 hours per week; 50000-70000 yards per week</td>
</tr>
<tr>
<td>Competition (Duel meet; Championship)</td>
<td>0 times per season; 2-3 times per season</td>
<td>7-8 times per season; 2-3 times per season</td>
</tr>
<tr>
<td>Support Team</td>
<td>The coach takes duty for all aspects; Consist of 1 athletic trainer, 1 physical therapist, 1 nutritionist and 1 psychologist</td>
<td></td>
</tr>
<tr>
<td>Budget</td>
<td>44,000 $ per year</td>
<td>260,000 $ per year</td>
</tr>
<tr>
<td>Coaches’ Training Philosophy</td>
<td>Improvement of athletic performance and academic achievement</td>
<td>Improvement of athletic performance and academic achievement; whole-person development</td>
</tr>
<tr>
<td>Swimmers’ Motivation for Training</td>
<td>External motivation: Reward; Internal motivation: Athletic spirit and self-improvement</td>
<td>Internal motivation: Interest of swimming, self-challenging, responsibility for team, and the sense of achievement</td>
</tr>
</tbody>
</table>

CONCLUSION: A variety of differences were found between China and US varsity swimming programs, which should explain the swimming performance level differences between two countries at both the university and national levels.

PURPOSE: The purpose of this study was to determine if a pre-race medical screening and risk stratification program predicts adverse events (ability of a runner to finish the race, or develop a medical complication) during an endurance running event. METHODS: This prospective study, conducted during the Two Oceans marathon races (21.1km and 56km) in South Africa over 4 years, involved 76654 consenting runners. A pre-race medical screening questionnaire at registration (3-4 months before the race), and were risk stratified into four groups: very high risk (VHR; existing cardiovascular disease - CVD), high risk (HR; risk factors for CVD), intermediate risk (IR; existing other chronic disease, medication use or injury), and low risk (LR). All runners in the VHR and IR categories were provided with educational information to decrease the risk of medical complications, and were also advised to undergo a pre-race medical assessment. Runners were tracked from registration to starting and finishing the race, and medical encounters (ME) were documented. Main outcome variables were the did-not-start rate (DNS, % runners registering but not starting) and the adverse event rate (AE) [defined as % starters that did-not-finish (DNF) or had an ME in each category].

RESULTS: The DNS rate (%: 95% CI) for runners was similar in all risk categories (VHR=19.5; 17.9-21.2, HR=18.8; 18.0-19.7, IR=18.4; 18.0-18.9, and LR=18.6; 18.2-19.1)(p=0.004). The DNF rates in the VHR (2.2; 1.6-3.0)(p=0.005), HR (1.8; 1.5-2.1)(p=0.017), and IR (1.9; 1.8-2.1)(p=0.001) were significantly higher compared to the LR (1.4; 1.2-1.5). The overall AE rates for runners in the VHR (2.3; 1.8-3.0) (p=0.0017), HR (1.8; 1.5-2.1)(p=0.032), and IR (2.0; 1.9-2.2)(p<0.001) were significantly higher compared to the LR (1.5; 1.3-1.6).

CONCLUSIONS: A pre-race medical screening, risk stratification and educational intervention program did not change the DNS in the risk categories. However, runners in the highest risk categories, that chose to start the race, were more likely to suffer an adverse event (not finish the race or present with a medical encounter) compared with runners in the lowest risk category.

Sport specialization has become more common in young athletes and recent evidence suggests sport-specialized training is related to an increased risk of sports injury. PURPOSE: The purposes of this study were to 1) assess the percent of high school sport specialization among collegiate football players and 2) determine whether sport specialization was related to rate of prior injury. METHODS: 101 NCAA Division III Collegiate Football players (Age: 20.38±1.35 years, height 1.83±0.06 m, body mass 96.12±14.95 kg) participated in the study. At the beginning of their intercollegiate season, the players completed a survey about high school sport specialization participation and prior high school and college sport injuries. Sport specialization was classified as low, moderate or high based on the players’ responses to questions on a) playing a primary sport in high school, b) quitting other sports to focus on the primary sport and c) training for football >8 months/year in high school.

RESULTS: In this study sample, 25.7% (n=26) of players reported being highly sport specialized and 40.6% (n=41) being moderately sport specialized in high school. Football was the primary high school sport reported for 67.3% (n=68) of players. Prior injury that limited or stopped their sports participation was reported in 83.2% (n=84) of players. While the collegiate football players classified as moderate and high sport specializers reported a higher incidence of prior injury relative to players classified in low sport specialization, the association was not statistically significant (Odds Ratio=2.66 (95% CI 0.92-7.67), p=0.07). The number of all prior injuries reported by moderate or high sport specializers (2.15±1.45) was not significantly greater than low sport specializers (1.74±1.62) (p=0.20). Similarly, the number of high school injuries reported by moderate or high sport specializers (1.30±1.30) was not significantly greater than low sport specializers (0.85±1.08) (p=0.09).

CONCLUSIONS: The prevalence of high school sport specialization in this sample of football players was consistent with prior reports of football players. While results support previous findings of higher mean numbers of prior injury with increasing sport specialization, the association was not statistically significant.
2) Injury types describe the detail of their injury status such as strain, contusion or tendonitis. 3) Injury duration refers to how long the athlete was unable to participate in training. K-means clustering analysis with the Euclidean similarity of injury log vectors was conducted to label players. The number of groups(k) was determined by applying the average silhouette method. The characteristics of clusters were analyzed descriptively, and the sports were allocated to each group followed by the athlete clusters. RESULTS: Five clusters were identified by the maximum average silhouette coefficient (0.153) among coefficients for randomly drawn k’s between 2 to 20. The first group, mainly baseball, men’s basketball, and men’s tennis, had injury to their ankle, arm, and hamstring for contusion and strain for a few weeks. The second group was mostly from football, with injury to their ankle, knee, and shoulder with the most extended injury durations. The third group, mostly football or track and field, were the athletes likely to have knee inflammation, and the duration was nearly half of a year. The injured body parts of the fourth group were back, finger, and hamstring, and the types of injuries were fracture and tendonitis. This cluster was mainly women’s basketball and track and field athletes. The members of the last group had head injury (e.g., concussion), and were soccer, softball or volleyball athletes. CONCLUSION: This study may help practitioners in recognizing the likelihood of an athlete’s injury according to their sport. Additionally, coaches could also consider this information in daily practices.

2664 Board #328 May 31 11:00 AM - 12:30 PM Ready To Tri: Characteristics Of Recreational Triathletes Carolyn M. Kienstra, William H. Cade, II, Thomas M. Best, FACSM. University of Miami, Miami, FL. Email: ckienstra@med.miami.edu  

Purpose: The sport of triathlon has been increasing in popularity, especially among recreational athletes. As triathletes compete in races ranging from around 16 miles to 140.6 miles or more and train in 3 disciplines simultaneously, it is difficult to identify consistent risk factors for injury among these athletes. The aim of this study was to evaluate characteristics of a group of recreational triathletes in regards to their medical history, training habits, and musculoskeletal injuries. Methods: Endurance athletes were recruited for participation from local triathlon clubs and upon presentation to the University of Miami Sports Medicine clinic. Triathletes over the age of 18 years were considered for participation. After consenting, they were sent a link via e-mail to complete an online survey. Results: Twenty-two triathletes completed the survey. The average age was 46.5 years old (range 24-60 years). Seventy-three percent reported an injury in the past year, and 32% reported multiple injuries. The lower extremity represented 66% of injuries. The knee accounted for 27%, followed closely by the hip at 23%. The back and shoulder accounted for 15% each. Other reported locations of injuries were the foot, ankle, leg, and neck. Athletes spent the most training time per week biking at 4.9 hours, followed by running at 3.9 hours, and then swimming at 2.3 hours. Almost 60% reported weight training for an average of 2 hours per week. Of those, 77% reported at least 1 injury, but only 23% had multiple injuries. Only 14% participated in some type of yoga or Pilates. The majority of athletes, 59%, trained with the help of a coach. Only 18% reported working with a nutritionist, and less than 5% worked with a sports psychologist. Thirty-six percent reported having a current, chronic medical condition. The most common conditions were asthma and anxiety. Sixty-four percent used some type of vitamin or supplement, with multivitamins being the most common (35%). A gluten free diet was followed by 21%, and 16% reported following a vegetarian or vegan diet. Conclusion: Establishing a better understanding of the characteristics of recreational triathletes along with trends in their training habits can help guide further research on injury risks and lead to training recommendations for injury prevention.

2666 Board #330 May 31 11:00 AM - 12:30 PM The Ability of Internal and External Workload to Predict Injuries in College Female Soccer Players Ai Ishida, Pamela D. Swan, FACSM, Joshua S. Beaumont, Jesse Vezina. Arizona State University, Downtown Phoenix, AZ.  

(No relevant relationships reported)

Purpose: The sport of soccer is one of the fastest growing sports among young females in the US. The current participation rate is similar to that of youth baseball. While there are published guidelines for safe pitching practices in softball, these guidelines are not based on research and thus may not be well monitored or enforced by caregivers or coaches. A potential consequence could be compromised safety and increased injury incidence among young softball pitchers. The purposes of this study were to: 1) evaluate caregivers’ knowledge of safe pitching guidelines for youth fastpitch softball, and 2) obtain pitching and injury data for youth fastpitch softball pitchers. METHODS: A 30-item study-specific survey was administered to caregivers of youth softball pitchers in 10U-18U age brackets. Knowledge of safe pitching practices, arm pain and injury, and pitching volume and type. 115 surveys were completed, 50.4% of which were completed by the player’s mother. RESULTS: Only 14.7% of caregivers reported knowledge of published softball pitching guidelines while 16.5% relied on safe pitching guidance from coaches, internet, or USSA-ASA recommendations. Of the 115 respondents, 57.4% pitched year round. Caregivers estimated that 26.1% pitched less than 65 pitches per game, 60.8% pitched more than 66 pitches per game, and 13% did not know how many pitches were thrown per game. 74% surveyed stated pitches were counted by the caregiver, spouse, or coach, but 20% of caregivers did not know whether pitches were counted or not during play. A total of 76 softball players reported arm pain, 33% of which were shoulder pain, 13.9% were upper arm pain, and 11.3% were elbow pain. 22% of respondents sought medical care for arm pain. Of 16U and 18U players who reported arm pain, 72.1% missed play due to arm pain. CONCLUSIONS: Caregivers need to be a primary target for education of pitching guidelines. Protection of pitching volume-related arm pain or injuries may be possible through increased awareness efforts at the national, regional and local levels. Increased involvement of caregivers in monitoring pitching volume may also positively impact early detection or prevention of chronic arm injuries and missed play in youth softball pitchers.

2665 Board #329 May 31 11:00 AM - 12:30 PM Caregiver Awareness of Safe Pitching Recommendations in Youth Fastpitch Softball Pitchers Michael Smith, Giorgio Zeppieri, Bryan Prine, Kevin Farmer, Stephanie Brombacher, Heather K. Vincent, FACSM, Jason L. Zaremski, FACSM, Michelle Bruner. University of Florida College of Medicine, Gainesville, FL. (Sponsors: Heather K Vincent, FACSM) Email: smithms@ortho.ufl.edu  

(No relevant relationships reported)

PURPOSE: Fastpitch softball is one of the fastest growing sports among young females in the US. The current participation rate is similar to that of youth baseball. While there are published guidelines for safe pitching practices in softball, these guidelines are not based on research and thus may not be well monitored or enforced by caregivers or coaches. A potential consequence could be compromised safety and increased injury incidence among young softball pitchers. Wearable micro-technology devices like heart rate (HR) monitors and global positioning system (GPS) units enable sport medicine teams to monitor athlete workloads during training and games. These data are valuable to help optimize sport performance and prevent injuries. Previous research has evaluated the utility of workload parameters such as internal load (IL) and external load (EL) to predict injury risk in male athletes, but it is unknown if these same variables are applicable in females. PURPOSE: To investigate the correlation between IL and EL measured by micro-technology in female college soccer players and examine their utility to predict risk of injury on lower limbs. METHODS: Twenty-three NCAA Division One women soccer players 19.2 ± 1.2 years old, 168.2 ± 7.3 cm, and 64.0 ± 7.8 kg were recruited. Data were collected during all practice and game play over the 14-week season. Workload parameters were categorized as being either acute (A) or chronic (C) and were derived by a HR monitor (Polar Team 2, Polar Electro OY, Kempele, Finland) and GPS unit (Optimeyes S5, Catapult Innovation, Melbourne, Australia). IL consisted of ratings of average HR (Avg-HR), training impulse (TRIMP i.e., HR x time), age estimated maximum HR (Max HR), and perceived exertion (S-RPE). EL consisted of total distance (TD), average speed (Avg-Spd), high speed running distance (HSR), and estimated maximum speed (Max Speed). RESULTS: There were significant correlations between S-RPE and TD (r = .82, p < .001), TRIMP and TD (r = .75, p < .001), Avg-HR and Avg-Spd (r = .80, p < .001) and high HR zone and HSR (r = .60, p < .001), Avg-HR and Avg-Spd (r = .80, p < .001) and high HR zone and HSR (r = .60, p < .001). Seven, lower limb injuries were recorded, primarily consisting of hip and knee strain. Acute Avg-HR and A to C ratio of Avg-Spd were significantly (p < .05) higher in injured as compared to the non-injured group. CONCLUSION: IL and EL were significantly correlated in this group of female soccer players. The injured group had overall higher intensity values prior to injury than the non-injured group. However, both very high and very low workload variables preceded injury incidents. Sport medicine teams are advised to consider individualizing training protocols to maximize performance and minimize injury as both very high and very low workloads may predict injury in female college soccer players.
2667  Board #331  May 31 11:00 AM - 12:30 PM  State-level Implementation of Health and Safety Policies Within Secondary School Athletics: 2018 Update

Samantha E. Scarneo1, William M. Adams2, Yuki Murata3, Rebecca L. Stearns4, Douglas J. Casa, FACSMP. 1University of Connecticut, Storrs, CT. 2University of North Carolina at Greensboro, NC. 3Nagoya University, Nagoya, Japan. (Sponsor: Douglas J. Casa, FACSMP)

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(No relevant relationships reported)

In 2017, a study released the findings of state-level implementation of health and safety policies to prevent catastrophic injuries within secondary school athletics. However, it is unknown if improvements have been made since this initial review.

**Purpose:** To provide an update on the assessment of state-level health and safety policies pertaining to the leading causes of sudden death and catastrophic injuries within secondary school athletics in the United States.

**Methods:** Utilizing the methodology described in Adams et al. (2017), we aimed to provide an update to the current policies adopted at the state level for the 2017-2018 academic year. State high school athletic association policies, enacted legislation and Department of Education policies were reviewed for all 50 states and the District of Columbia. States that mandated policies within the rubric created by Adams et al. (2017) were awarded points (0-100) and ranked from 1 (best) to 51 (worst). The median and mean percent was calculated and the rankings were updated.

**Results:** Twenty-nine states were awarded new policies in the 2017-2018 academic year (results are as of August 15, 2018). The median is now 47.75% (+0.65% change). The mean from 2017 was 47.65% (not originally reported), and is now 49.61% (+1.96%). States ranked 1 through 10 were New Jersey, North Carolina, Massachusetts, Kentucky, Florida, Missouri, South Dakota, Washington, Wisconsin and Hawaii. New Jersey has obtained the first-place rank (+11.99%, +3 spots in the ranking), while Florida is now ranked 5th (+14.2%, +18 spots in the ranking). Other substantial changes included Nebraska (+10%, +17 spots in the ranking), Kansas (+10.6%, +12 spots in the ranking) and South Carolina (+6.37%, +6 spots in the ranking). States ranked 40 through 51 were Louisiana, Connecticut, Oklahoma, Michigan, Minnesota, North Dakota, Iowa, Wyoming, New Hampshire, Montana, California, Colorado.

**Conclusion:** Many states continue to make positive changes with the implementation of health and safety policies for managing the leading causes of sudden death and catastrophic injury in sport. However, continued advocacy for the initiation, development and implementation of these policies are warranted to optimize the health and safety of secondary school athletes.

2668  Board #332  May 31 11:00 AM - 12:30 PM  Relative Age And Sports Performance In Elite Athletes According To Gender And Sport Modality

María A. Riffo1, Francisco Verdugo2, Sandra Mahecha-Matsudo1. 1Universidad Mayor, Santiago, Chile. 2Centro de Alto Rendimiento Santiago, Santiago, Chile.

(No relevant relationships reported)

The effect of relative age is a topic to consider in the selection of elite athletes to ensure that a good detection of sporting talents is being carried out during the athlete’s growth and maturation phase.

**PURPOSE:** Evaluate the relationship of relative age with sport performance of elite athletes according to gender and sports modality of sports and to evaluate differences between men and women.

**METHODS:** We analyzed the data of 1285 athletes who were selected and attended the High Performance National Center in Chile between 1992 and 2017. The athletes came from different sports disciplines which were divided into Combat Sports, Sports with Ball, Strength and Resistance and Combat sport showed an increase of those born in the first months. They were divided into three categories: 1) born in the last 3 months, 2) born in the first quarter, and 3) born in the last 3 months of the year, without significant differences between the groups. In sports with a balloon, this effect was not observed, while in Art and Precision sports a slight increase was observed in those born in the last months.

**CONCLUSIONS:** Although an effect of relative age was not observed in elite athletes who train in High Performance Center in Santiago, an important decrease was found in those born in the last 3 months, especially in strength and endurance and combat sports, leaving the doubt if younger athletes are being considered during the selection of sports talents and if they are having the same opportunities to compete as their peers who were born a few months earlier.

2669  Board #333  May 31 11:00 AM - 12:30 PM  Muscular Strength and Lean Mass Development of Young Male and Female Swimmers Throughout Adolescence

Taline Santos da Costa, Pedro Murara, Rodrigo Vancini, Claudio Andre Barbosa de Lira, Marília Santos Andrade. Federal University of São Paulo, São Paulo, Brazil.

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(No relevant relationships reported)

The knowledge of differences in strength and lean mass development across chronological ages may help to understand the relationship between both in each sex and to guide training programs. **PURPOSE:** To compare the strength and muscle mass between different ages categories and sexes in young swimmers. **METHODS:** Cross-sectional study. 74 swimmers (55 males and 21 females) aged between 10 to 20 years old were evaluated. They were divided according to the training categories (category 1: 12-13 years; category 2: 14-15 years; category 3: 16 years or more). The athletes underwent evaluation of lean mass (Kg) using the dual-energy X-ray absorptiometry (DXA) method, and evaluation of knee extensor muscular peak torque (Nm) and total work (J), using an isokinetic dynamometer. **RESULTS:** Category 1 for male athletes presented lower values than category 2 for knee extensors peak torque (81.9±17.0 vs 128.0±32.9N.m, p<0.05), total work (99.2±24.5 vs 165.9±49.2 J, p<0.05) and lean mass (29.1±5.1 vs. 42.8±9.7 Kg, p<0.05). Moreover, category 2 for male athletes presented lower values than category 3 for knee extensors peak torque (128.0±32.9 vs 182.4±26.6 N.m, p<0.05), total work (165.9±49.2 vs 238.8±40.2 J, p<0.05) and lean mass (42.8±9.7 vs 56.9±3.5 Kg). In the female group, there were difference only between category 1 and 3 for peak torque (76.7±12.2 vs 128.5±17.0 N.m, p<0.05) and total work (95.3±19.1 vs 168±3±21.9 J, p<0.05). There were no differences for lean mass between the female categories. There was no significant difference between sexes for lean mass, peak torque and total work in category 1. Only lean mass was significantly higher (p<0.05) in males than in females in category 2, and peak torque, total work and lean mass were higher (p<0.05) in males than in females in category 3. **CONCLUSIONS:** The increase in muscle strength is coincident with the increase in boys’ muscle mass. Unlike the boys, the girls’ muscle mass was not different between age categories evaluated, but the muscle strength became higher during the time, probably due to neuromuscular adaptation. After 15 years of age, the difference in muscle performance between the sexes became significant. Separating training sections after 15 years old might be important since their levels of muscle strength and lean mass are significantly different.

2670  Board #334  May 31 11:00 AM - 12:30 PM  Knowledge about Sports Injuries, Their Risk Factors and Prevention Among University Football players, 2018

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(No relevant relationships reported)

**PURPOSE:** In Sudan, football is the most prevalent sport amongst youth. Sport injuries amongst young football players are common. In order to design effective sports injury prevention strategies it is important to know the knowledge and understand the attitudes of players about sports injuries.

**METHODS:** This study was descriptive cross-sectional institutional based study in the University of Khartoum. Total coverage of football teams of faculties of medicine, dentistry, pharmacy, engineering, economy and business was performed and data was collected through an author designed self-administered questionnaire comprising of socio-demographic data, knowledge, and attitude about common sports injuries experienced in football players. Data was analysed with SPSS version 24.

**RESULTS:** The study included 90 football players from 6 colleges. 50% have experienced a sport injury in the last 2 years and 50% haven’t. Inadequate warm-up exercise (27%) and over practice (12%) were selected by participants as the major risk factors of sports injury in football players. Regarding the knowledge about common sports injuries 49% players have average knowledge, 31% players poor and only 20% players have good knowledge. Faculty of medicine team showed the highest amount of knowledge. Faculty of engineering and faculty of business showed the lowest level of knowledge. General attitudes towards football players’ safety and injury prevention show 72% players with positive attitude. A significant association between the knowledge and attitude of the players (P=0.013) was found. 74.4% of the players do not their current educational curriculum adequately addresses sport injuries, their
Effect of Exercise Mode and Intensity on Subsequent Postprandial Carbohydrate and Fat Metabolism in Persons with Spinal Cord Injury

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Email: dmcmillan@med.miami.edu

(No relevant relationships reported)

PURPOSE: To determine the effects of pre-meal exercise mode and/or intensity on postprandial energy expenditure, substrate partitioning, and blood substrate and hormone concentrations in persons with spinal cord injury (SCI).

METHODS: Nine adult men with chronic (≥1 yr) thoracic SCI consented to participation. Following assessment of neuromuscular strength and cardiorespiratory fitness, participants completed four experimental trials. On the first trial before the meal, participants completed ~42.5 min of circuit resistance exercise (CRT). The subsequent exercise trials were designed to be isocaloric. Participants then completed seated control (CON), high intensity interval training (HIIT), and CRT. Blood glucose concentrations were collected continuously and analyzed via indirect calorimetry and blood samples were taken every 30 min.

RESULTS: Participants exercised at 52±6, 53±7, and 65±5 %VO2peak for a cost of 120±19, 120±22, and 122±33 kcal during MCT, CRT, and HIIT, respectively. Only CRT appeared to have an elevated EE at 150 min post-exercise (1.43±0.15 vs 1.34-1.32 kcal min⁻¹ in other conditions). The greatest increases in accumulated whole-body fat oxidation during recovery were seen in CRT and HIIT (15.1±3.2 and 13.3±4.8 g·min⁻¹, respectively) compared to MCT and CON (11.1±4.7 and 10.6±4.6 g·min⁻¹, respectively). As with energy expenditure, only CRT appeared to have elevated fat oxidation at 150 min post-exercise (83.1±19.1 vs 64.8-67.9 mg min⁻¹ in other conditions). In accordance, integrated area under curve (iAUC) of blood triglycerides and glycerol was lowest and highest, respectively, in CRT. Blood glucose was similar in all conditions, but CRT showed the lowest iAUC for insulin.

CONCLUSIONS: Pre-meal exercise changed postprandial energy metabolism in persons with SCI. Independent of exercise energy expenditure, intensity is an important determinant of post-exercise energy expenditure. Furthermore, exercise mode incorporating resistance and high intensity exercise appears to stimulate greater fat oxidation during recovery.
group during isometric handgrip (HG) exercise. METHODS: Individuals with (n=13; 30±7yrs, 27.0±6.9kg/m²) and without ID (n=19; 28±7yrs, 25.5±3.7kg/m²) had cardiac autonomic function assessed via heart rate variability (HRV) in two-minute sections, before, during, and after seated isometric HG exercise at 30% of maximal voluntary contraction. ECG recordings were acquired and analyzed in the time (root mean square of successive differences (RMSSD)) and percentage of RR intervals differing by <50ms (pNN50), and frequency domains (low and high frequency (LF, HF), and LF/HF ratio). Data were log-transformed in the case of non-normal distribution, but raw data are presented below. RESULTS: HG exercise elicited a decrease in RMSSD, LF, and HF (P<0.05) in both groups that returned to baseline values during recovery. Controls reduced pNN50 during HG and recovered to values higher than seated, however, no changes were observed in ID (interaction, P>0.05). LF/HF ratio did not change in either group. CONCLUSION: Individuals with ID appear to have attenuated cardiac autonomic responses (i.e., depressed sympathetic tone or incomplete vagal withdrawal) to a sympathoexcitatory task, such as isometric HG exercise. These data suggest that autonomic dysfunction likely exists among individuals with ID even during submaximal intensities and may contribute to the low work capacity in this population. However, a greater sample size is required to fully elucidate these findings.

### Table: Heart Rate Variability (HRV) Measures

<table>
<thead>
<tr>
<th></th>
<th>Seated</th>
<th>Handgrip</th>
<th>Recovery</th>
<th>Seated</th>
<th>Handgrip</th>
<th>Recovery</th>
<th>ID</th>
<th>Repeated Measures ANOVA</th>
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<tbody>
<tr>
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<tr>
<td>RMSSD</td>
<td>40±11</td>
<td>30±12</td>
<td>45±14</td>
<td>35±14</td>
<td>45±14</td>
<td>40±11</td>
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<td>pNN50</td>
<td>15±36</td>
<td>30±32</td>
<td>14±10</td>
<td>0.05</td>
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<td>LF (%)</td>
<td>49±105</td>
<td>54±74</td>
<td>52±56</td>
<td>48±105</td>
<td>67±74</td>
<td>50±105</td>
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<tr>
<td>HF (%)</td>
<td>622±62</td>
<td>43±239</td>
<td>720±500</td>
<td>526±64</td>
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<td>LF/HF ratio</td>
<td>750±172</td>
<td>381±241</td>
<td>67±407</td>
<td>391±284</td>
<td>358±232</td>
<td>252±281</td>
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</tbody>
</table>

(All data are reported as mean ± standard deviation)

2675 Board #339 May 31 11:00 AM - 12:30 PM
Over-ground Walking Economy In Hemiparetic Stroke
Alyssa D. Stookey, Fredrick M. Ivey, Leslie I. Katznel. Baltimore VA Medical Center; Baltimore, MD.
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(No relevant relationships reported)

Hemiparetic stroke causes residual gait deficits that impair gait economy/efficiency. Although gait economy is traditionally assessed during sub-maximal treadmill walking, natural over-ground gait mechanics and associated over-ground economy cannot be ascertained using this method, as walking on a treadmill artificially distorts the extent of hemiparetic gait inefficiency by altering gait mechanics. PURPOSE: To examine economy of over-ground walking in those with chronic, hemiparetic stroke. Additionally, we sought to determine whether gait speed and distance walked relates to over-ground gait economy in this population. METHODS: Twenty-five chronic, hemiparetic stroke survivors underwent a peak exercise test with metabolic monitoring and a two-minute walk (6MW) tests both with and without a portable metabolic measurement system. Gait economy was calculated as measured VO₂ during the 6MW divided by predicted VO₂ for non-stroke age-matched subjects, according to a standard estimation equation utilizing ground speed. RESULTS: 6MW distance covered with the portable system (306±3 ± 138.8 meters) was highly correlated (r=0.93, P<0.001) to distance walked without the system (282.8 ± 113.2 meters), indicating that the lightweight equipment did not impede walking performance. Mean VO₂ during the 6MW (12.5 ± 3.2 ml/kg/min) was 67% of mean VO₂ peak (18.63 ± 5.42 ml/kg/min) and all subjects had impaired gait economy, according to commonly accepted criteria for gauging economy deficits, as the mean measured VO₂ was 45% higher than the average predicted VO₂ (8.6 ± 2.3 ml/kg/min) (P<0.001). Results further demonstrated a moderate association between gait economy and both gait speed (r = -0.5, P<0.05) and distance walked (r = -0.49, P<0.05). CONCLUSION: Stroke disability substantively impairs over-ground gait economy, with hemiparetic walking economy associated with walking speed and distance walked. Future research should focus on determining the extent to which economy of gait in over-ground walking can be improved with exercise rehabilitation, as well as determining which types of exercise training and therapy modalities are most beneficial to improving gait efficiency after disabling stroke. Supported by VA Rehabilitation Research and Development Career Development Award and NIH Grant 1T35AG036679.

2674 Board #338 May 31 11:00 AM - 12:30 PM
Attenuated Cardiac Autonomic Function in Response to Hand Grip Exercise Among Individuals with Intellectual Disability
Sara R. Sherman, Thessa I.M. Hilgenkamp, Elizabeth C. Schroeder, Bo Fernhall, FACSM, Tracy Baynard, FACSM. The University of Illinois-Chicago, Chicago, IL.
Email: sshern5@uic.edu

(No relevant relationships reported)

Individuals with intellectual disability (ID) are at a greater risk for co-occurring health conditions, such as cardiovascular disease (CVD). Previous research has indicated autonomic dysfunction, an important contributor to CVD risk, to be present in individuals with ID. However, autonomic dysfunction and its potential impact on work capacity has not been thoroughly investigated in individuals with ID. PURPOSE: To assess cardiac autonomic function between individuals with ID and a matched control...
Sleep duration (SD) is critical for exercise recovery, however collegiate student athletes are typically sleep deprived secondary to early morning workouts, class responsibilities, late day competitions and travel. Optimal cardiac autonomic function (CAF) is indicative of an athlete’s ability to recover and handle the next practice/ conditioning session. Measures of CAF include heart rate variability (HRV) and resting heart rate (RHR) that can be obtained during the last cycle of sleep. PURPOSE: The purpose of this study was to compare the impact of time-of-day practices/conditioning during two six-week periods on HRV, RHR, and SD in college football players. The two six-week periods compared were off-season early morning (6:00 am) summer conditioning and in-season fall afternoon (3:30 pm) practices. METHODS: THirteen male college football players were fitted with WHOOP wearable activity/recovery tracking devices that use photoplethysmography and accelerometer to determine HRV (RMSSD), RHR (bpm), and SD (hrs/day). Both HRV and RHR are measured during the last sleep cycle to determine CAF. The WHOOP device was worn throughout the entire day and night, including during practices, conditioning, and sleep. Data were downloaded to the user’s smartphone daily then uploaded into SPSS for statistical analyses. The six-week summer conditioning occurred at 6:00 am while the six-week fall practices occurred at 3:30 pm. RESULTS: A series of three paired sample t-tests were performed to compare HRV, RHR, and SD between the two six-week time periods for time-of-day comparisons. Both HRV (100 ± 2 vs 82.2, p = 0.002) and SD (4.5 ± 5.3, p = 0.002) were significantly different between the two six-week practice/ conditioning time periods while RHR was not significantly different (56.6 ± 58.2, p = 0.201). CONCLUSIONS: Both SD and one measure of CAF (HRV) differed based on time-of-day practices/conditioning in college football players. Athletes appeared to have higher CAF (HRV) during the six-week summer conditioning (6:00 am) period, while increased SD during the fall six-week (3:30 pm) period. Supported by The American Athletic Conference Research Consortium Grant (No relevant relationships reported)

PURPOSE: Investigate the immediate and residual impacts of sleep extension in tactical athletes. METHODS: A randomized controlled trial (Sleep extension = EXT vs Control = CON) was conducted on 50 (EXT: 20.12 ± 2.01 years vs CON: 19.76 ± 1.09 years) tactical athletes enrolled in the Reserve Officers’ Training Corps. Participants wore actigraphs for 15 consecutive nights and completed a cognitive/motor battery after 7 habitual sleep nights, after 4 sleep extension nights, and after the resumption of habitual sleep for 4 nights. The CON group remained on habitual sleep schedules for the duration of the study. RESULTS: During the intervention, the EXT group significantly increased mean sleep time (1.36 ± 0.71 hours, p < 0.001). After sleep extension, there were significant between-group differences on the mean score change since baseline in Psychomotor Vigilance Test reaction time (p = 0.026), Trail Making Test - B time (p = 0.027), standing broad jump (SBJ) distance (p = 0.001), and motivation to perform the cognitive tasks (p = 0.003) and the SBJ (p = 0.001), with the EXT group showing a greater enhancement in performance/motivation. After resuming habitual sleep schedules, significant between-group differences on the mean score change since baseline persisted on SBJ distance (p = 0.001) and motivation to perform the SBJ (p = 0.035), with the EXT showing greater enhancement in performance/motivation. CONCLUSION: Increasing sleep duration resulted in immediate performance benefits in psychomotor vigilance, executive functioning, standing broad jump distance, and motivation levels. Benefits on motor performance and motivation were evident four days after resumption of habitual sleep schedules. Sleep duration appears to positively impact performance and motivation levels in tactical athletes. The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government

E-48 Basic Science World Congress/Poster - Sleep and Athletic Performance
Friday, May 31, 2019, 7:30 AM - 12:30 PM
Room: CC-Hall WA2

2676 Board #340 May 31 11:00 AM - 12:30 PM
Cardiac Autonomic Function and Sleep Duration Changes Due to Time-of-Day Practices/Conditioning in College Football Players
Portia B. Resnick, William D. Hale. The University of Tulsa, Tulsa, OK.
Email: portia-resnick@utulsa.edu

2677 Board #341 May 31 11:00 AM - 12:30 PM
Immediate and Residual Effects of Sleep Extension on Performance and Motivation in Tactical Athletes
Bradley Ritland1, Guido Simonelli2, Rodolphe Gentili3, J. Carson Smith, FACSM4, Xin He1, Janna Mantua2, Thomas Balkin2, Bradley Hatfield, FACSM1. United States Army Institute of Environmental Medicine, Natick, MA. 2Walter Reed Army Institute of Research, Silver Spring, MD. 3University of Maryland, College Park, MD.
Email: bradley.ritland@gmail.com

2678 Board #342 May 31 11:00 AM - 12:30 PM
Sleep Quality and Psychosocial Variables Predict Common Cold in Marathon Runners
Sophie E. Harrison, Jason P. Edwards, Ross Roberts, Neil P. Walsh, FACSM. Bangor University, Bangor; United Kingdom. (Sponsor: Neil P. Walsh, FACSM)
Email: s.harrison@bangor.ac.uk

2679 Board #343 May 31 11:00 AM - 12:30 PM
Effects of Nap After Morning Exercise on Afternoon Performance and Overnight Sleep in Athletes
Karina Ando1, Hirojuki Sagayama2, Masako Hoshikawa2, Masaki Takahashi1, Shigenobu Shibata3, Hideyuki Takahashi1. 1Japan Institute of Sports Sciences, Tokyo, Japan. 2Japan Society for the Promotion of Sciences, Tokyo, Japan. 3Waseda University, Tokyo, Japan.
Email: karina.ando@jimpsport.go.jp

General population studies show that poor sleep and psychological stress predict common cold and recent work shows that early life adversity can have long lasting effects on immunity across the lifespan. However, the influence of these lifestyle and psychosocial factors on common cold in athletes remains poorly understood (Walsh NP, 2018, Eur J Sports Sci, 18: 820-31).

PURPOSE: To investigate the influence of sleep quality and psychosocial variables on upper respiratory symptoms (URS) in runners before and after a marathon.

METHODS: In a cohort, observational study 305 runners (68% male, age: 45 ± 9 years) were monitored during the 2-weeks before and after the Snowdonia marathon that takes place in the UK. URS were monitored using Jackson common cold questionnaire; whereby, criteria for a URS bout was a symptom score ≥ 2 on two or more consecutive days. Criteria for a repeated URS bout in the same participant required at least five consecutive days with a symptom score of zero between URS bouts. Participants completed questionnaires assessing personality, trait anxiety, perceived stress and the occurrence of early life adversity. Training load (weekly) and self-reported sleep quantity and quality (daily) were monitored. Chi-squares analyses compared pre and post marathon URS. Logistic regression was used to determine predictors of URS pre and post marathon.

RESULTS: URS incidence was similar in the two weeks pre- and post-marathon (P > 0.05, 39 vs. 42 URS bouts, respectively). When accounting for sex, age and prior illness, participants who experienced early life adversity were twice-as-likely to report a URS bout pre-marathon (OR, 2.20; P < 0.05). Other significant predictors of URS incidence pre-marathon were lower emotional stability (OR, 0.77; P < 0.05), higher perceived stress (OR, 1.08; P < 0.05) and higher trait anxiety (OR, 1.05; P < 0.01). During the two weeks after the marathon, participants were twice as likely to suffer a URS bout if they reported lower sleep quality (OR, 2.34, P < 0.01). Higher state anxiety immediately before the race (OR, 1.04, P < 0.05) also predicted URS post-marathon.

CONCLUSION: Self-reported sleep quality and early life adversity predict common cold in marathon runners.

One-half of Japanese athletes have problems with sleep and daytime sleepiness. Nap is used to reduce mental and physical fatigue and improve afternoon performance. However, the impact of nap on athletes’ performance is not clear. Few studies have been reported on how to spend a day towards the afternoon performance as recovery after morning exercise. PURPOSE: To examine the effects of a 90-min daytime nap after morning high-intensity exercise on afternoon performance and nocturnal sleep.

METHODS: Eight healthy athletes were recruited for this study. They performed high-intensity intermittent exercise in the morning. The exercise session began at 10:30-11:00. The high-intensity intermittent exercise consisted of 12 sets, 1-min bouts of cycling at 100% of VO2max and 4-min bouts at 0% of VO2max at 60 rpm, and then continued until at 100% of VO2max until exhaustion. After the exercise session, the participants consumed lunch at 13:00. Nap/no-nap trials were performed at 14:30-16:00 randomly for cross-over design and were separated by at least 1 week. The participants consumed dinner at 19:30. The bedtimes and wake-up times were adapted to each participant and kept consistent between the nap/no-nap trials. The sleep efficiencies of the daytime nap and nocturnal sleep were monitored using a sheet-shaped body vibrometer. Sleepiness, reaction time, and blood samples were measured before and after the nap/no-nap trials. Each measurement before trials and after trials was compared by two-way repeated measures of analysis of variance. RESULTS: The sleep efficiency in the daytime nap trial was 84.4 ± 4.1%. In the nap trial, sleepiness

Abstracts were prepared by the authors and printed as submitted.
was significantly reduced (nap score, -4.1 ± 1.4; no-nap score, 0.9 ± 1.2 score; P < 0.05) and the reaction time was significantly shortened (nap, -6.9 ± 3.7 ms; no-nap, 7.1 ± 4.3 ms; P < 0.05). In addition, growth hormone (nap, 0.8 ± 0.3 ng/mL; no-nap, 0.0 ± 0.0 ng/mL; P < 0.05), histidine, and cystine levels increased significantly in the nap trial. The nocturnal sleep efficiencies following the daytime nap were not disturbed (nap, 93.6 ± 1.5%; no-nap, 94.9 ± 1.7%; P > 0.05). CONCLUSION: The present study suggested that a 90-min daytime nap after morning high-intensity exercise reduces sleepiness, shortens reaction times and does not disturb nocturnal sleep in athletes.

Futsal is characterized as a high intensity game, which requires good physical conditioning, reaction speed and decision-making in a short time. In this scenario, sleep is an important factor to promote a good physical and cognitive recovery. However, studies show that adolescents suffer from interrupted or sleep deprivation, which damages their physical and psychological recovery. PURPOSE: To investigate the sleep patterns of futsal players and their performance during the competitive futsal game. Methods: 26 futsal players, male, aged 13-17 years were recruited. Volunteers answered sleep questionnaires, including Pittsburgh Sleep Quality Index, Epworth Sleepiness Scale and Morningness-Eveningness Questionnaire. Before and after the match, they answered the Sleep Diary. Separated by category, the athletes played an official futsal game, in which was held assembling a scout of each athlete during the match (passes, assists, shots, interceptions, fouls, yellow/red card). A descriptive analysis and distribution of relative frequencies were performed. In addition, Student t-test was used and a significance level at P < 0.05. The study was approved by UNIFESP Ethics Committee (protocols 011/2010). Results: The athletes had 15.08 ± 1.44 years and BMI 20.85 ± 2.21 kg/m², being 38.46% (n=10) of U-14, 34.62% of U-16 (n=9) and 26.92% of U-17 (n=7). Most of the athletes present good quality sleep (84.62%), low daytime sleepiness (65.38%) and indifferent chronotype (69.23%). In athletes with more than 6 years of training (Absence time: r=-0.524, p=0.01; Injury severity: r=-0.674, p<0.01), a negative correlation between sleep efficiency and injury characteristics of the 23 soccer players (Absence time: r=-0.524, p=0.01; Injury severity: r=-0.674, p<0.01) was found. Additionally, the results showed that for each increase in the Wake After Sleep Onset, each increase in the score for sleep efficiency, amount of injury (number) decreased and for each increase in the score for sleep efficiency, amount of injury (number) increased 0.02 (R2 = 0.30). CONCLUSIONS: It can be concluded that soccer players with poor sleep quality or nonrestorative sleep are prone to the risks of musculoskeletal injuries. Supported by UFMG, FAPEMIG, CAPES and CNPQ.

PURPOSE: Sleep is directly responsible for the recovery of energy spent during wake period, besides being fundamental in the development and maintenance of metabolic activities of the organism. The objective of the study was to evaluate the wake-sleep cycle of wheelchair rugby athletes during two stages of the regular season of the sport. METHODS: Six professional wheelchair rugby athletes of the Minas Quad Rugby team of Belo Horizonte (MG/BR), this team has national relevance being two times national champions and having players that are frequently called to represent the Brazilian national team during official competitions. The athlete used the actigraph, a non-invasive procedure for measuring the wake-sleep cycle utilizing an accelerometer and noninvasive procedure. It is considered to be gold standard to this kind of measure. The equipment was used for 10 consecutive days in two moments: 1) pre-season; 2) competitive period with the actigraph the athletes also received the sleep diary, it is a registration of any occurrences while using the equipment. The actigraph provided the following measurements: time he laid down, time he slept, time he woke up, time he got up, also sleep latency, sleep efficiency, total sleep time and wake after sleep onset. In addition, the players still responded to an anamnesis, and the questionnaires of daytime sleepiness (Epworth), subjective quality of sleep (Pittsburgh) and chronotype. RESULTS: Results showed that wheelchair rugby athletes had poor sleep quality in both stages. The athletes also demonstrated oscillations in the sleep-wake cycle depending on their routines, that is during the rest days the players presented different sleep measurements when compared with training session days and with competition days, at this time of the study there were significant results found analyzing the following variables: total sleep time (p=0.04), sleep efficiency (p=0.01) and wake after sleep onset (p=0.01), GLM-ANOVA. CONCLUSIONS: With the current study it can be concluded that professional wheelchair rugby players have poor sleep quality and their sleep oscillates during the regular season of the sport, even more, the athletes have sleep oscillations depending on the characteristics of their routine.
Both leptin (Lep) and estradiol (E2) influence bone formation. However, the combinatorial effects of Lep and E2 on bone microarchitecture have not been examined. Purpose: To investigate whether central Lep gene expression and/or systemic E2 interactions with exercise, which sometimes accompanies health-oriented diet changes, demonstrated possible negative effects of a KD on bone morphology in mice, but favorable impacts on blood glucose and body composition. Recent research has demonstrated possible negative effects of a KD on bone morphology in mice, but favorable impacts on blood glucose and body composition. Recent research has demonstrated possible negative effects of a KD on bone morphology in mice, but favorable impacts on blood glucose and body composition.

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exercise on cortical and trabecular bone morphology in mice. METHODS: Forty C57BL6 mice were randomized into 4 groups (n=10/group): 2 groups were fed a low-fat control diet (16% protein, 72% carbohydrate, 12% fat) with one group performing vigorous intensity (blood lactate ≥4mmol L−1) daily treadmill exercise (CEX), while the other served as sedentary controls (CSED). The remaining 2 groups were fed a high-fat, carbohydrate-deficient KD (16% protein, 84%fat) with one exercise group (KEX) and one sedentary control group (KSED). Treatment diets began 6 weeks pre-euthanasia and the exercise intervention occurred during the final 3 weeks. Femurs were analyzed for bone morphology using micro-computed tomography. Analysis variables included bone volume, ratio of bone to total volume, thickness, and bone mineral density (BMD) for both cortical and trabecular bone; trabecular number, spacing, and connectivity were also included. RESULTS: Two-way factorial ANOVA revealed an exercise effect on trabecular thickness (p=0.002) and an interaction between diet and exercise for trabecular BMD (p=0.038). Post-hoc analysis showed 5.8% thicker trabecular in exercise groups, CEX & KEX, compared to sedentary groups, CSED & KSED, (74.7±6.5μm vs. 45.1±5.0μm, p<0.05). Trabecular BMD was 3.0% higher in CEX compared to CSED (77.6±5.8mg·cm³ vs. 75.0±5.6mg·cm³, p<0.05), whereas trabecular BMD was statistically similar between KEX and KSED (75.7±6.2mg·cm³ vs. 75.9±5.6mg·cm³, p=0.99). No other significant effects or interactions were found. CONCLUSION: The positive effect of exercise on bone morphology shown in this research is in line with that found in the literature. Our results did not identify any detrimental in bone morphology in response to a ketogenic diet alone, but BMD changes induced by exercise in mice fed a control diet were negated by the ketogenic diet.

Funding provided by NIH R01 DK103860-01 and BoRSF

2714 Board #6 May 31 1:00 PM - 3:00 PM Circulating Sclerostin and MicroRNA-21 Are Predictors of Bone Mineral Density in Postmenopausal Women Zhaojing Chen1, Samuel R. Buchanan1, Michael G. Bemben, FACSM1, Debra A. Bemben, FACSM. 1California State University, San Bernardino, San Bernardino, CA. 2University of Oklahoma, Norman, OK. (Sponsor: Debra Bemben, FACSM) Email: zchen@csusb.edu (No relevant relationships reported)

Sclerostin is a potent inhibitor of the Wnt signaling pathway, which inhibits osteoblasts to form new bone (Turner et al., 2009). MicroRNAs (miRNAs) are short, non-coding RNAs that fine tune posttranscriptional gene expression. Recent research has shown that some circulating miRNAs (c-miRNAs) are upregulated in osteoporotic fracture individuals (Seeliger et al., 2014). Since both sclerostin and miRNAs regulate signaling pathways in bone, together they may be potential biomarkers of bone health. PURPOSE: To examine the relationships between serum sclerostin and specific c-miRNAs and to predict bone mineral density (BMD) based on circulating sclerostin and miRNA levels. METHODS: Seventy-three postmenopausal women aged 50 to 85 years old participated in this study. Body composition and aBMD of the total body, lumbar spine and hips were measured by DXA. Osteoporosis was determined using aBMD T-scores at lumbar spine, femoral neck, or total hip according to WHO criteria (aBMD T-score ≤ −2.5). Serum levels of sclerostin and bone resorption markers (CTX, TRAP5b) were measured by ELISA. Total RNA was extracted from serum, and relative expression levels of c-miRNAs (miR-21, -23a, -24, -100, -125b) were analyzed using miRNA assays and real-time PCR. RESULTS: There were no significant correlations between serum sclerostin and c-miRNAs. Serum sclerostin was significantly negatively correlated withCTX (r = −0.252, p < 0.05). Sclerostin levels were significantly lower in the osteoporotic group (n=10, 0.560 ± 0.158 ng/mL) compared to the normal BMD group (n=14, 0.776 ± 0.190 ng/ml, p=0.05). Stepwise regression analysis showed that miR-21 and sclerostin levels were significant predictors of BMD at all sites (standardized coefficient β (sclerostin)= 0.398 to 0.520, standardized coefficient β (miR-21)= −0.248 to −0.317, adjusted R²= 0.238 to 0.332, p<0.001). CONCLUSION: Our results indicate that circulating sclerostin and miR-21 are significantly associated with bone mineral density in postmenopausal women. Further studies are needed to examine the common signaling pathways that sclerostin and miR-21 regulate in bone metabolism.
and similarly at IP in both modalities, sclerotin (inhibitor of bone formation) increased significantly only in TM. This may reflect higher impact on the bone during running compared to cycling.

2716 Board #8 May 31 1:00 PM - 3:00 PM Bone Mineral Density Comparisons Between Contact and Non-Contact Male and Female Collegiate Athletes

Daleon E. Cousin, Michelle L. Eisenman, Emily L. Langford, Ronald L. Snarr, Greg A. Ryan. Georgia Southern University; Statesboro, GA.

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(No relevant relationships reported)

Bone mineral density (BMD) and bone mineral content (BMC) have been suggested to be greater in athletes that participate in-contact athletes. However, less research has been done comparing the nature of the sport and the impact that has on BMD and BMC in male and female collegiate athletes. PURPOSE: To determine the effects of BMD and BMC between full contact (FC), limited contact (LC) and non-contact (NC) sports in male and female athletes. METHODS: Data from 45 male (FC: football); 18, [basketball, baseball, soccer]; 21, NC [cheer, tennis, golf]; 6 and 33 female (FC: 9, LC [basketball, softball, soccer: 16, NC [cheer, tennis, volleyball, swimming, rifle, track]. 17) Division I athletes was collected via whole body dual-energy x-ray absorptiometry (DXA). One-way ANOVAs (male and female) were run to compare BMD, BMC and, body fat percentage (BF%) between sports. RESULTS: A main effect significant difference was noted between BMD (F(2,44) = 9.79, p < 0.01) and BMC (F(2,44) = 12.15, p < 0.01) in male athletes. Post-hoc LSD analysis revealed that significance in all variables was between FC (BMD: 1.46 ± 0.09 g/cm3) compared to LC (1.36 ± 0.12 g/cm3, p < 0.01) and NC (3403.3 ± 295.6 g, p < 0.01). BF% was not significantly different between any group (p = 0.09). No significant differences were noted with female athletes in any of the variables: BMD: FC (1.22 ± 0.07 g/cm3), NC: 1.24 ± 0.07 g/cm3, p > 0.01); BMC: (LC: 2797.6 ± 382.7 g, NC: 2883.8 ± 361.7 g, p = 0.51); BF% (p = 0.29). CONCLUSION: The nature of the sport may have an impact on an athlete’s BMD and BMC, but only if the athlete competes in a FC sport, where sufficient sustained compression occurs to increase bone formation.

F-07 Thematic Poster - Brain, Performance and Concussions

Friday, May 31, 2019, 1:00 PM - 3:00 PM
Room: CC-101B

2717 Chair: Dane B. Cook, FACSM. University of Wisconsin-Madison, Madison, WI.

(No relevant relationships reported)

2718 Board #1 May 31 1:00 PM - 3:00 PM Head Impact Exposure Alters Neural Synchrony and Complexity in Collegiate Athletes

Derek C. Monroe, Nicholas C. Cecchi, James W. Hicks, Steven L. Small. University of California, Irvine, Irvine, CA.

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(No relevant relationships reported)

White matter connects neighboring and distant cortical regions and is the basis for brain circuits. Regular exercise strengthens these connections, but athletes participating in contact sports, including water polo, are at risk for repeated head impacts capable of damaging white matter and impairing brain circuit function. One way of measuring functional connectivity of these circuits is through resting-state electroencephalography (EEG). PURPOSE: To test the hypothesis that repeated head impact exposure reduces fast-rhythm (‘gamma’) synchrony and an associated increase in TCS, TS, and RPE. METHODS: Thirteen intercollegiate water polo players (9 Men; 4 Women) were tested before and after the season. During the testing, each player completed a series of linear regression analyses to test the relationships among twPCA, gamma dWPLI, and MSE at fine (500 Hz), moderate (33-250 Hz), and coarse (12-30 Hz) timescales. RESULTS: Greater twPCA was associated with a loss of gamma dWPLI [r(17) = -0.799, p < 0.001]. There was a significant indirect effect of twPCA on MSE across moderate time-scales [beta = 0.456; 95% CI (0.048, 1.0432), p = 0.04]. Approximately 25% of the variance in MSE was accounted for by the mediator, gamma dWPLI (R² = 0.247). There was no mediation effect on MSE at fast or coarse time-scales (p > 0.05). CONCLUSIONS: One season of repeated head impact exposure altered brain dynamics in a dose dependent manner. The loss of fast-rhythm synchrony in athletes sustaining the greatest exposure contributed to a loss of complexity that could represent distributed and inefficient information processing at rest.

2719 Board #2 May 31 1:00 PM - 3:00 PM Concussion History Impairs Cerebrovascular Reactivity in Special Operations Forces Personnel


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(No relevant relationships reported)

Concussion has been an increasingly prevalent blast-related injury in Special Operations Forces (SOF) personnel over the last decade. Recent studies suggest physiological deficits, such as cerebrovascular function, may outlast clinical recovery following injury. Cerebrovascular reactivity (CVR) measures the cerebral blood flow response to variations in carbon dioxide partial pressures. Understanding how concussion history affects CVR may better inform physiological assessment and long-term outcome management following concussion. PURPOSE: To investigate how concussion history influences CVR in SOF personnel. METHODS: Thirty-nine SOF personnel completed a demographic survey self-reporting concussion history (concentration history = 22 (56.4%); age = 34.3 yrs ± 3.7 yrs) They were instrumented with transcranial Doppler (TCD) ultrasound to assess middle cerebral artery velocity (MCAv). Baseline TCD data were collected for 2 min. Changes in MCAv were measured in response to 5 breath-holding trials (30 s breath-hold/30 s rest) and 5 hyperventilation trials (30 s hyperventilation/30 s rest). We employed mixed effects models with quadratic mean structures to assess group differences in MCAv response to breath-holding and hyperventilation tasks. RESULTS: Baseline resting MCAv did not significantly differ (F1,1909 = 0.20, p = 0.90) between those with and without concussion history. During breath-holding (F1,1909 = 0.96, p = 0.34) and hyperventilation (F1,1909 = 0.31, p = 0.58). Among SOF personnel with concussion history, those with ≥ 24 had significantly diminished CVR response relative to those with ≤ 1 concussions during the breath-holding (F1,1909 = 4.84, p = 0.03) and the hyperventilation (F1,1909 = 5.07, p = 0.02) tasks. CONCLUSIONS: Changes in MCAv did not differ under resting conditions; however, SOF personnel with a greater concussion history showed impaired CVR when tested with physiological breathing stressors. While long-term neurophysiological effects of blast-related injury are currently unknown, assessing CVR response may provide further insight into cerebrovascular function and overall physiological health following blast exposure.

2720 Board #3 May 31 1:00 PM - 3:00 PM Prefrontal Cortex Neural Function and Decision-making Performance Following a Long Duration Incremental Exercise Protocol in the Heat while Wearing Personal Protective Equipment

Cory Cochoo1, Lynneth Stuart-Hill1, Olave Krigolson2, Patrick Neary1. 1University of Victoria, Victoria, BC, Canada. 2University of Regina, Regina, SK, Canada.

(No relevant relationships reported)

There is no research to date evaluating the effects of rapid and uncompensable core temperature (Tc) acquisition, as which occurs when one is wearing personal protective equipment (PPE), on neural function in prefrontal cortex and decision-making performance. PURPOSE: To study the effects of rapid and uncompensable Tc acquisition on neural function in prefrontal cortex and decision-making performance during a pre-and post-exercise Go/No-go test. METHODS: Fifteen male subjects (mean age, 32.7 ± 12.2 years) performed an incremental exercise test to a termination criterion in CONTROL and GEAR. Electroencephalography (EEG) data was recorded during a Go/No-go test pre- and post-exercise. Decision-making performance was also monitored during the pre-and post-exercise Go/No-go test. Heart rate (HR), thermal comfort scale (TCS), thermal sensation (TS), and rating of perceived exertion (RPE) were recorded at each 0.5°C increase in Tc. RESULTS: There were significant differences in time to termination (TTT) (CONTROL = 77.3 ± 12.6 min; GEAR = 50.3
± 6.9 min), pre-exercise HR (CONTROL = 76.8 ± 4.8 bpm; GEAR = 86.5 ± 5.1 bpm) and post-exercise HR (CONTROL = 161.1 ± 11.9 bpm; GEAR = 179.6 ± 6.8 bpm). Additionally, there were significant differences between CONTROL and GEAR end-exercise Tc (CONTROL = 38.57 ± 0.3°C; GEAR = 39.01 ± 0.3°C), TCS (CONTROL = 3.57 ± 0.6; GEAR = 4.63 ± 0.3), and TS (CONTROL = 7.57 ± 0.5; GEAR = 8.67 ± 0.3). Lastly, there was a 0.04°C/min increase in Tc during GEAR and 0.02°C/min increase in Tc during CONTROL. An analysis of frontal theta EEG power results showed no significant pre- and post-exercise values during a Go/No-go test in GEAR (F(1,14) = 6.069, p = 0.027)). There was also a significant difference when evaluating incorrect responses between pre- and post-exercise values in GEAR (F(1,14) = 5.515, p = 0.026). These differences were not observed during CONTROL. CONCLUSION: These data suggest that a long duration incremental exercise test while wearing PPE in the heat results in decreased cognitive control. This could have implications in occupations that wear PPE and need to make critical decisions while experiencing rapid and unencumbered Tc heat storage.

**2721 Board #4 May 31 1:00 PM - 3:00 PM**

**Concussion and the Pulmonary Light Reflex: Implications for Special Operations Forces Personnel**


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(No relevant relationships reported)

Pulmonary light reflex (PLR) is regulated by smooth radial muscles differentially innervated by sympathetic and parasympathetic pathways. The PLR has been posited as an autonomic nervous system (ANS) function index and a concussion biomarker. Few studies have examined static and dynamic PLR parameters in Special Operations Forces (SOF) combat and combat support soldiers. PURPOSE: To examine cross-sectional relationships between concussion history and PLR parameters in SOF personnel with and without concussion history. METHODS: The SOF personnel self-reported age and concussion history (0, 1, 2, and ≥3), and completed an assessment battery including PLR. We measured seven PLR parameters including initial and final pupal diameters, constriction and dilation velocities, constriction latency, time to 75% initial diameter recovery, and average maximum constriction velocity. These parameters were averaged across both eyes and separately regressed on concussion frequency while controlling for age (a priori α = 0.05). RESULTS: The SOF personnel (n = 76; mean age = 33.5 ± 3.6 years) reported the following concussion histories: ≥3 concussions (n = 19; 25%), two (n = 8; 10.5%), one (n = 7; 9.2%), and none (n = 42; 55.3%). Initial (β = -0.07; 95% CI: -0.13, -0.02) and final (β = -0.05; 95% CI: -0.09, -0.004) pupil diameters were smaller with age increases in SOF personnel, controlling for concussion history. Similarly, those who reported ≥3 concussions had significantly smaller initial pupil diameter compared to those without concussion history, controlling for age (β = -0.53; 95% CI: -0.98, -0.08). Those who reported ≥3 concussions also exhibited slower average (β = -0.46; 95% CI: 0.07, 0.84) and maximum (β = -0.64; 95% CI: 0.12, 1.13) constriction velocities than those without a concussion history, controlling for age. CONCLUSIONS: The SOF personnel with greater head injury history had altered static and dynamic pupillary light responses, which may indicate prolonged ANS dysfunction. Our previous neuroimaging findings demonstrate prolonged physiological deficits beyond self-reported symptom resolution and clinical recovery from concussion. The PLR is a rapid, non-invasive, cost effective tool that may assess deficits warranting further clinical investigation.

**2722 Board #5 May 31 11:00 PM - 3:00 PM**

**Development of a Lower Body Negative Pressure Device to Reduce Intracranial Pressure in Hospitalized Patients with Traumatic Brain Injury**

Dean Palmer, Justin Lawley, Tony Whitworth, Bert Vargas. 1IEEM, Dallas, TX; 2Parkland Hospital, Dallas, TX (Sponsor: Benjamin D. Levine, FACSM)

(No relevant relationships reported)

Elevations of intracranial pressure (ICP) are common in patients with a severe traumatic brain injury (TBI) with sustained elevations predicting morbidity and mortality. Aggressive management of elevated ICP is recommended and there is a need for non-invasive treatments that are complementary to existing surgical options. Using direct invasive recordings of ICP in three healthy subjects via implanted Omaya reservoirs, this laboratory observed a robust reduction in ICP during lower body negative pressure (LBNP) in the head-down tilt (HDT) position. PURPOSE: Develop a novel LBNP device that is suitable for use with hospitalized patients, which will be safe and well tolerated by patients with TBI, and will improve intracranial stability, patient disability and reduce the time from admission to discharge from the ICU. METHODS: Working with a team of ICU nurses, neurointensivists, engineers and physiologists, a comfortable, stable LBNP chamber was developed with sufficient access to the patient to allow standard of care for severe TBI patients. Studies to test this device in the ICU are ongoing and will impose low level LBNP (-20mmHg) 8 hours/day for 3 days. Throughout all interventions, hemodynamics and cerebral perfusion pressure will be monitored to maintain perfusion greater than 60mmHg and ICP will be carefully monitored for changes in intracranial pulse pressure. RESULTS: See figure for ICU based LBNP chamber design. CONCLUSION: Previous work by our group (Petersen et al, J Physiol 2018) showed that low level LBNP can reduce ICP safely in healthy controls. We have built a novel LBNP chamber for use with hospitalized patients that may lower ICP non-invasively in patients, thus improving patient outcomes.

**2723 Board #6 May 31 1:00 PM - 3:00 PM**

**Locus of Control Ratings do not Predict Concussion Reporting Intentions in Intercollegiate Athletes**

Melissa Anderson, L. Stephen Miller, Michelle L. Weber, Julianne D. Schmidt, University of Georgia, Athens, GA.

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(No relevant relationships reported)

Identification of all sport-related concussion continues to be challenging in part due to the lack of reporting by athletes. It is estimated that approximately 50% of all sport-related concussions at the collegiate level go unreported, however, reasons for failing to disclose a potential concussion are still unclear. In order to improve concussion reporting, we must identify factors that contribute to an athletes’ intentions to report. Student-athletes that identify as having more control over the outcomes in their life may feel a stronger sense of control over whether they will report a suspected concussion to a medical professional. PURPOSE: To examine the relationship between locus of control ratings and concussion reporting intentions in student-athletes. METHODS: Student-athletes from three universities were invited to complete a Qualtrics survey (n=206/498 response rate = 41.36%, male=34.46%). The Levenson Self-Rating Inventory of Locus of Control (LOC) scale is a 24 item survey that measures different perceptions of control (powerful others, internal, chance, and powerful self) related to control over events. All items are scored on a four-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Three separate Spearman’s rank-order correlations were used to determine whether LOC sub-scores (Internality, Powerful Others and Chance) correlated concussion reporting intentions (alpha=0.05). RESULTS: Locus of control sub-score ratings did not significantly correlate direct intentions; Internality (r=.055, p = .545), Powerful Others (r=.125, p = .169), or Chance (r = -.065, p = .474). In addition, indirect intentions were not related to the LOC subscales; Internality (r=.082, p = .367), Powerful Others (r = -.111, p = .223), or Chance (r = -.062, p = .497). CONCLUSION: Although LOC plays a role in predicting sport-related injuries risk and outcomes, it does not seem to significantly correlate with concussion reporting intentions in the current study. Results of this study suggest the importance of considering the multiple factors that may explain an athlete's intentions to report concussions beyond just how much control they perceive to have over the outcomes in their life.
Evidence has emerged highlighting the beneficial effects of exercise in reducing symptoms of Post-Traumatic Stress (PTS) and comorbid psychological conditions (e.g., anxiety, depression). However, most of these studies fail to address the effects of exercise on other disabling symptoms of PTS. **Purpose:** Examine changes in self-report fatigue following an acute bout of moderate-intensity continuous aerobic exercise (MICE) and a bout of high-intensity interval exercise (HIIE), relative to a no-exercise inactive control (SED), in participants with subsyndromal PTS. **Methods:** Using a within-subjects design, participants (N=25, 16 females; age (M±SD); 25.6 ± 9.1 yrs) completed three randomly ordered 35-min conditions (HIIE, MICE, SED). Participants reported an average PCL-5 score of 47.64 (exceeds cut-point for probable PTS of 33). Additionally, participants reported having at least one symptom in each of the major DSM-5 clusters of PTS. Fatigue was assessed before (Pre), immediate after (Post0), 20-min after (Post20), and 40-min after (Post40) each condition. **Results:** Significant Condition, Time, and Condition x Time effects were seen (all P<0.001). For HIIE, fatigue increased from Pre to Post0 [Cohen’s d= 0.90], decreased from Post0 to Post20 [d = 0.67], and decreased from Post20 to Post40 [d = 0.42]. Fatigue was not different Pre to Post40 HIIE [P = 0.31]. For MICE, fatigue increased slightly from Pre to Post0 [d = 0.33], decreased from Post0 to Post20 [d = 0.91], and showed no change from Post20 to Pre40 [P = 0.36]. Fatigue was reduced from Pre to Post0 MICE [d = 0.29]. Finally, fatigue decreased from Pre to Post0 SED [d = 0.48], showed no change from Post0 to Post20 or from Post20 to Post40, and was marginally reduced from Pre to Post40 [d = 0.32]. **Conclusion:** Participants reported elevated fatigue Post0 HIIE, but fatigue returned to baseline by Post40. While fatigue was elevated Post0 MICE, at Post40 fatigue was reduced relative to Pre. The present study provides evidence that both HIIE and MICE result in immediate increases in fatigue in individuals living with PTS, but such increases are short-lived. Future studies need to assess chronic exercise effects on fatigue, as fatigue is a disabling symptom of PTS.

**CONCLUSIONS:** RET significantly increased strength in GV with CMP. It resulted in no exacerbation of pain symptoms and did not increase mood disturbance. Resistance exercise appears safe and efficacious for Gulf Veterans with widespread pain. Supported by Dept. of Veterans Affairs grant: IO1-CX000383.
S598 Vol. 51 No. 5 Supplement

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

Board #2

May 31 1:00 PM - 3:00 PM

Heart Rate Response Relative to Body Weight/Body Fat and Fire Gear During Walking Protocol

John P. isacs, eastern kentucky university, richmond, KY

(No relevant relationships reported)

INTRODUCTION: Fire gear serves a specific purpose in protecting individuals from the harsh environments around them when combating fires. Little research has been done on how gear weight relative to an individual’s lean body mass (LBM) and body fat (BF) affects heart rate (HR). Being conscious of how the encumbrance of gear affects one’s HR is important because over-exertion from load carriage could possibly cause a decrease in performance and increase the risk of a cardiac event. PURPOSE: To assess HR response among individuals based on LBM and BF relative to the weight of different combinations of fire gear during a walking protocol.

METHODS: 22 recreationally trained college students (age 22±3 y/o, wt. 81±17 kg, ht. 177±10 cm) performed a walking protocol in personal protective equipment (PPE) 9.1 kg.), oxygen pack and mask (PM 11.3 kg.), and full gear (FG, combination of PM and PPE 20.4 kg.). Each subject completed 3 sessions total. Gear was determined using a randomized cross-over design. Subjects were tested for BF via air displacement plethysmography and weighed before the protocol. The original Bruce protocol was adjusted to (stage 1) 3 minutes (min) at 0.8 m/s and 0% grade (GR), (stage 2) 3 min at 0.76 m/s and 10% GR, (stage 3) 3 min at 1.1 m/s and 12% GR, (stage 4) 3 min at 1.5 m/s and 14% GR, and (stage 5) 4 min cool down at 0.8 m/s and 0% GR. HR was recorded during each minute of the protocol until completion. Results were analyzed using Linear Regression to identify the effect of BF and LBM on HR. Stage 4 HR’s were selected because the intensity is most comparable to actual situations.

RESULTS: R² of change reported 0.47 for both LBM and BF in FG, 0.65 in PM, and 0.52 in PPE. For LBM only, R² of change reported 0.36 (P<0.003) for FG, 0.60 (P<0.001) for PM, and 0.52 (P<0.001) for PPE. BF only, reported 0.08 (P=0.216) for FG, 0.02 (P=0.529) in PM, and less that 0.01 (P=0.908) for PPE.

CONCLUSIONS: The data suggests that more LBM and less BF can be advantageous in relation to HR during encumbered walking. Firefighters should focus on increasing their LBM to increase their overall performance during training or in real life high stress situations.

Board #3

May 31 1:00 PM - 3:00 PM

Physiologic Strain of SCBA (Maze) Training Compared to Circuit Training and Live Fire Training

Andrea F. Wilkinson, Alex A. Mattas, Cassandra I.K. Eddy, Jeffery L. King, Edgard MKVK Soares, Denise L. Smith, FACSM, 1Skidmore College, Saratoga Springs, NY; 2Houston Fire Department, Houston, TX; 3University of Brasilia, Brasilia-DF, Brazil. (Sponsor: Denise L. Smith, FACSM)

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(No relevant relationships reported)

Firefighting is a dangerous occupation and even training carries substantial risk. In fact, about 10-12% of firefighter line of duty deaths occur in training–most due to sudden cardiac death. Self-contained breathing apparatus (SCBA) protects from smoke inhalation; however, the effects of the SCBA on blood oxygen saturation during exercise are unclear. The purpose of this study was to look at the effects of the SCBA on blood oxygen saturation during exercise.

METHODS: Nine healthy male firefighters (35 ± 5 years, 180.2 ± 24.9 pounds, 69.8 ± 3.8 inches) completed a physical activity readiness questionnaire (PARQ+) to determine eligibility for the study. Participants performed an incremental treadmill test to estimate their VO₂max. One week later, participants exercised at 50% of their VO₂max wearing their SCBA (SCBA). One week later, participants exercised at 50% of their VO₂max not wearing their SCBA for the same duration (CON). Blood oxygen saturation was recorded at the lowest point (SO₂Low) and at the end of each exercise session (SO₂End). Heart rate (HR), blood lactate (LA) and rating of perceived exertion (RPE) were also measured and the end of each exercise session. For all variables, paired samples t-tests were used to compare differences between exercise sessions.

RESULTS: There was a significant difference in SO₂Low between the exercise sessions (p = 0.006; SCBA: 90.6 ± 3.5%; CON: 94.1 ± 1.4%). There was no significant difference in SO₂End between the exercise sessions (p = 0.01; SCBA: 94.3 ± 2.3%; CON: 95.7 ± 1.1%). Although not significant, there was a large difference in LA between the exercise sessions (p = 0.06; SCBA: 4.0 ± 3.0 mmol/L; CON: 1.9 ± 1.0 mmol/L). There were no significant differences in HR (p = 0.82; SCBA: 165 ± 21 bpm; CON: 164 ± 22 bpm) and RPE (p = 0.8; SCBA: 13 ± 1; CON: 13 ± 1) between the exercise sessions.

CONCLUSIONS: During exercise blood oxygen saturation was significantly reduced while wearing SCBA compared to CON. It is possible that while wearing SCBA the partial pressure of respiratory oxygen is reduced, resulting in oxygen not being diffused as efficiently.

Board #4

May 31 1:00 PM - 3:00 PM

Effects of Wearing a Self-Contained Breathing Apparatus on Blood Oxygen Saturation During Exercise in Firefighters

Brandon S. Pollock, Jason Springer, Tom Burgasser, Tim Berczik, Keith Burns, Jack Novak, Walsh University, North Canton, OH. 2Cleveland Clinic - South Pointe Hospital, Cleveland, OH. 3Massillon Fire Department, Stark County, OH. (Sponsor: Denise L. Smith, FACSM)

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(No relevant relationships reported)

PURPOSE: Firefighters face a number of risks as part of their occupation. The self-contained breathing apparatus (SCBA) protects from smoke inhalation; however, the effects of the SCBA on blood oxygen saturation during exercise are unclear. The purpose of this study was to look at the effects of the SCBA on blood oxygen saturation during exercise.

METHODS: Nine healthy male firefighters (35 ± 5 years, 180.2 ± 24.9 pounds, 69.8 ± 3.8 inches) completed a physical activity readiness questionnaire (PARQ+) to determine eligibility for the study. Participants performed an incremental treadmill test to estimate their VO₂max. One week later, participants exercised at 50% of their VO₂max wearing their SCBA (SCBA). One week later, participants exercised at 50% of their VO₂max not wearing their SCBA for the same duration (CON). Blood oxygen saturation was recorded at the lowest point (SO₂Low) and at the end of each exercise session (SO₂End). Heart rate (HR), blood lactate (LA) and rating of perceived exertion (RPE) were also measured and the end of each exercise session. For all variables, paired samples t-tests were used to compare differences between exercise sessions.

RESULTS: There was a significant difference in SO₂Low between the exercise sessions (p = 0.006; SCBA: 90.6 ± 3.5%; CON: 94.1 ± 1.4%). There was no significant difference in SO₂End between the exercise sessions (p = 0.01; SCBA: 94.3 ± 2.3%; CON: 95.7 ± 1.1%). Although not significant, there was a large difference in LA between the exercise sessions (p = 0.06; SCBA: 4.0 ± 3.0 mmol/L; CON: 1.9 ± 1.0 mmol/L). There were no significant differences in HR (p = 0.82; SCBA: 165 ± 21 bpm; CON: 164 ± 22 bpm) and RPE (p = 0.8; SCBA: 13 ± 1; CON: 13 ± 1) between the exercise sessions.

CONCLUSIONS: During exercise blood oxygen saturation was significantly reduced while wearing SCBA compared to CON. It is possible that while wearing SCBA the partial pressure of respiratory oxygen is reduced, resulting in oxygen not being diffused as efficiently.
full safety gear, including SCBA. Measurements were conducted on heart rate, skin temperatures (4 sites), core temperature, task performance (speed, rescue result), mood and comfort sensations.

**RESULTS:** In all conditions all firefighters were able to execute the rescue in the R-gear as well as in the S-gear with no differences in time, on average 8.5 min. There were significant reductions in heart rate in the R-gear versus the S-gear (p=0.02) and in core temperature increase: 1.69 (0.80 °C) in R-gear versus 2.52 (1.20) °C in S-gear (p=0.04). The increase in ABP was slightly higher in the R-gear, possibly due to the reduction in protection (35.1 °C versus 34.3 °C, p=0.009). But it did not reach dangerous levels, none of the maximum skin temperatures was higher than 37 °C. Comfort and strain ratings were lower in the R-gear, but there was an increase in the R-gear just prior to entering the room with the fire.

**CONCLUSIONS:** This pilot study addressed multiple aspects of the balance strain, protection and performance, all crucial to ensure safety and health for structural firefighters. The results showed that a small fire scenario could be addressed by the gear as effectively as the current gear, which was unexpected. The R-gear is expected to further reduce strain in most of the firefighter day-to-day work activities. The results also indicated that experienced firefighters would need to build confidence in the activities that can be executed safely in this clothing.

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**F-09**

**Thematic Poster - Pregnancy, Hormones and Gender**

Friday, May 31, 2019, 1:00 PM - 3:00 PM
Room: CC-102B

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**2734**

**Chair:** Linda E. May, FACSM. East Carolina University, Greenville, NC.

(No relevant relationships reported)

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**2735**

**Board #1 May 31 1:00 PM - 3:00 PM**

**Validity of the Pregnancy Physical Activity Questionnaire for Maternal Physical Activity Recall**

Michelle R. Conway1, Mallory R. Marshall1, Rebecca A. Schilts2, Nicole M. Talge3, Karin A. Pfeiffer, FACSM3, James M. Pivarnik, FACSM4, Western State Colorado University, Gunnison, CO. 2Sanford University, Birmingham, AL. 3Saginaw Valley State University, University Center, MI. 4Michigan State University, East Lansing, MI.

(No relevant relationships reported)

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The Pregnancy Physical Activity Questionnaire (PPAQ) is a commonly utilized self-report assessment of physical activity (PA) during pregnancy, but its validity when evaluating women's PA historically after the pregnancy ends is unknown.

**PURPOSE:** To evaluate the validity of the PPAQ for long-term recall of PA at two time points during pregnancy and once postpartum. **METHODS:** Between 2010 and 2018, 48 women completed the PPAQ at 21 and 32 weeks gestation and 12 weeks postpartum about their previous week's PA. These same women were emailed three separate PPAQs between two months and eight years after originally completing the questionnaires to recall their PA during those same time periods. Of these 48 women, 40 completed the follow up recall questionnaires (83%). Total number of metabolic (MET) minutes per week and percent time spent in light, moderate, and vigorous activity were compared between the original and long-term recall PPAQ values using paired sample t-tests or Wilcoxon Rank tests and Spearman correlation coefficients (SCC). The participants were then separated into two groups via a median split: those who originally completed the PPAQ ≥ five years ago and < five years ago. The paired sample t-tests, Wilcoxon Sign Rank tests, and SCC were repeated.

**RESULTS:** Total MET-minutes per week and amount spent in moderate activity were underestimated by 3000 – 4000 MET-minutes per week and 6%, respectively, and percent time in light activity was overestimated by 4-6%, when comparing long-term recall to original values. Women reported spending little time in vigorous intensity activity at both time points during pregnancy (2-4%). Twenty-one of the 36 comparisons were significantly different (5%). SCC values were lower for women who recalled PA ≥ five years postpartum compared to women who recalled their PA < five years postpartum for most time points and intensities.

**CONCLUSION:** It is important to continue to assess the long-term validity of self-report methods, such as the PPAQ. On average, participants tend to underestimate total and moderate PA and overestimate light PA, but by relatively small amounts (3561 MET-minutes per week, 6%, 4-6%, respectively) when recalling their activity up to eight years previous.
Results

Exercise (RE) has increased in popularity among pregnant women being the third most popular activity in previously active women. However, most of the RE interventions have been focused on birth outcomes from normal weight (NW) pregnant women or in overweight or obese (OWOB) pregnant women with pregnancy-related disease. Currently, we do not know how RE can influence morphometric measures in healthy OWOB pregnant women. **Purpose:** To determine the effect of RE during pregnancy of OWOB women on maternal morphometric measures. METHODS: 33 OWOB (25-Control group (CG) vs 8-RE group (REG)) healthy, low-risk, women with a singleton pregnancy have been analyzed for this study. All women signed an informed consent and agreed to participate in the study, which involves 3-exercise protocols (aerobics, resistance and aerobics/resistance) and a CG. Participants in the REG trained 3x/week, 50min, moderate intensity for ~20 weeks using machines, free weights and swiss balls. Maternal skinfolds and anthropometric measures were collected at 16 and 36 weeks of gestation. Student test was performed to determine differences between groups. RESULTS: Analysis does not show significant differences in most variables measured at 16 and 36 weeks (p>0.05): weight16 (CG=86.9kg vs REG=85.8kg), weight36 (CG=96.7kg vs REG=94.1kg), percentage of body fat16 (%BF) (CG=36.2 vs REG=36.3), %Fat36 (CG=37.1 vs REG=39.2), gestational weight gain (GWG) (CG=10kg vs REG=9.2kg), waist to hip ratio (WHR) at 16 (CG=0.79 vs REG=0.82). Significant differences were found in WIR36 weeks (CG=0.84 vs REG=0.77). 40% percent of the women in the CG exceeded their GWG recommendation vs 37.5% of REG women (p>0.05). Birth weight was not significantly different between groups (p>0.05): (CG=3.6kg vs REG=3.5kg). **Conclusion:** RE was not effective to prevent excessive GWG or to decrease %BF for OWOB pregnant women. The data suggest that, another exercise protocols should be evaluated between this population to test for the best efficacy. American Heart Association #15GRNT2447009

**RESULTS:**

Contralateral ventilation (V̇ O2) response measured during three consecutive step-transitions in 2

The kinetics response is affected by the phases of the menstrual and oral contraceptive cycles (no relevant relationships reported).

### Board #7

**May 31 1:00 PM - 3:00 PM**

**Oxygen Uptake Kinetics During the Different Phases of the Menstrual and Oral Contraceptive Cycles**

Anmol T. Mattu, Danilo Iannetta, Patricia K. Doyle-Baker, Juan M. Murias. University of Calgary, Calgary, AB, Canada.

Email: atmattu@ucalgary.ca

(No relevant relationships reported)

**PURPOSE:** To examine whether oxygen uptake (V̇ O2) kinetics changes across the phases of the menstrual and oral contraceptive cycles. **METHODS:** Fourteen highly active women who were either non-oral contraceptive users (n=7, 28.6 ± 1.6 yrs.) or monophasic oral contraceptive users (n=7, 22.3 ± 2.2 yrs.) participated in the study. The time-constant of the V̇ O2 kinetics response (tV̇ O2) was determined by ensemble-averaging the reaction kinetics from the 3-consecutive step-transitions in work rate, from 20 Watts (W) to a moderate-intensity work rate of 80 W. Each step was six minutes in duration. The test was completed during the menstruation phase of the cycles (follicular phase for non-oral contraceptive users or “inactive pill” phase for oral contraceptive users) and repeated during the respective non-menstruating phase (luteal phase or “active pill” phase). An ovalation test was used to validate the menstrual cycle phase. A metabolic cart was used to continuously measure expired gas concentrations and ventilatory rates. A one-way repeated-measures ANOVA was used to compare the differences in V̇ O2 kinetics across cycle phases between non-oral contraceptive and oral contraceptive users. Statistical significance was set at p<0.05. **RESULTS:** tV̇ O2 was not affected by cycle phases, regardless of contraception use, whereby tV̇ O2 was greater in the menstruation phases of the non-oral contraceptive and oral contraceptive cycles (241±7 s compared to the non-menstruating phases (195±5 s) (p<0.05). **CONCLUSION:** The speed of the V̇ O2 kinetics response is affected by the phases of the menstrual and oral contraceptive cycles, such that a greater tV̇ O2 is observed during the menstruation phase.

Anmol T. Mattu was supported by the NSERC Alexander Graham Bell Canada Graduate Scholarship.

### Board #6

**May 31 1:00 PM - 3:00 PM**

**Physical Activity Influences the Relationship between BMI and Adiposity Differently in College Males and Females**

Ginny M. Frederick1, Bhihha M. Das1, Michael V. Fedewa2, Rachelle M. Reed3, Rachel E. Salyer1, Michael D. Schmidt1, Ellen M. Evans, FACSM1. University of Georgia, Athens, GA. 2East Carolina University, Greenville, NC. 3University of Alabama, Tuscaloosa, AL. (Sponsor: Ellen M. Evans, FACSM) Email: vmf04863@uga.edu

(No relevant relationships reported)

**Purpose**

To investigate the impact of PA on BMI and %Fat in college-age males and females. Studies have documented that physical activity (PA) influences body composition. In addition to the well-established sex differences in body composition, college-age males and females also typically engage in more PA than their female counterparts. This difference in PA could potentially impact the relationship between BMI and %Fat. Therefore, the aim of this study was to determine if PA differentially influences the relationship between BMI and %Fat in college-age males and females. METHODS: BMI was calculated from weight and height measured using standard clinical protocols. PA was measured in steps/day using the NL-1000 accelerometer. %Fat was measured via DEXA. RESULTS: Males (N = 124, 18.4 ± 0.5 yrs, 23.2 kg/m²) and females (N = 282; 18.3 ± 0.5 yrs, 23.0 kg/m²) were nearly identical in age and BMI (both p > 0.05). As expected, males were leaner (18.4 ± 5.1 %Fat vs. 32.2 ± 5.7 %Fat, p < 0.001) and accumulated more PA (11,625 ± 2930 vs. 10,866 ± 3467 steps/day, p < 0.05) compared to females. Because of the known sex difference in %Fat, separate linear regression models were evaluated to explain the prediction of %Fat from BMI, PA, and BMI x PA. BMI explained 50.2% of the variance in %Fat among females and only 18.3% of the variance in males (p < 0.001) for both. Adding PA to the model significantly increased the variance in %Fat explained in both females and males (AR² = 3.4% and 3.5%, respectively, both p < 0.05). The addition of the BMI x PA interaction term improved the model in females (AR² = 13.3%, p < 0.005), but not males (AR² = 3.0 %, p = 0.933). **Conclusion:** Weight management is of high public health importance, especially for young adults who have an increasing risk for obesity during this stage of life. While many health promotion efforts focus on weight management with BMI as a primary outcome, it is important to account for sex differences with respect to the relationships among BMI, PA, and %Fat when using BMI for program evaluation in the young adult population.

**Character Count:** 1,741

### Board #5

**May 31 1:00 PM - 3:00 PM**

**The Impact Of Pms And Pmd On Physical Performance In Female Track And Field Athletes**

Reiko Momma1, Yuriko Tochigi2, Ai Hamasaki1, Koichiro Tanahashi1, Akari Takahashi3, Tomohito Sato3, Atsumu Yokota1, Norobu Mesaki1, Seiji Maeda3, Yuriko Tochigi1, Yuriko Tochigi1, Yuriko Tochigi1, Yuriko Tochigi1

1University of Tsukuba, Tsukuba, Japan. 2Japan Sport Council, Kita-ku, Japan.

(No relevant relationships reported)
2740 Board #6 May 31 1:00 PM - 3:00 PM  
Percentage Body Fat Predicted by Body Mass Index, Waist Circumference & Age in Different Racial & Gender Groups  
Yaozong He, Yan Yang, Weimo Zhu, FACSM. University of Illinois at Urbana-Champaign, Urbana, IL.  
(No relevant relationships reported)

Percentage Body Fat Predicted by Body Mass Index, Waist Circumference and Age in Different Racial and Gender Groups  
Studies have shown that percentage body fat (%BF) is highly correlated with the body mass index (BMI) and waist circumferences (WC) in different age, race, and gender. However, taking ethnicity factor into account to predict %BF has not been established.  
PURPOSE: We explored the equations of %BF predicted by BMI, WC, and age in different racial and gender groups. METHODS: We use National Health and Nutrition Examination Survey (NHANES 2003-2004) data with sample weighing 488058396 in five race groups including Mexican American (MA), other Hispanic (OH), Non-Hispanic White (NHW), Non-Hispanic Black (NHB), and other Race - including Multi-Racial (OR). %BF was measured by dual-energy X-ray absorptiometry (DXA). Prediction equation of %BF was developed based on different race and gender groups with predictors of WC, BMI, and age (20 and older). RESULTS: There was a statistically significant interaction between groups. The results of the regression equation in different race and gender groups are as follows:

<table>
<thead>
<tr>
<th>Race</th>
<th>Gender</th>
<th>%BF (Mean, SD)</th>
<th>R-square</th>
<th>Standardized Coefficients</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>28.276, 4.848</td>
<td>0.675</td>
<td>0.767, 0.704</td>
<td>0.717</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>27.286, 5.485</td>
<td>0.717</td>
<td>0.585</td>
<td></td>
</tr>
</tbody>
</table>

CONCLUSIONS: As previously reported, females have higher HR and %HR than males for similar %PO. However, and contradicting previous reports, RPE was similar between males and females for similar %PO. Based on the current results, traditional exercise intensity models are different between males and females. BL and %PO appear to be the models that might be used independently of sex.

2741 Board #7 May 31 1:00 PM - 3:00 PM  
Differences in Determining Exercise Intensity in Males and Females  
Jozelyn Rascon, Elizabeth Trujillo, Francisco J. Morales Acuna, Alvaro N. Gurovich, FACSM. The University of Texas at El Paso, El Paso, TX.  
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(No relevant relationships reported)

Even though there are physiological differences between males and females, heart rate (HR), rate of perceived exertion (RPE), power output (PO), oxygen consumption (VO2), and blood lactate (BL) levels have been used as measures of exercise intensity independently of the sex.  
PURPOSE: To determine if there are differences between sexes in different exercise intensity models.  
METHODS: Thirty (15 females) young, healthy individuals (age range 19-33 y) were scheduled for two testing visits 48-72 hours apart. During the first testing visit, a graded exercise test (GXT) was administered on a stationary bicycle. HR, RPE, PO, VO2, and BL were obtained at the end of each exercise step and peak PO and VO2max were recorded at the end of the test. BL during the GXT was used to determine 3 5-min steady-state workloads (low: 0-2 mmol/l; medium: 2-4 mmol/l; and high: >4 mmol/l) for the second test. HR, %HRmax (HR/220-age), RPE, PO, %O2max, VO2, %VO2max, and BL were also obtained at the end of each steady-state workload. A two-way repeated measures ANOVA was performed to compare all exercise intensity variables obtained during the second test between males and females (α=0.05).

CONCLUSIONS: There was no relationship between maternal physical activity during late pregnancy and infant motor development. The purpose of this study was to determine the relationship between maternal physical activity during late pregnancy and infant motor development at four months of age. METHODS: Physical activity was objectively assessed during late pregnancy (32-39 weeks gestation) via a wrist worn accelerometer. The amount of time spent sedentary and participating in light and moderate exercises were calculated for one week. Within 48 hours of birth, surveys were given to participants to complete prospectively with information on time their infants spend in different positions (sitting, prone, supine, supported and standing), infant feeding practices (breastfed vs. formula-fed), and other factors that could contribute to infant motor development during the first 4 months of life. Between 4 and 4.5 months of age, the motor development of the child was assessed by a board-certified pediatric physical therapist using the well-validated Alberta Infant Motor Scale (AIMS). RESULTS: Thirty women-infant pairs participated in the study (n=30). Infant motor development percentiles were not correlated to time spent sedentary (r=.02, p=.94), time spent participating in light activity (r=.03, p=.88), or time spent participating in moderate activity during late pregnancy (r=.04, p=.85). In addition, there was not a significant relationship between infant motor scores and the total time an infant spent in prone (“tummy time”) (r=.06, p=.81). Interestingly, infants who were exclusively breastfed at 4 months had a significantly higher mean motor score percentiles compared to those who were on formula (19.0 vs. 15.8, p=.003). CONCLUSIONS: There was no relationship between maternal physical activity levels during late pregnancy and infant motor development at four months of age. However, infants who were still breastfed at 4 months of age had higher motor development percentiles. The long-term implications of these data are substantial as motor performance in infancy is linked to an improved-cognitive function in school-age children.
Year-round participation in a single sport at the exclusion of other sports, also known as sport specialization, is associated with increased risk of overuse injury in youth athletes. To reduce this risk, several recommendations for participation volume have been developed. However, risk of overuse injuries may be dependent on specific movement profiles required by a given sport.

PURPOSE: To examine sport-specific associations of sport specialization and exceeding sport volume recommendations with overuse injuries in adolescent soccer, basketball, and volleyball athletes.

METHODS: 716 youth athletes (70.8% female, age 14.2±1.5 years old, 43.2% basketball, 19.4% soccer, 37.4% volleyball) were recruited to complete an anonymous questionnaire regarding their sport participation patterns and previous injury history. Sport specialization status was classified as low, moderate, or high using a widely utilized 3-point scale. Self-reported sport volume was used to classify athletes as either meeting or exceeding sport volume recommendations (playing their primary sport >8 months/year, hours/week of organized sport > age, days of sport participation per week >5). Multivariable logistic regression analyses were utilized to examine associations between variables of interest and overuse injury in the previous year.

RESULTS: Highly specialized volleyball athletes were more likely to report an overuse injury compared to low specialization volleyball athletes (OR [95% CI]: 2.3 [1.1-4.8], p<.01). Volleyball athletes who trained: more than 8 months per year (OR [95% CI]: 2.0 [1.1-3.5], p<.05), more hours per week than their age (OR [95% CI]: 2.0 [1.2-3.4], p<.01), or more than 5 days per week (OR [95% CI]: 2.1 [1.2-3.9], p<.05) were more likely to report an overuse injury compared to volleyball athletes who did not violate these recommendations. No significant associations were observed in soccer or basketball athletes (P>0.05).

CONCLUSIONS: The association between sport specialization, excessive sport volume, and overuse injuries may be specific to sports that are more repetitive or technical in nature, such as volleyball. Dissemination of sport-volume recommendations should be focused towards athletes, parents, and coaches in these sports.

PURPOSE: There is a lack of injury data on the collision sport of U.S. Rugby-7s, the aim was to determine match ankle injury-incidence and risk-factors in U.S. Rugby-7s.

METHODS: This was a prospective epidemiology study of players at USA Rugby Club 7-a-side competitive regional circuits and USA Rugby-7s Championships (2011-2016). Injury data were captured via the Rugby Injury Survey & Evaluation (RISE) Report. RESULTS: Overall injuries were found at 9.9/1000ph (n=313) (time-loss 2.5/1000ph, n=78; medical attention 7.4/1000ph, n=235; P<0.001). Females (3.5/1000ph; 12.3%; n=112) encountered fewer overall ankle injuries than males (7.6/1000ph; 10.8%; n=239; P=0.477). Backs (59%) more frequently than forwards (35%). Ankle injury severity, days absent was found at 41.5 days mean severity (CI: 24.4-58.6) with 68% follow-up. Overall injuries acutely (95%), occurred during the tackle (63.1%, 5.2/1000ph) and open play (29%, 2.5/10000ph). Lateral ligament sprains (3.7/1000ph) occurred more frequently than medial (0.9/1000ph). Risk factors among time-loss injuries and impact were frequent (direct-contact=1.7/1000ph, 68%; n=53; non-contact=0.8/1000ph, 32%; n=25; p<0.002). Contact injuries were higher among women (64%). New time-loss injuries (71.8%) occurred more often than recurrent-time-loss ankle injuries (28.2%). Recurrent ankle injuries occurred more frequently at greater-than-12-months (delayed-recurrence=12.8%) followed by a 2-month (early-recurrence=10.3%). Recurrent injuries occurred most frequently among elite players at a late recurrence-rate (2-12-months=28.6%) as compared to non-elite players at a delayed-recurrence (>12-months=14.1%). CONCLUSIONS: Ankle injuries are a frequent concern in collision sports. This is compounded when return-to-sport protocols are not adhered and may be a risk-factor for subsequent injury. U.S. Rugby-7s community ankle injury rates were lower compared to International elite Rugby-7s play at 7.1-25/1000ph (time-loss). Appropriate prophylaxis and agility training awareness, would benefit all levels of play. This emerging population may benefit from education on return-to-sport protocols and post-injury care which would decrease recurrent injury rates seen in this U.S. amateur population.
A high incidence of head injuries, including concussions, has been documented in a growing US rugby playing population. However, few studies have focused on describing common risk factors associated with head injuries. PURPOSE: The purpose of this study was to identify risk factors associated with head, neck, and face injuries (HNFI) among amateur U.S. rugby-7s players and investigate risk differences between genders. METHODS: Data were used from the Rugby Research and Injury Prevention Group’s injury registry (January 2010-2016). Anthropometric data, mechanism of injury, and other injury risk factors were tabulated by HNFI and gender. Logistic regression determined the relation between gender and HNFI. The final multivariable model was used to calculate the probability of HNFI and highlight gender differences. RESULTS: The final study sample consisted of 1,307 (68.2% men, 31.8% women) U.S. rugby-7s players and 1,679 (68.1% men, 31.9% women) injuries. From 2010-2016, 474 (28.2%) HNFI were documented. The most commonly injured body part and injury type were the head (47.7%) and concussion (40.3%), respectively. The final model revealed gender, age, position during contact, contact surface, and play legality were significantly associated with HNFI. Controlling for these factors allowed us to determine the specific risk factors associated with the risk of HNFI. CONCLUSION: Identifying gender-specific risk factors of injury will allow for a more effective injury prevention plan that addresses the specific needs of men and women of different levels of competitive play. Our analyses suggest there are differences in risk of HNFI in amateur Rugby-7s as it relates to player age, gender, and play legality. Age group analyses may help identify gender-specific HNFI risk factors within each age group.

Rugby-7s is a popular collision sport that is played by both sexes in the U.S. Collisions that occurs during Rugby are responsible for the majority of injuries during competition. PURPOSE: The objective of this study is to evaluate gender differences in match injuries among men and women amateur U.S. Rugby-7s athletes. METHODS: A prospective epidemiology study on Rugby-7s competitions (USA Rugby and USA Sevens tournaments) over 2010-2015 was performed. Injury rate (per 1000 player-hour (ph)) and biomechanics of injuries were recorded using the Rugby Injury Survey & Evaluation (RISE) report. Direct (injury from collision with an opposing player) and indirect mechanism (injury from the body part making contact with another factor such as playing surface) were recorded. Severity of injuries (days (d) absent from play) were determined. Comparative analysis between sexes were performed with statistical significance set at P<0.05. RESULTS: A total of 1223 contact match injuries were seen during the study (men: 852 injuries; women: 371 injuries). There was no significant differences in incidence of contact injuries for U.S. men vs. women Rugby-7s athletes (men: 55.4/1000ph; women: 59.0/1000phph; P=0.31). Female players however had a higher incidence of indirect injuries than males (women: 23.1/1000ph; men: 17.4/1000 ph, P=0.007). Female Rugby-7s players also sustained more severe injuries than males (women: 24.2/1000 ph; men: 18.0/1000 ph, P=0.004). Female Rugby-7s athletes also missed a significant more time with contact head/neck (women: 55.1/1000ph; men: 29.4/1000 ph, P=0.009) and lower extremity injuries (women: 70.7/1000ph; men: 41.2/1000 ph, P<0.01). CONCLUSIONS: Significant differences in mechanisms and mechanisms of injuries exist between U.S. men and women Rugby-7s athletes in our study population. Female players are more likely to sustain certain types of injuries and missed substantially more time after an injury when compared to their male counterparts. Gender differences in sports are important to consider when evaluating injury risk and formulating population-specific prevention programs.
reported playing other sports, with those participating in basketball indicating a 49% decreased odds of sustaining an injury compared to participating in other sports (OR 0.510, p=0.05).

Conclusions: An interpretation of these data is that adolescent players may incur injuries due to underdeveloped neuromuscular systems capable of sustaining progressively higher volumes of play as experience and competition level increase. Participation in a secondary sport like basketball may protect against injury by conferring cross-sport benefits of jump-landing, cutting and body positioning. Position-specific injuries suggest technique-driven risk factors that should be further investigated biomechanically.

Determinants of Concussion Symptomology and Resolution Time in US High School Soccer Players

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Email: avinashc@email.unc.edu

Reported Relationships: A. Chandran: Other (please describe): The National Athletic Treatment, Injury and Outcomes Network (HS NATION) data were provided by the Datatyls Center for Sports Injury Research and Prevention. HS NATION was funded by the National Athletic Trainers’ Association Research and Education Foundation (NATA REF), and the Central Indiana Corporate Partnership (CICP) Foundation.

Conclusions are a concern among soccer players of all ages. However, determinants of concussion symptomology and other sequelae have not been examined in high school soccer players.

Purpose: Examine the impact of sex, injury history, injury mechanism, and setting on concussion symptomology and resolution time among HS soccer players.

Methods: The HS NATION-SP captured soccer-related injury data collected by athletic trainers (ATs) during the 2011/2012-2013/14 academic years. We specifically examined injuries diagnosed as concussions: Outcomes of interest included symptoms reported with concussions as well as resolution time, categorized as resolved in 7 days, 14 days, 21 days, and >28 days. Exposures of interest included sex, injury history, injury mechanism associated with concussion, and setting (competition vs. practice). We used ordinal logistic regression models to assess the odds of reporting specific symptoms as a function of exposures, as well as other observed symptoms. We then used ordinal logistic regression models to assess exposure effects on the odds of reporting a longer symptom resolution time. Odds Ratio (OR) estimates with 95% confidence intervals (CI) excluding 1.00 were deemed significant.

Results: A total of 189 concussions were reported, with most observed in girls (56%). Symptoms resolved within 7 days in 41% of reported concussions. Interestingly, we detected several symptom dependencies, such as higher odds of light sensitivity (OR= 20.71, 95% CI: 8.58, 50.00) with concurrent noise sensitivity, and higher odds of irritability (OR= 9.04, 95% CI: 3.74, 21.85) and drowsiness (OR= 7.46, 95% CI: 3.48, 15.98) with concurrent insomnia. We also observed lower odds of longer symptom resolution time in concussions due to player contact mechanisms than those due to non-player-contact mechanisms (Adj. OR= 0.33, 95% CI: 0.18, 0.59).

Conclusions: Determinants of soccer-related concussions and their sequelae appear to be multifactorial. The observed symptom dependencies may encourage clinicians to evaluate players for specific symptoms in the presence of others while also indicating common neurological pathways affected by trauma in this context. Injury mechanism may also be associated with concussion outcomes, although future investigation is warranted.
ingesting 146 g of carbohydrate. Transcriptional regulation of substrate metabolism was assessed using RT-qPCR in vastus lateralis biopsy samples obtained before (PRE) and after (POST) the exercise bout.

**RESULTS:** PRE glycogen synthase kinase 3ε expression was 40% lower (P<0.05; time-by-treatment interaction) in LOW than AD. GLUT4, hexokinase 2, phosphofructokinase, and pyruvate kinase expression were not different between LOW and AD. PRE fatty acid translocase was 40% higher (P<0.05; time-by-treatment interaction) in LOW than AD. Independent of time, fatty acid binding protein, carnitine palmitoyltransferase 1A, and hydroxycyl-CoA dehydrogenase/3-ketoacyl-CoA dehydrogenase expression were each 40% higher (P<0.05; time effect) in LOW than AD. In LOW, POST peroxisome proliferator-activated receptor δ was 177% higher (P<0.05 time-by-treatment interaction) than PRE, with no change in AD.

**CONCLUSION:** Initiating aerobic exercise with low muscle glycogen content upregulates the transcriptional control of fat oxidation without modulating intramuscular regulation of glucose metabolism, even when exogenous glucose is ingested during exercise.

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**METHODS:** Using a randomized, crossover design, 12 men (mean±SD: age = 21±4 y; body mass: 83±11 kg; VO2peak = 4.4±3 mL/kg/min) completed 2 cycle ergometry glycogen depletion trials separated by 7–d, followed by a 24-h period of high fat (1.5 g/kg carbohydrate, 3.0 g/kg fat) or high carbohydrate (6.0 g/kg carbohydrate, 1.0 g/kg fat) refueling to elicit low (LOW) or adequate (AD) glycogen stores. Participants then performed 80-min of steady-state cycle ergometry (64±3% VO2peak) while ingesting 146 g of carbohydrate (95 g glucose +51 g fructose; 1.8 g min). Substrate oxidation (g/min) during exercise was determined by indirect calorimetry and tracer techniques with 13C-glucose and 13C-fructose. Muscle glycogen (mmol/kg dry wt) was determined by fluorometric assays from vastus lateralis biopsies obtained before and after glycogen depletion and before (PRE) and after (POST) steady-state exercise trials.

**RESULTS:** Muscle glycogen concentrations were the same between treatments before (LOW: 467±99 AD: 472±109) and after both depletion exercise bouts (LOW: 207±99, AD: 210±145). Following 24-h refueling, PRE glycogen was lower in LOW (217±103) compared AD (396±70, P<0.05). POST glycogen in AD (229±94, P=0.05) was lower than PRE but remained higher than LOW (137±131, P<0.05). Glycogen did not change PRE to POST in LOW. Exogenous carbohydrate oxidation rate was not different between LOW (0.84±0.14) and AD (0.87±0.16; P=0.05). Fat oxidation was higher, and total and endogenous carbohydrate oxidation was lower in LOW (0.55±0.10, 1.59±0.40, and 0.75±0.29) compared to AD (0.38±0.13, 2.03±0.36, 1.17±0.29; all P<0.05).

**CONCLUSION:** These data show that initiating steady-state aerobic exercise with low muscle glycogen content does not cause greater reliance on exogenous carbohydrate for fuel.

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**METHODS:** To examine energy metabolism, total and exogenous CHO utilization, blood glucose and performance after consuming different isocaloric glucose beverages before a sustained treadmill run. **METHODS:** 10 male experienced endurance runners (32±4.9 yr; 73.5±3.1 kg; %fat 15.3±2.1; VO2peak 55.9±1.5 mL/kg/min) participated in a crossover-designed study, on 3 occasions: Slow digestion CHO (S), Fast digestion (F), and Water (C). Participants consumed a single 50g dose of either S or F prior to running 3hrs at 58% VO2peak. Pulmonary gas exchange and plasma glucose were assessed at -15, 0 (run-start), 30, 60, 90, 135,180 min for glucose, metabolic rate, and CHOox. Breath CO2 was analyzed for exogenous C13 rate of appearance. Immediately post-run participants completed a time-to-fatigue test at 110% VO2peak. **RESULTS:** There were no significant differences in VO2 between groups during the run (p=0.46). There was a significant difference in CHOox for C vs. S and F (C 1.0; S 1.33; F 1.45±0.1 g/min) (p=0.12). There was a significant difference in breath 13CO2 appearance for C vs. S and F, as well as S vs. F (F: 0.0002; S 0.0012; F 0.0009±0.0011 mmol/min) (p<0.001), in addition to a significant time x trial for C and S vs. F (p<0.001). There was a significant difference in AUC CHO dose oxidized to CO2 for S vs. F (S 1.09; F 1.41±0.2 mmol) (p=0.03). There was a significant difference in plasma glucose for C vs. S, but not for F (C 89.1; S 95.9; F 93.5±1.9 mg/dL) (p=0.001), in addition to a significant time x trial difference for C and S vs. F (p<0.001). There was no significant time-to-fatigue to any trial (C 161.1; S 223.7; F 156.1±34.4 sec) (p>0.18).

**CONCLUSION:** The consumption of a single bolus of CHO beverage prior to a 3hr run elicits significant alterations in energy metabolism compared to just water, with CHO burning significantly less total carbohydrate and more fat than a rapidly digested carbohydrate. The S CHO provided a more stable and consistent energy metabolism profile, in addition to the most stable glucose concentration during the run. These findings provide evidence that S CHO provides a consistent blood glucose and sustained exogenous energy supply during a sustained endurance run.

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**BACKGROUND:** Initiating aerobic exercise with low muscle glycogen content promotes greater fat and less endogenous carbohydrate oxidation during exercise. However, whether oxidation of exogenous carbohydrate increases when exercise is initiated with low muscle glycogen is not well defined.

**PURPOSE:** Determine if exogenous carbohydrate oxidation during aerobic exercise is affected by the level of muscle glycogen at the onset of exercise.

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The ability for carbohydrate (CHO) to provide sustained energy availability and stable blood glucose is important for prolonged endurance. **PURPOSE:** To examine energy metabolism, total and exogenous CHO utilization, blood glucose and performance after consuming different isocaloric glucose beverages before a sustained treadmill run. **METHODS:** 10 male experienced endurance runners (32±4.9 yr; 73.5±3.1 kg; %fat 15.3±2.1; VO2peak 55.9±1.5 mL/kg/min) participated in a crossover-designed study, on 3 occasions: Slow digestion CHO (S), Fast digestion (F), and Water (C). Participants consumed a single 50g dose of either S or F prior to running 3hrs at 58% VO2peak. Pulmonary gas exchange and plasma glucose were assessed at -15, 0 (run-start), 30, 60, 90, 135,180 min for glucose, metabolic rate, and CHOox. Breath CO2 was analyzed for exogenous C13 rate of appearance. Immediately post-run participants completed a time-to-fatigue test at 110% VO2peak. **RESULTS:** There were no significant differences in VO2 between groups during the run (p=0.46). There was a significant difference in CHOox for C vs. S and F (C 1.0; S 1.33; F 1.45±0.1 g/min) (p=0.12). There was a significant difference in breath 13CO2 appearance for C vs. S and F, as well as S vs. F (F: 0.0002; S 0.0012; F 0.0009±0.0011 mmol/min) (p<0.001), in addition to a significant time x trial for C and S vs. F (p<0.001). There was a significant difference in AUC CHO dose oxidized to CO2 for S vs. F (S 1.09; F 1.41±0.2 mmol) (p=0.03). There was a significant difference in plasma glucose for C vs. S, but not for F (C 89.1; S 95.9; F 93.5±1.9 mg/dL) (p=0.001), in addition to a significant time x trial difference for C and S vs. F (p<0.001). There was no significant time-to-fatigue to any trial (C 161.1; S 223.7; F 156.1±34.4 sec) (p>0.18).

**CONCLUSION:** The consumption of a single bolus of CHO beverage prior to a 3hr run elicits significant alterations in energy metabolism compared to just water, with CHO burning significantly less total carbohydrate and more fat than a rapidly digested carbohydrate. The S CHO provided a more stable and consistent energy metabolism profile, in addition to the most stable glucose concentration during the run. These findings provide evidence that S CHO provides a consistent blood glucose and sustained exogenous energy supply during a sustained endurance run.
Hepcidin-25 levels increased 3 h post-exercise (p<0.001), however, they did not differ between trials (p=0.46) or diets (p=0.84). CONCLUSIONS: Strenuous exercise undertaken following chronic adaptation to a LCHF diet is associated with a greater post-exercise IL-6 response than when exercise is undertaken with high CHO availability. The elevated IL-6 response in athletes adapted to a LCHF diet is not attenuated by an acute increase in exogenous CHO availability. Despite diet-induced differences in IL-6 responses, no differences in hepcidin levels were evident, suggesting IL-6 is likely not the primary factor determining the magnitude of post-exercise hepcidin levels. Baseline iron status may be a more dominant factor regulating this response. Increased IL-6 levels may negatively influence other body processes, and the long-term impact of adhering to LCHF on other health outcomes warrants further investigation. Funded by the ACU Research Fund and the AIS High Performance Sport Research Fund.
Free Communication/Slide - Changing Physical Activity Behaviors Across the Life-Course
Friday, May 31, 2019, 1:00 PM - 3:00 PM
Room: CC-105B

Chair: Eric C. Conchola. Oklahoma State University, Stillwater, OK.

NO relevant relationships reported

May 31 1:00 PM - 1:15 PM
Are Lower-leg and Thigh Muscle Resistance Training Methods Equally Effective to Dynamic Balance for Community-Dwelling Elderly Females?
Hiroshi Kohnoh. Toyo University, Asaka-Shi, Japan.
Email: kohnoh@toyo.jp

NO relevant relationships reported

May 31 1:15 PM - 1:30 PM
Using Gamification to Enhance Student Participation in Classroom Activity Breaks
Lexie R. Beemer, Lauren Allport, Tiwaloluwu A. Ajibewa, Shreyah Bahl, Emma Weston, Mayas Damen, Ben Ransier, Darin Stockdill, U. Sean Vance, Rebecca E. Hasson, FACSM. University of Michigan, Ann Arbor, MI. (Sponsor: Rebecca E. Hasson, FACSM)
Email: abeemer@umich.edu

NO relevant relationships reported

May 31 1:30 PM - 1:45 PM
Comparing Health Improvements Achieved Through Different Pathways Of A Community-based Motivational Interviewing Physical Activity Programme
Matthew Wade1, Nicola Brown2, James Steele1, Bernadette Dancy3, Anne Majumdar3, ‘ukactive Research Institute, London, United Kingdom. ‘St Mary’s University, London, United Kingdom.
Email: matthewwade@ukactive.org.uk

NO relevant relationships reported

May 31 1:45 PM - 2:00 PM
Effects Of A Teacher-led Movement-training Program On Physical Fitness, Motor Skills, And Physical Activity In Third And Fourth Grade Students
Brittany Masteller, John R. Sirard, FACSM. University of Massachusetts Amherst, Amherst, MA. (Sponsor: John Sirard, FACSM)
Email: brittanymasteller@gmail.com

NO relevant relationships reported

CONCLUSIONS

significantly (P=0.029).

P=0.046)) improved significantly in LLG. TMG knee extension strength improved LLG: 143.1±33.1 to 95.6±18.9 cm., TMG: 144.9±26.4 to 135.7±37.2 cm, F=3.92, F=5.01, P=0.038), area covering of COP with eyes open (LLG: 14.1±3.3 to 9.1±2.7 cm2, TMG: 15.1±3.3 to 18.9±9.0 cm2, F=5.84, F=0.09), total length of COP (LLG: 143.1±33.1 to 95.6±18.9 cm, TMG: 144.9±26.4 to 135.7±37.2 cm, F=3.92, P=0.06) improved significantly in LLG. TMG knee extension strength improved significantly (P<0.02)

CONCLUSIONS: Lower-leg muscle training was found more effective to improve dynamic balance ability than thigh muscle training for community-dwelling females.

PURPOSE: To compare the magnitude of lower-leg training program and thigh muscle training program to dynamic balance ability changes for community-dwelling elderly Japanese women.

METHODS: After giving written informed consent, the subjects, unable to stand on one leg for more than 25 seconds with their eyes open, were divided into a lower-leg training group (LLG; 10 females, 72.9±14.2 yrs, BMI 22.1±1.8) and a thigh muscle training group (TMG; 10 females, 70.6±2.5 yrs, BMI 22.1±1.2). The program was 60min. two times per week for 16 weeks. Each training program consisted of three parts. At first, participants learned about management skills for their physical stiffness. Secondly, they learned each resistance program. LLG participated in the program using unstable disk and elastic band. TMG learned program was to strengthen their thigh muscles with elastic band. Finally, both groups learned a three-minute arm and leg combined exercise program with music. Participants were asked to follow their learned management skill program and resistance program every day and check it on the card. Dynamic balance ability was measured by one-leg standing time with their eyes open, the area covering and total length of the center of gravity sway (COP) with eyes open or close by stadiometer. Knee extension strength was evaluated. Each measurement items were assessed before and after the intervention period. Student’s t-test and two-way repeated measures ANOVA were used to test the effectiveness.

RESULTS: The class participation rates were 82%: 4% and 81%: 5% and home participation rates were 76%: 10% and 72%: 15% respectively. One-leg standing time with their eyes open LLG: 14.0±3.0 to 19.9±2.2 sec., TMG: 12.4±2.5 to 15.9±2.2 sec, F=8.54, P=0.009), total length of COP (LLG: 143.1±33.1 to 95.6±18.9 cm, TMG: 144.9±26.4 to 135.7±37.2 cm, F=3.92, P=0.06) improved significantly in LLG. TMG knee extension strength improved significantly (P<0.02)

CONCLUSIONS: Gamification increased student MVPA participation by 86% and enjoyment of AB by 6%. This equated to students accumulating approximately 21 minutes of classroom activity per day, 13 of which were MVPA. These findings suggest gamification may be a key tool to increasing classroom activity and physical activity enjoyment in children attending low-income schools.

Benefits of regular physical activity (PA) are well documented, however physical inactivity remains a global public health challenge. The National Institute for Health and Care Excellence recommend brief advice to elicit positive PA behaviour change.

PURPOSE: Assess PA and mental wellbeing impact of signposting [SP] and Social Action [SA] group pathways of a motivational interviewing (MI) community-based PA intervention.

METHODS: Participants (18-74 yrs, BMI of 28-35 kg/m2) from Essex, UK, were invited to take part in a community-based, primary care PA programme which uses MI techniques. Self-reported PA (IPAQ) and mental wellbeing (Short Warwick Edinburgh Mental Wellbeing Scale) data were collected at baseline (following an initial 30 minute MI appointment), 12 weeks, 6 months, and 12 months.

Participants were assigned to receive activity SP after the initial MI appointment or attend a SA group (weekly healthy lifestyle support for 12 weeks) depending on their GP surgery. Multilevel modelling were used to derive point estimates and 95%CI’s for each time point and change scores (i.e. time x - time y).

RESULTS: 2084 participants attended a baseline appointment (61% women, mean age 61 years (SD 12), 95% White or White British, 68% disabled). Mean total PA (MET-min-week) was significantly greater at baseline for the SP group (SP: 1439, 95%CI [1323-1556]; SA: 1126, 95%CI [1045-1207]). Both pathways significantly increased the amount of total PA at 12 weeks, 6 months, and 12 months. However, there were no significant differences in the changes between pathways. No significant differences in mental wellbeing between pathways at any of the four time points. Mental wellbeing significantly increased for both pathways from baseline to 12 weeks, remaining constant at 6 months. Non-significant reduction in mental wellbeing from 6 months to 12 months for the SP pathway (-1.1, 95%CI [-2.5-0.4]), but a significant increase for the SA pathway (1.3, 95%CI [0.1-2.4]). No significant differences in the changes between pathways.

CONCLUSION: Both pathways produced similar improvements in PA and mental wellbeing suggesting MI based PA interventions with SP or SA are both effective in improving health outcomes. However, no difference in the results indicate SP should be recommended, especially as the SA group requires more resource.

PURPOSE: Fundamental Integrative Training (FIT) is a circuit-style strength training approach designed to be implemented in conjunction with a physical education program.

The purpose of this study was to test the effectiveness of gamifying activity breaks (AB) to enhance student participation, enjoyment, and confidence during AB in low-income schools.

METHODS: Nine, 3rd through 6th-grade classrooms (approximately 300 students) in one elementary-middle school in Detroit, Michigan (79% Hispanic; 80% qualified for free/reduced lunch) participated in this 20-week intervention where teachers implemented 5, 4-minute AB/day (10 minutes/week). Gamification of AB occurred during weeks 13-20 of the intervention and included the use of game design elements and classroom goals for the percentage of students engaging in moderate-to-vigorous physical activity (MVPA). Students had the opportunity to win daily, weekly, and post-intervention prizes for meeting their classroom goal. Student AB participation was measured via direct observation. Student AB enjoyment was measured via the Physical Activity Enjoyment Scale questionnaire. Student AB confidence was measured via a single-item question from the Physical Activity Self-Efficacy Scale.

RESULTS: Compared to the standard intervention (weeks 6-12), the gamified intervention resulted in a significant increase in student MVPA (standard: 38:2.3% vs. gamified: 60:2.1%, P=0.01) and student enjoyment (standard: 3.6±0.1 vs. gamified: 3.8±0.1, P=0.01) during an AB, with no change in student confidence (standard: 7.1±0.2 vs. gamified: 7.2±0.2, P=0.90).

CONCLUSIONS: Gamification increased student MVPA participation by 86% and enjoyment of AB by 6%. This equated to students accumulating approximately 21 minutes of classroom activity per day, 13 of which were MVPA. These findings suggest gamification may be a key tool to increasing classroom activity and physical activity enjoyment in children attending low-income schools.

Abstracts were prepared by the authors and printed as submitted.
Kruskal-Wallis rank-sum tests were used to compare pre-post changes between the INT and CON groups for all variables. RESULTS: Sedentary time decreased for the INT group (p=0.004) but increased in the CON group (p>0.04). No significant differences were observed between groups for any of the physical fitness, motor skill, or physical activity variables. CONCLUSIONS: The current study adds valuable insight into the efficacy of delivering a FIT intervention into an existing PE curriculum. Future studies should continue to explore the relationships between physical activity, fitness, and motor skills in children to identify causal pathways and intervene appropriately.

2766 May 31 2:00 PM - 2:15 PM Changes On Non-exercise Physical Activity Are Related To Improvements In Mitochondrial Function Independently Of Structured Intentional Exercise
Elvis Alvarez Carnero, Robert Standley, Giovanna Distefano, Paul M. Coen, Bret H. Goodpaster. Florida Hospital. Translational Research Institute, Orlando, FL. Email: Elvis.carnero@fhhosp.org

Whether exercise interventions increase or reduce non-exercise physical activity (NEPA) is controversial. Few studies have examined this potential effect on relevant physiological outcomes, particularly in the context of randomized controlled trials. PURPOSE: To determine the effects of a structured exercise program on NEPA, and the independent association between NEPA and both cardiorespiratory fitness (VO2max) and mitochondrial capacity within skeletal muscle. METHODS: Thirty-seven older (age=69±5yrs) adults were randomized to one of the following 6-month interventions: Health education (CON: n=12), diet induced weight-loss (DIWL: n=12), or Weight-loss and exercise (WLEX: n=15). CRWL and WLEX participants had a goal of 10% weight-loss through calorie restriction. Subjects in the WLEX group completed a supervised combined aerobic and resistance exercise program. We quantified components of PA by a multisensory device. VO2max was determined by cycle ergometry. Maximal oxidative phosphorylation (OXPHOS) and maximal uncoupled respiration (ETS) of permeabilized myofibers from biopsies was evaluated by high-resolution respirometry. Repeated measures analysis was performed to compare differences between the three groups pre and post intervention. Adjusted correlations to weight loss (WL) between NEPA and VO2max, ETS and OXPHOS were performed. RESULTS: After the intervention WLEX increased significantly NEPA compared with the other groups (NEPA: WLEX: 89.6±84.5 min/day; DIWL: 3.7±42.4 min/day; CON= -10.5±63.6 min/day; F= 8.87 for time x group interaction, p<0.001). Change in NEPA was positively correlated with change in mitochondrial capacity within muscle, exercise programs in older obese adults may also increase non-exercise physical activity, which in turn appears to independently correlate with improved aerobic capacity. These results highlight the greatest contribution to in-school PA for students, PE instructors and school health administrators. Linear regression models were used to determine intervention effects for all health outcomes, adjusting for baseline values, age, gender, BMI, and socio-economic variables. RESULTS: After one year, a significant positive intervention effect on children’s BMI was found (p<0.04). Further, children in the IG spent significantly more days in sufficient PA than children in the CG (3.1±2.1 days vs. 2.5±1.9 days; p<0.05). Children in the IG also performed significantly better in the three minute endurance run than their counterparts in the CG (0.05±0.46 min vs. 286.9±43.2 min; p<0.001).

CONCLUSIONS: This teacher-centered health promotion using a low-dose bottom-up approach with action alternatives achieved significant positive effects in the reduction of BMI and significant increases in endurance capacity and daily PA. The programme is therefore ideal for integrating health promotion more intensively into the everyday life of children.

Over 1/3rd of school-age children are overweight or obese. To address this problem, school-age children are recommended to take part in 60 minutes of daily moderate-to-vigorous physical activity (MVPA), with 30 minutes of this daily MVPA being in-school. Physical education (PE) classes offer ideal opportunities for physical activity (PA) as they utilize varying modules including team sports, general fitness, and social (e.g. dance). Yet, how much overall PA and MVPA occurs over these differing PE class modules remains unclear. The System for Observing Fitness Instruction Time (SOFIT) is a simple observational tool that PE instructors can use to calculate PA.

PURPOSE: To observe student PA levels across multiple PE modules using SOFIT. METHODS: A modified SOFIT was used to assess PA over 15, 90-minute PE classes (N = 124) across 3 modules: team sports (8 sessions), general fitness (3 sessions), and dance (4 sessions) in a single middle school. PA was coded from 1-5 corresponding to lying down, sitting, standing, walking, and vigorous, respectively. The same observer recorded PA in the last minute of a 5-minute interval based on activity in the prior 4 minutes. Separate 1-way ANOVA examined differences in MVPA (i.e. scores 4) and overall PA across modules with Tukey-Kramer post hoc analyses as appropriate. RESULTS: Overall PA differed significantly across modules (p = 0.2), with team sports producing higher PA (3.80±0.36) than dance (3.19 ± 0.37; p = .04). PA was similar across all modules (team sports: 4.29 ± ± 0.43, general fitness: 4.06 ± 0.28, dance: 3.70 ± 0.41; F = 2.83; p = .09).
CONCLUSION: Although team sports produced greater overall PA, all modules are viable options for producing MVPA during PE classes in this population. To improve adherence to these different activities, future researchers should compare enjoyment levels for students across these activities. Overall, as PE classes are the greatest contribution to in-school PA, PE instructors in primary and secondary schools and for classroom teachers can use our findings to choose appropriate modules to teach children PA, and, concurrently, positively address the childhood obesity epidemic.

2769 May 31 2:45 PM - 3:00 PM Cardiovascular, Metabolic, And Perceived Effort In A Simulated Commute On A Regular And Electric Bicycle
Helaine M. Alessio, FACSIM, Tim Reiman, Brett Kemper, Courtney Kemper, Ryan Mullen, McKenna DiRè, Winston Von Carlowitz, Arden McMath, Rachel Pugh, Kyle Timmerman, FACSIM, Miami University, Oxford, OH. Email: alessih@miamioh.edu

Use of electric bicycles (e-bikes) with battery powered assist when pedaling, may incentivize active transport for people who may not be fit enough to ride several miles to school, work, or for leisure. E-bikes may enhance one’s daily physical activity levels, possibly creating cardiovascular and metabolic health benefit and be an environmentally friendly transportation option. PURPOSE: To compare cardiovascular, metabolic, and ratings of perceived effort (RPE) when riding an e-bike for 3 miles at two different assist levels (boosts that vary in intensity), in comparison with a regular bicycle. METHODS: Male (n=16) and female (n=14) subjects, aged 19-61 yr, completed a YMCA submaximal test and three e-bike rides on a typical commute, at their own pace on a standard bicycle and on an e-bike at both E-2 assist, and E-3 assist levels. Participants wore a heart rate (HR) monitor and COSMED that recorded HR and oxygen consumption (VO2). RPE on a 6-20 Borg scale was reported at the end of each 3-mile ride. A linear mixed effects model estimated the differences within subjects and between bicycle types on variables of interest at the 95% confidence level. RESULTS: In every model, for every variable, a significant difference (p<0.05) existed between riding a regular bicycle compared with an e-bike at both assist levels: HR (Reg=133 vs E-2=124 and E-3=114 beats/min-1), % of VO2
max (Reg=-56 vs E-2=48 and E-3=40%, RPE (Reg=12.3 vs E-2=9.8 and E-3=8.4, respiratory quotient (Reg=-89 vs E-2=85 and E-3=85), METS (Reg=6.7 vs E-2=5.8 and E-3=4.8), caloric expenditure (Reg=519 vs E-2=436 and E-3=359 kcal/m²hr⁻¹), time (Reg=-13.7 vs E-2=11.8 and E-3=10.3 min) and VO2 (Reg=-23.6 vs E-2=20.3 and E-3=16.8 mL/kg/min⁻¹). CONCLUSIONS: Compared with regular bicycles, riding e-bikes at assist levels 2 and 3 resulted in 2.5 - 3.9 min faster 3-mile times and lower perceived efforts from somewhat hard for regular bicycle to very light for either e-bike assist levels. Speed and lower RPE may incentivize people to ride e-bikes which may contribute to environmentally friendly active transport. Compared with regular bicycling, 10-20% lower metabolic and cardiovascular responses associated with e-bikes, if performed regularly, may still benefit fitness and health.

| Table 1. Mean (SD) comparison of kinematic and kinetic variables between FFS-M and FFS-C |
|----------------------------------------|------------------|------------------|
|                                        | FFS-M            | FFS-C            |
| Foot PF at initial contact (°)        | -3.41 (2.4)      | -8.94 (3.4)      | <0.001 |
| Ankle PF at initial contact (°)       | -6.05 (4.1)      | -13.5 (5.5)      | <0.001 |
| Peak ankle DF velocity (°/s)         | 444 (90.0)       | 579 (87.1)       | 0.004  |
| Foot INV at initial contact (°)       | 16.7 (4.6)       | 16.0 (5.7)       | 0.861  |
| Ankle INV at initial contact (°)      | 12.5 (4.5)       | 12.9 (5.5)       | 0.976  |
| Peak ankle EV velocity (°/s)         | -333 (86.7)      | -465 (124.0)     | 0.012  |
| Peak posterior load rate (BW/s)      | 15.5 (5.7)       | 26.5 (10.8)      | 0.022  |
| Peak medial load rate (BW/s)         | 7.12 (2.5)       | 9.51 (2.7)       | 0.055  |
| Peak resultant load rate (BW/s)      | 55.7 (12.0)      | 66.4 (17.8)      | 0.114  |

F-13 Free Communication/Slide - Foot and Ankle
Friday, May 31, 2019, 1:00 PM - 3:00 PM
Room: CC-202C

2770 Chair: Robert Gregory, Southern Connecticut State University, New Haven, CT. (No relevant relationships reported)

2771 May 31 1:00 PM - 1:15 PM
Differences In Foot Kinematics Between Forefoot Strikers In Minimalist And Conventional Running Shoes
Tryntjie Fokkema¹, Jereme Outerleys², Alessandra Bento Matias², Adam C. Clasey², Irene S. Davis, FACSM². ¹Erasmus MC University Medical Center; Rotterdam, Netherlands. ²Harvard Medical School, Cambridge, MA. Email: t.fokkema@erasmusmc.nl (No relevant relationships reported)

Foot contact when analyzing running biomechanics data, but most techniques are restricted to use in the laboratory. The accurate identification of foot contact from a single triaxial accelerometer mounted on the tibia may be useful for in-field measurements of gait. PURPOSE: To determine criterion-related validity of a new technique for determining foot contact from the resultant acceleration of the distal tibia compared to foot contact determined from vertical ground reaction force. METHODS: As part of a larger study, 19 runners (10 female, 9 male; 31 ± 6 years; 1.70 ± 0.08 m; 68.6 ± 11.6 kg) participated. Synchronous tibial acceleration and ground reaction force data were recorded at 1000 Hz using a triaxial accelerometer mounted to the skin over the distal antero-medial tibia and a force plate embedded in the floor. Participants completed 10 running trials at 3.0 m/s. Resultant acceleration was calculated and foot contact was determined using a custom algorithm that identified a minimum prior to peak resultant acceleration. Foot contact was also determined as the time at which vertical ground reaction force exceeded a threshold of 20 N. 95% limits of agreement between the two methods were calculated. RESULTS: On average the result of acceleration identified foot contact 2.1 ± 5.4 ms earlier than ground reaction force. The 95% limits of agreement for were -8.5 to 12.8 ms. With this approach 95% of foot contacts identified from resultant acceleration were within 10 ms of foot contact identified from ground reaction force. CONCLUSION: Identifying foot strike from resultant tibial acceleration measured using a single triaxial accelerometer is a valid technique for foot contact identification in the field. Study funded by College of Nursing and Health Professions Research Award.
Impact Of Reduced Plantar Sensation On Balance Control
Caitlin O'Connell, Gustavo Sandri Heidner, Nicholas Murray, J. Chris Mizelle, Patrick Rider, Zachary Domire. East Carolina University, Greenville, NC.
Email: oconnellca17@ecu.edu (No relevant relationships reported)

PURPOSE: Balance control has often been used to examine neural function. Given the robustness of balance control, perturbation is often needed to allow for more sensitive measurement. Our previous work has shown that balance is perturbed when a participant is placed in a moving virtual reality environment (VR). This situation creates a sensory mismatch between plantar sensation and visual feedback. The purpose of this study was to examine balance control when plantar sensation was reduced by cooling the plantar sole. We hypothesized that reducing plantar sensation would increase sway displacement, velocity and approximate entropy in a moving VR.
METHODS: Six healthy young adults completed baseline balance tests: quiet standing (QS) and challenged by an anterior-posterior sinusoidal movement of a 360° projected picture of the lab within the VR head set. After the baseline balance test, participants placed the bottom of their feet in an ice bath until the plantar sole reached a temperature of 10-15°C. Reduced plantar sensation (RPS) was confirmed using a monofilament test. Balance tests were then repeated with participants standing on a cold steel plate with a temperature below 15°C to ensure consistent temperature of the plantar sole. Statistical analysis was performed on anterior-posterior center of pressure displacement, velocity and approximate entropy to determine differences between baseline and RPS balance tests within each balance condition (α=0.05).
RESULTS: Displacement increased when plantar sensation was reduced during the VR condition (p = 0.04, Baseline = 1.8 ± 0.8 cm, RPS = 2.4 ± 0.9 cm). There were similar trends that velocity (p = 0.08, Baseline = 5.1 ± 2.0 cm/s, RPS = 6.2 ± 2.6 cm/s) and approximate entropy (p = 0.1, Baseline = 0.13 ± 0.06, RPS = 0.1 ± 0.03) were greater when plantar sensation was reduced during the VR condition. There was no difference between reduced plantar sensation and baseline balance during QS.
CONCLUSIONS: Reducing plantar sensation elicited increased sway with a more consistent pattern (increased approximate entropy) when balance was perturbed by a moving virtual environment, suggesting that participants had reduced balance control capabilities due to the sensory mismatch. Funding provided by the Office of Naval Research (N00014-17-1-272).

The Effects of Ankle Taping on Double Leg Balance after Plyometric Exercises
Russell Lowell1, Jackson Roper1, Madeline Phillips1, Abby McCarthy1, Hannah Nelson1, Anna Blackley1, Abraham Frech1, Moroni de Moors2, Branden Ziebell1, Jared Hornsby1, Will Peveler1, Jeff Simpson2, David Titcomb1, Andy Bosak1. Liberty University, Lynchburg, VA. 1University of West Florida, Pensacola, FL. (Sponsor: Dr. James Schoffstall, FACSM) (No relevant relationships reported)

Ankle taping (AT) is a common preventative method to decrease the likelihood of ankle ligament injuries. Many athletic trainers use AT for athletes involved in high volume jumping sports to increase ankle stability. Ankle proprioception and postural control can be altered due to the restriction caused by AT and therefore, athletes need to be aware of the potential changes. PURPOSE: To compare AT center of pressure displacement (COPDsp) vs no ankle taping (NT) COPDsp, in the X- and Y- direction, before and after a fatiguing plyometric protocol. METHODS: Descriptive data (Ht. = 178.67 ± 8.88, Wt. = 79.69 ± 9.55, BMK = 12.20 ± 4.38, age = 22.81 ± 2.56) was measured for 16 averagely fit college-age males. AT and NT sessions were prescribed in a counterbalanced order. Both sessions were separated by no less than 72 hours and no more than 96 hours of recovery. Each subject completed the same plyometric protocol and balance testing on a force plate at a temperature 15°C and approximate entropy (OE) trials. Significant differences for COPDsp between pre- and post- fatigue and both taping sessions were measured using a 2x2x2 repeated-measures ANOVA. Statistical significance was set at p < 0.05 for all analyses. RESULTS: The interaction between AT PRE EC (1.37 cm) and AT POST EC (1.16 cm) trials in the X direction were significant, p = 0.041. Significant differences also occurred between AT PRE EO (1.33 cm) and AT POST EO (1.75 cm) trials in the X direction, p = 0.039. No significant differences occurred in the Y direction for AT PRE EC POST EC trials (p = 0.507) or AT PRE-POST EO trials (p = 0.196). No significant differences occurred in all NT PRE-POST EC and OE trials, p > 0.05. CONCLUSIONS: The current results suggest AT caused an increase in the COPDsp X direction, while there was no difference in the Y direction. Future studies may seek to examine the effects of AT on the experiences of athletes with experience wearing AT and the resulting effects during a dynamic balance test.
Persistent pain is the most common complaint reported by those with chronic symptoms following ankle sprain with its prevalence peaking in middle-aged adults. Despite the high prevalence rate and associated adverse effects on mobility, quality of life, and physical activity, the influence of persistent ankle pain on lower extremity function during gait in middle-aged adults has not been examined. PURPOSE: To identify the modifiable lower extremity kinematic dysfunction during walking gait associated with persistent ankle pain in middle-aged adults. METHODS: Ten individuals with persistent ankle pain (9F, 1M; 55.4 ± 6.52 years; 166.8 ± 6.73 cm; 78.24 ± 25.05 kg) and nine matched uninjured controls (8F, 1M; 53.0 ± 5.79 years; 168.2 ± 6.06 cm; 75.81 ± 24.46 kg) volunteered for the study. Three-dimensional lower extremity kinematics and kinetics were collected during five barefoot walking trials at a self-selected speed. Lower extremity sagittal and frontal joint positions were used to calculate joint ROM and maximum joint position during 1° double-limb support, single-limb support, and 2° double-limb support. Position at initial contact in the sagittal and frontal plane was also calculated. MANOVA tests assessed group differences with an alpha level of p<0.05. Significant tests were followed by independent t-tests with Bonferroni corrections. RESULTS: Front foot inversion increase is significantly increased in those with persistent ankle pain compared to controls during overground walking (p<0.05). Persistent ankle pain subjects were in an inverted position at initial contact (2.91 ± 4.32°), while controls were in an everted position at initial contact (2.35 ± 3.25°). No other group differences were noted. CONCLUSIONS: Persistent ankle pain subjects demonstrate significant increases in rearfoot inversion at initial contact compared to controls. This altered movement pattern may result in further stress of the ankle joint structures, which may contribute to their persistent ankle pain. Additional research with a larger sample size and greater male representation is needed to further explore the effects of ankle pain on gait. This project was supported by the College of Health Sciences Student Research Grant Award at University of Wisconsin-Milwaukee.

**F-14 Rapid Fire Platform - Mental Health & Athletic Performance**

**May 31 1:00 PM - 1:10 PM**

**Changing the Tide: Psychological Outcomes Among Active Duty Service Members Following a Surf Therapy Program**


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(No relevant relationships reported)

Surf programs for individuals with psychological conditions exist; however, data evaluating such programs are limited. PURPOSE: This study examined psychological outcomes among active duty service members participating in a surf therapy program at Naval Medical Center San Diego. METHODS: Seventy-four active duty service members completed self-report questionnaires before and after the 6-week program and before and after each surf therapy session. RESULTS: Multivariate modeling results demonstrated that total scores for symptoms of depression (β = -2.31, p < .01), anxiety (β = -3.55, p < .001), posttraumatic stress disorder (probable PTSD subgroup only; β = -14.55, p < .001), and negative affect (β = -6.40, p < .001) significantly decreased from pre- to post-program, while positive affect significantly increased (β = 9.46, p < .001). Within each session, depression/anxiety symptoms significantly lessened (β = -3.35, p < .001) and positive affect significantly improved (β = 8.97, p < .001). Within-session changes did not differ across sessions (p > .05). Results for subgroups with probable PTSD or major depressive disorder were comparable to those of the full sample. CONCLUSION: Immediate benefits of surf therapy included significantly reduced depression/anxiety and increased positive affect. As a complementary intervention, surf therapy may improve depression, anxiety, and PTSD symptoms, with potentially unique benefits on affect.

**2761 May 31 1:10 PM - 1:20 PM**

**Resilience and Mental Health Screening in Collegiate Athletes**

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(No relevant relationships reported)

Screening for mental health disorders common in collegiate athletes can be challenging due to time constraints and concerns about the willingness of athletes to report given the need for multiple screening tools to cover the broad spectrum and concerning stigma surrounding mental health. PURPOSE: This study evaluates the Brief Resilience Scale (BRS) as a tool to identify mental health conditions in collegiate athletes. The BRS is a 6-question screening tool assessing one’s ability to recover from stress. METHODS: Collegiate athletes were anonymously surveyed completing BRS and mental health screening tools including the Patient Health Questionnaire-2 (PHQ-2) for depression, Generalized Anxiety Disorder Assessment (GAD-7), Adult ADHD Self-Report Scale (ASRS), SCOFF eating disorders questionnaire and Pittsburgh Sleep Quality Index (PSQI). Correlations between BRS and the screening tools were determined using Pearson’s correlation. Mean BRS scores among athletes screening positive or negative with the screening tools were compared by t-test. RESULTS: 468 athletes (67.1% male, 34.6% division I, 37.4% division II, 39.3% division III) participated in the study; 44% completing all 6 screening tools. Significant differences in the mean BRS were seen among athletes screening positive vs. positive on 4/5 mental health screening instruments (PHQ-2: 3.08 ± 0.70, t-test: p = 0.03).
Significant correlations were seen between BRS and all 5 screening instruments; the highest percentages reporting high risk for anger and sport type. No significant differences were found for anger risk and sex. Overall, 54.7% (N=337/616) revealed moderate risk from a NCAA Division I Institution. Demographic information (e.g., age, self-reported height and weight, sex, academic status, sport type) and the Anger Index Self-Test were collected via SurveyMonkey. Descriptive statistics and chi-square analysis were used to identify the distribution of responses. Alpha levels were set at 0.05.

CONCLUSIONS: Resilience (BRS) shows significant correlation with mental health screening instruments in athletes. As a short survey that avoids the stigma of many mental health questions, BRS may provide an efficient and effective alternative screening instrument to identify those athletes most at risk and in need of further specific screening.

**2782**
May 31 1:20 PM - 1:30 PM
Examination of Anger Prevalence In NCAA Division I Student-athletes
Robert M. Madden, Samantha R. Weber, Toni M. Torres-McGehee, Allison Smith. University of South Carolina, Columbia, SC. (No relevant relationships reported)

Anger may have an impact on performance. Once anger is triggered, it may not allow "at risk" and injury status, multiple injuries and injury type. Conclusions: Neuropsychiatric disorder risks may affect injuries in NCAA Division I student-athletes, especially those with a PA disorder risk. Student-athletes at risk for neuropsychiatric disorders during pre-season should be referred to a mental health professional for further evaluation.

**2783**
May 31 1:30 PM - 1:40 PM
Examination of Mental Health Risks and Injury Prevalence in NCAA Division I Collegiate Athletes
Jane Sweeney, Toni M. Torres-McGehee, Samantha R. Weber, Robert Davis Moore, Jacob Kay. University of South Carolina, Columbia, SC. (No relevant relationships reported)

Research in mental health for student-athletes is a growing topic among healthcare professionals. Studies examining pre-existing mental illness risk (e.g., depression (DEP), anxiety, attention deficit hyperactivity disorder (ADHD)) and injury are limited. Purpose: To examine the effects of psychoaffective (PA) disorders (DEP, anxiety) and neurodevelopmental (ND) disorder (ADHD) risks and injury status (yes/no), injury type (acute/chronic), and multiple injury status (yes/no) in NCAA Division I student-athletes. Methods: A retrospective analysis of student-athlete medical records from 2013-2014 (n=218) and 2015-2016 (n=174) academic years was used from a NCAA Division I Institution. Mental health screening medical records from pre-participation exams (e.g., Center for Epidemiologic Studies Depression Scale, State-Trait Anxiety Inventory, Behavioral and Emotional Screening System) identified mental health risks. Athena electronic medical records identified injury data. Descriptive statistics and chi-square analysis were used to identify the distribution of "at risk" injury status, multiple injuries and injury type. Results: Student-athletes (34.7%) were at risk for at least 1 neuropsychiatric disorder (PA disorders: 17.6%, n=69; ND disorders: 8.9%, n=35; comorbid disorders: 7.9%, n=31). Student-athletes (34.4%) reported at least 1 injury throughout the respective academic year. Of those at risk for PA disorders (46.4%), ND disorders (25.7%) and comorbid disorders (29%) also reported sustaining an injury. Those at risk for PA disorders (14.5%) and ND disorders (8.6%) had a higher prevalence of sustaining multiple injuries than those not at risk (7.9%). Acute injuries were sustained more commonly across all groups regardless of mental health status. PA risk group sustained 29.0% (n=20) acute and 17.4% (n=12) chronic injuries, the ND group sustained 14.3% (n=5) acute and 11.4% (n=4) chronic injuries, and the comorbid group sustained 19.4% (n=6) acute and 9.7% (n=3) chronic injuries. Conclusions: Neuropsychiatric disorder risks may affect injuries in NCAA Division I student-athletes, especially those with a PA disorder risk. Student-athletes at risk for neuropsychiatric disorders during pre-season should be referred to a mental health professional for further evaluation.

**2784**
May 31 1:40 PM - 1:50 PM
Examination of Eating Disorder Risk among Recreational Athletes
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With fitness becoming a new trend (e.g., Pure Barre, Zumba, CrossFit, Mudrun, marathons, etc.) the general adult recreational athlete may be engaging in the same physical demands and mental stressors associated with organized sport. In turn, this may predispose the recreational athlete to being at risk for disordered eating (DE)/ eating disorders (ED).

Purpose: To examine the prevalence of Eating Disorder (ED) risk across gender in male and female recreational athletes.

Methods: Data from a larger cross sectional study was used. A convenience sample of male and female recreational athletes (n=58; age: 26.4±6.1 years; males: n=34; height: 179.1±6.2 cm; weight: 78.3±11.0 kg; females: n=24, height: 164.9±6.6 cm, weight: 65.4±9.0 kg) from the southeastern region of the United States participated in the study. Participants completed a basic demographic survey, the Eating Disorder Inventory-3 (EDI-3), and the EDI-3 Symptoms Checklist (SC). Basic descriptive statistics were used for demographic information. Cross-tabulations were used to examine the proportion of participants classified as “at risk for EDI-3 and EDI-3 SC” by gender.

Results: Significant differences were found between ED risk and gender [X2(3, N=58) = 11.8, P=0.008]; within gender groups for EDI-3 (males: 17.6%, n=6; females: 4.2%, n=1), EDI-3 SC (males: 17.6%; n=6; females: 45.8%, n=11), and both EDI-3 and EDI-3 SC (males:26.7%, n=9; females: 41.7%, n=10). Overall, significant differences were found between pathogenic behaviors and gender for eating (males: 20.7%, n=12; females: 29.3%, n=17, P=0.008) and purging (males: 0.0%, n=0; females: 5.2%, n=3, P=0.034). No significant differences were found for exercise 50-100% of the time to lose weight (males:3.4%, n=2; females: 5.2%, n=3; binge eating (males:15.5%, n=9; females: 15.5%, n=9), laxatives (males:3.4%, n=2; females: 0.0%, n=0), diet pill use (males:5.5%, n=3; females: 8.6%, n=5), and use of diuretics (males:7.1%, n=1, females: 1.7%, n=1).

Conclusion: ED risk was prevalent for both male and female recreational athletes; however females displayed an overall higher risk for EDs and pathogenic behaviors such as dieting and purging. In this new and growing population education, prevention, and clinical interventions from qualified healthcare professionals should be accessible.

**2785**
May 31 1:50 PM - 2:00 PM
Sport Differences In Resiliency Development Of Men’s NCAA Football And Basketball Athletes
Justin R. Geijer, Connie A. Mettille. Winona State University, Winona, MN. (No relevant relationships reported)

The National Collegiate Athletic Association (NCAA) has recently identified mental health as a primary health concern for student-athletes. Each sport contains its own unique stressors, which may require sport-specific stress reduction and resiliency-building techniques.

Purpose: The purpose of this investigation was to identify the differences in stress impacts and resiliency in men’s NCAA football and basketball athletes.

Methods: Thirteen NCAA Division II men’s basketball athletes 32 NCAA Division II men’s football athletes were surveyed before and after the 2016-2017 competition season. The survey contained 35 questions, which were selected from the College Student Health Survey (Boynton Health, University of Minnesota, Minneapolis, MN).

The survey addressed aspects of physical health, drug and alcohol use, screen time, relationships, sleep, stress management, and resiliency. Post-season surveys were analyzed to determine differences between sports in stress management and resiliency. Independent t-tests were used to determine differences between survey question responses. Alpha levels were set at 0.05.
RESULTS: Football athletes reported significantly better ability to respond to adversity (p=0.001), and withstand difficult situations (p=0.001). No significant difference existed between athletes in regards to the number of days their physical health (p=0.58) or mental health (p=0.95) was negatively impacted in the past 30 days.

CONCLUSIONS: While no significant differences existed in the number of days in which mental or physical health was negatively impacted, significant differences were found in the football and basketball athletes’ perceived abilities to respond to stressful situations. Future research should investigate the development and efficacy of sport-specific resilience-building techniques.

2786 May 31 2:00 PM - 2:10 PM
A Comparison Of Depression, Anxiety, And Stress Levels Of Basketball Athletes In Different Collegiate Divisions
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Participating in sports helps to promote a healthy lifestyle. However, as competition level increases so do physical, emotional, and mental demands placed on the athletes. These increased demands could also increase susceptibility to depression, anxiety, and stress. PURPOSE: To investigate differences in self-reported in-season levels of stress, anxiety and depression in collegiate men’s and women’s basketball players from collegiate levels of NCAA Division I, II, III, and the NAIA.

METHODS: 102 collegiate basketball players completed the Depression Anxiety and Stress Scale-42 (DASS-42) and demographic information questionnaire including variables measuring hours of sleep, credit hours enrolled and history of injury. The DASS-42 is a self-reported questionnaire that uses three scales to measure an individual’s emotional state of depression, anxiety, and stress; each scale has fourteen items. Of the 102 athletes, 26 were from a NCAA Division I, 23 from Division II, 23 from Division III, and 22 of the NAIA.

RESULTS: There was not a statistically significant difference in stress, anxiety and depression scores by division levels (DIV, DII, DIII, and NAIA), p = .896, p = .883, p = .729, respectively. However, differences were found between males and females, with females reporting higher levels of stress compared to males (median score 4.0 and 13.0, respectively; p < .001), anxiety (median score 3.0 and 6.0, respectively; p < .001), and depression (2.0 and 5.0, respectively; p = .003). A comparison of hours of sleep by gender revealed males were more likely to get more sleep, however the difference was not statistically significant (p = .182). Similarly there was also not a statistically significant difference between males and females for the number of credit hours currently taken (p = .221), but females were more likely to take more credit hours. CONCLUSION: There were no significant difference in depression, anxiety and stress levels between the different collegiate divisions. However, female athletes are at greater risk of depression, anxiety, and stress than males.

2787 May 31 2:10 PM - 2:20 PM
Screening Athletes For Disordered Eating: Are We Asking The Right Questions?
Franklin Sease, FACSM, Vicki Nelson. Greenville Health System, Greenville, SC.
(No relevant relationships reported)

PURPOSE: Little data is available to evaluate the performance of preparticipation screening questions in practice. The performance of consensus PPE questions was examined in comparison to the validated 5-question SCOFF screening tool to detect eating disorders. METHODS: 230 collegiate athletes (194 male) completed an anonymous survey including 3 consensus PPE questions regarding eating habits (prior history of eating disorder, adherence to a special diet, and current attempts to gain or lose weight) and the SCOFF screening tool. RESULTS: 10 athletes (4.3%, 3.6% of males, 8.3% of females) screened positive for an eating disorder using the SCOFF tool. The standard PPE questions combined to identify 43% of athletes as having concerning dietary habits (sensitivity 50%, specificity 59%, positive predictive value 5%, negative predictive value 98%). One athlete self-reported a diagnosed eating disorder. This individual was detected using the SCOFF tool and was not detected using the PPE questions. An analysis of the component questions identified the single question “Do you worry that you have lost control over how much you eat?” from the SCOFF tool to be the most sensitive and specific (70%, 100%) to detect disordered eating in collegiate athletes. CONCLUSIONS: Our results suggest that the current consensus PPE screening questions are neither sensitive nor specific to detect eating disorders in collegiate athletes. Further studies are needed to determine the appropriate questions for screening in the collegiate athlete population.

2843 May 31 3:15 PM - 5:15 PM
Quantification of Ground Reaction Forces for Skilled Versus Recreational Baseball Hitting
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(No relevant relationships reported)

PURPOSE: Successfully hitting a baseball requires the hitter to properly use ground reaction forces (GRFs) in all three directions. The normal pattern of the GRFs during the baseball swing and the importance of the timing of these forces have been identified, but have not been compared among hitters across various competition levels. Therefore, the purpose of this study was to investigate how the peak GRFs in the medially-lateral direction (GRFx), anterior-posterior direction (GRFy), and vertical direction (GRFz), as well as time to reach peak GRFs for the lead and trail legs vary between athletes who play at the collegiate level and those who have not.

METHODS: Active baseball players were recruited and separated into two groups, recreational (n = 6) and skilled (n = 6), with the skilled players competing at the NCAA level. Each athlete performed three swing trials while standing in their normal hitting stance on two force platforms sampling at 1000 Hz. The dependent variables included the peak GRFs, GRFx, and GRFy normalized to body weight, and the time to peak GRFx, GRFy, and GRFz in milliseconds before ball contact for the lead and trail legs, as determined by Visual3D software. Values were averaged for each respective group and compared using independent sample t-tests (p < 0.05).

RESULTS: The skilled group demonstrated a significantly lower posterior peak GRF (Recreational = -0.26 ± 0.03 BW, Skilled = -0.43 ± 0.03 BW, p = 0.02), a significantly higher vertical peak GRF (Recreational = 0.97 ± 0.03 BW, Skilled = 1.03 ± 0.02 BW, p = 0.005) and a reduction in time to vertical peak GRF in the trail leg (Recreational = -0.40 ± 0.06 ms, Skilled = -0.54 ± 0.11 ms, p < 0.028) in comparison to the recreational group. CONCLUSION: The ability of the skilled athletes to control their trail leg peak GRFx while creating a significantly higher peak GRFy and reaching the peak GRFx faster helps to both facilitate velocity of the swing and control their body movement. Combining these three distinct kinetic differences in the swing could lead to differences in bat velocity and skill level between these two groups.
2846  Board #3  May 31 3:15 PM - 5:15 PM

UCL Stiffness Response to a Moderate Pitching Bout

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Purpose: The effect of a single pitching bout on the material stiffness of the ulnar collateral ligament (UCL) was investigated in five competitive baseball pitchers (age: 20.0 ± 2.6 years). Differences in the response were compared between one pitcher with arm trouble and four asymptomatic pitchers. Methods: Shearwave ultrasound elastography was used to measure the material stiffness of the UCL prior to, and on the four days following, a moderately-intense pitching bout. The pitching bout consisted of a minimum of 50 full-effort pitches in either a practice or game situation. Pitch velocity was measured and maintained within 10% of expected maximum velocity to ensure full effort was given. Participant arm health was measured using the Kerlan-Jobe Orthopaedic Clinic Shoulder and Elbow Score (KJOC) prior to the first imaging session. Results: Four pitchers reported “playing without any arm trouble” with a mean KJOC score of 90.4 out of 100.0. One pitcher reported “playing, but with arm trouble” and had a KJOC score of 60.2. Each of the asymptomatic pitchers showed an immediate increase in UCL stiffness (mean increase = +15.99%) compared to baseline followed by a marked decrease and trend towards returning to baseline values on days 2-4. The UCL stiffness of the symptomatic pitcher showed a different immediate response (−29.47%) before returning towards baseline values on days 2-4. Conclusions: UCL material stiffness in a pitcher with arm trouble responded differently to a moderate pitching bout compared to a small sample of asymptomatic pitchers. A decrease in material stiffness of the UCL immediately following a pitching bout may be evidence of elbow distress and be useful in the identification of pitchers with increased injury risk.

The flow of mechanical energy of sequential motion provides a mechanism by which the throwing arm is accelerated during baseball pitching. Muscles can indirectly influence the energy level of distal segments to which they are not attached by way of the interaction torques transferring energy up the kinetic chain. No study to date, however, has addressed these causal components of mechanical power, specifically in relation to valgus loading at the elbow, which is prone to pitching-related injuries. Purpose: To determine the components of muscle and velocity-dependent torques that contribute to the power of throwing arm segments when the elbow is under valgus load during pitching.

Methods: The throwing motions of 10 adult pitchers (age = 22.9 ± 4.1 years, height = 1.87 ± 0.93 m, and mass = 86.5 ± 7.4 kg) were biomechanically measured using 3D motion capture after written informed consents were provided by the participants.

Table 1. Pitcher characteristics and number of curveball kinematic sequences performed per pitcher. *LOP: Level of Play (P: Professional, C: collegiate, HS: high school)

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2847  Board #4  May 31 3:15 PM - 5:15 PM

Does The Kinematic Sequence Of A Curveball Pitch Vary Within Baseball Pitchers?
Donna M. Scarborough, Shannon Linderman, Pablo Colon, Eric M. Berkson. Massachusetts General Hospital, Boston, MA.

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Purpose: The performance of a proximal-to-distal transfer of segmental angular velocity (or kinematic sequence) is reported to reduce stress on musculoskeletal structures of the overhand baseball pitcher’s throwing arm and maximize ball velocity. The commonly asserted risk for injury of curveball pitching has not been demonstrated biomechanically. This study evaluates the kinematic sequence (KS), and their variability, of a curveball pitch in an effort to better characterize the stress on the arm during this pitch.

Methods: 3D biomechanical pitch analyses using high-speed motion capture cameras (360Hz) were performed on 71 curveball pitches (5-6 pitches per pitchers) from 14 baseball pitchers (4 high school, 8 collegiate and 2 professional) with a mean age 19.21 ± 2.94 years. The peak angular velocity of five body segments: pelvis, trunk, arm, forearm and hand were analyzed to determine the kinematic sequence patterns for each curveball pitch.

Results: None of the 71 pitches demonstrated the proximal-to-distal KS order. Eleven different KS patterns were demonstrated, and the most prevalent order was pelvis→ trunk→ arm and hand segments peaking simultaneously -> forearm. No players performed only 1 KS pattern among the curveball pitches. An average of 3 different KSs were observed per pitcher.

Conclusions: Deviation from the proximal-to-distal KS during pitch delivery results in an inefficient movement. The KS patterns of the fastball pitch have recently been described. This study evaluated the KS patterns of the curveball pitch. The most frequently performed KS during the curveball is with the forearm segment generating peak velocity simultaneously after the hand and shoulder velocity peaks. It is not known how the stresses across the shoulder and elbow are associated with this KS. Variation in KSs performed through curveballs may help prevent injury to the throwing arm, in particular if some KS patterns create more stress on the throwing arm than others.

2848  Board #5  May 31 3:15 PM - 5:15 PM

Induced Power Analysis Of Sequential Body Motion And Elbow Valgus Load During Baseball Pitching
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(No relevant relationships reported)
The resulting kinematic and kinetic data were included in a state-space power analysis using a 10-DOF model. The contributions of the torque-induced components to the mechanical work of the forearm were determined by integrating the power curves in time between the instants of front foot contact (FC) and maximum external rotation (MER) of the throwing shoulder. RESULTS: Pitchers threw with a maximum elbow valgus torque of 70.1 ± 2.2 Nm. The trunk flexion (r1) and rotation (r3) components of the muscle-induced torque were the greatest positive contributors to the work of the forearm. Muscle torques contributed a total of 44.5 ± 23.4 J while velocity-dependent torques absorbed 69.6 ± 37.1 J, representing 61% of the total work (114.1 J) of the distal arm segments during the arm-cocking phase (Figure 1).

CONCLUSIONS: Trunk motion in the early part of the arm-cocking phase appears to drive the power of accelerating the throwing elbow in valgus via velocity-dependent torques.

2849
Board #6 May 31 3:15 PM - 5:15 PM
Glenohumeral-Rotation-Deficits In High School, College, And Professional Baseball Pitchers With And Without An Mucl Injury
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PURPOSE: To assess if a glenohumeral-internal-rotation-(IR)-Loss (GIRLoss), a glenohumeral-external-rotation-(ER)-Gain (GERGain) or a total-rotational-motion-(TRM)-deficit (TRMD) predict medial ulnar-collateral-ligament (MUCL) injury-risk among high-school (HS), college (COLL), and professional (PRO) baseball-pitchers with-and-without-MUCL-injury. It was hypothesized that pitchers with MUCL injury would have >GIRLoss and TRMD compared to pitchers without MUCL injury, with no differences in IR, ER, TRM, GIRLoss, GERGain, and TRMD. METHODS: Two-hundred-sixteen-male HS, COLL, and PRO pitchers were equally divided into MUCL-injury-group (n=108) and control-group (n=108) without MUCL injury. Control-group was matched with the MUCL-injury-group according to number, level & age. Bilateral shoulder passive IR/ER were measured and GIRLoss, GERGain, TRM, and TRMD calculated. A two-way-analysis-of-variance (p<0.05) was employed to assess shoulder-rotational-differences among the two-groups and three-pitching-levels. RESULTS: Compared to control-group, MUCL-injured-group had <GIRLoss (21±14°-versus-13±8°; p=0.001), GIRGain (14°±9°-versus-10°±9°; p=0.004), and TRMD (7±13°-versus-3±9°; p=0.008). For all pitching levels ~60% of subjects in MUCL-injury-group had GIRLoss>18°, compared to ~30% of subjects in control-group. ~60% of subjects in MUCL-injury-group had TRMD>5°, compared to 50% of subjects in control group. No differences were observed among HS, COLL, and PRO pitchers for GIRLoss (16°±12°, 17°±11°, 19°±13°, respectively; p=0.131), GERGain (11°±9°,11°±10°,13°±10°, respectively; p=0.171), TRM (5°±11°,5°±11°,5°±14°, respectively; p=0.711), throwing shoulder ER (11°±10°,11°±11°,13°±8°, respectively; p=0.472), throwing shoulder TR (50°±11°,49°±11°,48°±10°, respectively; p=0.121) & throwing shoulder TRM (162°±14°,160°±15°,161°±14°,respectively;p=0.770). CONCLUSIONS: Greater GIRLoss, GERGain, and TRMD in MUCL-injured-pitchers compared to uninjured-pitchers implies these variables may be related to increased-MUCL-injury-risk, especially since GIRLoss>18° and TRMD>5° demonstrate an increased MUCL injury risk. Shoulder rotational motion and deficits do not vary among HS, COLL, and PRO levels of pitchers.

Conclusions: Shoulder rotational motion and deficits do not vary among HS, COLL, and PRO pitchers, especially since GIRLoss>18° and TRMD>5° demonstrate an increased MUCL injury risk. Greater GIRLoss, GERGain, and TRMD in MUCL-injured-pitchers compared to uninjured-pitchers implies these variables may be related to increased-MUCL-injury-risk, especially since GIRLoss>18° and TRMD>5° demonstrate an increased MUCL injury risk.

2850
Board #7 May 31 3:15 PM - 5:15 PM
Kinematic Factors that Contribute to Batting Performance in Collegiate Baseball
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To remain competitive in collegiate athletics, sports teams now employ advanced analytical tools to identify improvable domains. In baseball, technological limitations have precluded comprehensive interpretation of swing mechanics. Recent developments in technology now permit more complex assessments. PURPOSE: To test how kinematic factors of bat swing associate with in-season batting performance in college athletes. METHODS: We enrolled 13 batters from a DI baseball team in Northern California and used Proxus (Boston Biomotion, USA) to conduct three-dimensional analyses of swing mechanics. Each athlete performed six five-repetition sets of swings at increasing loads of magnetic resistance: 1lb, 2lb, 3lb, 5lb, 7lb, and 9lb. Proxus software computed explosiveness (rate of power production) and endurance (replication of power production in successive swings). Players were tracked through the 2017 season and all batting statistics were recorded. Linear regressions tested the effects of explosiveness and endurance on in-season batting performance. Significance was set at p<0.05; owing to a small sample and the novel equipment, trends (p<0.08) were considered. RESULTS: 11 of 13 players had a base hit during the study season; these 11 constituted the study sample. They played 40.1±13.2 games and batted .264±.048. Mean swing explosiveness was 313.7±59.3 and endurance was 97.7±1.4. Batting average was positively related to swing endurance (R=0.638); an additional point of endurance predicted an 8.7% increase in batting average (p=0.047). Runs (R=0.869), triples (R=0.628), and home runs (R=0.585) per at-bat were positively correlated with swing explosiveness, in contrast, at-bat, an additional point of explosiveness predicted a 0.2% increase in runs (p=0.001), 1.3% increase in triples (p=0.052), and 0.8% increase in homeruns (p=0.075). Neither explosiveness (p=0.121) nor endurance (p=0.529) associated with games played. CONCLUSIONS: In three-dimensional analyses of swing mechanics, increased explosiveness and endurance predicted an improved batting average, more extra base hits, and more runs scored per at-bat. Scouts may be wise to consider swing mechanics in their estimations of a player’s value. Likewise, players and coaches may choose training programs that optimize mechanics accordingly.
The Impact of Varying Exercise Protocols on Neurogenesis and Angiogenesis in the Dentate Gyrus
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The Impact of Varying Exercise Protocols on Neurogenesis and Angiogenesis in the Dentate Gyrus
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Exercise is being considered for associations with improved neuronal health and longevity, synaptic plasticity, increased cerebral blood volume and angiogenesis, overall brain volume, and neurogenesis which collectively may have the power to forestall neurodegenerative disease. PURPOSE: To investigate the effects of varying exercise protocols on indices of neurogenesis and angiogenesis in the dentate gyrus of the hippocampus to inform efforts to forestall cognitive decline associated with neurodegenerative disease. METHODS: The indices of neurogenesis and angiogenesis were assessed using the surrogate measures of maximal oxygen uptake (VO2max), cognitive function as assessed by the Rey auditory verbal learning test (RAVLT), and urinalysis of brain-derived neurotrophic factor (BDNF) concentration taken just prior to and just after a six-week training protocol. Twelve college-aged males were randomized into either high intensity interval training group (HIIT) or a steady-state training group (SS) and were compared to six sedentary controls over the course of a six-week supervised training study. RESULTS: Findings reflect an association between exercise and improved cognitive function. Specifically, cognitive function improved significantly with HIIT training (RAVLT=3.66, p=0.045) and a significant correlation between cognitive function and improved VO2 from HIIT training was also shown (r=0.98; p=0.010). Cognitive function and neurotrophin concentration both increased significantly with steady state training compared to controls (ARAVLT=4.40, p=0.011; ABDNF=54.00pg/ml, p=0.007). CONCLUSION: varying exercise protocols have a varying impact on cognitive function as assessed by the RAVLT, urine BDNF, and VO2. Findings hold implication for pathologies that involve cognitive decline.

Not Just for Joints: Physical Activity is Associated with Greater Cortical Thickness among Adults with Osteoarthritis
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MEDECINE & SCIENCE IN SPORTS & EXERCISE®

Board #3 May 31 3:15 PM - 5:15 PM
Fitness Trumps Fatness: An Examination of Cognition and Cerebral Volume
Julian M. Gaitán, Sarah R. Losee, Ryan J. Dougherty, Jennifer M. Oh, Catherine L. Eslinger, Cynthia D. Carlson, Holly Fred A. Rowley, Yue Ma, Sanjay Asthana, Mark A. Sager, Bruce P. Hermann, Sterling C. Johnson, Barbara B. Bendlin, Dane B. Cook, FACSM, Ozioma C. Okonkwo. University of Wisconsin - Madison, Madison, WI.

PURPOSE: To determine whether cardiorespiratory fitness (VO2peak) is related to cognition and cerebral volume in the presence of fatness in a late-middle-aged cohort at risk for Alzheimer’s disease (AD). METHODS: 127 enrollees in the Wisconsin Registry for Alzheimer’s Prevention (age = 64.1 ± 5.8 years, N = 127, 43 male) underwent a graded maximal exercise test, anthropometric measurement, neuropsychological examination, a structural brain MRI scan, fasting venipuncture to assess insulin resistance (HOMA-IR), and APOE genotyping. Subjects were categorized as high vs low on VO2peak using age- and sex-specific cutoffs from normative data and high vs low on waist-to-height ratio using sex-specific cutoffs. This resulted in four groups: Low fit/High fat (Lofit-Hifat; n = 43); Low fit/Low fat (Lofit-Lofat; n = 11); High fit/High fat (Hifit-Hifat; n = 28); High fit/Low fat (Hifit-Lofat; n = 41). Four cognitive domains were examined: Verbal Learning & Memory, Immediate Memory, Speed & Flexibility, and Working Memory. Cerebral volume was computed from MRI scans as the ratio of cerebrospinal fluid to the sum of gray and white matter. MANCOVA and follow-up ANCOVAs (adjusted for HOMA-IR, APOE, and in a secondary analysis, sex) were used to test whether fitness/fatness group associated with cognition and cerebral volume. RESULTS: There was a significant main effect of group on Verbal Learning & Memory (p = 0.003). Compared to the Hifit-Hifat group, Hifit-Lofat and Hifit-Hifat (β = 0.527, p = 0.057) while Hifit-Hifat and Hifit-Lofat were not different (β = 0.027, p = 0.151; β = 0.020, p = 0.451). When sex was added to the statistical models, there was no longer an effect of group on cognition or cerebral volume. CONCLUSION: In a cohort at risk for AD, cardiorespiratory fitness is associated with better cognition in Verbal Learning & Memory and greater cerebral volume even in the presence of high fatness, which may have implications for the relationships. Cardiorespiratory fitness may be more important than achieving a favorable body habitus for preserving cognition and brain health.

Brain Activity for Food Inhibition In Children With Higher Cardiorespiratory Fitness: An fMRI Study
Kell Grandjean da Costa1, Henrique Bortolotti1, Kaline Brito1, Galtieri Medeiros1, Fernanda Falchero-Fontes2, Daniel Aranha Cabral1, Maria Luiza Medeiros1, Gleydiane Fernandes1, Menna Price1, Eduardo Bodart1, Gislle Irazabal1, Daniel Cardoso da Costa1, Ingrid Peixoto1, University Hospital, Federal University of Rio Grande do Norte, Natal, Brazil. 2Brain Institute, Onofre Lopes University Hospital, Federal University of Rio Grande do Norte, Natal, Brazil.

Inhibitory cognitive control in children has been associated with future educational attainment, healthy body composition, and eating behavior. The regular practice of aerobic exercise has shown to improve inhibitory cognitive control in children, however the brain areas involved in this cognitive domain, in particular those related to the inhibition of high caloric food, are unclear. PURPOSE: To identify the effects of enhanced cardiorespiratory fitness on brain activity involved in food-specific inhibitory control in children. METHODS: 32 children (10.1 ± 4 years old) participated in this study by completing general anthropometric assessments, a graded shuttle run test to estimate cardiorespiratory fitness (VO2max) and a food-specific cognitive task while acquiring functional magnetic resonance imaging (fMRI) data in a 1.5 T MRI scanner.
During the scanner children performed a Go/No-go task. Pictures of objects (neutral) were used as Go stimulus and caloric food and toys pictures as No-go stimulus. The entire protocol consisted in three blocks No-go food, and three No-go toy. Each block contained 50 trials (80% Go stimulus). Children were divided in two groups (Lower fitness x Higher Fitness) separated by the median value of VO_{max}. Unpaired Student’s t-tests were used to compare cognitive performance between groups. Food specific-inhibitory control was assessed comparing which brain areas were more activated during No Go conditions (Food) between groups by a two sample t-test. RESULTS: No differences were found between groups for the cognitive performance (number of errors) and general anthropometric variables (p=0.05). However, children with higher cardiorespiratory fitness during the food-specific Cognitive task had greater activation of areas related to cognition (prefrontal cortex and inferior parietal lobule), motor control (primary motor cortex and primary somatosensory cortex) (t(2)= 9.9, p=0.005). CONCLUSION: Cardiorespiratory fitness might influence the brain activity during inhibition control of high caloric food in children. This finding suggests that regularly performed aerobic exercise by children may promote functional adaptations on the brain that could affect future eating behaviors.

2857 Board #5 May 31 3:15 PM - 5:15 PM Prefrontal Hemodynamics And Affective Responses To Incremental Exercise
Mark E. Hartman, Matthew Ladwig, Panteleimon Ekkekakis, FACSFM. Iowa State University, Ames, IA. (Sponsor: Panteleimon Ekkekakis, FACSFM)
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No relevant relationships reported

Neuroimaging investigations in non-exercise contexts have shown that the dorsolateral prefrontal cortex (dlPFC), medial PFC and anterior cingulate, are engaged when individuals attempt to cognitively control negative affect. Moreover, there are indications that aversive interoceptive stimuli preferentially activate the right hemisphere. We theorized that affective responses to incremental exercise would be regulated by the same prefrontal network implicated in non-exercise affect regulation. We hypothesized that there would be preferential right-dlPFC activation, among individuals with low tolerance to exercise intensity and, therefore, less positive affective responses to challenging intensities of exercise (i.e., above ventilatory threshold, VT).

PURPOSE: To investigate dlPFC activation and affective responses during incremental exercise. METHODS: Thirty-eight participants (15M, 21F; Age: 23.7 ± 6.9 y; BMI: 24.0 ± 4.8 kg·m^{-2}; VO_{2peak}: 32.8 ± 7.8 ml·kg^{-1}·min^{-1}) completed an incremental cycling test to volitional termination. They were divided into low- and high-Tolerance groups based on a median split of their Tolerance scores (Preference for Exercise by children may promote functional adaptations on the brain that could affect future eating behaviors.

2858 Board #6 May 31 3:15 PM - 5:15 PM Acute Exercise Alters Brain Activation In Older Adults: What Is The Role Of Sleep?
Alfonso J. Alfiniti1, Adam P. Spira2, Lauren R. Weiss2, Junyeon Won2, Casandra Nyhus2, Corey S. Michelson3, Caroline Simon4, Daniel D. Callow2, J. Carson Smith, FACSM4. Johns Hopkins University, Baltimore, MD. 1University of Maryland, College Park, MD. (Sponsor: J. Carson Smith, FACSM)

No relevant relationships reported

Insufficient sleep is associated with altered brain activation and poor cognitive performance. Aerobic exercise training enhances neural efficiency and improves cognition.

PURPOSE: To examine sleep’s role in the effect of acute aerobic exercise on brain functional activation and cognitive performance. METHODS: We studied healthy, physically active older adults (n = 31; mean age = 66.2 ± 7.4 years (range = 55-81); 74.2% women; 93.6% > high school education; body mass index = 25.7 ± 4.2). During two counterbalanced study visits, participants engaged in 30 minutes of moderate-intensity bicycle exercise or seated rest, followed by a functional MRI scan. While in the scanner, participants completed the Erickson Flanker Task. Prior to the first study visit they also completed 7.9 ± 3.3 nights of wrist actigraphy. Actigraphic sleep indices included total sleep time (TST), sleep efficiency (SE), wake after sleep onset (WASO), and average wake bout length (WBL). RESULTS: Compared to rest, acute exercise significantly increased functional activation in the right superior parietal lobule (SPL; beta = 0.14, p = 0.011) and decreased activation in the left anterior cingulate cortex (ACC; beta = -0.09, p = 0.012). After adjustment for age, sex, race, and education, greater WASO was associated with less exercise-induced change in SPL activation (beta = -0.05, p = 0.001). There were no significant associations between TST, SE, or WBL and exercise-induced changes in regional brain function. CONCLUSIONS: Acute moderate-intensity exercise alters functional activation in brain regions involved in executive function and inhibitory control, which align with previous exercise studies showing a conflict-related shift from ACC to SPL activity. Our findings suggest that the short-term effects of acute exercise may accumulate and promote the cognitive improvements linked to exercise training. Moreover, our findings suggest that greater time awake after initial sleep onset (i.e., sleep fragmentation) may attenuate the benefits of aerobic exercise on functional activation in the aging brain. Randomized controlled trials are necessary to further evaluate the interactive effects of sleep and acute exercise in older adults.

Acute exercise (EX) affects neural activation, assessed with functional magnetic resonance imaging (fMRI), and is a suggested mechanism in the effects of EX on behavioral measures of cognition. PURPOSE: We investigated the effect of EX on neural activation during a set switching task (SST). METHODS: Six healthy, right-handed older adults (M = 71.4 ± 5.1) completed two separate visits [EX; 30 min of cycling at 55-65% Heart Rate Reserve and rest (RS); 30 min of seated rest]. After EX or RS participants completed a SST during an fMRI. SSTS are a measure of executive function where participants shift attention between sets of rules during the task. Switch cost (cost) is the performance difference between switching (i.e. A, B, A) and repeat trials (i.e. A, A, A). The conditions included rest, a high switching block [70% switching, 30% repeat trials (HS)], and a low switching block [20% switching, 80% repeat trials (LS)]. fMRI analyses using FSL included assessment of main effects of activation during HS and LS blocks during EX and RS and a comparison of activation with reaction time cost. RESULTS: Across both HS and LS and EX and RS, participants similarly activated the lateral occipital cortex and frontopolar area. In addition, there was significant activation of the superior and inferior frontal gyri, middle frontal gyrus, cerebellum VIb, thalamus, caudate, and insula following RS in HS and LS. There were no unique areas of activation in EX following RS, however in LS there was activation in the temporal occipital fusiform gyrus, inferior frontal gyrus, and middle frontal gyrus. In relation to performance, cost during HS was associated with activation of the cerebellum VIb following EX and activation of the thalamus and occipital pole following RS. Further, cost during LS was associated with activation in the frontopolar area after EX and activation in the thalamus following RS.

CONCLUSION: Similar activation during HS and LS following rest and EX suggests a common network for SSTS. During the HS blocks, EX did not elicit additional unique activation, as seen following RS or the LS block, suggesting EX-induced increased functional activation. More research is needed to better understand the implication of differential activation. Results presented at ACSM will include additional participants; findings and conclusions will reflect the final analyses.

2859 Board #7 May 31 3:15 PM - 5:15 PM The Effect of Exercise on Neural Activation in Older Adults
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No relevant relationships reported

Acute moderate-intensity exercise affects neural activation, assessed with functional magnetic resonance imaging (fMRI), and is a suggested mechanism in the effects of EX on behavioral measures of cognition. PURPOSE: We investigated the effect of EX on neural activation during a set switching task (SST). METHODS: Six healthy, right-handed older adults (M = 71.4 ± 5.1) completed two separate visits [EX; 30 min of cycling at 55-65% Heart Rate Reserve and rest (RS); 30 min of seated rest]. After EX or RS participants completed a SST during an fMRI. SSTS are a measure of executive function where participants shift attention between sets of rules during the task. Switch cost (cost) is the performance difference between switching (i.e. A, B, A) and repeat trials (i.e. A, A, A). The conditions included rest, a high switching block [70% switching, 30% repeat trials (HS)], and a low switching block [20% switching, 80% repeat trials (LS)]. fMRI analyses using FSL included assessment of main effects of activation during HS and LS blocks during EX and RS and a comparison of activation with reaction time cost. RESULTS: Across both HS and LS and EX and RS, participants similarly activated the lateral occipital cortex and frontopolar area. In addition, there was significant activation of the superior and inferior frontal gyri, middle frontal gyrus, cerebellum VIb, thalamus, caudate, and insula following RS in HS and LS. There were no unique areas of activation in EX following RS, however in LS there was activation in the temporal occipital fusiform gyrus, inferior frontal gyrus, and middle frontal gyrus. In relation to performance, cost during HS was associated with activation of the cerebellum VIb following EX and activation of the thalamus and occipital pole following RS. Further, cost during LS was associated with activation in the frontopolar area after EX and activation in the thalamus following RS.

CONCLUSION: Similar activation during HS and LS following rest and EX suggests a common network for SSTS. During the HS blocks, EX did not elicit additional unique activation, as seen following RS or the LS block, suggesting EX-induced increased functional activation. More research is needed to better understand the implication of differential activation. Results presented at ACSM will include additional participants; findings and conclusions will reflect the final analyses.

2860 Board #8 May 31 3:15 PM - 5:15 PM Association of Sleep Duration with Exercise-Induced Reductions in Default Mode Network Connectivity in Healthy Older Adults
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No relevant relationships reported

Exercise promotes neuroprotective effects in several large-scale brain networks that are vulnerable to dysregulation in aging and disease. Aging-related changes in sleep may also disrupt functional connectivity within these networks, including the default mode network (DMN), in which brain regions that are not engaged during wakeful tasks are engaged. PURPOSE: To determine the effect of moderate-intensity acute exercise on resting-state DMN functional connectivity (DMN-fNC) in the brains of healthy older adults, and how this might be altered by poor sleep.
METHODS: On separate days, 32 physically active older adults (24F, 66.3 ± 7.3 years) completed 30 minutes of moderate-intensity cycling (RPE 14-15) or rest in a counterbalanced order prior to resting-state BOLD fMRI data acquisition. Actigraphic sleep indices, including total sleep time (TST) and sleep efficiency (SE; proportion of time in bed spent asleep), were calculated using wrist actigraphy data from 8 ± 3.5 nights prior to the first study visit. We utilized a seed-based correlation analysis (seed: left posterior cingulate cortex [PCC]; MN1.2-542) to determine the effect of exercise on DMN-rsFC. We tested the association of TST and SE with residualized exercise-induced change in DMN-rsFC (fMRI-DN-rsFC) with multiple linear regression.

RESULTS: A paired-samples t-test revealed decreased DMN-rsFC in the left inferior parietal lobule (IPL; MNI -41 -51 45, k = 108, 864 mm³) after exercise compared to rest. TST and SE explained 25% of the variance in exercise-induced DMN-rsFC (R² = .253, t(29) = 4.91, p = .015). Every 30-minute increase in TST was associated with a β = 0.019-unit decrease in DMN-rsFC between the left PCC and left IPL (β(29) = -3.13, p = .004).

CONCLUSION: Our findings suggest that acute moderate-intensity cycling exercise reduces functional connectivity between the left PCC and left IPL, two core DMN regions. Shorter sleep duration was associated with attenuated exercise-induced reduction in functional connectivity between these regions. Given the vulnerability of DMN regions to beta-amyloid deposition, our finding that exercise-induced effects on DMN-rsFC are modulated by sleep duration may have implications for optimizing results of exercise-based interventions aimed at preventing AD. Further research is needed to investigate this possibility.

F-33 Thematic Poster - New Findings in Children and Youth
Friday, May 31, 2019, 3:15 PM - 5:15 PM
Room: CC-104B

2861 Chair: Russell R. Pate, FACSM, University of South Carolina, Columbia, SC.

Previous authors have demonstrated that the availability of neighborhood parks and greenspace is positively associated with physical activity engagement and health outcomes in youth. Yet, given the documented influence of perceptions of neighborhood safety, cleanliness, and traffic calming measures on physical activity participation in youth, further investigation is needed to consider the impact of perceived park access on youth health outcomes. PURPOSE: To examine the relationship between perceived access to neighborhood resources supporting physical activity and weight-related health status in youth. METHODS: Data from 17 urban public elementary schools, representing 733 students (mean age = 7.32 ± 1.78 years; males = 372, females = 361) was collected from the 2016-2017 Roanoke Valley Community Healthy Living Index. A correlation analysis examined the relationship between perceived access to resources supporting physical activity and BMI-for-age z-scores. RESULTS: A significant negative relationship was found between perceived access to resources supporting physical activity and weight-related health status in youth, r(731) = -0.08, p = .01. Conclusions: As perceptions of access to neighborhood-level resources supporting physical activity increased, weight-related health status in youth improved. These findings contribute to the existing literature on neighborhood-level correlates to health by considering the impact of family perceptions of access to healthy-living resources on youth health outcomes.

2862 Board #1 May 31 3:15 PM - 5:15 PM
Neighborhood Resources Supporting Physical Activity: Perceived Access and Weight-Related Health Status in Youth
Elizabeth Ackley, Peyton Rohrbaugh, Hannah Kolcz. Roanoke College, Salem, VA.
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The benefits of school garden programs are far-reaching; however, few studies have assessed the impact of school gardens on PA levels in a youth population. PURPOSE: To assess the impact of school gardens on physical activity (PA) levels in a youth population. METHODS: Data were obtained from 62 low-income 4th grade students in a central Texas school participating in TX Sprouts—a large, school-based gardening, nutrition, and cooking randomized controlled trial. A wall-mounted stadiometer and Tanita scale were used to measure students’ height, weight, and body fat percentage, respectively. ActiviGraph wGT3X+BT accelerometers captured student PA on garden days and non-garden days. Evenson (2008) cut points were used to calculate time spent in sedentary (SED) and in moderate-to-vigorous PA (MVPA). Total step counts (TSLC), and energy expenditure (kcal) were also obtained. Linear mixed modeling was used to determine the effect of TX Sprouts on PA, controlling for age, sex, and BMI. RESULTS: Students were 60.3% female, 59.7% Hispanic with a mean age of 9.2 ± 0.4 years, and 45% of students were affected by overweight/obesity. When compared to non-garden days, on garden days students demonstrated greater MVPA (β = 2.96, p < .001), TSLC (β = 551.45, p < .001), kcal (β = 18.04, p < .001), and a reduction in SED (β = -9.21, p < .001). This equates to an increase of approximately 3 minutes MVPA, 549 steps, 17.6 kcals, and a decrease of 9.4 minutes TSLC.

CONCLUSION: Results showed increased PA for students on garden days vs. non-garden days. While findings reflect PA during one hour of a school day, garden lessons could have a substantial and meaningful impact on children’s PA if incorporated multiple times throughout the school week. Supported by NIH Grant R01 HL123865.

2863 Board #2 May 31 3:15 PM - 5:15 PM
The Association Between School Gardens and Physical Activity: A Way to Increase Youth Physical Activity
Fiona M. Asigbee, John B. Bartholomew, Estelle M. Jowers, Natalie M. Golalszewski, Vanessa L. Errisuriz, Reem Ghaudar, Hoover Amy, Matthew J. Landry, Erfan Khazaee, Sarvenaz Vandoyousefi, LaShuane P. Johnson, Jasmine N. Davis. University of Texas at Austin, Austin, TX.
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(No relevant relationships reported)

The previous studies have suggested that sedentary behaviors and physical inactivity might be independent risk factors for executive dysfunction. PURPOSE: To examine the independent and combined relationships of after-school sedentary time (ST) and daily physical activity (PA) with executive function in children and tentatively explore which of these two behaviors had greater impact on children’s executive function. METHODS: A total of 4,304 children aged 6-12 years were recruited in 2017. ST, PA and executive function were assessed using the International Physical Activity Questionnaire Short Form (IPAQ-SF) and the Behavior Rating Inventory of Executive Function (BRIEF), respectively. Participants were categorized into 4 groups: 1) low ST, high PA; 2) low ST, low PA; 3) high ST, high PA; 4) high ST, low PA. RESULTS: The mean age of the participants was 9.01±1.72 years. Children in group 4 had the highest T-scores of BRIEF indices (48.2±8.44, increased symptom), followed by those in group 3 (47.10±8.05), group 2 (45.8±1.78), and group 1 (44.1±7.31), with P<0.05 for each pairwise comparisons except for that between group 1 and 2. Multiple linear regressions showed that ST was positively related to the T-score of all indices, independent of MVPA (P<0.05). However, MVPA was negatively associated with the T-score of metacognition index (MI) and global executive composite (GEC) only in the high ST subgroup (P<0.05). CONCLUSION: Children with both low ST and high PA may have beneficial influence on their executive function. Notably, children with high ST and low PA demonstrated more significant deficits on the BRIEF than those with low ST and low PA, which suggested that intervention efforts should be paid more on reducing ST in addition to promoting PA.

PREVIOUS AND CURRENT TURNOVER OF S618 VOL. 51 NO. 5 SUPPLEMENT
Physical activity (PA) is associated with a wide range of health benefits in children and youth. Identifying factors that might influence activity level is important to aim future public health strategies. Cross-sectional studies have demonstrated an association between motor skills and PA in childhood; however few studies have examined whether early motor development in infancy is associated with PA in childhood. PURPOSE: To examine whether age for onset of walking predicts PA in 7 year olds. METHODS: We used data from the Norwegian Mother and Child Cohort Study (MoBa), which is an ongoing population-based birth cohort study. The mothers reported age for onset of walking (months) and PA at 7 years (frequency of participation per week in moderate-to-vigorous PA [MVPA]) through questionnaires. The PA-questionnaire’s validity is tested against accelerometer assessed MVPA (Hav- erudd et al. 2018). We used multiple regression analyses and adjusted the analyses for gestational age, sex and weight at 1 year and parental education as a marker for socio-economic status. A formal test showed no evidence of an interaction by sex.

RESULTS: A total of 33013 participants are included in the analysis (49% girls), and the mean age (sd) were 7.1 (0.14) years at follow-up. The average age (sd) for onset of walking were 12.9 (1.86) months, and average participation rate (sd) were 4.3 (2.45) times/week in MVPA. We observed a negative association between age for onset of walking and participation in MVPA in childhood (B=-0.08, 95%CI=-0.10, -0.07) independent of confounders. CONCLUSION: The finding indicate that earlier age for onset of walking may predict PA in childhood. However, while the association may be considered weak, i.e. each month earlier onset of walking is associated with 0.08 higher participation rate in MVPA (frequency per week), self-reported PA is likely prone to random measurement error attenuating the true association.

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Board #6: May 31 3:15 PM - 5:15 PM
The Effect Of Exercise In Addition To A Lifestyle-intervention On Hepatic Fat In Overweight Children
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Purpose: To compare the prevalence of responders (R) and non-responders (NR) for hepatic fat content and liver enzyme levels between overweight children participating in a family-based lifestyle intervention (LS) or in a family-based lifestyle plus exercise intervention (LS+Ex).

Methods: This study included 102 overweight children (8-12 y; 55% girls; 57% with obesity according WOF criteria) that completed the 22 weeks of the EFIGRO (ClinicalTrials.gov id: NCT02258126) two arms parallel intervention trial. The LS group (N=53; 10.6±1.1 y; 55% girls; 55% with obesity) attended a family-based lifestyle-and psycho-educational program composed by 11 sessions of 90 minutes. The LS+Ex group (N=49; 10.5±1.1 y; 55% girls; 55% with obesity) attended the same educational program and additionally participated in an exercise program that included aerobic and strength exercises, 3 days/week, 90 mins/session. Before and after the intervention, hepatic fat content was measured by magnetic resonance imaging, and alanine aminotransferase (ALT), aspartate aminotransferase (AST) and gamma-GT were measured in fasting plasma samples. Children were categorized as R when the effect size (d-choen) was ≥0.2, and as NR when d-choen was <0.2.

Results: Regarding hepatic fat content, there was a significantly higher prevalence of R (P=0.035) in the LS+Ex group (54%), than in the LS group (34%). Moreover, the difference in the prevalence of R between the two groups was also significant for GGT (69% and 38% of R, for the LS+Ex and LS groups, respectively, P=0.002), while there were no significant differences in the prevalence of R in changes in ALT (45% vs. 37% of R, for the LS+Ex and LS groups) and AST/ALT (40% vs. 35% of R, for the LS+Ex and LS groups) between the two groups (all P>0.05).

Conclusions: There was a higher prevalence of responders for hepatic fat content and GGT levels in the group of children with overweight that participated in the family-based multicomponent intervention program that included exercise. These results suggest that lifestyle-intervention programs for improving obesity associated comorbidities in children should include exercise training to improve their hepatic health.

INTRODUCTION: Obesity is a complex disease that may be influenced by physical activity (PA), sleep, and diet; though little is known if individual behavior guidelines are related to cardiometabolic risk factors. PURPOSE: To examine the association between meeting PA, sleep, and dietary guidelines and cardiometabolic risk factors and adiposity in adolescents. METHODS: Adolescents, ages 10 to 16 years, wore an accelerometer for 7 days, including overnight to capture PA and sleep. The PA guideline was defined as ≥ 60 minutes of moderate-to-vigorous PA per day. The sleep guideline was 9-11 hours (10-13 years of age) or 8-10 hours (14-16 years of age) per night. The dietary guideline was based on the Healthy Eating Index 2015 score calculated from a self-administered dietary recall. Scores ≥70 were classified as meeting guideline. Cardiometabolic risk factors were assessed in a clinical setting including body mass index percentile (BMIp); waist circumference (WC); DXA for total body fat; abdominal MRI for visceral adipose tissue (VAT); and a fasting blood draw for high-density lipoprotein cholesterol, triglycerides, and glucose. Generalized linear regression was used to assess meeting the guidelines and cardiometabolic risk factors, with adjustment for age, sex, race, and other guidelines. RESULTS: Of the 342 participants, 239 (69%) provided complete measures. Adolescents were 12.4 ± 1.9 years of age, most were white (61%), had increasing LM during a long-term RT intervention. However, there was a positive association with two of the branch chain amino acids, leucine and valine. Thus, the type of protein may be more important than total protein intake for increasing LM during a long-term RT intervention.

RESULTS: Participants completed 92 % of scheduled RT sessions. LM increased significantly from baseline to 9 mos. (1.2 ± 1.7 kg, p <0.0001) with high inter-individual variability (range = -2.0 to 6.2 kg). Grams of total protein (β=0.01 SE=0.01, p=0.34), animal protein (β=0.02 SE=0.01, p=0.15), vegetable protein (β=0.03 SE=0.04, p=0.44), and isooleucine (β=4.3 SE=1.9, p=0.09), were not associated with changes in total LM per unit of energy-adjusted protein intake. However, leucine (β=1.8 SE=1.2, p=0.03) and valine (β=3.7 SE=1.4, p=0.01) were positively associated with changes in total LM per unit of energy-adjusted protein intake.

CONCLUSIONS: There was no association with total protein intake and changes in LM in young adults enrolled in a 9-month RT intervention. However, there was a positive association with two of the branch chain amino acids, leucine and valine. Thus, the type of protein may be more important than total protein intake for increasing LM during a long-term RT intervention.

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Rapidly digested and absorbed proteins enhance the muscle protein synthesis response following resistance exercise, with the degree of hyperaminoacidemia suggested to be an important consideration. However, most studies have used supplemental protein sources, with little focus on how consumption of protein within a mixed meal influences postprandial amino acid (AA) responses. PURPOSE: To examine the pattern of postprandial AA responses to consuming whey protein isolate before or within a mixed meal after resistance exercise. METHODS: Eight resistance trained men (age 21 (1) y; body mass 80.2 (8.4) kg; body fat 13 (6) %) completed two trials in a randomized order. Trials consisted of ~1 h lower-body resistance exercise, a 30 min post-exercise feeding period and a further 150 min supine rest period. Post-exercise nutrition was identical in composition (400 mL water at 0 min; an oat flapjack + 600 mL water at 15-30 min) and included 20 g of whey protein isolate, which was either consumed in the drink at 0 min (SUPP) or mixed into the oat flapjack consumed at 15-30 min (MEAL). Blood samples were taken every 15-30 min post-exercise to determine amino acid, glucose and insulin concentrations. RESULTS: Compared to MEAL, leucine and essential AA (EAA) concentrations were higher at 15-30 min and lower at 120-180 min in SUPP (P<0.05), whilst total AA (TAA) concentrations were higher at 30-50 min and lower at 150 min in SUPP Peak leucine (SUPP:414 (70) mmol/L; MEAL: 216 (40) mmol/L; P<0.001), EAA (SUPP:2404 (411) mmol/L; MEAL:1502 (235) mmol/L; P<0.001) and TAA (SUPP:4860 (759) mmol/L; MEAL:3450 (467) mmol/L; P<0.01) concentrations were all greater during SUPP vs MEAL, with peak concentrations also achieved earlier in SUPP. Total postprandial area under the curve for leucine, EAA and TAA concentrations were all greater during SUPP (P<0.05). There were no between-trial differences for glucose or insulin responses (P>0.05). CONCLUSIONS: Consumption of protein in supplemental form prior to, rather than within a mixed meal, facilitates a more rapid and pronounced postprandial aminoacidemia following resistance exercise. This might offer some advantage where maximizing the anabolic effect of resistance exercise is desirable. This project received no funding. The whey protein isolate was provided by Volac International Ltd.
Dietary protein consumption maximizes the anabolic response during resistance training (RT) by triggering muscle protein synthesis and providing the indispensable amino acids for protein synthesis and protein balance. Leucine is considered the key amino acid in this process, suggesting that differences in protein quality may influence RT-induced gains in muscle mass and strength. In this respect, despite adequate sources of lower anabolic properties of plant vs. animal-based protein, the effects of an exclusive plant-based dietary protein diet on RT-induced adaptations are currently unknown.

**PURPOSE:** To investigate the impact of dietary protein source (plant- vs. mixed diet-based protein) on RT-induced changes in muscle mass and strength in total protein-matched young healthy men.

**METHODS:** Nineteen vegan (VAG 26±5 kg; 72.7±7.1 kg, 1.78±0.06 m) and nineteen omnivores (OMN 26±4 kg; 73.7±3.8 kg, 1.78±0.06 m) physically active young men were enrolled in a 12-week, twice-weekly, lower-limb RT program. Dietary protein intake was adjusted to 1.2g/kg/d, with groups via supplementing either soy (VAG) or whey (OMN) protein. Leg lean mass (LLM, by DXA) and lower-limb maximal strength (leg-press RT-setting, 1-RM) were determined PRE and POST intervention. Six 24-hour dietary recalls were performed at baseline (for habitual protein intake determination) and three during the intervention, for monitoring purposes.

**RESULTS:** Significant increases in LLM were observed in both VAG (PRE=19.1±2.2 kg and POST=20.1±2.2 kg, Δ%=6±4.5 %, p<0.0001) and OMN (PRE=19.4±1.9 kg and POST=20.5±2.3 kg, Δ%=7±5.0%, p<0.0001). Similarly, 1-RM was significantly increased in both VAG (PRE=258±59 kg and POST=253±41 kg, Δ%=2±3.3%, p<0.0001) and OMN (PRE=261±63 kg and POST=261±73 kg, Δ%=2±1.9%, p<0.0001). No group by time interactions were found. Finally, total protein intake was similar between groups (VEG=1.6±0.4 kg/d and OMN=1.7±0.2 kg/d, p=0.30). CONCLUSION: A higher protein-content (~1.6g/kg/day) exclusive plant-based (including soy) protein diet is similarly effective as a mixed-diet in supporting RT-induced muscle adaptations, suggesting that total protein, rather than protein quality, may be more important for muscle adaptation in young individuals. Supported by FAPESP grant 16/22083-3.

**BOARD #4 MAY 31 3:15 PM - 5:15 PM**

**Leucine Co-Ingestion Augments the Muscle Protein Synthetic Response to the Ingestion of 15g Protein During Recovery from Resistance Exercise in Older Men**

Andrew M. Holwerda, Kevin J.M. Paulussen, Maarten Overkamp, Joy P.B. Goessens, Irene-Fleur Kramer, Will K.W.H. Wodzig, Lex B. Verdijk, Luc J.C. van Loon, Maastricht University, Maastricht, Netherlands. (Sponsor: Janice L. Thompson, FACS)

**Email:** andy.holwerda@maastrichtuniversity.nl

**NO RELATIONSHIPS REPORTED**

**PURPOSE:** Older adults have shown an attenuated post-exercise increase in muscle protein synthesis rates following ingestion of smaller amounts of protein when compared to younger adults. Consequently, more protein may be required to increase post-exercise muscle protein synthesis rates in older as compared to younger men. The present study investigated whether co-ingestion of 5 g free leucine with a single 1.5 g bolus of protein augments the muscle protein synthetic response during recovery from resistance-type exercise in older men.

**METHODS:** Twenty-four healthy older men (67±1 y) were randomly assigned to ingest 15 g milk protein concentrate (MPC80) with (15G+LEU; n=12) or without (15G; n=12) 1.5 g free leucine after performing a single bout of resistance-type exercise. Post-prandial protein digestion and amino acid absorption kinetics, whole body protein metabolism, and post-prandial myofibrillar protein synthesis rates were assessed using primed, continuous infusions with L-[ring-2H5]-phenylalanine, L-[ring-2H2]-tyrosine and L-[1-31C]-leucine combined with the ingestion of intrinsically L-[1-13C]-phenylalanine labeled milk protein.

**RESULTS:** A total of 70±1% (10.5±0.2 g) and 75±2% (11.5±0.3 g) of the protein-derived amino acids were released in the circulation during the 6-h post-exercise recovery phase in 15G+LEU and 15G, respectively (P=0.05). Post-exercise myofibrillar protein synthesis rates were 16% (0.058±0.003 vs 0.049±0.002 %·h⁻¹; p=0.05; based on L-[ring-2H5]-phenylalanine) and 19% (0.071±0.003 vs 0.060±0.003 %·h⁻¹; p=0.05; based on L-[ring-2H2]-tyrosine) greater in 15G+LEU when compared with 15G. CONCLUSIONS: Leucine co-ingestion augments the post-exercise muscle protein synthetic response to the ingestion of a single 15 g bolus of protein in older men.

**BOARD #5 MAY 31 3:15 PM - 5:15 PM**

**Pre-Sleep Consumption of Casein Protein on Resting Metabolic Rate and Appetite in Premenopausal Women**

Christopher Schattinger¹, Christopher M. Schsttinger¹, Joseph R. Leonard¹, Ashley E. Artese¹, Cara L. Pappas¹, Michael J. Ormsbee, FACS², Lynn B. Panton, FACS².

¹Florida State University, Tallahassee, FL. ²Roanoke College, Salem, VA.

**NO RELATIONSHIPS REPORTED**

**CONCLUSION:** Protein supplementation does not further augment physiological adaptations to prolonged endurance exercise training.

**PurposE:** It has recently been speculated that protein supplementation may further augment the gains in whole-body oxidative capacity and endurance exercise performance following prolonged endurance exercise training in healthy, young males. However, leg muscular endurance increased by 6±7% (time P<0.001), with no differences between groups (time x treatment interaction, P=0.84). Whole body lean mass was unchanged over time (P=0.97). However, leg lean mass showed an increase following endurance exercise training (P<0.001), which tended to be greater in PRO (P=0.037). Conclusions were prepared by the authors and printed as submitted.
Maintenance of muscle strength helps preserve functional capacity and independence in aging populations. Protein intake above the current recommended dietary allowance (RDA) is believed to optimally facilitate resistance training adaptations; however, the suitability of consuming these protein amounts for middle-aged adults remains unclear.

**PURPOSE:** To determine whether dietary protein ingestion above the RDA modulates muscle strength and body composition to resistance exercise training in middle-aged adults.

**METHODS:** 27 participants were randomly assigned to consume either the RDA of protein (0.8-1.0 g/kg/d; 50 ± 2 y, BMI = 27.9 ± 0.1 kg/m²) or twice the RDA (1.6-1.8 g/kg/d; 52 ± 2 y, BMI = 28.1 ± 0.9 kg/m²) during a 10-wk progressive resistance training program. Participants were counseled on equal distribution of protein, and consumed either 15g or 30g protein in the immediate post-exercise period and nightly before sleep, respectively. Body composition was assessed by dual-energy x-ray absorptiometry. One repetition maximum assessments were used to determine muscular strength for both lower and upper body exercises. Strength assessments were performed at baseline and after the 10-wk intervention.

**RESULTS:** There was a significant increase ($P < 0.05$) in muscle strength in all exercises for both groups across time (Table 1). However, there was no significant difference in strength between groups ($P > 0.05$) after the intervention. Body fat % was not significantly different across time (Table 1). However, there was no significant difference in strength between intervention groups ($P > 0.05$). Lower body lean body mass significantly improved ($P < 0.05$) with resistance training in both groups with no group differences ($P > 0.05$).

**CONCLUSION:** Dietary protein intake comparable to the RDA coupled with moderate post-exercise and nightly protein doses is adequate to support training-induced muscle strength and mass gains in middle-aged adults.

Supported by USA National Cattlemen’s Beef Association (NCBA)

**Table 1**

<table>
<thead>
<tr>
<th>RDA (n = 14) 2x RDA (n = 13)</th>
<th>Baseline</th>
<th>Post-intervention</th>
<th>Baseline</th>
<th>Post-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body Fat (%)</strong></td>
<td></td>
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</tr>
<tr>
<td>34.9 ± 2.3</td>
<td>34.0 ± 2.3</td>
<td>31.7 ± 2.4</td>
<td>31.9 ± 2.4</td>
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<tr>
<td><strong>Lower Body Lean Body Mass (kg)</strong></td>
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<tr>
<td>16.2 ± 1.4</td>
<td>17.2 ± 1.4*</td>
<td>18.1 ± 1.4</td>
<td>18.8 ± 1.4*</td>
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<tr>
<td><strong>One Repetition Maximum (kg)</strong></td>
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<tr>
<td><strong>Leg Press</strong></td>
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<tr>
<td>100.8 ± 9.9</td>
<td>151.1 ± 18.8*</td>
<td>100.5 ± 10.1</td>
<td>149.3 ± 17.1*</td>
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<tr>
<td><strong>Leg Curl</strong></td>
<td></td>
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<tr>
<td>57.1 ± 4.5</td>
<td>72.5 ± 6.5*</td>
<td>65.6 ± 6.04</td>
<td>85.8 ± 7.2*</td>
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<tr>
<td><strong>Leg Extension</strong></td>
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<tr>
<td>63.3 ± 5.0</td>
<td>94.4 ± 10.3*</td>
<td>66.1 ± 5.4</td>
<td>97.4 ± 13.2*</td>
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<tr>
<td><strong>Chest Press</strong></td>
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<tr>
<td>39.6 ± 5.4</td>
<td>48.4 ± 6.2*</td>
<td>41.4 ± 5.5</td>
<td>55.2 ± 5.9*</td>
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<tr>
<td><strong>Shoulder Press</strong></td>
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<tr>
<td>16.9 ± 3.17</td>
<td>25.3 ± 3.9*</td>
<td>16.7 ± 2.3</td>
<td>28.6 ± 3.3*</td>
<td></td>
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<tr>
<td><strong>Seated Row</strong></td>
<td></td>
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<tr>
<td>41.5 ± 4.2</td>
<td>55.6 ± 4.3*</td>
<td>46.2 ± 5.1</td>
<td>57.0 ± 4.9*</td>
<td></td>
</tr>
<tr>
<td><strong>Bicep Curl</strong></td>
<td></td>
<td></td>
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<tr>
<td>16.4 ± 1.3</td>
<td>22.1 ± 2.2*</td>
<td>19.6 ± 2.1</td>
<td>28.2 ± 2.6*</td>
<td></td>
</tr>
</tbody>
</table>

**F-35**

**Thematic Poster - Running**

**Friday, May 31, 2019, 3:15 PM - 5:15 PM**

**Room: CC-102B**

**2878 Chair: Christopher J. Lundstrom. University of Minnesota, Minneapolis, MN.**

**No relevant relationships reported**

**2879 Board #1**

**May 31 3:15 PM - 5:15 PM**

**Are Changes In Running Economy Associated With Changes In Performance In Runners? A Systematic Review and Meta Analysis**

Ian J. O’Sullivan,1 Mark I. Johnson,1 Sarah B.Clarke,2 Peter Francis1 (Leeds Beckett University, Leeds, United Kingdom. 1Northern Michigan University, Marquette, MI. Email: i.osullivan7595@student.leedsbeckett.ac.uk)

**No relevant relationships reported**

Improvements in running economy (RE) are thought to lead to improvements in running performance (P). The identification of modifiable factors that affect RE and by association, P has been the focus of a significant body of research in recent years. Modifiable factors affecting RE are broadly classified as, biomechanical, anthropometric, physiological, extrinsic and training related. Interventions have been used to alter one or more of these factors with a view to improving RE. The underlying assumption is that an improvement in RE will also lead to an improvement in P. **PURPOSE:** The aim of this study was to assess the effect of interventions of at least 2-weeks’ duration on RE and P and to determine whether there is a relationship between changes in RE (ΔRE) and changes in running performance (ΔP). **METHODS:** A database search was carried out in Web of Science, Scopus and SPORTDiscus. In accordance with a PRISMA checklist 10 studies reporting 12 comparisons between interventions and controls were included in the review.

**RESULTS:** There was no correlation between percentage ΔRE and percentage ΔP ($r = 0.46$, $P = 0.936$, 12 comparisons). There was a low risk of reporting bias in relation to incomplete data sets. There was an unclear risk of selection bias associated with random allocation to intervention and control groups and reporting of baseline differences in RE and P between intervention and control groups. There was also an unclear risk of performance bias relating to the monitoring of non-intervention training, detection bias associated with differences in determination of the performance outcome measure and attrition bias associated with reporting of participant dropout. Meta-analyses found no statistically significant differences between interventions and control for RE (SMD (95% CI) = −0.37 (−1.43, 0.69), 204 participants, $p = 0.49$) or for P (SMD (95% CI) = −0.65 (−2.62, 24.72, 204 participants, $p = 0.99$). **CONCLUSIONS:** Methodologies for subject allocation to intervention and control groups and the reporting of differences in baseline characteristics of control and intervention groups and reporting of participant dropout were infrequently applied in the included studies. Studies of greater statistical power, with standardised measures of performance and greater control of non-intervention training are required.
RE was correlated with cadence, GCT, and GCT imbalance by Pearson correlations. 

**Results:** The average VO2max among the runners was 68.6±4.9 ml·kg⁻¹·min⁻¹ and 59.3±1.1 ml·kg⁻¹·min⁻¹, and the average LT was 80.8% and 83.5% VO2max for men and women, respectively. The relationship between RE at the LT and the measured running dynamics is displayed in Table 1. There was a very strong, positive correlation between GCT imbalances and the caloric cost of running. **Conclusion:** GCT imbalances were a stronger determinant of RE than GCT or cadence. Future research should determine how to improve GCT imbalances and if doing so can improve economy and performance.

### Table 1. Relationship between running dynamics and running economy

<table>
<thead>
<tr>
<th>Caloric Cost (kcal·kg⁻¹·km⁻¹)</th>
<th>GCT</th>
<th>GCT Imbalance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>-.454</td>
<td>.492</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.161</td>
<td>.124</td>
</tr>
<tr>
<td>N</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>GCT = Ground Contact Time; <em>p</em> &lt; 0.001</td>
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</tbody>
</table>

**Purpose:** Neuromuscular factors play critical role in running economy (RE), the present study was to investigate the relationship between leg stiffness, relative maximal strength, Counter movement jump (CMJ) , drop jump height (DJ), reactive strength and leg stiffness. The present data highlight that reactive strength and leg stiffness maybe component to neuromuscular function for developing RE in long-distance runners.

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**Recommendations:**

Maximal aerobic capacity (VO2_max) and running economy (RE) are markers of running performance. A valid evaluation of RE may occur through allometric scaling of body mass (alloVO2max, ml·kg⁻¹·min⁻¹), energy cost (EC, kcal·kg⁻¹·km⁻¹), or percent of VO2max (%VO2max). Little is known about physiological changes that occur in competitive runners over a marathon training cycle. The VDOT score, incorporating VO2max, enables comparison of race performances under different temperature conditions. **PURPOSE:** To determine whether VO2max and measures of RE change with marathon training; to evaluate the relationship between these variables and VDOT. METHODS: Eight runners (age 34 ± 2 years; marathon: <30 miles; <30 females; 5 males) completed treadmill marathon-intensity-effort (MIE) and VO2max tests at 10 and 1 km·h⁻¹ pre-marathon. Body composition (%BF) was determined using hydrostatic weighing. Paired t-tests were used to compare pre- and post-training values. The alpha level for significance was set at 0.05. RESULTS: Body fat decreased from 18.7 ± 5.1% to 16.7 ± 1.6%, VO2max increased from 51.6 ± 2.4 to 63.9 ± 1.1 ml·kg⁻¹·min⁻¹, and %VO2max during the MIE decreased from 82.1 ± 2.0 to 72.3 ± 3.2% (p < 0.05 for all). VDOT was significantly associated with alloVO2 (r = -0.779, p = 0.039) but not with %VO2max (r = -0.717, p = 0.09). CONCLUSIONS: Experienced competitive runners may increase VO2max and decrease %VO2max after a marathon-specific training cycle. The decrease in alloVO2 in a MIE is likely due to a higher VDOT, as other measures of RE did not change significantly. In this cohort, alloVO2 was negatively related to race performance.
**2885** Board #7  
**May 31 3:15 PM - 5:15 PM**  
**High-Speed Treadmill vs Ground-Based Training for Sprint Speed Among College Athletes**  
Keith A. Court, Monica O’Rourke. California Baptist University, Riverside, CA.  
Email: keith@qctspeed.com  
(No relevant relationships reported)

**Introduction:** Practitioners often debate as to which speed-training method is most effective for improving speed. Ground-Based Speed Training (GBST) has been the predominant method, however with technological advances, High Speed Treadmill Training (HSTT) has been implemented and used (Hauschildt, 2010; Jerome-Koral, Herrera, & Millet, 2018; Johnson, Eastman, Feland, Mitchell, Mortensen, & Egger, 2013; Ross et al., 2009). **Purpose:** This study compared HSTT and GBST for improving speed and reducing 40-yard sprint times among collegiate athletes.  

**Methods:** Twenty-one collegiate football and baseball players were randomly assigned to HSTT (n = 7), GBST (n = 7) or control group (n = 7). Experimental groups completed 8 specialized training sessions 2 times a week for 4 weeks. HSTT group trained using PerformX Tred-X30 high-speed treadmill in each session with inclines of 5% to 30% GBST group performed sprints that involved resisted and assisted training modalities: toe sled, uphill running, partner runs and downhill running. **Results:** Pre-test 40-yard sprint-time scores indicated no significant difference between groups prior to intervention (F(2,18) = 1.059, p = .367, n² = .105). Post-intervention indicated there was a 19.3% difference in times between the three groups (F(2,18) = 2.152, p = .145, n² = .193). HSTT group exhibited a significant difference among pre-intervention 40-yard sprint time (M = 5.02, SD = .320) to post-intervention (M = 4.80, SD = .312), (t(6) = 5.418, p = .002) while GBST group did not; pre-intervention (M = 4.95, SD = .305) to post-intervention (M = 4.97, SD = .360), (t(6) = -0.488, p = .67). **Conclusions:** HSTT group increased linear speed and decreased sprint times over GBST and control groups. HSTT may be an effective way to improve sprint speed for times over various distances in a shorter period of training time than GBST and these improvements can be transferred to collegiate and professional athletic performance.

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**F-36** Free Communication/Slide - Energy Balance-Weight Control  
Friday, May 31, 2019, 3:15 PM - 5:15 PM  
Room: CC-105A

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**2887** Chair: Edward L. Melanson, FACSM. University of Colorado Denver, Denver, CO.  
(No relevant relationships reported)

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**2888** May 31 3:15 PM - 3:30 PM  
**Randomized Trial Examining the Effect of a 12-week Exercise Program on Eating Behaviors**  
Jessica L. Unick,1 Shira Dunsiger,1 Tiffany Leblond,1 Korina Hahn1, J. Graham Thomas3, Ana M. Abrantes4, Elissa Epel1, Laura Stroud1, Rena R. Wing1, 2 The Miriam Hospital and Brown Medical School, Providence, RI. 2Brown Medical School and Butler Hospital, Providence, RI. 3University of California San Francisco, San Francisco, CA. (Sponsor: David Garcia, FACSM)  
Email: junick@lifespan.org  
(No relevant relationships reported)

**Purpose:** This efficacy trial tests the hypothesis that exercise training impacts eating behaviors, specifically through a reduction in overeating and internal disinhibition (the tendency to eat in response to cognitive or emotional cues), in a sample of women who are overweight or obese. **Methods:** Participants were inactive at baseline and self-identified as ‘stress eaters’ (eating more than usual when ‘moderately’ or ‘extremely’ stressed). They were randomized to 12 weeks of exercise training (EX) or to a no-exercise control (CON). EX participants were given an exercise goal of 200 min/wk of combined supervised and home-based exercise (30% supervised; home-based exercise was confirmed via accelerometry). No dietary instructions were provided to any participants. Assessments occurred at baseline and 12 weeks. Overeating episodes were measured over 14 days at each assessment using ecological momentary assessment (EMA; 5 surveys/day delivered randomly via smartphone). Internal disinhibition was assessed questionnaire.

**RESULTS:** 39 participants (EX: n=19, CON: n=20) completed the study (age: 40.8±10.3 years BMI: 31.6±3.9 kg/m²). Adherence to the exercise intervention was high (99.4% of all prescribed exercise was confirmed via accelerometry) and 12-week weight change did not differ by condition (EX: -1.13±5.3%, p = 0.42±2.0%, p<0.11). At week 12, the proportion of eating episodes that were characterized as overeating episodes was 18.4% in EX vs. 24.5% in CON (p=0.01). The odds of an overeating episode were lower in EX relative to CON and became more pronounced over time (condition*time=-.005, SE=.002, p=0.01). Specifically at week 12, the odds of having an overeating episode among EX participants was 0.58 times the odds of having an overeating episode within CON’s. Internal disinhibition decreased in EX (pre: 4.1±2.2, post: 2.8±1.8), but not CON (4.3±2.6 to 4.2±1.3, p<0.02). **CONCLUSIONS:** Exercise...
Exercise is often prescribed for weight control; however, it is not uncommon that weight loss is less than expected. Unexpected results may be influenced by compensatory eating behaviors following exercise. PURPOSE: The aim of this study was to examine differences in eating behaviors after steady state (SS) and high intensity (HI) exercise. METHODS: Nine, recreationally active college-aged females participated in this study. Prior to testing, subjects completed a Visual analog scale (0-100) to individualize exercise. Subjects completed three trials in a randomized order: control (CON), HI exercise, or SS exercise. Each trial took place during the first week of the luteal phase of their menstrual cycle. During the CON trial, subjects remained seated for 30 minutes. During SS and HI trials, subjects ran on a treadmill at 70% VO2max for 1 hour, 90% VO2max for 30 minutes, and 100% VO2max for 1 minute for 34 minutes. Food intake was recorded 24 hours before and up to 72 hours after each trial. Resting metabolic rate (RMR) was measured prior to and after 24, 48, and 72 hours following each trial. A visual analog scale was used to assess appetite before and immediately following each trial. RESULTS: Caloric expenditure was higher during SS (302.78±28.40 kcal) and HI (278.39±24.94 kcal) compared to CON (68.10±2.94 kcal) (p<0.001); however, no differences existed over time in selected variables. There were no significant differences in weight loss across 12 months. METHODS: Data were examined from sedentary adults (N=309; BMI: 32.3±3.8 kg/m²; age=45.1±7.9 years) enrolled in a behavioral program and randomized to a reduced calorie diet (DIET, N=107), diet plus a moderate dose of MVPA (MOD-EX, N=101), or diet plus a high dose of MVPA (HIGH-EX, N=101). All groups received weekly intervention sessions in months 1-6 followed by 2 group and 2 telephone contacts per month in months 7-12, and were prescribed a diet to reduce energy intake (1200-1800 kcal/day). MOD-EX was prescribed unsupervised MVPA that progressed to 150 min/ wk, whereas HIGH-EX was progressed to 250 min/wk. Body composition and VAT were measured by DXA (GE Lunar IDXA, Corescan) along with weight at 0, 6, and 12 months. RESULTS: Weight significantly decreased in all groups at 6 months (DIET: -9.0±5.9 kg, MOD-EX: -10.2±6.4 kg, HIGH-EX: -9.4±5.3 kg; p<0.001) and 12 months (DIET: -10.0±8.3 kg, MOD-EX: -11.1±8.1 kg, HIGH-EX: -9.7±6.9 kg; p<0.001), with no significant difference between groups. A similar pattern was observed for percent body fat (Baseline: 43.3±5.5%, 6-month: 38.3±7.0%, 12-month: 37.7±6.5%; p<0.001) with a significant difference between groups.
Impact of Intermittent Fasting on Energy Balance and Associated Health Outcomes in Lean Adults

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(Purpose: To establish the effects of a diet combining intermittent fasting (IF) with calorie restriction on energy expenditure and metabolic health, and to isolate the relative contributions of fasting and negative energy balance to any observed effects.

Methods: After a 4-week control phase, 36 lean adults (mean±SD; age = 42±11 years, BMI = 23.9±2.1 kg/m\(^2\)) were randomised to one of three conditions for 20 days:

1. Daily calorie restriction (75.75% of habitual intake daily), 2. IF with calorie restriction (15% alternating 24 hours of fasting and feeding to 150% of habitual intake), and 3. IF without calorie restriction (24 hours of fasting and feeding to 200% of habitual intake). The IF groups, transitions from fasting to feeding and vice versa occurred at 15:00 each day. In addition to free-living measures of energy intake (weighed record) and physical activity (combined heart rate/accelerometry), body composition (DEXA), metabolic rate and substrate oxidation (indirect calorimetry), fasted health markers and postprandial metabolic responses were measured at pre- and post-intervention.

Results: Energy intake was reduced in the two energy-restricted groups (75.75% = -2602±904 kcal/d, 0.15 = -2105±1105 kcal/d; p<0.24) and maintained by 0.200 (+63±143 kcal/d; p=0.01 v 75.75%, p=0.01 v 0.15%). A pattern mirrored by changes in body mass (75.75% = -1.9±1.0 kg, 0.15 = -1.6±1.1 kg, 0.20 = -0.5±1.1 kg; p=0.46 75.75 v 0.15%, p=0.01 75.75 v 0.200, p=0.04 0.150 v 0.200). However, the decrease in fat mass with 75.75% (-1.8±0.8 kg) was greater than the decrease accompanying 0.150 (-0.8±0.9 kg, p=0.01 v 75.75%), both of which differed from the stability seen following 0.200 (-0.1±0.7 kg, p=0.01 v 75.75%, p=0.05 v 0.150). Furthermore, physical activity energy expenditure decreased following 0.150 when compared to 0.200 (0.150 = -410±707 kcal/d, 0.200 = -247±594 kcal/d; p=0.07) but was unaffected by 75.75% (+4527±79 kcal/d; p=0.24 v 0.150, p=0.31 v 0.200). Despite these differences, metabolic rate, substrate oxidation, fasting biochemistry and postprandial metabolism were all unaffected.

Conclusions: In lean adults, restricting calories through a complete alternate-day approach to IF attenuated reductions in fat mass and prompted declines in physical activity, whilst metabolic health was unaffected.

May 31 4:30 PM - 4:45 PM

Changes In Health-related Quality Of Life In A 12-month Behavioral Weight Loss Intervention: The Heart Health Study

Katherine A. Collins, Renee J. Rogers, John M. Jakicic, FACSM. University of Pittsburgh, Pittsburgh, PA. (Sponsor: John Jakicic, FACSM)

Overweight and obesity have been shown to adversely affect health-related quality of life (HRQOL). HRQOL has been shown to improve with weight loss. However, it is important to examine whether physical activity in conjunction with weight loss has an added benefit for improvement in HRQOL. PURPOSE: To examine whether HRQOL improves with a lifestyle intervention for weight loss with varying doses of moderate-to-vigorous physical activity (MVPA) in adults who are overweight or obese.

Methods: Participants (N=270; age = 45±7.95 years; BMI = 32.2±3.7 kg/m\(^2\)) engaged in a 12-month behavioral weight loss intervention. Participants were randomized to reduced calorie diet (DIET; N=), diet plus 150 min/week MVPA (DIET+PA150; N=), or diet plus 250 min/week MVPA (DIET+PA250; N=). All groups received weekly in-person intervention sessions for months 1-6, with combined in-person and telephonic sessions for months 7-12. Diet was prescribed at 1200-1800 kcal/day. Assessment of body weight and HRQOL (SF-36) were measured at baseline, 6 months, and 12 months.

Results: Weight significantly decreased in all groups at 12 months (DIET: -9.2±5.8 kg, DIET+PA150: -10.2±6.4 kg, DIET+PA250: -9.5±5.4 kg; p<0.001) with no significant difference between groups. There were significant improvements in HRQOL components of physical function, energy and fatigue, and change in health (Table); however, these did not differ by group. There were no significant changes in social function, mental health, pain, and general health.

Conclusion: The addition of moderate or higher levels of physical activity to an energy restricted diet for weight loss did not improve quality of life compared to the diet alone. These results demonstrate the positive benefits that weight loss may have on HRQOL regardless of whether physical activity is included as a component of the intervention. (Supported by: NIH (R01 HL103646)
Resistance exercise that incorporates intra-set rest between repetition blocks (i.e., cluster sets [CS]) can produce a smaller metabolic stress and endocrine response than traditional sets (TS). PURPOSE: To examine the effect of CS on the acute cytokine response in resistance trained women. METHODS: 12 resistance-trained women (mean ± SE; 23.1 ± 1.1 years; 160.1 ± 1.5 cm; 62.5 ± 1.7 kg; 5 ± 1 years training) completed 3 sessions in the follicular phase. One-repetition maximum (IRM) back squat (BS) (98.7 ± 4.1 kg), and BS:body mass (1.6 ± 0.1) were determined in Session 1. For Session 2 (3 days post Session 1) and Session 3 (7 days post Session 2), subjects were randomly assigned to either 4 sets of 10 reps with 120 seconds (s) inter-set rest (TS) or 4 x (2 x 5 reps) with 30s intra-set rest and 90s inter-set rest (CS). All performed both protocols at 70% IRM BS. Instructions were to perform every rep “as explosively as possible”. Blood was collected pre-exercise (PRE), immediately after sets 1, 2, 3, 4 (mean ± SE; 23.7 ± 1.1 years; 160.1 ± 1.5 cm; 62.5 ± 1.7 kg; 5 ± 1 years training) completed five experimental visits: a VO2 max, and a cycling trial in 23°C/45%RH, 23°C/70%RH, 34°C/20%RH and 34°C/45%RH. After supine rest, exercise conditions consisted of 60mins of cycling at 60% VO2max, a 15min rest, and a time to exhaustion (TTE) trial at 90% VO2max. Blood was obtained before exercise (PRE), after 60min cycling (60), and after TTE (90). Serum concentrations of IL-1β, IL-2, IL-6, IL-10, IL-15, IL-1α, IL-12(p40), IL-5, TNFα, IL-8, MCP-1, IL-12(p70), VEGF, and IL-1α were assayed in duplicate using a 32 panel Mouse Cytokine Magnetic Multiplex Assay. Analysis of variance was performed to determine significant differences to the groups. Serum collected from mice sacrificed at the 4-week and 20-week time points were assayed in duplicate using a 32 panel Mouse Cytokine Magnetic Multiplex Assay. Data indicate that changes in TNFα may be related to time spent above critical Tc of 33.5°C and 35°C. Increases in IL-6 appear to be related to time spent above Tc of 38.5°C.

Inflammatory cytokines are thought to be at the root of prostate tumor progression. Exercise has been shown to be beneficial in men with prostate cancer (PCa), however, the impact of exercise on tumor physiology is not clearly understood. PURPOSE: Test the hypothesis that exercise inhibits tumor progression and modulates pro-tumorigenic cytokine concentrations in the transgenic adenocarcinoma of mouse prostate (TRAMP) model. METHOD: Thirty, 10-week old TRAMP mice were randomized to either voluntary wheel running (VWR) or control group. Palpable tumors and VWR activity were monitored weekly. Mice were sacrificed at 4, 8, 12 and 20-weeks to assess time point differences. Excised tumors were paraffin embedded, sectioned, and stained with hematoxylin and eosin. Sectioned tumor slides were scored by a pathologist blinded to the groups. Serum collected from mice sacrificed at the 4-week and 20-week time points were assayed in duplicate using a 32 panel Mouse Cytokine Magnetic Multiplex Assay. Analysis of variance was performed to determine significant differences between treatment groups. RESULTS: Control mice presented first with palpable tumors at 14 weeks of age. VWR significantly delayed the presence of palpable tumors by 5 weeks (19 weeks old, p<0.05). No significant pathological changes were observed as a function of time. Before data were pooled for analysis, a treatment effect was observed with VWR mice having significantly lower number of high-grade tumors compared to controls. Specifically, 71% of control mice had high grade tumors compared to only 17% in the VWR group (p<0.001). Of the 32 cytokines measured, VWR significantly lowered concentrations of tumor modulating cytokines except (pre: 1291.2±310; post: 702.2±273; p<0.03). IL-1α (pre: 457±97; post: 167±161; p<0.03), IL-5 (pre: 4.7±0.2; post: 1.9±0.4; p<0.001), IL-12(p40) (pre: 16.9±1.5; post: 0.31±0.3; p=0.004), IL-10 (pre: 31.3±7.4 ng/mL; post: 30.3±6.0; p=0.03) and VEGF (pre: 1.37±0.3; post: 0.31±0.3; p=0.004). No changes were observed in the control group. After 20 weeks, VWR group had significantly lower IL-5 (con: 3.75±0.7; VWR: 1.90±0.4; p<0.03) and VEGF (con: 1.72±0.7; VWR: 0.31±0.3; p=0.02) compared to controls. CONCLUSIONS: These results suggest VWR suppresses tumor aggressiveness by altering the inflammatory cytokine profile. Further research on mechanisms of action is needed.

Purpose: To identify relationships between cytokines and time spent above critical body temperatures in response to aerobic exercise in various environments. METHODS: 12 recreationally active men (24 ± 3.1 yrs; 1.81 ± 0.07m; 81.5 ± 8.0kg; 47.2 ± 4.8 ml/kg/min) completed five experimental visits: a VO2 max, and a cycling trial in 23°C/45%RH, 23°C/70%RH, 34°C/20%RH and 34°C/45%RH. After supine rest, exercise conditions consisted of 60mins of cycling at 60% VO2max, a 15min rest, and a time to exhaustion (TTE) trial at 90% VO2max. Blood was obtained before exercise (PRE), after 60min cycling (60), and after TTE (90). Serum concentrations of IL-1β, IL-6, IL-10 and TNF-α were analyzed via ELISA. Participant’s rectal (Tre) and skin temperatures (Tsk) at five locations: Chest, Triceps, Forearm, Thigh and Calf were monitored continuously. Whole body temperature (Twb) and Tre were calculated via weighted averages. Area Under the Curve with respect to increase (AUC) was calculated for Tc and Tce. Data were analyzed as Pearson Product Moment Correlations between AUC for Tc, Tce and Tsk with changes in cytokine concentration. Time spent above specific critical temperatures for Tc and Tce was related to changes in cytokine concentrations from PRE-60 and PRE-90 using stepwise linear regression. RESULTS: Correlations were observed between TNFα PRE-60, and PRE-90 with Tre (r=0.576, p=0.001), and Tsk (r=0.661, p=0.001; r=0.516, p=0.001, respectively) but not Tce. Time spent with Tsk above 33.5°C and 35°C were predictive of increases seen in TNFα PRE-60 (r=0.695, p=0.001). TNFα PRE-90 was related to time spent above 33.5°C for Tce (r=0.593, p=0.001). Time spent with Tc above 38°C was correlated, but not predictive of increases seen in TNFα from PRE to 60 and PRE to 90 (p=0.03, p=0.02). Time spent above 38.5°C for Tsk displayed significant correlations with increases seen in IL-6 PRE-60 (r=0.470, p=0.002). No other correlations or relationships were observed with changes in cytokine concentration and body temperature. Conclusions: Data indicate that changes in TNFα may be related to time spent above critical Tc of 33.5°C and 35°C. Increases in IL-6 appear to be related to time spent above Tce of 38.5°C.
INTRODUCTION: Low blood perfusion and hypoxia are characteristic features of tumors and are factors of resistance to radiation and chemotherapy. A few rodent studies show that aerobic exercise, that has no severe side effects, may improve perfusion and reduce hypoxia but the significance of exercise intensity is unknown. Current studies investigate the duration of the reduction in hypoxia after exercise cessation and examine the effect of this exercise regime on tumor radiation response.

METHODS: Female CDF1 mice were injected with the C3H mammary carcinoma and immediately after exercise injected with Hoechst 33342 staining enabled analyses of perfused vessels in the tumor (latter analyses ongoing. Data not presented). RESULTS: The mean hypoxic fraction was 9.0±5.2% for mice exposed to the high intensity running schedule and was significantly lower compared with the hypoxic fraction in tumors from the control group (14.2±6.2%, Student’s T-test p=0.046) and low intensity group (13.6±4.0%, p=0.034) but not the moderate intensity group (12.6±7.0%, p=0.19). CONCLUSION: High intensity for 30 minutes may reduce tumor hypoxic fraction in mice and our current studies investigate the duration of the reduction in hypoxia after exercise cessation and examine the effect of this exercise regime on tumor radiation response.
Resolved Issues: Older Adults
Friday, May 31, 2019, 3:15 PM - 4:55 PM
Room: CC-306

**2903** Chair: Kenneth Vitale. University of California San Diego, San Diego, CA. (No relevant relationships reported)

**2904** Discussant: Arthur Jason De Luigi. MedStar NRH/Georgetown University Hospital, Olney, MD. (No relevant relationships reported)

**2905** Discussant: Wayne Elton Derman. Stellenbosch University, Cape Town, South Africa. (No relevant relationships reported)

**2906** May 31 3:15 PM - 3:35 PM
The Effects of a Linearly Progressed Resistance Training Program on a Previously Sedentary 86 Year Old Woman
John Petrizzo1, Jeremy Koppel2, Erica Christen2, Inna Koppel2, Robert M. Otto, FACSM1, John Wygand, FACSM2. 'Adelphi University, Garden City, NY. ’Feinstein Institute for Medical Research, Manhasset, NY. (Sponsor: Robert M. Otto, FACSM) Email: jpetrizzo@adelphi.edu
(No relevant relationships reported)

**History:**
86 year old previously sedentary female agreed to participate in a linearly progressed resistance training program for six months. Prior to participation, the subject was evaluated by a physician and cleared to participate in the program. Medical history revealed a history of atrial fibrillation, hypothyroidism, hypertension, glaucoma, osteoarthritis, as well as peripheral edema. The subject reported the use of Norvasc, Losartan Potassium, Hydralazine Hcl, and Doxazosin Mesylate for her hypertension, Xarelto for her atrial fibrillation, Levothyroxine for her hypothyroidism, Latanoprost for her glaucoma as well as Lasix for her peripheral edema. Prior to initiation of the resistance training intervention, the subject’s only self-reported physical activity was walking. She reported walking, on average, 1 - 3 hours per week. The subject also reported sleeping, on average, less than 5 hours per night.

**Physical Examination:**
The subject completed the Short Physical Performance Battery (SPPB) prior to initiating the resistance training intervention. Results of the subject’s initial SPPB showed that she was unable to maintain a semi-tandem or tandem stand for 10 seconds, required the use of a walker to ambulate a distance of four meters, and was unable to transfer from sit-to-stand without the use of her upper extremities.

**Test and Results:**
Initial SPPB score of 2/12, consistent with poor balance, gait speed, and lower extremity functional strength
Initial Leg Press calculated 1RM = 23.1 kg
Initial Lat Pulldown calculated 1RM = 8.6 kg
Initial Bench Press calculated 1RM = 7.7 kg

**Intervention:**
A linearly progressed resistance training program comprised of the leg press, barbell bench press, and lat pulldown machine was implemented an average of twice per week for 6 months. The goal of the resistance training program was to make a small increase in the training load used on each of the three exercises as often as possible.

**Outcomes:**
Improvements of calculated 1RM of 209.8%, 268.4%, and 94.1% were noted for the leg press, lat pulldown, and bench press respectively. SPPB score double from 2/12 to 4/12. Additionally, the subject was also able to successfully transfer from sit-to-stand without the use of her upper extremities for assistance and no longer required the use of a walker during ambulation.

**2907** May 31 3:35 PM - 3:55 PM
Complications Post Unicompartmental Knee Arthroplasty and Physical Therapy Manual Therapy
Julie B. Barnett. UT Health San Antonio Texas, San Antonio, TX. Email: barnettj3@uthscsa.edu
(No relevant relationships reported)

**History:**
65 year old male underwent an initial medial unicompartmental knee arthroplasty and physical therapy manual therapy and exercise. The patient had a significant increase in pain after physical therapy manual techniques in extension and exercises interventions. Subsequently, the patient underwent a total knee arthroplasty after a lateral tibial plateau fracture was revealed.

**Physical Examination:**
Patient had approximately minus 10 degrees of knee extension at eight weeks post unicompartmental medial arthroplasty.

**Differential Diagnosis:**
Joint adhesions vs muscular restrictions vs fracture.

**Test and Results:**
Passive range of motion measurements taken during physical therapy with restrictions in knee extension passive range of motion. 2nd MRI revealing lateral tibial plateau fracture.

**Final Working Diagnosis:**
Lateral tibial plateau fracture per MRI

**Treatment and Outcomes:**
Total knee arthroplasty performed and patient eventually gained full range of motion of the knee joint, normal gait, and reduction in pain.

**2908** May 31 3:55 PM - 4:15 PM
Transplant Frailty Prehabilitation
Demitri Constantinou, Keegan Willemsen. University of the Witwatersrand, Wits, South Africa. (Sponsor: Yoganathan Coopoo, FACSM) Email: demitri.constantinou@wits.ac.za
(No relevant relationships reported)

**History:**

**Physical Examination:**
Colour - ashen/pallor. HR = 62 bpm, regular, good volume. BP = 96/74 mmHg. Cor - NAD Lungs - NAD. Abdomen - NAD. Clinically balance reduced, generalised muscle weakness.

**Differential Diagnosis:**
Anemia, paraneoplastic syndrome, chemotherapy / oncology deconditioning, cardiac dysfunction

**Test and Results:**
Lab results - marginally raised liver enzymes. No current anemia. Staged treadmill test using modified Bruce Protocol with ECG monitoring and mobile metabolic measurements. The results showed pre-exercise HR = 60 bpm, regular, pre exercise BP = 94/76 mmHg. Maximum BP post exercise expected increase with peak RPE of 15/20 although physically could not continue. ECG normal at rest and with effort. Peak heart rate = 184 (112% of predicted). Exercise time - 9.58 minutes. Maximum load to stage 5 = 17 mets. Peak Vo2 = 18.8 ml/min/ kg at 08.30 minutes. RER reached 1 at 3.15 mins. Ventilatory equivalent was high, and occurred early - implying early anaerobic dependent metabolism, likely from compromised aerobic energy system. Liver dysfunction with effects on glycolysis and gluconeogenesis unknown.

**Final Working Diagnosis:**
General deconditioning of multiple etiologies related to liver tumor

**Treatment and Outcomes:**
Exercise prehabilitation for transplant to improve aerobic function, muscle strength and balance. Exercise sessions three times per week, with significant improvements in objective outcome measures and subjective energy levels, function and quality of life.

**2909** May 31 4:35 PM - 4:55 PM
Age and Gender Specific Issues - Power Based Exercise Program in a Postmenopausal Female
Michele Aquino, John Wygand, FACSM, Robert M. Otto, FACSM, John Petrizzo. Adelphi University, Garden City, NY. (Sponsor: John Wygand, FACSM) Email: maqui no@adelphi.edu
(No relevant relationships reported)

**History:**
70 year old female with Osteoporosis was referred to Physical Therapy for gait and balance training. The patient denies any prior history of cancer, diabetes, neurological history, prior orthopedic injuries/surgeries, or major cardiac events/surgeries. Her health and fitness goals were to improve her overall fitness and decrease her cardiovascular risk factors. The patient was placed on a linearly progressed resistance training program utilizing age-appropriate lifts.

**Test and Results:**
SPPB score of 4/12, consistent with poor balance, gait speed, and lower extremity functional strength. Initial SPPB score of 2/12, consistent with poor balance, gait speed, and lower extremity functional strength.

**Intervention:**
A linearly progressed resistance training program comprised of the leg press, barbell bench press, and lat pulldown machine was implemented an average of twice per week for 6 months. The goal of the resistance training program was to make a small increase in the training load used on each of the three exercises as often as possible.

**Outcomes:**
Improvements of calculated 1RM of 209.8%, 268.4%, and 94.1% were noted for the leg press, lat pulldown, and bench press respectively. SPPB score double from 2/12 to 4/12. Additionally, the subject was also able to successfully transfer from sit-to-stand without the use of her upper extremities for assistance and no longer required the use of a walker during ambulation.

Abstracts were prepared by the authors and printed as submitted.
current prescribed medications include Lipitor, Norvasc, Hyzaar, and Lexapro. The patient further mentions a history of osteopenia, but a recent DEXA scan classified the patient as Osteoporotic at femoral neck with a T-score of -2.5. The patient was prescribed 70 mg of Fosamax QD and continued with supplemental Calcium with Vitamin D. The patient reported reduction of balance with day to day activities and reported a fear of falling, but denied any falls.

Physical Examination:
Postural assessments demonstrated excessive forward head posture, with increased thoracic kyphosis along with excessive lumbar lordosis. Neurological assessment and ROM at the lumbar spine and hips were all within normal limits. Limited muscular strength was noted in bilateral lower extremities. Deficits in static balance were also noted with tandem stance.

Test and Results:
Dynamic Gait Index Score of 15/24, consistent with an increased fall risk.
DEXA results at femoral neck: T-Score: -2.5; BMD: .572 gr/cm²
DEXA results at lumbar spine: T-Score: -2.2; BMD: .807 gr/cm²

Intervention:
A Progressive Resistive Functional Power based exercise program was conducted an average two times per week for one year. A treadmill warm-up followed by progressive functional activities such as sit to stands for speed, forward step ups for speed, hip abduction and hip extension for speed were included. Progressions consisted of increased resistance and increased speed of movement.

Outcomes:
DEXA scan demonstrated BMD improvements of 29% (742 gr/cm²) and 24% (1.003 gr/cm²), as well as improvements in T-score to -2.1 to -1.5 at her femoral neck and lumbar spine, respectively. The changes attenuate fracture and mortality risk. Furthermore, a 7 point change in her Dynamic Gait Index score was noted post intervention, resulting in a decreased risk of falling. The patient has continued to be independent with a home exercise program along with continued use of her prescribed medications.

History:
A Female 68 yrs old was presented to the exercise rehabilitation clinic with:
Mitochondrial Disease (ragged red muscle fibers, excessive mitochondria)
POLG-associated CPEO
Osteoporosis

Physical Examination:
Extreme muscle weakness
Low BMI
No eye movement tracking, eyelids paralyzed
Fatigue

Differential Diagnosis:
Severe cervical kyphosis and mild thoracic kyphosis and anterior pelvic tilt, low muscle strength.

Testing and Results:
A continuous recumbent cycle protocol with peak power of 28 Watts, peak blood pressure 168/74 mmHg, 110 bpm.

Functional testing findings: 30-second Sit to stand test: 3 reps in 30 seconds; Dumbbell bicep curl test (60 seconds): Left arm was 30 reps, Right arm was 20 reps; Romberg (eyes open): <3 seconds for each leg, Tandem stance balance test: not possible without modification.

Results:
- Post 8 week test results
30-second Sit to stand test: 6 reps in 30 seconds (100% increase); Dumbbell bicep curl test (60 seconds): Left arm was 47 reps (17 rep increase), Right arm was 41 reps (21 rep increase); Romberg (eyes open): Left leg was 4.50 seconds (~2 second improvement) and right leg was 5.46 seconds (~3.5 second improvement), Tandem stance balance test: Left leg was 6.12 seconds and right leg was 5.59 seconds (and increase on both sides from 0 seconds). Working Diagnosis:
Mitochondrial myopathy with POLG-associated CPEO and osteoporosis with associated poor muscular strength, poor balance and posture.

Treatment and Outcomes:
The client attended a community clinical exercise rehabilitation program for 8 weeks, 2 x week 30 minutes. After a 5-minute warm up on a recumbent cycle (28-30 Watts), the client went through a one-on-one resistance & mobility training session focusing on variations of: Strength training, proprioception training, upper body & neck mobility & posture, co-ordination and muscle activation, functional balance training.

Outcomes:
A low intensity progressive resistance program that incorporates a variation of balance, proprioception, flexibility and muscle activation as well as upper back mobility training is recommended for the mitochondrial myopathy conditions. Program should be continued for a further 10-12 weeks, 2 x per week of ~30 minutes with slow to moderate intensity progression.
HISTORY: A 15-year-old male football player presented with low back pain that was worse on the left side. His injury occurred about 3 weeks ago during practice where he dove to tackle another teammate and had sharp pain in his lower back. He stated running/sprinting, jumping, twisting to throw the football, and sometimes bending forward all worsened the pain. Rest seemed to help, but he continued to have a dull ache in his low back that was fairly constant. He has tried heat and stretching before practice. He denies numbness, tingling, or weakness. He denies any bowel/bladder incontinence. He is a year-round athlete and also participates in basketball and hockey.

ROS: pertinent negatives include no fevers, rash, recent weight loss/gain, or joint aches in his low back that was fairly constant. He has almost nightly awakening secondary to back pain. She denies numbness, tingling, weakness, or radiation of pain into her lower extremities. She has a history of celiac disease. There is a family history of hypothyroidism, celiac disease, and rheumatoid arthritis.

PHYSICAL EXAMINATION: Height: 5'7" Weight 133 lbs. Gen: no acute aches in his low back that was fairly constant. He has almost nightly awakening secondary to back pain. She denies numbness, tingling, weakness, or radiation of pain into her lower extremities. She has a history of celiac disease. There is a family history of hypothyroidism, celiac disease, and rheumatoid arthritis.

Neuro: reflexes 2÷, strength 5/5 in upper and lower extremity.


TEST AND RESULTS:
- DXA: L1-L3 t-score -2.2BMP: Na 140, K 4.4, Cl: 105, CO2: 28, Creatinine 0.59, GFR >90, Glucose: 97, Calcium 9.8
- TSH: 0.04 (0.40 - 4.00 mU/L) T4: 0.30 (0.76 - 1.46 ng/dL)
- PTH: 19 (18 - 80 pg/mL)
- VITA D 37 (20 - 75 ug/L)

Further Labs: Free T3: 2.0 (2.1-4.2 pg/mL)
- FSH: 100.1 LH: 23.8 Prolactin 5 (3-27ug/L)
- Insulin Growth Factor 1: 89 (49 - 224 ng/mL)
- Cortisol stimulation test: (850AM) 16.3, 30 min: 22.5, 1 hour: 26.0 (8 AM Reference Range 4-22 ug/dL, 30-60 minutes post stim: >20 ug/dL)
- Tissue Transglutaminase IgG: <1

Lumbar X-ray: Anterior vertebral compression deformity involving T7, T8, and T9 vertebral bodies. There is also anterior wedging of T10 vertebral body which may be physiologic.

MRI Head/Brain: No focal abnormality of the pituitary gland.

FURTHER WORKING DIAGNOSIS: Osteoporosis with insufficiency fracture and isolated central hypothryosism

--Spondylolysis with spondylolisthesis at L5-S1
--Anterolisthesis with spondylolysis of L5 on S1.
--Desiccation at the level of L5-S1 with mild loss of disc height
HLA-B27: negative
TSH: 0.86 (normal)
Vitamin D: 37
CBC: within normal limits
CRP: 6.8 (normal)
ESR: 16 (normal)

FINAL/WORKING DIAGNOSIS:
Spondyloarthritis

TREATMENT AND OUTCOMES:
1. Referral to rheumatologist
2. Initiation of Methotrexate and Humira
3. Returned to swimming within 4 weeks of initiation Methotrexate, and 2 weeks of initiation of Humira, with significant reduction in low back pain

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2918

May 31 4:35 PM - 4:55 PM
Elite Weightlifter With Acute Back Pain
Taoufik Bel Fekih, Nidal Hammad, Louis Holtzhausen, FACSM, Yasin Al-Mahadma, Aspetar; Doha, Qatar; (Sponsor: Louis Holtzhausen, FACSM)
Email: taoufik.belfekih@aspetar.com

HISTORY: An 18 years old male, elite weightlifter sustained a sudden onset of sharp pain in the low back during back squat training (150 kg), with an episode of numbness of posterior right thigh which quickly resolved.

The pain was localized in the right lateral L4-L5 area, with intensity rated 8/10 on a Numerical Pain Scale.

Training history: Weightlifting and resistance training 6 days (30 hours)/week.

PHYSICAL EXAMINATION: No gait abnormality

Training history: Weightlifting and resistance training 6 days (30 hours)/week.

No neurological deficit, Straight leg raise test negative

No neurological deficit, Straight leg raise test negative

No neurological deficit, Straight leg raise test negative

Para-spinal muscular spasm and a mildly limited ROM in right rotation, lumbar spine extension, lateral flexion to the right.

Pain-free sacroiliac joint.

Tenderness on palpation of spinous process and L4-L5 facet area on the right side.

Tenderness on palpation of spinous process and L4-L5 facet area on the right side.

Pain-free sacroiliac joint.

Tenderness on palpation of spinous process and L4-L5 facet area on the right side.

Neurological examination normal, including motor function, sensory and reflexes.

Neurological examination normal, including motor function, sensory and reflexes.

Neurological examination normal, including motor function, sensory and reflexes.

Differential Diagnosis: A simple “lumbago”

Intervertebral disc prolapse

Burst fracture

Spondylolysis

Acute deterioration of spondylolisthesis

Test and Results: Standard X-rays showed probable L5 pars lesion, Loss of disc height at L4-L5. An osseous fragment overlying the L4-L5 neural foramina.

The MRI images showed an apophyseal ring fracture involving the posterior-inferior L4 vertebral body, with mild bone edema. There was no clear root impingement. There was an L5-S1 disc hernia.

CT scan with 3D rendering confirmed the presence of L4-L5 (acute) ring fracture; and CT scan with 3D rendering confirmed the presence of L4-L5 (acute) ring fracture; and CT scan with 3D rendering confirmed the presence of L4-L5 (acute) ring fracture.

In a lumbar brace for 4 weeks.

In a lumbar brace for 4 weeks.

In a lumbar brace for 4 weeks.

Abstain from weight-lifting for 8 weeks (reviewed regularly)

Abstain from weight-lifting for 8 weeks (reviewed regularly)

Abstain from weight-lifting for 8 weeks (reviewed regularly)

Vitamin D supplementation: 50,000 IU, 1 tab/week

Calcitonin IM injections 100 UI/dayx10 days

Graded exercise rehabilitation, including incident-free progressive weight loading.

The athlete returned to previous level of activity after 8 weeks.

He could back squat 260 kg at 3 months’ post injury, and won the Junior World Championships in his weight class.
and IL-6 (p<0.01; Table). Mean arterial pressure and PWV were unaltered (p>0.05), and heart rate increased at 24h (p<0.05). β-stiffness and pulse pressure increased in high fit participants, with no change in low fit (interaction, p>0.02). Carotid wave reflections were reduced at 24h in both groups (p<0.05). CONCLUSION: While neither fitness nor acute inflammation altered aortic stiffness, fitness may alter the sensitivity of the carotid artery to acute inflammation. Future research is necessary to examine the mechanism of these differential stiffness responses during acute inflammation and their implications for the cerebral vasculature.

2924 May 31 3:45 PM - 3:55 PM Vascular Responses To Extreme Exercise Following Catheterization-induced Damage In Humans. Andrea Tryfonos1, Rafaela Rodighiero1, Matt Cock1, Joseph Mills1, Daniel J. Green1, Ellen A. Dawson1. Liverpool John Moores University, Liverpool, United Kingdom. *Liverpool Heart and Chest Hospital, Liverpool, United Kingdom. The University of Western Australia, Perth, Australia.

Diagnosis and treatment for coronary artery disease (CAD) includes angiography and/or percutaneous coronary intervention. However, catheterization may result in acute artery dysfunction and damage. Whilst exercise training is recommended for CAD patients following catheterization, it is not known if there is an acute period when exercise may be detrimental due to the prior catheterization. In support of this, animal models have demonstrated exercise-induced paradoxical vasoconstriction post catheterization. PURPOSE: This study, for first time in humans, aims to examine the vascular responses to acute exercise following catheterization. METHODS: 24 CAD patients (age: 66±7.1 years; 31.9±7.4 kg/m², 83.3% males) undergoing transradial catheterization were assessed pre and 1 week post intervention. Endothelial function was assessed by radial artery (RA) flow mediated dilation (FMD) in both catheterized and control arm. Bilateral RA diameter and blood flow were assessed during handgrip exercise (HE), 3 min stages at 5%, 10% of maximum voluntary contraction.

RESULTS: Pre-post catheterization, between the catheterized and control arm, and between HE intensities were determined using mixed-linear model (SPSS 25).

RESULTS: FMD was impaired in the catheterized arm [6.4% (5.0, 7.7)] to 4.3% (2.9, 5.6)] but not in the control arm [6.5% (5.2, 7.8) to 6.5% (5.2, 7.9)], post catheterization (time*arm p<0.05). There was a significant dose-dependent increase in blood flow with incremental exercise (p<0.01). However, there was no difference in the exercise responses between arms or pre-post catheterization. Baseline RA diameter was higher in the catheterized arm post catheterization [0.28cm (0.26, 0.30) to 0.29 (0.28, 0.31); p<0.001]. There was no dilatation in the RA, in any condition, with increasing exercise intensity (p<0.05).

CONCLUSION: Endothelial function, assessed by FMD, was impaired 1 week post catheterization. Interestingly, the RA ability to dilate with increased blood flow was not apparent pre or post catheterization. This suggests either that the artery does not dilate at these exercise intensities, or that these patients have an inherent impaired vasodilation. Further work is needed to examine this with different exercise intensities/modes and in different groups following catheterization.

2925 May 31 4:05 PM - 4:15 PM Effect of Acute Hyperglycemia on Microvascular Hemodynamics and Tissue Oxygenation during Handgrip Exercise. Shane M. Hammer, Andrew M. Alexander, Kaylin D. Didier, Lillie M. Huckaby, Camryn N. Webster, Thomas J. Barstow, FACSM. Kansas State University, Manhattan, KS.

Acute hyperglycemia elicits endothelial dysfunction at rest through reactive oxygen species-mediated damage to the endothelial surface layer (ESL). The ESL is associated with many of the mechanisms responsible for appropriate microvascular adjustments to exercise. PURPOSE: To test the hypotheses that acute hyperglycemia would lead to 1) an ‘overshoot’ in deoxygenated heme concentration (deoxy-[heme]) at exercise onset reflecting greater fractional oxygen extraction and 2) less increase in total heme concentration (total-[heme]) during exercise reflecting less increase in microvascular hematocrit. METHODS: Three healthy young men (26 ± 4 yr) completed a 10-minute constant-load handgrip exercise test at 40% of peak power (9.6 ± 0.7 W) under control conditions (CON) and during acute hyperglycemia (HGL), i.e., 90-minutes after oral consumption of a 10 ounce solution containing 75g of dextrose. Near-infrared spectroscopy was used to measure deoxy-[heme] and total-[heme] of the flexor digitorum superficialis (FDS) continuously at rest and during exercise. RESULTS: Deoxy-[heme] and total-[heme] were significantly greater during exercise (189 ± 28 µM and 341 ± 34 µM, respectively) compared to rest (164 ± 13 µM and 302 ± 17 µM, respectively) (p<0.01). Deoxy-[heme] and total-[heme] were significantly greater during exercise (181 ± 14 µM and 327 ± 22 µM, respectively)
**S634**

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**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

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**F54**

**Free Communication/Poster - Youth**

Friday, May 31, 2019, 1:00 PM - 6:00 PM

Room: CC-Hall WA2

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**2926**

May 31 4:05 PM - 4:15 PM

**A Longitudinal Investigation On The Effect Of Age And Sex On Flow-mediated Dilation In Children**

Joey P. Baccauan1, Katharine D. Curric2, Nicole A. Proudfoot1, Brian W. Timmons1, Maureen J. MacDonald1.1, McMaster University, Hamilton, ON, Canada. 2Michigan State University, East Lansing, MI.

No relevant relationships reported

Flow-mediated dilation (FMD) is a non-invasive assessment of arterial endothelial function. Previous cross-sectional analysis suggests resting arterial diameter and FMD increase throughout childhood, with no sex-based differences in FMD until girls exceed that of boys at 17-18 years old. No previous investigations included longitudinal examinations of the change in FMD over time, between boys and girls.

**PURPOSE:** To assess the effects of age and sex on arterial diameters and FMD in school-aged children annually over a 3-year period. We hypothesized that resting arterial diameters will be larger in boys compared to girls at every time point and will increase each year, in both sexes. We also hypothesized that there would be no difference in FMD in girls versus boys over all 3 years as all of the children were tested younger than 17-18 years.

**METHODS:** This observational study assessed 100 participants initially aged 8.5±1.1 years, (range 6-10 years, 53 boys) annually for 3 years from the School-age Kid's health from early Investment in Physical activity (SKIP) study. The primary outcome was brachial artery FMD, which was measured using ultrasound technology. **RESULTS:** One-way repeated measures ANOVA was followed up with paired-sample t-test to compare mean differences between years. Two-way repeated measures ANOVA with sex as the between subjects' factor was used to determine interaction effects. Resting arterial diameter was largest across the cohort at year 3 (2.8±0.28mm) compared to year 1 (2.7±0.30mm, p=0.001) and year 2 (2.7±0.30mm, p=0.001). Contrary to our hypothesis, allometrically scaled FMD for boys was larger than girls (boys: 6.4±3.09, girls: 6.2±3.17mm, p=0.002) and no time differences were observed between years 1, 2 and 3 (year 1: 6.2±3.13, year 2: 6.2±3.14, year 3: 6.35±3.15%, p=0.67). On average, boys had a larger resting arterial diameter compared to girls (boys: 2.8±0.3, girls: 2.6±0.24, p=0.001). **CONCLUSION:** Differences observed in resting arterial diameter are driven by year 3 data and allometrically scaled FMD was larger in boys compared to girls, which may be explained by boys having larger resting arterial diameters compared to girls, and may also be accounted for by rapidly changing growth patterns in children. Funded by CIHR.

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**2927**

May 31 4:15 PM - 4:25 PM

**HiITing The Brain enhances Cerebrovascular shear Stress; The Link To Neuroprotection?**

Damian M. Bailey1, Takuro Washio2, Kazuya Suzuki3, Shigehiko Ogoh4, FACSM5, University of South Wales, Pontypridd, United Kingdom. 6Toyo University, Kawasaki, Japan.

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No relevant relationships reported

High-intensity interval exercise training (HIIT) is considered a more time-efficient alternative to moderate-intensity continuous training (MICT) that can optimize local vasodilatation. However, the underlying mechanisms of this vascular action are currently under investigation.

**PURPOSE:** Pilot examination to characterise local cerebrovascular shear stress responses during an acute bout of HIIT and MICT.

**METHODS:** Following ethics approval, 2 physically-active males (21-23 yrs) were randomly assigned to HIIT or MICT (semi-recumbent cycling) preceded by a standardized warm-up separated by sufficient time to allow for full haemodynamic recovery. During HIIT, subjects performed 3 intervals (each consisting of 2 mins at 60W and 2 mins at 100W) and for MICT, isovolume work performed continuously at 80W for 12 mins. Diameter, blood flow and shear rate in the internal carotid artery (ICA) were measured using Doppler ultrasound at rest and averaged over the final 4 mins of HIIT and MICT. The end tidal partial pressure of carbon dioxide (PETCO2), heart rate (HR), mean arterial pressure (MAP) and oxygen uptake (FO2) were recorded continuously photoplethysmography and respiratory gas analysis.

**RESULTS:** Exercise-induced increases in HR, MAP and FO2 were comparable between HIIT and MICT and were accompanied by an equivalent, progressive reduction in PETCO2. In contrast, ICA diameter decreased more markedly during HIIT [Δ (exercise minus rest) HIIT: -0.15 mm vs ΔMICT: 0.01 mm] with increased velocity (ΔHIIT: 7.75 vs. ΔMICT: 3.39 cm.s⁻¹) and corresponding elevation in shear rate (ΔHIIT: 38 vs. ΔMICT: 9 s⁻¹).

**CONCLUSION:** These findings, albeit proof-of-concept, provide preliminary evidence highlighting a fourfold greater elevation in local cerebrovascular shear stress during HIIT compared to an equivalent volume of MICT. This is primarily attributable to local vasodilatation that cannot be explained by hyperventilation-induced hypocapnia though likely represents a functional response coupling cerebral O2 delivery to demand. To what extent repeated exposure to the intermittency of HIIT-induced cerebrovascular shear stress confers enhanced neuroprotection in the long-term is currently under investigation.

Supported by a Royal Society Research Fellowship (#WM 100707)

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**2928**

May 31 4:25 PM - 4:35 PM

**Impairments In Lower Limb Microvascular Function Associated With Cycle Phases In Young Healthy Women.**

Rogério N. Soares, Anmol T. Mattu, Juan M. Murias. University of Calgary, Calgary, AB, Canada.

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No relevant relationships reported

Impairments in lower limb microvascular function associated with cycle phases in young healthy women.

Rogério N Soares, Anmol T Mattu, Juan M Murias. University of Calgary, Faculty of Kinesiology.

Purpose: Differences in women’s hormone concentrations throughout the menstrual cycle affects vascular responsiveness. Previous investigations have shown that these changes can be modulated by regular use of oral contraceptives. However, most of these studies only assessed changes in vascular function at the upper limb conduit artery level. This study investigated whether vascular function at the lower limb microvasculature of healthy young women might be affected by the phase of the menstrual cycle. Methods: 14 young (25 ± 5 years of age) physically active women participated in the study. The participants were assigned to two groups of seven participants each according to oral contraceptive use: non-contraceptive group (women who did not use any contraceptive within the last two years prior to the intervention - NCP) and oral contraceptive group (seven women who used oral contraceptive regularly for at least two years prior to the intervention – OCP). The participants underwent two lower limb vascular occlusion tests (5 min of baseline, 5 min of occlusion, and 8 min following cuff release) in two different phases of the menstrual cycle (follicular and luteal phase). Microvascular responsiveness was assessed by the percent of change of the NIRS-derived muscle oxygen saturation (SO2) reperfusion slope (%/sec) of the tibialis anterior muscle. Results: There was no difference in the reperfusion slope of the NCP group between the follicular (1.18 ± 0.5 %/sec) and luteal (1.01 ± 0.3 %/sec) phases. The reperfusion slope of the OCP group was significantly steeper in the follicular (0.85 ± 0.2 %/sec) compared to the luteal phase (0.63 ± 0.2 %/sec). Conclusion: Use of oral contraceptive is associated with reduced microvascular function in the luteal phase in young physically active women.

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**2955**

May 31 2:00 PM - 3:30 PM

**Vertical Jump and Agility Performance Improves After 8-week Conditioning Program in Youth Female Volleyball Athletes**

William D. Hale1, Roger O. Kollock1, Jeff Pace1. 1The University of Tulsa, Tulsa, OK. 2Titan Sports and Performance Center, Tulsa, OK.

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No relevant relationships reported

Volleyball athletes must employ specific conditioning exercises with high levels of force, high rates of speed, and quick changes of direction. Volleyball sport-specific vertical jumping ability can be assessed through various types of vertical jumping protocols such as the block vertical jump (BVJ), the countermovement vertical jump (CMJ), and the two-step approach vertical jump (AVJ). Sport specific agility testing for volleyball can be assessed with a 9-cone (9C) test to determine the athletes’ ability to respond quickly and accurate movement with change-of-direction and/or acceleration and deceleration.

**PURPOSE:** The purpose of this study was to determine if an 8-week combined high intensity interval training and plyometric (HIIT-PT) conditioning program improves
performance on three vertical jump protocols and agility time in youth female volleyball athletes. METHODS: Eleven female youth volleyball players (ages: 15±2.7 yrs.; height: 68.2±1.3 in; mass: 143.5±14.8 lbs) completed an 8-week summer HIIT-PT conditioning program. The 8-week summer conditioning program consisted of combined 2 x week (60 min each) high intensity interval exercises and 2 x week (60 min each) plyometric exercises. Three vertical jump protocols (BVJ, CMJ, AVJ) and an agility test (9C) were administered at the beginning of the first week and at the end of week 8 of the summer HIIT-PT conditioning program. RESULTS: Prior to data comparisons, a Kolmogorov-Smirnov test of normality was performed for each of the four variables and determined to be from a normal distribution (BVJ: p = 0.06, CMJ: p = 0.20, AVJ: p = 0.18, 9C: p = 0.12). A series of paired sample t-tests were performed to compare pretest and posttest vertical jump heights (inches) and agility times (seconds). All three vertical jump protocols significantly increased (BVJ: 14.6 vs 16.1, p = 0.000; CMJ: 17.3 vs 18.4, p = 0.000; AVJ: 21.0 vs 23.1, p = 0.001) and agility times decreased (9C: 25.3 vs 23.6, p = 0.000) following the 8-week HIIT-PT summer conditioning program. CONCLUSION: Results from this study indicate that employing an 8-week combined HIIT-PT conditioning program may improve jumping and change-of-direction outcomes in youth female volleyball athletes.

Purpose: The purpose of this study was to determine if the Talk Test (TT) is a valid measure of exercise intensity at VT in children. Methods: Thirty healthy children (age 8-12 y) performed maximal incremental exercise with respiratory gas exchange and with the TT. During the last 30 seconds of each stage they read a passage containing 100-106 words and were asked if they could “speak comfortably”. Gas exchange was measured and was used to identify VT. Comparison measurements occurred at the last positive (LP), equivocal (EQ), and negative (NEG) stages of the TT. Results: There were significant (p<0.05) differences in VO2 (VT vs LP and NEG stages; 0.95 vs 0.80 vs 0.71), 0.284* and 1.17, 0.504*), HR (VT vs LP, EQ, and NEG stages; 136.0 ± 19.0 vs 126 ± 12.91, 0.05 vs 15.40* and 160.5 ± 16.28, *), and RPE (VT vs LP and NEG stages; 5.2 ± 7.0 vs 3.6 ± 1.32, 0.09*) Conclusion: It was concluded that the EQ stage of the TT was a valid measure of the exercise intensity at VT in children, as it is already known to be in adults.

With physical training and normal adolescent growth, gains in lean muscle mass can be seen among the healthy adolescent population. Assessing these gains is crucial to physical training and normal adolescent growth, gains in lean muscle mass can be seen among the healthy adolescent population. Assessing these gains is crucial to

To classify the health status of children, criterion standards for body composition and body mass index (BMI) have been established by FITNESSGRAM according to gender and age. Standards for aerobic capacity (AC) have also been established to assess cardiorespiratory function. Tri-Ponderal Mass Index (TMI) has been shown to better classify overweight and obesity than BMI in youth. PURPOSE: The purpose of this study was to determine the association between TMI and FITNESSGRAM BMI classification in sixth-grade children. METHODS: Data from children 3-5 years old (N=352, 179 males) who participated in the National Youth Fitness Survey (2012) were used. Included in this study were demographics, anthropometrics, physical activity questionnaire by parent report, and motor skill score determined by Test of Motor Development-2nd Edition. Multiple regression was conducted to examine the relationship between physical activity and motor skills controlling for sex, race, and parent’s socioeconomic status. RESULTS: The most commonly reported activities were running (43%), playing outdoor games (35%), and riding a bike (34%). Motor skills standard scores were locomotor (Mean (SE)=9.99 (1.61)), object control (Mean (SE)=8.52 (0.14)), and gross motor skill (Mean (SE)=95.57 (6.8)). Participation in the following activities were positively related to gross motor skill score: riding a bike (β (SE)=5.27 (2.02), p=0.02), and scooter riding (β (SE)=9.83 (2.59), p=0.002), swimming (β (SE)=4.01 (1.17), p=0.004), and jumping on a trampoline (β (SE)=7.45 (3.09), p=0.03). The exception of riding a bike the activities positively related to gross motor skill score had a reported range of participation between 7-12%. CONCLUSIONS: The key findings of this study indicated that participation in specific physical activities were related to gross motor skill score in preschool aged children. Further, it showed that with the exception of riding a bike the activities that the children participated in the most were not the same as those activities that were positively related to their gross motor skill score.
between TMI and BMI was .98, and the correlation between BMI and AC was .82. The correlation between TMI and AC was .80. Receiver Operating Characteristic (ROC) analysis indicated that a TMI of 13.97 represents the best cut-off score for classifying girls within the HFZ for BMI, with 94% classified correctly, and AUC = .98. Also, a TMI of 13.41 represents the best cut-off score for classifying boys within the HFZ for BMI, with 94% classified correctly, and AUC = .98. For determining High Risk classification for BMI, a TMI of 14.90 represents the best cut-off score for classifying girls as High Risk for BMI, with 96% classified correctly, and AUC = .98. Also, a TMI of 15.24 represents the best cut-off score for classifying boys as High Risk for BMI, with 94% classified correctly, and AUC = .98. CONCLUSIONS: TMI is strongly associated with classification according to FITNESSGRAM BMI standards in sixth-grade children. These data suggest that a TMI of 13.97 for girls and 13.41 for boys are the best criteria for HFZ classification for FITNESSGRAM BMI. Also, a TMI of 14.90 for girls and 15.24 for boys are the best criteria for High Risk classification for FITNESSGRAM BMI. TMI is a substantial factor in determining overweight and obesity, and body size has been shown to be an important health-related outcome, especially in youth.

A Comparison Of Health-related Fitness Variables Between Youths In Singapore And Taipei

Yew Cheo Ng1, Govindasamy Balasekaran, FACSM1, Stanley Sai Hui1, FACSM2, Vishvakshar Vycitor Govindaswamy1, Jolene Lim1, Peggy Bogy1, 1Nanyang Technological University, Singapore. 2The Chinese University of Hong Kong, Hong Kong, Hong Kong. 3Concordia University Chicago, Chicago, IL.

Health-related fitness (HRF) variables may reduce cardiovascular risk factors if detected early in youths. A comparison between two similar high-density cities may reveal more information on their health status. PURPOSE: To compare HRF variables between youths in Singapore (SGP) and Taipei (TP).

METHODS: A total of 1595 youths from SGP (age: 13.49 ± 1.21 years, height: 159.76 ± 8.94 cm, weight: 51.91 ± 13.8 kg, Body Fat (BF): 21.5 ± 10.25 %) and 1620 youths from TP (age: 13.84 ± 0.91 years, height: 160.89 ± 7.86 cm, weight: 55.57 ± 13.35 kg, BF%: 23.29 ± 10.30 %) participated in this study. Body Mass Index (BMI) was calculated and BF% was measured by bio-electric impedance analysis. Aerobic fitness, lower limb flexibility, arm strength, and abdominal endurance were tested using the 15m youth Progressive Aerobic Cardiovascular Endurance Run (PACER) test, one-legged sit-and-reach (SRT), handgrip strength (HS), test, and 1-minute sit-up test (SUT) respectively.

RESULTS: Higher percentage of youths from TP were in the normal (TP: 54.88%, SGP: 46.89%) and overweight (TP: 18.15%, SGP: 12.70%) BMI range, while there was a higher percentage of overweight youths in SGP (40.41%) compared to TP (26.90%). Significant differences were found between SGP and TP for height (SGP: 159.76 ± 8.94 cm, TP: 160.89 ± 7.86 cm, p < 0.0005), weight (SGP: 51.91 ± 13.8 kg, TP: 55.57 ± 13.35 kg, p < 0.0005), BMI (SGP: 20.19 ± 4.21 kg/m², TP: 21.35 ± 4.28 kg/m², p < 0.0005), BF% (SGP: 21.51 ± 10.25 %, TP: 23.29 ± 10.30 %, p < 0.0005), SRT (SGP: 55.57 ± 10.1 cm, TP: 51.79 ± 12.02 cm, p < 0.0005), SUT (SGP: 38.94 ± 11.92, TP: 33.03 ± 9.71, p < 0.0005), HS (SGP: 40.93 ± 23.30, TP: 37.75 ± 18.86 s, p < 0.0005). No significant difference was found in HS between youths in both countries (SGP: 25.18 ± 7.77 kg, TP: 25.45 ± 7.33 kg, p = 0.32), with SGP having a lower obesity rate (SGP: 12.7%, TP: 18.15%).

CONCLUSIONS: Higher BMI and BF% values were found in TP as compared to SGP. While youths in both countries had similar arm strength, SGP youths had higher abdominal endurance, better flexibility and higher aerobically fitness as compared to TP youths. Youths from both countries have differences even with similar population density and should maintain their fitness health status through physical activities as this will help to reduce the risk of cardiovascular diseases in the future.
Assessment of Motor Quotient (CAMQ), for the assessment of childhood motor quotient had been proposed in theory, but validity data were lacking. The purpose of this study was to explore validity evidence in the CAMQ among children 7 to 9 years.

METHODS: The CAMQ validity was evaluated through two analyses that utilized cross-sectional data obtained through local schools in Chongqing, China. A confirmatory factor analysis (CFA) compared the data to the theoretical model. Patterns of association between age and gender and the CAMQ total and domain scores were examined using regression models. The CAMQ was completed by 572 children (53.5% male) in 7 to 9 years (mean 8.2 years), with all guardian of children approached agreeing to participate.

RESULTS: The CAMQ model included three domains: physical competence (fitness), athletic performance (motor skill) and motor behavior (motivation). Using CFA analyzed the validity data 577 children with complete raw scores. The results showed the χ2/df=2.79, GFI = 0.96, CFI=0.95, NFI=0.93, TLI= 0.95, RMSEA=0.05. Regression models showed that interpretative categories, developed from age and gender-adjusted normative data, were not associated with age indicating that the CAMQ is suitable for use across this age range. Children’s gender was associated with physical competence and athletic performance domain scores, indicating that further research is required regarding the gender adjustment of the raw CAMQ scores.

CONCLUSIONS: The CAMQ offers a comprehensive assessment of physical competence, athletic performance, and motor behavior as components of children motor quotient (7 to 9 years). Monitoring these measures enhances our understanding of children’s motor quotient and assists with the identification of areas where additional supports are required.

ACKNOWLEDGEMENT: Supported by NPOPPS 15CYT011, Humanities and Social Sciences by Ministry of Education 17YC890020, and Fundamental Research Funds for the Central Universities 1709240.

# Board 10
**Comparison Of Adolescents’ Fitness Between Hong Kong, Taipei And Shanghai**

**Peggy Boey**, Govindasamy Balasekaran, FACSIM, Stanley Sai-Chuan Hui, FACSM, Yong Mei Liu, Dajiang Lu, Vishnu Nair, Victor Govindaswamy, Ng Yew Choel, Jolene Zhiyuan Lim, Nanyang Technological University, Singapore, Singapore. The Chinese University of Hong Kong, Shatin, Hong Kong. National Yang-Ming University, Taipei, Taiwan. Shanghai University of Sport, Shanghai, China. Concordia University Chicago, Chicago, IL.

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(No relevant relationships reported)

**Results:**

Poor health status in childhood has been documented to persist into adulthood, reducing quality of life. Poor health status in childhood has been documented to persist into adulthood, which would lead to higher cardiovascular diseases in future which would lead to higher quality of life.

**Methods:** Adolescents from Shanghai, Hong Kong and Taipei are vastly different in all health-related fitness variables which could be attributed to environmental and social factors. However, they are generally healthy and fit with good BF% level and CF. Adolescents should continue to be exposed to regular physical activity. To conduct a statistical analysis of the data, one-way ANOVA and multiple comparisons (Tukey’s HSD test) were employed. Significant differences were observed in the inverse relationship between BF% and CF (r = -0.46; p < 0.0005), and abdominal strength and CF (r = 0.54; p < 0.0005). Significant differences were found to be poor. In the lean children, the reason is thought to be low muscle mass and expenditure due to a lack of physical activity. Moreover, their low expenditure failed to show the χ2/df = 2.79, GFI = 0.96, CFI = 0.95, NFI = 0.93, TLI = 0.95, RMSEA = 0.05. Regression models showed that interpretative categories, developed from age and gender-adjusted normative data, were not associated with age indicating that the CAMQ is suitable for use across this age range. Children’s gender was associated with physical competence and athletic performance domain scores, indicating that further research is required regarding the gender adjustment of the raw CAMQ scores.

**Conclusions:** The CAMQ offers a comprehensive assessment of physical competence, athletic performance, and motor behavior as components of children motor quotient (7 to 9 years). Monitoring these measures enhances our understanding of children’s motor quotient and assists with the identification of areas where additional supports are required.

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**Board 11**

**The Effects of Plyometric or Combined Training on Kicking Time in Teenager Taekwondo Athletes**


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(No relevant relationships reported)

**Purpose:** To compare the effectiveness of a general plyometric training (GP) and a GP plus transfer exercises (GP + TE) on kicking time (KT) in cadet and junior taekwondo athletes.

**Methodology:**Volunteers were 33 athletes between 12 and 17 years old and taekwondo practice experience of 3.0 ± 1.2 yr. Participants were randomly assigned to GP, GP + TE, or a control (CON) group, and underwent a 3-week intervention, training 3 times per week. The training session was divided into a stretch, a general warm-up and the treatment phase, according to the specifications for each group, each lasting approximately 10 min. Following the intervention, the athletes completed their regular training. The exercises performed by the participants only differed in the 10-min lasting the intervention. The GP group completed 8 sets of 6 repetitions of countermovement jumps (CMJ), the GP + TE group completed the same exercise exercises as the GP group immediately followed by a taekwondo kicking technique on a kicking pad. The CON group only performed static stretching. A Fitlight Trainer System was used to measure before and after KT performance. For the KT drill, the athlete was instructed to use the dominant leg in a circular kick (“Bandal Chagui”) and in a frontal kick (“Mipan Chagui”). The front leg was used for both kicks, and the first sensor of the measurement system was located at ankle height to start the time and a second sensor was located at the height of the performer’s navel to stop the time and register the KT.

A 3 × 2 (groups × measurements) general linear model ANOVA was used to analyze K.T. Results: No significant interaction or main effects were shown on circular kick KT scores (p > 0.05). A significant measurement main effect was found on frontal kick KT (F = 4.743, Pre < 0.054 vs. Post = 0.344 ± 0.0046; p < 0.037) regardless of the experimental group. Conclusion: The GP and the GP + TE training elicited similar improvements in frontal kick KT in cadet and junior taekwondo athletes. Circular kick KT was unaffected by training.
[PURPOSE] This study aimed to measure the intensity of a given physical exercise during an elementary school level physical education class.

[METHODS] The subjects of this study were 28 elementary school children (16 boys and 12 girls) in the 5th grade. To measure exercise intensity, a Lifecorder GS (manufactured by SUZUKEN Co., Ltd) was used. There were five target units of exercise including long jump, expression, tag rugby, hurdle run, and Tee-ball. The length of each class as well as the proportion of each exercise were measured according to the period recording method (Instruction, Management, Motor learning, Cognitive learning). To assess the difference in intensity across each of the five units of exercise, the coefficient of variation (CV) was calculated. A corresponding one-way analysis of variance (ANOVA) and multiple comparison test were used for clarification. In addition, when Bartlett’s test was applied and a significant main effect was observed, a test of equal variances between the two groups was used.

[RESULTS] Regarding individual differences in exercise intensity, significant differences were found between tag rugby and both ball games and long jump, as well as between expression and long jump. The coefficient of variation was calculated as follows: expression (29%), tag rugby (27%), Tee-ball (25%), hurdle run (18%), and long jump (17%). In addition, differences in units were significantly higher in exercise intensity between hurdle run and tag rugby, expression and tee ball, as well as between long jump and Tee-ball.

[CONCLUSIONS] In physical education classes, there is a difference in physical activity among the five exercises measured, and it is presumed that the magnitude of these differences varies depending on the individual exercise. That such individual differences exist in physical education classes is, in itself, not a problem. However, this would become undesirable in any situation in which the difference becomes large, thus failing to ensure consistency in the amount of physical activity and potentially resulting in children performing less physical activity. In order to secure a consistent level of activity intensity in physical education lessons, it is necessary to take measures for children with less physical activity.

PURPOSE: The purpose of this study is to investigate the relationship between physical fitness characteristics of girls and their attitudes toward and preference for exercise and physical education.

METHODS: The participants of this study were 181 public elementary school girls, ranging from third grade to sixth grade. Eight items of a physical fitness test were divided by grade, and we calculated T-scores; the average T-scores of the eight items was taken as the total physical fitness score. An upper group of physical fitness was established for those that scored in the upper 25% (45 people); the lowest 25% (45 people) made up the lower group of fitness. These two groups were analyzed. A questionnaire survey was conducted using a five-point scale for the investigation of attitude and preference of exercise and physical education.

In order to investigate the difference between the attitudes toward and preference for exercise and physical education between the two groups, an independent t-test was used.

RESULTS: Statistical analysis of survey results demonstrated that 31 out of 40 items showed a significant difference. Among them, for items such as “I don’t want to get tired,” “I am not interested in exercise,” “I dislike feeling inferior,” “I don’t want people to know about my abilities,” and “I don’t want my friends to get angry when I can’t do something well,” the lower group reported higher scores than the upper group.

CONCLUSIONS: Based on physical fitness level, the upper group and the lower group displayed very different thinking processes about exercise and physical education. It is particularly conceivable that girls with inferior physical fitness have negative thoughts about exercise. In addition to this, girls with inferior physical fitness was suggested that tends to extremely dislike to be seen movement and to be evaluated by someone.

PURPOSE: This study aimed to clarify the difference between the amount of physical activity obtained and the physical fitness characteristics of infants in extended child care and those not in extended childcare.

[METHOD] Forty-two aged 6-years-old children enrolled in a private kindergarten participated with 21 of those having used extended childcare for two years or three years (the use group), and 21 who had not used it (the non-use group). The amount of physical activity the infants engaged in was measured using Panasonic’s Day calorie. For physical fitness and exercise ability, we conducted an infant physical fitness test and calculated the T score by gender and age (0.5 year categorizations) from the results of the seven items measured; the average T score of seven items was taken as the total physical fitness score. A t-test that did not correspond to the comparison between the number of steps and the total physical fitness score within the normal amount of childcare time of the use group and the non-use group was applied. In addition, Pearson’s correlation coefficient was used to examine the relationship between the use group and the non-use group’s physical fitness levels and overall physical fitness scores.

[Results and Discussion] The results of the analysis found that there was no significant difference in amount of physical activity and physical strength/exercise ability between the use group and the non-use group. Regardless of whether extended-hours childcare use is used or not, it appears that the same tendency was shown because all of the children are doing the same activities in their regular childcare hours. On the other hand, the extended-hours childcare children showed 2,335.84 steps per hour, so it is possible that extended-hours childcare is playing an important role in securing the amount of physical activity.

PURPOSE: This study aimed to clarify the relationship between physical fitness characteristics of girls and their attitudes toward and preference for exercise and physical education.
To compare elementary school children’s physical activity levels during two different seasons in Northern Norway.

METHODS: Elementary school children from 1st, 3rd, 5th and 7th grade were recruited to wear an accelerometer (GT3X-BT, ActiGraph, LLC, Pensacola, United States) for seven consecutive days during two different seasons: The winter season in November (n= 235), and the summer season in June (n= 214). The primary physical activity outcome was measured as total counts per minute and time spent at different activity intensities. We defined moderate-to-vigorous physical activity (MVPA) as ≥2000 counts per minute, as previously used (Ekelund et al., 2004).

RESULTS: Girls had more counts per minute during the measured week in the summer season (616 ± 380.5) compared to the winter season (589 ± 124.8) (p<0.001), while there was no significant differences among boys. Boys spent more time in MVPA during the winter season (71.5 minutes ± 26.7) compared to the summer season (61.5 minutes ± 12.9) (p<0.05). Children in 7th grade spent more time in MVPA during the winter season (64.6 minutes ± 26.1) compared to the summer season (44.9 minutes ± 23.6) (p<0.001). There were no differences between sexes for time spent in MVPA or counts per min (p>0.05) during the winter season, except for counts per min in 1st grade (p<0.05). During weekdays in the winter season, 53.1% of the children reached MVPA of ≥60 minutes physical activity daily. In weekdays during the summer season, 62.5% of the children reached MVPA ≥60 minutes.

CONCLUSION: Girls had more counts per minute during the measured week compared to the winter season, but there were no differences in time spent in MVPA. Boys spend more time in MVPA during the winter season compared to the summer season. 62.5% met the recommended 60 min per day of MVPA during the summer compared to the winter where 53.1% met the recommendations.

Board #18
May 31 2:00 PM - 3:30 PM
Associated Factors To Health Risk Behaviors in Adolescent’s Athletes
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PURPOSE: To verify associated factors with health risk behaviors (HRB) in Brazilian adolescents’ athletes. METHODS: Cross-sectional study, with 367 athletes (15.68±0.78 years) from Curitiba-PR/Brazil. The HRB evaluated were: insufficient levels of physical activity, high TV and videogame time, low consumption of fruits and vegetables, consumption of alcohol, tobacco and illicit drugs, sexual and violent behavior. Investigated associated factors were: sex, age, socioeconomic status, type of sport, years of training and weekly training volume, evaluated through questionnaires. Poisson regressions analyzed the factors associated with HRB, adopting p<0.05.

RESULTS: The collective sport (PR: 3.11, 95% CI: 1.13-8.58) and years of practice (PR: 1.14, 95% CI: 1.01-1.29) were positively associated to high TV time. For the high videogame time, inverse associations were seen for age (PR: 0.59, 95% CI: 0.39-0.89) and for the weekly training volume (PR: 0.92, 95% CI: 0.86-0.99), but not for years of practice (PR: 1.12, 95% CI: 1.01-1.25). For vegetable consumption, inverse associations were seen for the weekly training volume (PR: 0.98, 95% CI: 0.96 - 0.99). Age was positively associated with mild (PR: 1.64, 95% CI: 1.32-2.03) and excessive (PR: 1.82, 95% CI: 1.34-2.48) alcohol consumption. On the other hand, inverse associations were seen for the weekly training volume and mild (PR: 0.95, 95% CI: 0.92-0.99) and excessive (PR: 0.94, 95% CI: 0.89 - 0.99) alcohol consumption. Positive associations were seen for age (PR: 5.99, 95% CI: 3.36-27.38) and weekly training volume (PR: 1.20; 95% CI: 1.01-1.45) for tobacco consumption, and age for illicit drug use (PR: 18.08; 95% CI: 3.38-56.65). Girls were less likely to have sexual (PR: 0.28, 95% CI: 0.08-0.34) and violent (PR: 0.23, 95% CI: 0.08-0.62) risk behaviors. CONCLUSIONS: It was observed that characteristics of sports practice, such as years of practice and weekly training volume may favor healthy behaviors such as a lower videogame time, alcohol consumption and increased consumption of vegetables in adolescent’s athletes.

Board #20
May 31 2:00 PM - 3:30 PM
Relationship Between Physical Fitness Level At Age 6 And Motivation And Perseverance
Rio Kojima1, Kosho Kasuga2. 1Gifu University graduate school, Gifu, Japan. 2Gifu University, Gifu, Japan. (Sponsor: Kiyoei Tanaka, FACSM)

PURPOSE: The purpose of this study was to investigate the relationship between physical fitness (PF) level at the age of 6 and longitudinal change of motivation (M) and perseverance (P).

METHODS: The participants were 186 young children (87 boys and 99 girls). For measuring PF, PF tests for young children were conducted. Principal component analysis was performed for the seven PF test parameters, and first principal component scores were converted into T-scores classified by sex and age (categories spanning 0.5 years), which were treated as overall PF scores. The upper 25% of the overall PF scores was classified as a higher PF level group (47 participants), and the lower 25% of the overall PF scores was classified as a lower PF level group (47 participants). In order to objectively investigate young children’s personal characteristics with regard to “M”and “P”, a questionnaire survey was administered to the young children’s schoolteachers.

A two-factor analysis of variance (PF level group × grade) that corresponded to M and P was performed and principal component scores were compared. With respect to “M”and “P”, the results showed no significant interaction between PF level and grade; however, a significant main effect was observed between the PF level groups and grade.

The multiple comparison test between the grade levels showed that both “M”and “P” were significantly higher in the higher PF level group at age 6 than at age 4 and at age 5.

Discussion:

Board #19
May 31 3:30 PM - 4:30 PM
Comparison Of Physical Activity, Cardiovascular Endurance And Perception Of Quality Of Life Between Adolescents Engaged And Non-engaged In After School Sports Program
Ana Beatriz Pacifico1, Edina Maria De Camargo1, Thiago Silva Piola2, Jhonatan Gritten Campos1, Gislaina Cristina Vagetti2, Valdomiro De Oliveira2, Wagner De Campos2. 1Universidade Federal do Paraná, Curitiba - Paraná, Brazil. 2Universidade Estadual do Paraná, Curitiba - Paraná, Brazil. (Sponsor: Carlo Baldari, FACSM) Email: ana_pacifico@hotmail.com

Objective: To compare the level of physical activity, cardiovascular endurance and perception of quality of life of male and female adolescents, of three different periods: 1) engaged in after school sports programs; 2) engaged in any other type of regular physical exercise; 3) not engaged in any type of formal physical exercise.

METHODS: The sample consisted of 374 adolescents, 198 boys (16.35 ± 0.65) and 176 girls (16.19 ± 0.67). The QAPA questionnaire was used to evaluate the level of physical activity (min/week) and the Facer test for cardiovascular endurance (VO2 max). The KIDSSCREEN-52 was used to evaluate perception of quality of life. Anova’s One-way and post hoc Scheffé were used for the comparisons, with p<0.05.

RESULTS: non-exercising adolescents presented lower levels of physical activity (Boys: 471,72 ± 570.07 min/week; Girls: 332.09 ± 359.22 min/week) and cardiovascular endurance (Boys: 36.41 ± 7.00 ml/kg/min; Girls: 31.16 ± 3.23 ml/kg/min) when compared to those engaged in after school sports programs (Boys: 1074.17 ± 733.98 min/week; 40,15 ± 6,50 ml/kg/min; Girls: 985.00 ± 634,95 min/week; 33.46 ± 4.70, respectively) and other type of regular physical exercise (Boys: 866.89 ± 572.45 min/week; 38.49 ± 5.45 ml/kg/min; Girls: 615.43 ± 467.78 min/week; 32.96 ± 4.56 ml/kg/min, respectively), p<0.01. Boys (77.51 ± 8.45 points) and girls (74.88 ± 8.90 points) engaged in after school sports program had higher scores for perception of quality of life when compared to boys (72.74 ± 9.15 points) and girls (74.18 ± 6.95 points) engaged in other type of physical exercise and non-exercise boys (72.18 ± 10.31 points) and girls (69.98 ± 9.35 points), p<0.05.

Conclusion: engaged adolescents in after school sports programs presented higher levels of physical activity, cardiovascular endurance and better perception of quality of life. Support: Fundação Araucária.
Integrative neuromuscular training (INT) is a method of conditioning that includes strength and conditioning exercises which are designed to enhance both health- and skill-related components of physical fitness. While previous investigations have examined the effects of INT on performance, the acute cardiometabolic responses to INT have not been examined. PURPOSE: To examine the acute cardiometabolic responses to a specific INT protocol and to compare these responses to a bout of moderate intensity treadmill (TM) walking in children. METHODS: 14 children (10.7±1.1 yr) were tested for peak oxygen uptake (VO\textsubscript{2peak}) and peak heart rate (HR) on a maximal TM test and subsequently participated in 2 experimental conditions on nonconsecutive days: a 12-min INT protocol of 6 exercises and a 12-min TM walking protocol at 50% VO\textsubscript{2}peak. The INT protocol included balance board squats (EX1), medicine ball squats with press (EX2), planks with side step (EX3), medicine ball forward lunges (EX4), battling rope double arm waves (EX5) and medicine ball slams (EX6). Each INT exercise was performed twice for 30 sec with a 30-sec rest interval between sets and exercises. Participants performed the INT and TM protocols while connected to a metabolic system and HR monitor. RESULTS: Throughout INT mean HR significantly increased from 121.1±9.0 b/min during EX1 to 183.5±7.9 b/min during EX6 and mean VO\textsubscript{2} significantly increased from 14.9±3.6 ml kg\textsuperscript{-1}min\textsuperscript{-1} during EX1 to 33.3±6.0 ml kg\textsuperscript{-1}min\textsuperscript{-1} during EX6 (p<0.05). Mean HR and VO\textsubscript{2} values during INT ranged from 60.9% to 92.4% of HRpeak and from 28.1% to 63.0% of VO\textsubscript{2peak}, respectively. During the TM condition, mean HR and VO\textsubscript{2} values ranged from 121.1±11.7 b/min to 150.4±17.3 b/min and from 19.2±2.5 ml kg\textsuperscript{-1}min\textsuperscript{-1} to 26.8±6.2 ml kg\textsuperscript{-1}min\textsuperscript{-1}, respectively. Mean HR and VO\textsubscript{2} values were significantly higher during EX5 and EX6 of INT than during the same time intervals of TM walking (p<0.05). CONCLUSION: These data indicate that INT can pose a moderate to vigorous cardiometabolic stimulus in children, and selected INT exercises are more intense than moderate intensity walking.

Factors influencing peak power (PP) during childhood are still unclear. Even though physical activity in children consists mostly of high intensity short burst movement, there are limited longitudinal studies assessing PP during childhood. PURPOSE: To evaluate PP in children and identify the possible influence of sex and body fat (BF). METHODS: Forty-four children (24 girls and 20 boys), were evaluated in 1<sup>st</sup> grade and for the next four consecutive years (mean group age on the first and last evaluation: 6.4±0.5, and 10.5±0.5 years respectively). Counter-movement vertical jump height (JH) was determined using an electronic platform and converted to PP(W) using Canavan & Vescovi’s equation. Height and weight were measured, and VO\textsubscript{2} peak was estimated using post-exercise heart rate at 20 seconds after the exercise test (CIRC) and treadmill high-intensity interval running (TM) in children. RESULTS: Mean VO\textsubscript{2} peak was significantly different between girls and boys (p<0.05). Pearson correlations to evaluate relationships between JH, PP and relative power peak (RPP). Independent sample test was used to detect differences between sex. RESULTS: JH increased between grades, being significant between 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> grade (27.1±4.3, 28.4±4.2, 29.9±4.9, 31.7±6.0, 32.7±7.0 cm/s, for 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> grade respectively). RPP (W/kg) also increased significantly from 3<sup>rd</sup> to 4<sup>th</sup> grade (907.0±41.9, 1177.8±35.5, 1537.7±96.3, 1587.9±46.3, 1812.3±47.3 W for 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> grade respectively, p<0.01). No differences were found in JH or PP between boys and girls in any grade. Negative correlations were found between BF and JH (r = -0.48 , -0.59 , -0.63 for the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> grade respectively, p<0.01). Significant correlations were found between JH and PP for boys (r = 0.68, 0.71, 0.74 for the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> grade and 0.62 for the 4<sup>th</sup> grade, p<0.01). CONCLUSION: These results suggest that JH and PP increase similarly between boys and girls as they move from 1<sup>st</sup> to 4<sup>th</sup> grade and are negatively influenced by BF. Further studies addressing the variation in growth characteristics and health behaviors that potentially influence muscle power during childhood are needed. Supported in part by FIP/FDEG/UPRPRP.

Rope skipping is a fun and excellent moderate to vigorous physical activity (MVPA) for school students especially for elementary and junior high schools. Studies demonstrate that prolonged rope skipping exercise could effectively improve aerobic fitness. Considering the specificity principle in fitness evaluation, it is desirable to develop a rope-skipping specific exercise testing for evaluating aerobic fitness. Purpose The purpose of this study was to develop a prediction model to estimate peak oxygen uptake (VO\textsubscript{2peak}) from a sub-maximal cadence rope skipping test among secondary school students. METHODS A total of 58 secondary school students (38 boys, 20 girls, age=13.8±1.1 yrs) completed two different forms of rope-skipping exercises (free-style skipping & Gallop-style skipping, in randomized order) with a steady cadence of 60 skips per min, for 3 min each and at least 20 min apart. Exercise heart rates (EHR) throughout the 5-min skipping and additional 1-min post-exercise HR (PHR) were monitored continuously using Polar HR monitor. Students also completed a treadmill VO\textsubscript{2peak} test using calibrated direct VO\textsubscript{2} metabolic measuring system (COSMED K4b2). Moderate to vigorous physical activity habits (MVPA), in term of average min per day were assessed by questionnaire. VO\textsubscript{2peak} was then correlated with HER and PHR at various time points, as well as MVPA, BMI, age, and gender, using stepwise regression, to determine criterion-related validity. Regardless of skipping style, VO\textsubscript{2peak} was best correlated with PHR at 20s after the exercise, followed by MVPA, gender, and BMI. The best equation was: VO\textsubscript{2peak} = 70.422 + (7.542*gender) + (1.26*MVPA) - (470*BMI) + (1.16*PHR@20); R = .870, SEE = 4.54 ml kg\textsuperscript{-1}min\textsuperscript{-1}, using the free-style rope skipping test. Both free-style and Gallop-style rope skipping gave similar level of criterion-related validity. CONCLUSION A 3-min free-style cadence rope skipping submaximal test was effective to estimate VO\textsubscript{2peak} of secondary school students using post-exercise heart rate at 20 seconds after the exercise, gender, and BMI. This test is particularly suitable for athletes of rope skipping to evaluate aerobic fitness due to its’ good validity and specificity.
Conclusions: The number of parents intending to create more opportunities for children to exercise increased. However, this change in consciousness did not necessarily lead to an actual increase. The result suggests that other factors are involved in increasing opportunities for children to exercise, such as time and environment. This study was limited by time constraints. Therefore, it is necessary to continue the program over a longer period of time and analyze further changes in parental consciousness to determine the influence on opportunities for children’s exercise activities.

Purpose: To describe the anthropometric and fitness profiles of 6-8 grade students who participated in 2-3 days/week of PE classes during the academic year.

Methods: Data was collected on all willing 6-8 graders from the years 1992 to 2002, for a total of 10 years. Body Comorbidities were included 1992 (height 79.3 ± 3.3 in, weight 102.6 ± 28.2 lbs), 1267 7th graders (height 62.4 ± 3.0 in, weight 117.7 ± 31.4 lbs), and 634 8th graders (height 63.1 ± 3.2 in, weight 125.7 ± 29.7 lbs) at a Chambersburg, PA Junior high school. Participants completed fitness measures (height, weight, one-mile run, and curl ups) once in a year. Descriptive/frequency statistics were used to examine dependent t-tests for each participant, analyzing by grade and gender. Values were compared to the normative healthy fitness zones (HFZ) by FITNESSGRAM. Results: 6th grade boys had a mean body mass index (BMI) of 19.7 ± 3.7 kg/m², one-mile run of 9.4 ± 2.3 minutes, and curl ups of 45.8 ± 10.1; 63.9% met the HFZ for BMI, 53.1% met the HFZ for one-mile run, and 67.2% met the HFZ for curl ups. 7th grade girls had a mean BMI of 20.6 ± 4.8 kg/m², one-mile run of 10.7 ± 2.3 minutes, and curl ups of 39.9 ± 10.7; 57.5% met the HFZ for BMI, 70.0% met the HFZ for one-mile run, and 94.7% met the HFZ for curl ups. 7th grade boys had a mean BMI of 20.2 ± 3.8 kg/m², one-mile run of 9.0 ± 2.6 minutes, and curl ups of 49.7 ± 11.6; 71.9% met the HFZ for BMI, 72.2% met the HFZ for one-mile run, and 97.1% met the HFZ for curl ups. 7th grade girls had a mean BMI of 21.5 ± 5.0 kg/m², one-mile run of 10.7 ± 2.6 minutes, and curl ups of 41.3 ± 10.7; 63.8% met the HFZ for BMI, 69.2% met the HFZ for one-mile run, and 98.7% met the HFZ for curl ups. 8th grade boys had a mean BMI of 21.1 ± 3.7 kg/m², one-mile run of 9.2 ± 3.3 minutes, and curl ups of 50.9 ± 11.6; 67.2% met the HFZ for BMI, 53.1% met the HFZ for one-mile run, and 85.8% met the HFZ for curl ups. 8th grade girls had a mean BMI of 22.6 ± 4.9 kg/m², one-mile run of 10.5 ± 1.8 minutes, and curl ups of 38.8 ± 9.6; 54.0% met the HFZ for BMI, 59.7% met the HFZ for one-mile run, and 80.1% met the HFZ for curl ups.

Conclusions: Many junior high aged children are not meeting standards that are accepted regarding BMI, one-mile run, and curl ups. More work is needed to decrease BMI and obesity in children. More physical activity/sports involvement outside of PE programs may be needed for children not meeting these HFZ standards.
were found between selected and non-selected athletes (p = 0.05). 4% of non-selected athletes dropped out of all sport participation. 84% of selected athletes were still in the same sport compared to 68% of athletes who left in the same sport but who were not selected. Discussion: In general athletes at try-out were already taller than the general population, in some sports were maturing earlier, and were born early in the selection year. If not selected a large percentage changed sports. Coaches should be aware of the consequences of selecting the oldest, tallest and more mature athletes on continued sports participation.

**BACKGROUND:** Children and adolescents with high levels of cardiorespiratory fitness (CRF) have a favourable cardiovascular risk profile and a reduced risk of myocardial infarction, stroke, and mortality in adulthood. Furthermore, levels of CRF tend to track from adolescence to adulthood. The 20m shuttle run test (20mSRT) is the most widely-used test to estimate CRF in adolescents. The Irish Life Health Schools Fitness Challenge is a national initiative designed to improve CRF levels among first year students attending Irish secondary-level schools.

**PURPOSE:** To assess the effect of the annual Irish Life Health Schools Fitness Challenge on CRF in 12-year old boys and girls between 2012 and 2017.

**METHODS:** Participating schools used a 20mSRT to assess CRF levels before and after a 6-week exercise intervention. The exercise intervention was designed and implemented by teachers. The results of this investigation suggest that it may possibly influence RFD in high school students despite girls displaying greater somatic maturity and multi-frequency bioelectrical impedance analysis to determine whole body phase angle (50 kHz), overall LBM, and segmental LBM of the arms, legs, and trunk.

Participants performed an IMTP with a custom-built rack and force plates to determine peak RFD, absolute PF, and PF relative to body mass. Stepwise linear regression was used to determine the relationships between IMTP performance and exercise. LBM as well as somatic development indicators of PIT with anthropometric and psychometric measures.

**CONCLUSIONS:** Independent sample t-tests were used to evaluate sex-based differences. Pearson correlations were also used to compare IMTP performance with overall LBM and whole body phase angle.

**RESULTS:** Sex-based differences were shown for maturity offset (female: 2.5±0.6y; male: 0.9±0.8y), whole body mass (LBM; female: 101.3±15.9kg; male: 117.8±18.3kg), arm LBM (female: 10.2±2.6kg; male: 12.7±2.7kg), RFD (female: 1596.17N‡s−1; male: 2742.41N‡s−1. RFD was significantly associated with arm LBM (r=−0.239; p=0.05) while the addition of trunk LBM improved the model (r=−0.454; p<0.05).

**CONCLUSION:** Significant sex-based differences in the upper body musculature likely influence RFD in high school students despite girls displaying greater somatic maturity than boys. Phase angle may also play a role in the rate of muscular strength expression in adolescents.

The Pediatric Inactivity Triad (PIT) has been recently proposed as a new way to examine the relationships between physical inactivity and impaired health in youth. Physical inactivity, dynapenia, and physical illiteracy are believed to be the primary determinants of PIT.

**PURPOSE:** The purpose of this investigation is to determine if important relationships exist between the proposed determinants of PIT with anthropometric and psychometric measures.

**METHODS:** Thirty children (10 females, 20 males) completed a series of tests and questionnaires to assess physical activity (Evaluation of Physical Activities in Youth: EASY), muscular strength and power (hand grip, vertical leap), physical literacy (Physical Literacy Assessment for Youth: PLaY), and trunk muscle performance (20mSRT). Work rate was increased until volitional exhaustion on a cycle ergometer on separate days. Protocol order was counterbalanced. The 20mSRT involved running back and forth between two lines 20m apart, keeping in time with a series of audio signals. The starting speed was 8.5 km.h-1 and increased by 0.14 m.sec-1 every min. The test was terminated if a participant stopped voluntarily, or was unable to maintain the set pace.

**RESULTS:** Mean 20mSRT score was significantly higher in boys than girls at baseline (p<0.001) by 16% (53.5±14.7 vs. 62.0±15.4) in boys (n=14,378) and 19% (29.8±9.7 vs. 35.4±10.2) in girls (n=14,759) (p=0.001). The results of this investigation suggest that it may possibly influence RFD in high school students despite girls displaying greater somatic maturity and multi-frequency bioelectrical impedance analysis to determine whole body phase angle (50 kHz), overall LBM, and segmental LBM of the arms, legs, and trunk.

Participants performed an IMTP with a custom-built rack and force plates to determine peak RFD, absolute PF, and PF relative to body mass. Stepwise linear regression was used to determine the relationships between IMTP performance and exercise. LBM as well as somatic development indicators of PIT with anthropometric and psychometric measures.

**CONCLUSIONS:** Independent sample t-tests were used to evaluate sex-based differences. Pearson correlations were also used to compare IMTP performance with overall LBM and whole body phase angle.

**RESULTS:** Sex-based differences were shown for maturity offset (female: 2.5±0.6y; male: 0.9±0.8y), whole body mass (LBM; female: 101.3±15.9kg; male: 117.8±18.3kg), arm LBM (female: 10.2±2.6kg; male: 12.7±2.7kg), RFD (female: 1596.17N‡s−1; male: 2742.41N‡s−1. RFD was significantly associated with arm LBM (r=−0.239; p=0.05) while the addition of trunk LBM improved the model (r=−0.454; p<0.05).

**CONCLUSION:** Significant sex-based differences in the upper body musculature likely influence RFD in high school students despite girls displaying greater somatic maturity than boys. Phase angle may also play a role in the rate of muscular strength expression in adolescents.

**BOARD #31 MAY 31 2:00 PM - 3:30 PM**

**Sex-Based Differences in the Upper Body Musculature May Influence Rate of Force Development in High School Students**

Erica R. Golstein,1 Michael J. Redd,2 Tristan M. Starling-Smith1, Alison M. Redd,2 Jeffrey R. Stout2,2 David H. Fukuda2.1

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(No relevant relationships reported)
metabolic rate (BMR) and resting metabolic rate (RMR). REE), but there are different operational definitions for REE, including basal classification in 61.4% of cases (see table). Comparing the findings of studies that use MET PA (1.51-2.99 METyBMR and METyRMR were calculated (Cosmed K4b
2). Participants also performed structured physical activities (PA) ranging for supine rest to 4.8 METyBMR and METyRMR were calculated
yBMR and METyRMR). There was a
3, 1, Anderson M. Marches 2, Erika K. Hussey2, Gil Guerra-Ju nel3, Ezquiel M. Goncalves1,

Determinant Factors of Cellular Health Among Adolescent Girls and Boys

Raquel David Langer1, Anderson M. Marques 2, Erika K. Hussey2, Gil Guerra-Ju ñer3, Ezquiel M. Goncalves1,

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(No relevant relationships reported)

Several studies have demonstrated that cardiorespiratory fitness (CFR) and body adiposity are strong indicators of health during childhood and adolescence. However, it is not known if these parameters are associated with cellular health. For example, phase angle (PA) is used to evaluate nutritional status and is an indicator of cellular health. PURPOSE: In this study, we test if body composition and CFR have an influence on cellular health among adolescents of both genders. METHODS: 203 girls (12.7 ± 1.3 years) and 221 boys (12.8 ± 1.3 years) were evaluated. The peak of height velocity (PHV) was used as an indicator of somatic maturation. The percentage of fat mass (%FM) was calculated based on skinfold thickness (triceps and calf). CFR was assessed with the Leger test. Bioelectrical impedance analysis provided parameters to calculate the values of PA and fat-free mass (FFM). Bivariate correlation was used to verify the association between PHV and PA, %FM, FFM and CFR. We used partial correlation to evaluate if PHV was a mediator of the relationship between PA, %FM, and CFR. A linear regression analysis adjusted by PHV was used to verify if variables (%FM, FFM and CFR) influenced cellular health among adolescents of both genders. RESULTS: The PHV showed a significant positive correlation with FFM in girls (r = 0.83, p<0.001) and boys (r = 0.83, p<0.001); with PA in girls (r = 0.24, p<0.01) and boys (r = 0.38, p<0.001); and with %FM but only in girls (r = 0.15, p<0.05). PHV was negatively correlated with CFR in girls (r = −0.54, p<0.001) and boys (r = −0.20, p<0.01). Linear regression of the PA and CFR showed the PHV had an effect on %FM in girls (β = 0.23, p<0.05) but not in boys (β = 0.01, p=0.834), on FFM in boys (β = 0.697, p<0.001) and in boys (β = −0.614, p<0.001). CONCLUSION: We discovered that PA when controlled by somatic maturation seems to be more influenced by %FM in girls, CFR in boys, and FFM in both genders of adolescents. Interestingly, cellular health and CFR (for girls) and %FM (for boys) were not associated with PA. This has implications for physical activity behavior for improved health in adolescents of both genders. Supported by CAPES (No. 23001.00422/98-30)

Youth metabolic equivalents (MET) are multiples of resting energy expenditure (REE), but there are different operational definitions for REE, including basal metabolic rate (BMR) and resting metabolic rate (RMR). PURPOSE: To compare MET, defined as multiples of BMR (METyBMR versus RMR (METyRMR), METHODS: Data from two studies (N = 255, 47.4% male, mean ± SD age 10.2 ± 1.5 years) were analyzed. For all participants, BMR was predicted using Schofield's equations. RMR was assessed during 30-min supine rest while wearing a portable metabolic unit (Cosmed K4b2). Participants also performed structured physical activities (PA) ranging from sedentary behaviors (SB) to vigorous PA. METyBMR and METyRMR were calculated by dividing steady state oxygen consumption by BMR and RMR, respectively. Values were compared using two-way (Activity X MET) analysis of variance on a mixed-effects model. Post-hoc tests were performed with Bonferroni correction (α = 0.05). METyBMR and METyRMR values were also classified as SB (≤1.50 MET), light PA (1.51-2.99 MET), moderate PA (3.00-5.99 MET), or vigorous PA (≥6.00 MET). Classifications were compared with a confusion matrix. RESULTS: There was a significant interaction between activity and MET calculation. METyBMR and METyRMR differed significantly for 20 of 31 activities (64.5%), with differences ranging from 0.2 MET for supine rest to 4.8 MET for the running course (p < 0.001). For intensity classification, METyBMR and METyRMR gave the same classification in 61.4% of cases (see table). CONCLUSION: METyBMR and METyRMR are comparable (within 5 MET) for SB, but higher for moderate to vigorous PA, becomes progressively higher than METyRMR as intensity increases, reaching differences >40% at METyBMR and METyRMR are not interchangeable units, and care is necessary when interpreting and comparing the findings of studies that use METy.
was evaluated based on number of errors during No-go stimuli. T-tests were applied to verify differences between independent variables and cognitive performance. Thereafter, a four step mediation was applied using SIBP as a mediator of the relation between BMI and number of errors. RESULTS: NNT group had higher number of errors compared to NT one (4.14 ± 0.92 vs. 2.43 ± 0.54, p = 0.002). In addition, a relationship between BMI and number of errors (β = 0.38, SE = 0.16, p=0.02) was found. However, when considering SIBP, this relationship was no longer statistically significant (β = 0.24, SE = 0.16, p = 0.13). The bootstrapped unstandardized indirect effect was 0.13 and the 95% confidence interval ranged from 0.02 to 0.35. This indicates SIBP as a full mediation of the relation between BMI and inhibitory control.

CONCLUSION: We confirm the relationship between body mass index and inhibitory control in children and for the first time present systolic blood pressure as a mediating mechanism.

2991 Board #37 May 31 2:00 PM - 3:30 PM Examining the Relationship Between Physical Activity and Cardiometabolic Biomarkers in Youth with Overweight or Obesity
Justin B. Moore, FACSM1, M. Rosa Bernal López2, Joseph A. Skelton1, Andrew M. South1, Antonio Vargas-Candel2, Ricardo Gómez-Huelgas1, Javier Benitez-Porres2.1Wake Forest School of Medicine, Winston-Salem, NC. 2Institute of Biomedical Research in Malaga (IBIMA), University Hospital of Malaga (Regional Hospital), Malaga, Spain. 3Institute of Biomedical Research in Malaga (IBIMA), University Hospital of Malaga (Regional Hospital), Malaga, Spain, Malaga, Spain. 4University of Malaga, Malaga, Spain.

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While physical activity is known to have beneficial effects in youth, including short-term improvements in adiposity, little is known regarding the association of physical activity with cardiometabolic biomarkers among youth. This is especially true in youth with overweight or obesity. PURPOSE: To determine the relationship between achieving 30 minutes of moderate-to-vigorous physical activity (MVPA) per day and markers of cardiometabolic health in youth with overweight or obesity. METHODS: Eighty-one children (mean age 6.7yrs ± 1.2, 54% male, 47% with overweight, 53% with obesity), who are participating in a longitudinal intervention to increase physical activity and cardiometabolic health provided data on physical activity (via accelerometer), body composition (via DXA), blood pressure, and fasting biomarkers (insulin, glucose, triglycerides, & cholesterol). A series of ordinary least squares regressions were conducted examining the relationship between the various markers (insulin, glucose, triglycerides, & cholesterol) and age, sex, and percent body fat (model two).

RESULTS: Our results indicated that percent body fat was negatively associated with achieving 30 minutes of MVPA (b = -2.98, P<0.01) after controlling for age and sex. Of the remaining biomarkers, only fasting insulin was associated with achieving 30 minutes of MVPA (b = -3.81, P<0.01), but this relationship became non-significant (b = 2.36, P<0.16) when adding percent body fat to the model (b = 0.50, P<0.01). CONCLUSIONS: Achieving 30 minutes of MVPA was negatively associated with adiposity, but other cardiometabolic biomarkers were not associated with achieving 30 minutes of MVPA among youth with overweight and obesity.

Supported by University of Málaga (Campus of International Excellence Andalucía Tech) and Institute of Health Carlos III, co-sponsored by the Fondo Europeo de Desarrollo Regional-FEDER (Miguel Servet Type 1 program C15/00028).
Patellofemoral pain (PPF) is a multifactorial knee pathology and prevalent in physically active individuals. Running is one of the most popular forms of exercise accounting with nearly 17 million runners in the US. Despite the health benefits, running may lead to injury with more than 20% of runners injured annually. Of those, 10% develop PFP. Emerging evidence suggests chronic PFP may lead to patellofemoral osteoarthrits, a condition characterized by cartilage breakdown. However, little is known about how activities that cause the symptoms of PFP influence cartilage health. Diagnostic ultrasound imaging is an emerging technique to measure cartilage thickness immediately after physical activity. No research has analyzed femoral cartilage deformation followed by running in patients with PFP.

PURPOSE: To determine if 30 minute running changes cartilage thickness and joint pain in patients with PFP compared to healthy adults.

METHODS: As part of an ongoing investigation, 6 adults (n=3 PFP, age: 21.3±0.6yrs, BMI: 20.5±3.2kg/m²; n=3 healthy, age: 21.0±1.0yrs, BMI: 21.9±1.4kg/m²) participated. A GE LOGIQe diagnostic ultrasound machine with a 12MHz linear probe was used to obtain the knee cartilage images before and after 30 minutes running. Perceived pain level was measured using a 10cm Visual Analog Scale (VAS). Correlation between percent cartilage thickness change and VAS was performed to measure the association between two variables and a simple regression analysis was performed to determine the predictability of cartilage thickness measure according to the pain level change.

RESULTS: Pain level and cartilage deformation showed a strong correlation (r=0.85, p<0.033), and pain level change explained 72% of the variance in cartilage thickness (R²=0.72, p = 0.03)

CONCLUSIONS: Though continuation of this investigation is needed to confirm our findings, the strong positive association between pain level and cartilage deformation implies that measuring pain by VAS before and after physical activities may be an easy and effective means for clinicians to evaluate cartilage deformation.
men, 9 women). Each participant stood on one leg unsupported, with the opposite foot reaching as far as they could without losing balance in 3 directions: anterior (ANT), posteroanterior (PA), and posterolateral (PL). There were significant differences in age and body mass index (p < .05) between groups. When standing on the dominant (right) leg, there was a significant difference (p = 0.037) in the PM reach distance between groups, with the left LBP group (86.1 ± 4.7 cm) reaching a shorter distance than the right LBP group (101.6 ± 5.2 cm). There were no significant differences in the ANT and PL directions. In addition, there were no differences in all directions between groups when standing on the non-dominant (left) leg.

**CONCLUSIONS:** The results of the study suggest that using a composite score may fail to show dynamic balance deficits. The PM reach direction appears to be the most challenging testing component for patients with LBP.

### 2998

**Board #44**  
**May 31 2:00 PM - 3:30 PM**  
**Skeletal Muscle Size, Quality And Function In Patients With Several Years After Total Hip Arthroplasty**

Akiro Yoshiko1, Kohei Watanabe1, Toshio Moritani, FACSM2, Moroe Beppu3, Ryoyuki Imuragi1, Taikuya Otani1, Hiroshi Shiratsuchi1, Naonobu Takahira1,1Chukyo University, Nagoya, Japan. 2Kyoto Sangyo University, Kyoto, Japan. 3Japan Hip Joint Foundation, Tokyo, Japan. 4Edogawa Hospital, Tokyo, Japan. 5The Jikei University, Tokyo, Japan. 6Fanabashi Orthopedic Hospital, Chiba, Japan. 7Kitasato University, Kanagawa, Japan. (Sponsor: Toshio Moritani, FACSM)

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(No relevant relationships reported)

Total hip arthroplasty (THA) leads decrease of physical activity and muscle function, and it would induce asymmetric motor performance in daily life since most cases of THA are applied to one side. For prevention of muscle dysfunction, some sports activities such as golf, walking, swimming and so on are recommended after THA. Recently, muscle quality, i.e. fat and/or connective tissue within skeletal muscle, has been used as one of important factors to determine muscle function. **PURPOSE:** The purpose of this study was to compare muscle size, quality and function between the operated and non-operated legs in patients with one side THA with several years’ exercise habits after THA. **METHODS:** Fourteen men and women (67.1 ± 5.3 years; height, 161.3 ± 6.8 cm; body mass, 65.5 ± 18.5 kg) with exercise habits, such as golf, participated in this study. They had THA surgery in either side several years ago (4.9 ± 2.5 years). B-mode transverse images of rectus femoris were taken using ultrasound system (Logiq e Premium, GE Healthcare, USA), and isometric knee extension strength (KE) was measured in both operated and non-operated legs. Muscle thickness as an index of muscle size, echo intensity as an index of muscle quality and KE were compared between operated leg and non-operated leg. **RESULTS:** There were no differences between operated leg and non-operated leg in muscle thickness (1.4 ± 0.5 cm vs. 1.4 ± 0.4 cm, P = 0.05), echo intensity (88.7 ± 17.8 u.a. vs. 88.9 ± 17.3 u.a., P > 0.05) and KE (38.3 ± 13.8 kg vs. 41.3 ± 12.3 kg, P = 0.03). **CONCLUSION:** As the result of several years passing after THA, the difference of thigh muscle size, quality and function was not shown between operated and non-operated leg. Several year’s exercise habits can improve not only muscle size and function but also muscle quality.
simple and easy approach. Using a randomized controlled trial design, we examined the effectiveness of 1-yr. supervised FMS (functional movement system) based training.

METHODS: 122 male, healthy college pilot trainees (20.1 ± 0.3 yr.) were randomly assigned to FMS training (n = 62) and regular physical education control (n = 60), 178.99 times, about 192 hours in total, during one year, and their height, weight and a set of fitness were measured before and after the study.

RESULTS: Overall adherence to prescribed exercise sessions was 178.99±12.95 times or a 93.6% adherence rate, and there is no difference between groups. FMS scores in the training group increased by 29.7% (from pretest of 13.8 ± 1.44 to posttest of 17.9 ± 1.03), but only 5.1% improvement in the control group (from 13.7 ± 1.28 to 14.4 ± 1.06). Similar changes were observed in weight, BMI, hand-grip (HG), stand-long-jump (SLJ) and Sit-&-Reach (S&R), which are summarized in the table below (M±SD).

<table>
<thead>
<tr>
<th>Group</th>
<th>Weight (kg)</th>
<th>Height (cm)</th>
<th>BMI</th>
<th>FMS</th>
<th>HG (kg)</th>
<th>SLJ (m)</th>
<th>S&amp;R (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0.85±1.50</td>
<td>0.02±1.30</td>
<td>0.70±3.81</td>
<td>1.83±1.69</td>
<td>0.10±0.07</td>
<td>2.42±1.05</td>
<td></td>
</tr>
<tr>
<td>Training</td>
<td>0.92±2.04</td>
<td>0.06±3.01</td>
<td>0.31±1.36</td>
<td>4.10±2.17</td>
<td>0.18±0.06</td>
<td>4.42±1.19</td>
<td></td>
</tr>
</tbody>
</table>

Effect size = 0.26

F = 7.388

* * * p< .01, * * * * p< .001.

CONCLUSIONS: The FMS based training can effectively improve FMS and other physical fitness of college pilot trainees.

KEY WORDS: exercise intervention, randomized controlled trial, college students

3002 Board #48 May 31 3:30 PM - 5:00 PM Low-volume High-intensity Interval Training On Cardio-metabolic Health And Adherence-related Psycho-perceptual Responses In Overweight/obese Middle-aged Adults Eric Tsz Chun Poon1, Jane Jie Yu1, Sinead Sheridan1, Ka Wing Chan1, Stephen H.S. Wong, FACSIM1. 1The Chinese University of Hong Kong, Hong Kong, Hong Kong. 2The University of Hong Kong, Hong Kong, Hong Kong. Email: ericpoonct@gmail.com

High-intensity interval training (HIIT) has been proposed as a time-efficient protocol to improve metabolic health. However, its practical efficacy in terms of cardio-metabolic and adherence compared with higher-volume moderate-intensity continuous exercise (MICE) remains unclear.

PURPOSE: To compare the training effects between low-volume HIIT and higher-volume MICE on cardio-metabolic and psycho-perceptual responses in overweight/obese middle-aged men.

METHODS: Twenty overweight/obese men (mean age: 48.0 ± 5.7 years) were randomly assigned to undertake either HIIT (n=10) or MICE (n=10) training for 8 weeks (3 sessions/week). HIIT sessions consisted of ten 1-minute intervals of exercise at 80-90% HRmax separated by 1-minute active recovery. MICE sessions involved 50-minute continuous exercise at 65-70% HRmax. Health-related variables including cardiovascular fitness (VO2max), body composition and cardio-metabolic blood markers were assessed before and after the intervention. Adherence-related psycho-perceptual variables including enjoyment and self-efficacy were also assessed after the intervention. Paired-sample t-tests were used to compare changes within a group before and after the intervention. Analyses of Covariance were used to compare the group difference in outcome variables after controlling for baseline values.

RESULTS: Both groups showed similar VO2max increase over the 8-week intervention (HIIT: 32.5 ± 5.6 to 36.0 ± 6.2; MICE: 36.3 ± 6.0 to 21.5 ± 40.2 ± 5.1 mL kg^-1 min^-1, both p < 0.05). Both groups had significant fat's loss (HIIT: 24.5 ± 3.4 to 23.2 ± 3.5; MICE: 23.0 ± 4.3 to 21.5 ± 4.1, both ps < 0.05) and there was a trend favoring MICE (p = 0.054). Compared to the baseline, MICE group significantly decreased weight, body mass index (BMI), waist circumference and glycated hemoglobin whereas HIIT increased high-density lipoprotein after the intervention. However, these variables did not differ significantly upon group comparison. The self-efficacy and enjoyment responses were found similar between HIIT and MICE (both ps > 0.05).

CONCLUSIONS: Our findings suggest that low-volume HIIT elicits a similar improvement of cardiovascular fitness and adherence-related psycho-perceptual responses as traditional higher-volume MICE in overweight/obese middle-aged men.

3003 Board #49 May 31 3:30 PM - 5:00 PM Features of Gaseous Metabolism during Exercise Tolerance Testing in Overweight Women Peizhen Zhang, Beijing Sport University, Beijing, China. (Sponsor: Xiangzong Shi, FACSIM) (No relevant relationships reported)

PURPOSE: To reveal differences of gas metabolism indexes between overweight and normal weight women when they did exercise under different load, instruct overweight women to do exercise scientifically.

METHODS: Women between 20 and 30 years were divided into normal weight(NW) group(N=15, BMI=18.23±9.4 kg/m2) and overweight(OV) group(N=15, BMI=24.5 kg/m2). After the baseline test, using modified Bruce treadmill protocol, the air metabolism indexes of two groups were determined by Cortex MetaMax 3B portable gas metabolic analyzer, including VO2 min, minute ventilation(MV), breathing frequency(BF), expiratory end-tidal CO2 concentration(ETCO2), inspiratory end-tidal O2 concentration(ETO2), arterial blood carbon dioxide partial pressure(PaCO2), VCO2, oxygen pulse and maximal voluntary ventilation(MMV), etc.

RESULTS: Most of indexes such as VO2, VCO2, MV rose gradually with the load increase during exercise tolerance testing except for ETO2, PaCO2, PaO2 and VCO2 of OW group at grade 4 and grade 5 was significant lower than NW group by 5.6 mmHg and 0.6L/min separately. ETO2 of OW group at grade 3 and 4 were significant lower than NW group about 0.5% and 0.6% respectively. During recovery stage, most of indexes decreased gradually, while ETO2 presented a rising trend. During the recovery stage, ETO2, of OW group was significantly lower than NW group(5.3% vs 5.8%), while MMV, MV and oxygen pulse were significantly higher than NW group. MMV of OW group at 2, 3 and 4 minutes were significant lower than NW group by 1L/min, 1L/min and 0.9L/min; MV of OW group was significantly lower than normal weight group by 17.9L/min, 20.1L/min and 16.9L/min. The oxygen pulse of OW group during whole 5 minutes recovery period were significantly higher than NW group by 2.7L/min, 3.9L/min, 3.9L/min, 2.9L/min and 2.0L/min. The gaseous metabolism between two groups was significantly different when they did 7.1 and 10.2 METs exercise.

CONCLUSIONS: Although there was no difference in gas metabolism between overweight and normal weight women in resting state, the respiratory function of overweight women was weaker than normal weight women during exercise, especially at the intensities of 7.1 and 10.2 METs. After exercise tolerance testing, the recovery rate of gas metabolism in overweight adult women was slower than that of normal weight women.

3004 Board #50 May 31 3:30 PM - 5:00 PM Effects of two Different Stretching Methods Program On Range of Motion in Military Paula Paraguassu Brandão1, Carlos José Nogueira2, Adriane Oliveira Sampaio2, Alisson Gomes Da Silva3, Mário César Conceição3, Gilmar Weber Senna4, Estêlio Henrique Martin Dantas4. 1Celso Lisboa University, Rio de Janeiro, Brazil. 2Air Force – FAB – Air Cadets Preparatory School, Barbacena, Brazil. 3Federal University of the State of Rio de Janeiro, Rio de Janeiro, Brazil. 4Catholic University of Petrópolis, Petrópolis, Brazil. 5Tiradentes University, Aracaju, Brazil. (No relevant relationships reported)

The proprioceptive neuromuscular facilitation and stretching methods are commonly applied in warm-up routines, often with the aim of injury prevention. PURPOSE: to investigate the effect of a 12-week program of flexibility training on range of motion (ROM) of shoulder and lumbar spine joints in male military. METHODS: 90 young male military (17.02 ± 1.24 years old), of a universe of 500 students from Air Cadets Preparatory School, were randomly assigned in 3 groups with 30 subjects each: one: stretching (SG), proprioceptive neuromuscular facilitation (FNPG) and control (CG). The ROM was measured by goniometry based on LABFIBE protocol in three moments: before, during (6-week) and after training (12-week). The experimental groups performed 3 sets with 5 seconds rest intervals, 5 times a week, for shoulder horizontal flexion (SHF), shoulder horizontal extension (SHE) and lumbar spine flexion (LSF). The scale of perceived exertion in the Flexibility (PERFLEX) (0 - 110) was used to control the intensity in both groups, SG (31 - 60) and FNPG (61 - 80). The exercise duration was 5 seconds for the SG and 8 seconds for each phase (contraction-relaxation) for the FNPG. RESULTS: There were no significant differences among 3 groups in the ROM baseline values. The comparative analysis of ROM rates, defined through one-way ANOVA combined with Tukey post-hoc test, showed significant differences in the following movements to the FNPG: SHF (Δ% = 4.6, p < 0.001); SHE (Δ% = 6.6, p < 0.002); LSF (Δ% = 5.6, p = 0.001). CONCLUSION: it was concluded that the program of flexibility training by FNPG resulted in higher rates of development of ROM when compared to the stretching.
Chinese Preschool Children (3-6 years old) Physical Activity Guidelines (2018 ed) recommends that preschool children should accumulate at least 180 minutes of physical activity (PA) at any intensity throughout the day, including no less than 60 minutes of Moderate-to-Vigorous PA (MVPA).

**PURPOSE:**

Step count/SC targets corresponding to these recommendations to assist parents and childcare workers, who will guide children to achieve the PA goal.

**METHODS:**

903 preschool children were instructed to wear the ActiGraph GT3x accelerometers sensor for more than 4 days, including at least 3 workdays and 1 weekend, for at least 6 hours per day. The ActiGraph GT3x was worn on the hip (SB), Light PA (LPA), Moderate PA (MPA), Vigorous PA (VPA). MVPA, Total PA (TPA) and SC were obtained by GT3x. Receiver operating characteristic curve (ROC) was applied to analyze the thresholds for SC associated with MVPA and TPA, as well as sensitivity and specificity. The statistical analysis was performed by SAS JMP 13.

**RESULTS:**

The survey obtained valid data from 795 participants. The total wearing days were 4520, with the wearing time of 765.12±96.96min. The time of SB, LPA, MPA, VPA, MVPA, TPA and SC was 470.27±150.24min, 24.65±74.25min, 42.99±20.53min, 16.27±12.50min, 59.26±30.91min, 304.93±94.65min and 8005±3160 steps, respectively. In 4520 days, 43.94% of MVPA for students enrolled in online walking reached to 180min. Only 3 days which contained 60min or more MVPA did not reach to 180min of TPA. The consistency test result was Kappa = 0.9987 (P<0.0001). Thus, the evaluation of MVPA was more valuable.

The study also carried out ROC analysis of SC and MVPA which reached to 60min or not. The result showed the Area Under Curve index was 0.5900, corresponding to the SC of 7686 steps. The specificity was 0.8505 and sensitivity was 0.7395. When setting the SC standard as 8000, which is close to 7686 steps, the consistency test result was Kappa = 0.5715 (P<0.0001), and it was acceptable.

**CONCLUSION:**

Based on the data, we suggest that SC target of 8000 steps per day can be used to determine whether Chinese preschool children meet the PA recommendations by the national guideline. Supported by Jiangsu Province Education Science 12th Five-Year Plan (T=2015/010) and General Administration of Sport of China Scientific Research Project (2015SB072)

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As female students enter college they are given many opportunities to be physically active including fitness classes and student gym memberships. Despite many benefits and opportunities, many female college students are not achieving the recommended 10,000 steps per day (Clemente et al, 2016). Activity trackers provide additional short bursts of MVPA and thus could be valuable tools for female college students to use to improve their physical activity levels. Therefore, the purpose of the study was to test if female college students could increase their MVPA if they had access to an activity tracker. The results showed that female college students who wore an activity tracker increased their MVPA by 25% compared to those who did not wear an activity tracker.

**PURPOSE:**

To determine the relationship of HRFK, PA, and HRFK instructional practices among female and male physical educators.

**METHODS:**

A three-part questionnaire was administered to physical educators (N = 796; 409 female) from seven US states. Part 1 of the questionnaire included the International Physical Activity Questionnaire (IPAQ), measuring vigorous, moderate, and light PA min/wk. Part 2 included 10-items from PE Metrics Standards 3 & 4 Assessment, measuring participants’ HRFK. Part 3 included the Physical Education Curriculum Analysis Tool (PECAT) to determine the extent to which participants teach and assess student HRFK. Survey responses were adapted to a 5-point likert scale. One-way ANOVA along with post-hoc tests were conducted and gender comparisons made.

**RESULTS:**

Female physical educators scored significantly higher in HRFK (85% HRFK, F(2,794)=4.17, r=.285, p=.002 [r=102, d=21]), and reported less weekly minutes of vigorous PA (1422.2 min/wk, F(2,794)=27.88, p<.0001, d=1.44) than male counterparts (82% HRFK, 157.5 min/wk vigorous PA). Females also reported significantly greater teaching of HRFK (14.8 vs 13.9, F(2,794)=3.09, r=2.37, p=.009, [r=.09, d=17]) and assessment of HRFK than male physical educators, approaching significance (9.7 vs. 9.3, F(2,794)=1.24, r=.157, p=.058, [r=.06, d=11]).

No differences in moderate and light PA were observed.

**CONCLUSION:**

In spite of participating in less weekly vigorous PA, female physical educators in the study demonstrated greater HRFK and emphasized teaching and assessing HRFK more, thus may be more effective in promoting health-related fitness and lifelong student PA.
post-survey results. Conclusion. Educating an athletic staff with 3 nutrition education interventions amplifies their knowledge base and self-efficacy; regardless of gender, title, or education level. This study warrants the need for further research to examine the implementation of this new knowledge base from the athletic staff to the athletes.

3009 Board #55 May 31 3:30 PM - 5:00 PM
Gender Differences in Golf Performance After Various Warm-ups
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Distinct injury differences exist between genders in golf, however, performance improvement benefits have not been studied.

PURPOSE: To examine golf performance differences by gender following individual and combined warm-up components.

METHODS: Sixty-five (31 male, 34 female) proficient golfers performed 5 baseline swings, followed by 10 swings after seven randomly ordered warm-up combinations (aerobic exercise (AE); stretching (ST); specific activity (SP); aerobic exercise & stretching (AE+ST); aerobic exercise & specific activity (AE+SP); stretching & specific activity (ST+SP); and all 3 components (ALL)), on non-consecutive days. Club and ball flight characteristics were measured.

RESULTS: Clubhead speed (CHS) improved following AE, SP, AE+ST, AE+SP, ALL (p<0.001), ST, and ST+SP (p<0.05). Carry distance (CD) improved after AE, AE+ST, AE+SP, ALL (p<0.001), ST, and ST+SP (p<0.05). Significant improvements were also seen in ball speed (BSPEED) for AE, AE+ST, AE+SP, ALL (p<0.001), SP, and ST (p<0.01), however, ST+SP showed non-significant increases. For launch angle (LA), AE, ST, AE+SP, and ALL (female) showed non-significant increases, whereas ST+SP, AE+ST, and ALL (male) showed non-significant decreases. Finally, in backspin (BSPIN), AE, ST, AE+SP, ST+SP (male), and ALL (female) showed non-significant increases, whereas AE+ST, ST+SP (female) and ALL (male) had non-significant decreases.

CONCLUSION: There were no significant gender differences following a warm-up. AE was the most valuable element to complete for performance improvement, with the greatest increases seen after AE+SP, AE, and ALL. ST significantly decreased CD, BSPEED, and CHS, however, ST+SP showed significant increases in CD and CHS, suggesting that 30 seconds of SP off-sets any negative effects of static stretching. Performance also significantly increased with AE+ST, suggesting that pre-warming the body may also negate any harmful effects of static stretching. The overall reliability was high (0.831-0.989), suggesting golfers had consistent swings, thus the performance changes were a result of the warm-up components. This was further supported by significant changes in CHS and BSPEED but not LA or BSPIN, indicating that CD improved solely as a result of increased BSPEED attributed to increased CHS.

3010 Board #56 May 31 3:30 PM - 5:00 PM
Actions of The Nasf-ab In A City Of The Extreme North Of Brazil
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PURPOSE: Analyze if the teams the Núcleo Ampliado de Saúde da Família e Atenção Básica (NASF-AB) - Extended Core of family health and primary health care - of Sistema único de Saúde do Brasil (SUSS) - Unified Health System – of Brazil, of the city of Macapá in the State of Amapá, It's act in accordance with what is proposed by the Ministry of health.

METHODS: The present study is a descriptive and explanatory research. It includes both qualitative and quantitative character. Which is used the monthly reports of the Ministry of health.

RESULTS: The results obtained from the documentary survey show a good analysis about NASF-AB professionals’ actions. It was analyzed 3 among 9 available which are health actions, individualized care and home visits accompanied with the Estratégia Saúde da Família (ESF) - The family health strategy. The analysis took into account all the professionals that compose the teams and their actions of the selected items. Among the data obtained it is essential to emphasize that of all health actions only 7.5% of them had participation of the physical education professional, with the psychologist was 23.8%. When analyzing the number of individualized care in absolute terms there is a large difference between the number of attendances of the psychology professional, which was 1625 individuals, and the social work professional, which in 5 months took care of 632 users.

CONCLUSION: The research evidenced that the attendances made by the NASF-AB teams, among the 3 items analyzed, is below the expected level of what should be, especially when it’s considered that the teams should use working the matrix support, which probably does not occur. If a chosen area is taken into account and the population selected It is understand that the population reach is still restricted. In front of exposed believes that should provide greater training for these professionals.
INTRODUCTION: Conducting physical activity research in a real-world setting, such as leisure centres (LCs), faces many barriers. Because of this, most applied research has a limited scope of both setting and population. This research explores the barriers and possible solutions for implementing research into real-world settings.

Methods: During January 2018, a multicentre Randomized Controlled Trial aimed at increasing PA levels and member retention rates of LC’s was piloted. The research was conducted at six different LC across England. In February and March of 2018, semi-structured telephone interviews with 12 total staff from the different LC’s were conducted. Interviews were meant to gather feedback on the implementation of research study processes in the LCs and staff were prompted to reflect on specific barriers and success to the research implementation process. Data were analysed thematically using NVivo.

Results: Feedback indicated that communication between exercise professionals (EP), the sales staff, LC staff, and research team was impaired, largely due to the compartmentalized nature of the LCs and busy working hours. It was criticised that both recruitment procedure and delivery of intervention sessions were described in the same manual, therefore confusing staff as to which procedure was to be carried out by the sales team or EP’s. Additionally, compared with sales teams, EPs were overall more confident in recruiting research participants.

Discussion: Based on these qualitative interviews, primary suggestions to aid the implementation of intervention studies in the leisure industry include 1) the necessity of appointing a study manager per LC, 2) scheduling regular conference calls between research staff and LCs to aid the intra- and inter-organisational exchange of information, and 3) the involvement of EPs in study recruitment and intervention delivery. To improve the staff’s understanding of all study processes, the distribution of separate manuals for the recruitment procedures and intervention delivery is suggested.

Conclusion: These recommendations can aid research implementation into real-world settings, and eventually translate into higher rates of LC use and increased PA at the population level.

PURPOSE: To evaluate the effectiveness of foam rolling (FR) and vibrating foam rolling(VFR) on the rehabilitation of exercise-induced muscle fatigue (EIMF).

METHODS: Sixty-six male college students (age: 24.5±2.5 yrs) were randomly divided into three groups: a control group (n=22), a FR group (n=22) and VFR group (n=22). All subjects performed a bout of bottom-up squats for obtaining EIMF. All subjects were measured for peak torque (PT), peak torque/body weight (PT/BW), average peak torque (APT) and total work (TW) by using an isokinetic test system. The only difference among groups was that the FR group and VFR group performed a 1-min FR exercise protocol and VFR exercise protocol separately before each post-EIMF protocol measurement (0.5h, 24h, and 48h). The data was analyzed by one-way ANOVAs with LSD post-hoc tests, and independent t-tests.

RESULTS: See below table for all results. At 0.5h after the EIMF protocol, PT, PT/BW, APT and TW significantly decreased in FR group, VFR group and control group (all p<0.01), and there were no significant group differences in these variables. At 24h after the EIMF protocol, PT and TW in FR group were 10.92% and 16.90% higher than in the control group (P=0.01, P<0.05), there were significant group differences between FR group and VFR group (P=0.05).

CONCLUSIONS: Foam rolling and Vibrating Foam Rolling resulted in a faster recovery in muscle strength and muscle work following a bout of bottom-up squats.
rate response was greater on the ST (84±15 bpm) when compared to the SC (75±12 bpm; p<0.01) and SB (73±12 bpm; p=0.01). Total caloric expenditure on the ST (27.4±7.07 kcal) was greater than SC (16.55±3.07 kcal; p=0.01) and SB (16.85±2.54 kcal; p=0.01); however, no difference existed between SC and SB. Caloric expenditure per minute was greater on the ST (2.73±0.71 kcal) versus the SC (1.64±0.28 kcal; p<0.01) and SB (1.69±0.26 kcal; p=0.01). Additionally, the ST required increased MET values (2.35±0.49 METs) than the SC (1.43±0.28 METs; p<0.01) or the SB (1.50±0.33 METs; p<0.01). No significant differences were observed between the SB and SC for any of the comparisons. CONCLUSION: The ST produced a greater heart rate response and caloric expenditure than the SC or SB, indicating that active balanced sitting may be a feasible way to reduce sedentary office behaviors. Consistent with previous literature, there were no differences in heart rate or caloric expenditure between the SB and the SC during any condition. These results suggest that active sitting, which includes a strong balance component, may be crucial to increasing energy expenditure beyond that of sitting on a SC.

**Board #65** May 31 3:30 PM - 5:00 PM

**Different Frequencies Of High-intensity Interval Training On Aerobic Fitness And Fatness In Overweight/obese Young Adults**

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(No relevant relationships reported)

**PURPOSE:** To compare the effect of high-intensity interval training (HIIT) on aerobic fitness, body composition, and blood pressure.

**METHODS:** Forty-seven overweight/obese young men aged between 18 to 30 years were randomly allocated to non-interventional control (CON; n=14), three HIIT sessions weekly (HIIT×3; n=14), two HIIT sessions weekly (HIIT×2; n=10), and one HIIT session weekly (HIIT×1; n=9). Each HIIT session consisted of 12 × 1-minute of 30-meter shuttle runs at 90% of heart rate reserve (HRR) and interspersed with 11 × 1-minute bouts of jogging at 70% HRR. Aerobic fitness, body fatness, and blood pressure were examined before, after 4 weeks and 8 weeks of the intervention. Aerobic fitness was measured by 20-meter shuttle multisite run test, body fatness was measured by bioelectrical impedance analyzer and blood pressure was assessed by electronic sphygmomanometer.

**RESULTS:** Aerobic fitness in all HIIT groups were significantly higher than CON at post-test. Percent body fat mass, absolute body fat mass, trunk fat mass, and systolic blood pressure in all HIIT groups were significantly lower than CON at post-test. The change of aerobic fitness (%Δ total running distance: r=0.6, p<0.01) was positively correlated with the exercise frequency of HIIT. The Δ% percent body fat mass (r=−1.10, p=0.01), Δ% absolute body fat mass (r=−0.5, p<0.01), Δ% absolute trunk fat mass (r=−0.4, p<0.01) and Δ% systolic blood pressure (r=−0.4, p<0.05) showed negative correlation with the exercise frequency of HIIT.

**CONCLUSIONS:** Dose-response in the improvement of aerobic fitness, reduction of body fatness, reduction of systolic blood pressure among different exercising frequencies of HIIT were observed. HIIT, even with lower frequency (once weekly), improved aerobic fitness, body fatness, and blood pressure in overweight or obese young adults.

**Board #64** May 31 3:30 PM - 5:00 PM

**The Experiences of College Students Enrolled in a Fitness Walking Class with Shelter Dogs**

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Many four-year colleges and universities no longer require physical activity courses as part of student curricula but continue to offer elective physical activity courses. These elective courses are important given the benefits associated with physical activity, the low levels of physical activity found within the college student population, and the importance of establishing lifelong physical activity habits at earlier life stages.

College and universities also stress the importance of community engagement within their courses. In the physical activity context, service-learning curricula has been used to teach responsibility, life skills, and values to students suggesting that addressing the physical activity needs of others, such as shelter dogs, within activity-based courses may benefit multiple entities.

**PURPOSE:** The purpose of this study was to examine the experiences of students enrolled in a service-learning fitness walking course in which students walk local shelter dogs.

**METHODS:** Data were collected over six fall semesters and three summer sessions. During this time, the course was offered twelve times and a total 66 reflection papers were gathered. The Experiences of College Students Enrolled in a Fitness Walking Class with Shelter Dogs...
were submitted. These papers were guided by five questions constructed to assess the objectives of the course. Adopting a grounded theory approach, the papers were inductively analyzed first using open coding, followed by focused and axial coding. RESULTS: One central theme emerged under which several subthemes was identified. The central theme was the importance of walking to shelter dog physical and emotional well-being. As one subtheme, students described feeling motivated and obligated to attend class regularly so the dogs could get physical activity. Other subthemes included the importance of walking for humans, the importance of patience, enjoyment of interacting with the dogs, learning about the physical activity needs of dogs, and deconstructing stereotypes of shelter animals.

CONCLUSIONS: The results of this study suggest that students enjoyed engaging in regular walks for the wellbeing of the shelter animals. While students did acknowledge that they were also getting physical activity, this was secondary. Findings suggest that multiple entities can benefit from service-learning physical activity courses and be sources of motivation for students.

3020 Board #66 May 31 3:30 PM - 5:00 PM
A Survey of HBCU Nutritional Habits, Attitudes About Health and Risk Perception
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PURPOSE: The purpose of this study was to explore nutritional habits, attitudes about health, and risk perception in an HBCU population of rural northeastern North Carolina. Specific targets of assessment included nutritional status, perceptions surrounding health risks, environmental risks and risk perception related to common diseases such as prediabetes (PD), high blood pressure (HBP), stroke, asthma, cancer and cardiovascular disease (CVD).

METHODS: A total of 300 university students, faculty and staff (N = 300, M = 143, F = 157, ages 18-65 yrs, Mean = 23.39 yrs, SD = 8.40 yrs), of any activity level, from all parts of campus were surveyed utilizing the REAP-S and RPS-DD instruments. SPSS correlations and Chi Square tests were used to analyze survey and demographic data.

RESULTS: A strong positive correlation was demonstrated between the beliefs of “I feel I have very little control over risks to my health” and “If I am going to get diabetes, there is not much I can do about it” (R = 0.23, R² = 0.52, p < .001). That exercising regularly could reduce risk strongly correlated to controlling weight gain (R = 0.25, R² = 0.62, p < .05) and processed meals (N = 295, R = 0.12, p < .032) correlated with beliefs related to a lack of control. A negative correlation was demonstrated between this perception and a willingness to make change (N = 287, R = -0.23, p < .05). Increased consumption of sweets (N = 295, R = 0.15, p < .007) and perceived cancer risk (R = 0.31, R² = 0.09, p < .032) correlated with beliefs related to negative linear trends (R = 0.29, R² = -0.09, p < .036), and beliefs that personal efforts would help control risk (N = 294, R = -0.19, p < .05). Perceived risk for heart disease correlated with family CVD diagnosis (N = 292, R = -0.50, p < .001), perceived cancer risk (N = 287, R = -0.53, p < .001), perceived HBP risk (N = 283, R = -0.39, p < .001), perceived stroke risk (N = 289, R = 0.56, p < .001), and perceived asthma risk (N = 286, R = -0.34, p < .001).

CONCLUSIONS: Findings suggest perceived control is a powerful indicator of perceptions of the effectiveness of positive health behaviors, and engagement in management behaviors. Family CVD diagnosis strongly impacted personal perceptions of risk for cancer, HBP, stroke, and asthma risk. Future research should evaluate effective interventions centered around healthy exercise and nutrition practices, with an emphasis on internal locus of control.

3021 Board #67 May 31 3:30 PM - 5:00 PM
Differences In Strategic Constructs Of The Transtheoretical Model Across The Levels Of Sitting Time
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Differences in Strategic Constructs of the Transtheoretical Model across Levels of Sitting Time
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The strategic constructs, such as processes of change, self-efficacy, and decisional balance, of the Transtheoretical Model (TTM) have been relatively neglected by researchers in spite of the fact that they potentially provide important insight into the content of behavior change interventions. As most criticisms of the TTM are targeted at the central organizing construct, the stages of change, due to its arbitrary stage classification, the direct comparison between objective values attaching to a specific behavior and the strategic constructs is warranted. PURPOSE: To investigate the differences in strategic constructs of the TTM across objectively measured sitting time.

METHODS: A total of 201 college students conducted a TTM questionnaire for sedentary behavior and wore an accelerometer for seven consecutive days in order to obtain objective sitting time. Multivariate analyses of variances (MANOVA) with post-hoc pairwise comparisons were conducted to determine mean differences in the strategic constructs across observed sitting time. Tests for linear trends were conducted using orthogonal polynomial coefficients. A two-sided p < 0.05 was considered statistically significant.

RESULTS: Compared with participants in higher quintiles of sitting time, 7 out of 10 processes of change (e.g., mostly consciousness raising [η² = 0.09], followed by social liberation [η² = 0.08], contingency management [η² = 0.06], etc.) were used significantly more frequently by those in the lowest quintile (p < 0.05) with negative linear trends (p < 0.05). No significant differences were found in the constructs of self-efficacy and decisional balance across the quintile.

CONCLUSION: Based on this preliminary analysis it appears that the use of certain processes of change would be more beneficial to reduce sitting time or to protect their current sitting time from relapse.

3022 Board #68 May 31 3:30 PM - 5:00 PM
Influence Of Non-cognitive Ability Scores On Physical Fitness Improvement: An Examination Using Longitudinal Data
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Recently, many activities have been conducted to improve physical fitness owing to the decline in children’s physical fitness observed in Japan. Such activities have led to gradual improvements in physical fitness. With the commencement of a study to examine the educational effect of exercise promotion, this program entered a new stage. Specifically, we focused on motivation, perseverance, and positive attitudes that are emphasized in young children. These non-cognitive abilities are considered indispensable for future social success. A few studies have examined the relationship between physical fitness and non-cognitive abilities. Last year, we also presented a study on the relationship between non-cognitive abilities and physical fitness of children using cross sectional data, and identified the need to examine the longitudinal relationship. PURPOSE: The present aim to examine the influence of non-cognitive abilities on physical fitness improvement using longitudinal data.

METHODS: We conducted physical fitness tests and a non-cognitive ability survey on 264 young children. Data were collected during the same period for 2 years. Participants were classified into the improved and non-improved groups based on the extent of change in their ranking in the class. Differences in non-cognitive ability scores in the first and second years were examined using 2-way ANOVA with physical fitness improvement, sex, and grade as factors.

RESULTS: No significant interaction was confirmed between gender, grade, and physical fitness improvement in any year. A significant main effect of sex, grade, and physical fitness improvement was observed in the first year, and of sex and physical fitness improvement in the second year. Girls’ non-cognitive ability score was significantly higher than that of boys. Among 4-year-olds, the non-cognitive ability score was significantly higher in the first year as compared to that in the second year. The non-cognitive ability score of participants in the improved group was significantly higher than that of participants in the non-improved group.

CONCLUSIONS: The present findings confirmed that non-cognitive abilities have a positive effect on the extent of improvement in physical fitness.

3023 Board #69 May 31 3:30 PM - 5:00 PM
Breaking Up Prolonged Sitting Improves Cognitive Function In Qatari Females
Bryna C.R. Chrismas1, Lee Taylor, FACSM2, Anissa Cherifi2, Suzan Sayegh3, Daniel P. Bailey1. 1Qatar University, Doha, Qatar. 2ASPETAR - Orthopaedic and Sports Medicine Hospital, Doha, Qatar. 3University of Bedfordshire, Bedford, United Kingdom. (Sponsor: Dr Lee Taylor, FACSM)
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Within Qatar, 83% of the population participate in little or no physical activity (PA). A sedentary lifestyle is associated with impaired cognitive function. However, cultural barriers [i.e. Islamic traditional clothing (e.g. Abaya)], as well as the climate (i.e. hot and humid), reduce the ability of Qatari females to engage in PA. PURPOSE: Examine the effects of an ecological valid PA intervention using a three-way ANOVA with physical fitness improvement, sex, and grade as factors.

METHODS: Within Qatar, 83% of the population participate in little or no physical activity (PA). A sedentary lifestyle is associated with impaired cognitive function. However, cultural barriers [i.e. Islamic traditional clothing (e.g. Abaya)], as well as the climate (i.e. hot and humid), reduce the ability of Qatari females to engage in PA. PURPOSE: Examine the effects of an ecological valid PA intervention using a three-way ANOVA with physical fitness improvement, sex, and grade as factors.
familiarization. Trials two and three were identical, accept in one visit the participants remained seated for 5-h (SIT), and in the other visit they interrupted their sitting time every 30-min with a 3-min walk (WALK) on a motorized treadmill at a moderate walking speed (rating of perceived exertion 12 - 14). Cognitive function was assessed using the Computerized Mental Performance Assessment System (COMPASS) at 15-min before baseline (-15-min), and then at 2.5-h and 5-h. The following tests were completed; serial-3 subtractions (2 min), serial 7 subtractions (2 min), simple reaction time (50 stimuli), choice reaction time (50 stimuli), and Stroop (60 stimuli). The visual analogue scale for fatigue (VAS-F) was completed at the same time intervals. Linear mixed models were used to examine differences in COMPASS and VAS-F for condition (SIT, WALK), and time (-15-min, 2.5-h, 5-h). Data is reported as effect size; 95% confident limit. RESULTS: There was a greater number of RVIP correct scores in WALK compared to SIT (0.84; ±0.06). There was a quicker reaction time (RT) for RVIP in WALK compared to SIT (-0.66; ±0.70). RVIP false was lower in WALK compared to SIT (-0.51; ±0.73). Stroop RT was quicker in WALK compared to SIT (-0.96; ±0.05). RT for congruent Stroop was quicker in WALK compared to SIT (-0.92; ±0.68). VAS-F was lower in WALK compared to SIT (-0.40; ±0.16). CONCLUSION: Interrupting prolonged sitting with moderate intensity walking offers an ecologically valid intervention to enhance cognitive function in Qatari females. Supported by Qatar University CHSS SEED grant (CHSS-SF-16-2).

3024 Board #70 May 31 2:00 PM - 3:30 PM The Effects Of Regenerative Injection Therapy Compared To Corticosteroids For The Treatment Of Lateral Epicondylitis
Julie B. Barnett1, Madison N. Bernacki2, Jessica L. Kainer3, Hannah N. Smith4, Annette M. Zaharoff5, Sandeep Subramanian6. 1UT Health San Antonio Texas, San Antonio, TX. 2The Non-Surgical Center of Texas, San Antonio, TX. Email: barnettj3@uthscsa.edu

BACKGROUND The lateral epicondyle is a common site for chronic tendinosis, a condition characterized by overuse and degeneration of a tendon due to repeated microtrauma. This leads to pain and functional limitations. There is a growing interest in non-surgical forms of treatment for this condition including provision of corticosteroid injections and regenerative injection therapy (provision of autologous blood and platelet rich plasma injections).

PURPOSE: The study objective was to compare the effectiveness of corticosteroid compared to regenerative injection therapy for the treatment of chronic tendinosis at the lateral epicondyle (i.e. lateral epicondylitis).

METHODS: Researchers systematically reviewed randomized controlled trials published in English language from 2008-2018. Databases used included PEDro, Scopus, Pubmed, and CINAHL. Ten articles met our selection criteria as an RCT level of evidence with a total of 682 patients. Sackett’s ratings adapted to include PEDro scores helped assess study quality. Analyzed results focused on pain, function and outcomes.

RESULTS: The corticosteroid groups demonstrated greater benefits in the short-term follow up (36 months; level 1A) and the regenerative injection therapy groups (both autologous blood and platelet rich plasma) demonstrated greater long-term improvements lasting for a period of about 2 years (1A level). One hundred subjects were randomized to receive corticosteroid (n = 49) or platelet rich plasma (n = 51) injections in a double blind RCT. A greater proportion of people reported a reduction of pain and DASH scores by >75% (clinically significant) in the platelet rich plasma group at the 6 months and one-year assessment period.

CONCLUSIONS: Regenerative injection therapy results in greater long-term pain relief and improved function for people with lateral epicondylitis.

3025 Board #71 May 31 3:30 PM - 5:00 PM Evaluation of Intervention Effects of Different Exercise Modes on Non-alcoholic Fatty Liver Disease
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PURPOSE: Based on the analysis of more than 1000 documents in the past 5 years and visiting physical activity experts, coaches and athletes, this paper discusses aerobic exercise (AE), resistance exercise (RE), and high-intensity interval training (HIIT) in non-alcoholic fatty liver disease (NAFLD). Discuss The main differences of intervention methods, intervention time, and intervention effects among the NAFLD people, To explore the targeting and dose-response relationship of different exercise models intervention in NAFLD.

METHODS: (1) Through searching in Pubmed, Web of science and other databases, articles were selected for analysis according to the corresponding inclusion criteria and exclusion criteria. (2) Expert survey. (3) Interview method.

RESULTS: (1) AE, RE and HIIT can reduce hepatic steatosis and improve liver histology in NAFLD people, but their intervention effects are different. AE stands out in reduce body weight; RE stands out in reduce hepatic fat, decreases insulin resistance (IR) and increases muscle strength; HIIT has a significant effect in reducing hepatic fat and enhancing cardiovascular fitness. (2) The frequency, duration, and intervention period of AE and RE are similar; achieve the same or better intervention effect, HIIT only requires the 1/3 exercise time of the previous two. (3) People of different age, gender, physical fitness and disease degree have different choices in sports mode. Scientific monitoring and medical supervision are necessary conditions for improving the relationship between the dose and effect of exercise.

CONCLUSIONS: RE may be more effective than AE in patients with poor cardiovascular fitness, sarcopenia, and NAFLD who are unable to tolerate or participate in AE; HIIT has certain advantages in the time-effect and dose-effect due to less exercise time and smaller amount of exercise, This is easy for the NAFLD people to accept, and it will facilitate long-term adherence in the future.

3026 Board #72 May 31 3:30 PM - 5:00 PM Visualization Analysis of International Research of Physical Activity Promoted built environment
Zhenduo Liu1, Liping Jiang2, Yuning Jia3, Penghui Xie2, Yanan Wang1, Joonyoung Lee4, Brooke Doherty1. 1East China Normal University, Shanghai, China. 2Tongji University, Shanghai, China. 3University of North Texas, Denton, TX. Email: barnettj3@uthscsa.edu

PURPOSE: Through sorting out the process of studies focused on international physical activity promoting-type built environment, this paper aimed to reveal the basic characteristics and research“hotspots” in this field through software analysis and to provide suggestions for future research.

METHODS: Based on the literature about international physical activity promoting-type building environment from the Web of Science, The researchers searched 3,678 research papers and references in the field of health promotion during 2004—2018 and used Citespace Version 5.2 (Chen, 2018) for bibliometric analysis and visualized analysis.

RESULTS: The results revealed that: (1) current studies mainly come from western countries (i.e., primarily the United States, Canada, and Australia); (2) the research “hotspots” focus on different forms of physical activity, obesity, and body mass index control in built environment.

Conclusion: Transportation planning and management, urban planning, and behavioral science have focused on building environments that can promote physical activity. Majority of the research has mainly emphasized the relationships between health and built environment and physical activity assessments. While facing the serious problem of childhood obesity, it is important to consider building environment construction as one of the main solutions.
Health and wellness coaching (HWC) is a promising strategy and potentially highly effective approach for weight loss in short term and healthy behavior change. As a partnership process between the coach and the client, it emphasizes behavior change to better client health. Coming up as a new approach that focuses on behavioral change without a diet prescription, HWC seems to be likely to promote body weight loss and improve quality of life. PURPOSE: the aim of this study is to present and evaluate HWC in promoting changes in body composition and to improve the self-assessment of quality of life.

METHODS: 13 subjects completed the intervention. Body composition (Bodpod®) and quality of life (WHOQOL-bref) were assessed at baseline (P1) and after 12 weeks of HWC (P2). 12 HWC sessions were completed, which were held weekly (1 hour each) + 36 Physical Activity sessions (1 hour each, 3 times a week). No diet was prescribed during the whole process. Data was collected at the School of Physical Education and Sport, University of São Paulo. RESULTS: In P2, HWC sessions were associated with reductions in body weight (-2.16 kg) and fat mass (-1.91 kg). Great improvement in all aspects of self-rated quality of life was also shown (physical health, psychological domain, social relationship, environment and overall quality of life). These outcomes emphasize the effectiveness of HWC in promoting fat loss and behavioral changes with high impact in quality of life. CONCLUSIONS: HWC was able to promote weight loss, fat loss, to maintain fat free mass and to improve quality of life in a 12 week program, combined with an exercise program. Therefore, the strategy was effective in promoting better health, once it empowers individuals to take actions for their own health.

Purpose: The Gallon Jug Shelf Test (GJST) is a validated assessment of an older persons’ capacity to transfer moderately heavy objects from a knee-high to a shoulder high shelf. Since power is a major determinant of performance during activities of daily living, we calculated power during the performance of the GJST.

METHODS: Sixty-six sedentary overweight office workers (mean ± SD: age = 45.3 ± 12.3 years, BMI = 32.4 ± 5.8 kg/m²) participated in this 12-month study. Participants were cluster randomized to a control (C), (N = 21), a sit-stand desk (D), (N = 23), or a treadmill desk (T), (N = 22) group. Group T was asked to accumulate 2 h of walking and 1 h of standing at the workstation in bouts of 10 to 30 min daily. Group D was asked to accumulate standing for 3 h/day in bouts of 10 to 30 min. Group C did not receive a workstation that enabled behavior change at work and was encouraged to meet the federal physical activity guidelines during the study. All participants self-reported regional musculoskeletal pain using the Modified Nordic Musculoskeletal questionnaire at baseline and month 12. Musculoskeletal regions included the lower back, upper extremity (neck and shoulders), wrist and forearm, and lower extremity (knees, ankles, and feet).

Conclusion: While workstation interventions to decrease sedentary behavior yielded no reductions in self-reported pain over 12 months, increasing daily accumulated standing and/or walking time did not introduce new musculoskeletal pain in seated office workers. These findings may help alleviate concerns associated with change in musculoskeletal pain when introducing ergonomic solutions to break continuous workplace sitting.
PULPOSE: The present study examined changes in self-regulation and self-efficacy in sedentary employees participating in a 10-week walking intervention. METHODS: 68 sedentary employees were enrolled in a 10-week walking intervention. Subjects were randomly assigned (based on initial BMI and gender) to one of three groups consisting of two walking protocols: intermittent walking (Age = 46±9, BMI= 30.3±5.7 kg/m²) continuous walking (Age = 48±9, BMI= 30.3±6.17 kg/m²) or control group (Age = 42±10, BMI= 27.6±5.11 kg/m²). The two experimental groups received self-paced walking programs that were time and intensity matched, as well as, a mobile health intervention with weekly strategies to improve self-efficacy and self-regulation skills via text messages, e-mails and videos. The control group received a self-pace walking program only. All groups completed a self-regulation and self-efficacy measured by questionnaire and walking behavior measured by a wrist worn accelerometer at baseline, week 6 and week 11.

RESULTS: Results from the mixed ANOVA showed group and time interaction (F[4,130]=8.017, p<.001, and a large effect n²=0.19). The continuous group significantly improved overall self-regulation and its sub-scales from pre-test to week 6 and post-test (p<0.05). Self-efficacy decreased significantly from pre-test to week 6 (p=0.047) and post-test (p=0.008) for all groups. Walking activity changed significantly (F[4,130]=2.526, p=.044, n²=0.072, with the continuous walking group significantly increasing walking from pre-test to week 6 (p=0.033), and a significant higher percentage of change compared to the control group from pretest to post test (p=0.042).

CONCLUSIONS: For sedentary employees a continuous walking program is a better approach to improve self-regulatory skills and may provide a more feasible approach to prescribing exercise in sedentary office employees. Intermittent physical activity approach to improve self-regulatory skills and may provide a more feasible approach to prescribing exercise in sedentary office employees.

Electronic activity monitors, commonly known as wearables, have proliferated both in research and in consumer use. However, there is limited reports on how wearables are operationalized in physical activity interventions in comparison to how their utilized by consumers. PURPOSE: To describe and evaluate the findings of two studies that evaluated the use of wearables among generally healthy individuals. METHODS: Study 1—Medscape, Medline, PsycInfo and Cochrane databases were searched in 2017. Included studies were assessed using an intensity scale that measured the extent of wearable usage. The intensity scale assessed duration, personalization, reach, and frequency of the wearable within the intervention with a higher intensity score reflecting higher usage. Study 2—Participants (n=33, 78.8 % Female, 51.5 % aged 18-24 years, 56.3 % White, 27.0 ± 6.7 kg/m²) were recruited to participate in an online survey. Participants were eligible if they were an adult and if they owned a wearable device aimed to promote physical activity. The intensity scale utilized in Study 1 was used in Study 2. Independent T-Tests were performed to compare intensity scores between Study 1 (effective interventions only) and Study 2. Summary of RESULTS: Study 1—22 citations, reporting on 25 unique interventions arms, met the inclusion criteria. Of these, 7 found significant group differences in physical activity and/or weight loss outcomes. These studies utilized several wearable features (86.7 %) and allowed participants to interact with the wearable at their own discretion (51.1 %). Study 2—72.7 % and 42.4 % reported positive physical activity and weight outcomes after using their wearable. Participants often used their device daily (87.9 %) and use multiple wearable features (75.8 %). The intensity scores from Study 2 (18.2 ± 2.7) were higher than Study 1 (15.4 ± 3.9) (t=5.6, p<0.05). In particular, consumers reporter higher frequency of use than effective research interventions (t=5.7, p<0.01).

CONCLUSION: Wearables are not utilized similarly within interventions as they are with commercial consumers. Interventions should consider more mandated use of the wearable in the study design to reflect the consumer experience. This will aid in determining the effectiveness of wearables to promote physical activity and weight loss.

Purpose: Physician have an enormous role in physical activity (PA) promotion for the purpose of prevention and management of non-communicable diseases. Thus, this study was to explore the PA counselling practices of medical doctors when in their foundation year as this is the time that serves as a bridge between medical school and specialty/general practice training.

Methods: A qualitative study was undertaken amongst 11 Foundation Doctors (FD) in the Manchester University National Health Service (NHS) Trust using a purposive sampling approach. In-depth interviews were conducted, transcribed verbatim and analysed thematically.

Results:
more than half of the participants had low physical activity level at both inclusion and after 12 months, suggesting that a fitness club membership in itself might not be sufficient to meet the current physical activity recommendations.

**3036 Board #82 May 31 3:30 PM - 5:00 PM**

**How Best to Use Your Limited Cardiovascular System Training Equipment Budget: A Case Study**

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(No relevant relationships reported)

**PURPOSE:** The Student Life and Wellness Center (SLWC) at Utah Valley University (UVU) spent $300,540 on its current fleet of 46 pieces of cardiovascular system training equipment (cardio equipment). UVU students pay for gym equipment from student fees. SLWC managers want to know how to use their cardio equipment budget and gym space efficiently to benefit students most. **METHODS:** All the cardio equipment was purchased from Life Fitness (Rosemont, IL). The equipment reports usage data to Life Fitness, and we retrieved that data from their Halo Fitness Cloud. All the equipment had been in use for 24 months except the treadmills which have only been in use for 3 months. **RESULTS:** Overall use (distance, hours, and workouts) was compared. Use/month/dollar was compared, in order to best understand the value and popularity of each device.

**DISCUSSION:** Powermills are the most used equipment in our sample: whether measured as distance, hours, or workouts. They are also the best overall value. FlexStriders cost the most money and were used the least. **CONCLUSION:** Through simple analysis of automatically-recorded data, UVU can use student money effectively. Students will have the equipment they like to use, and less student fees will be needed as costly unpopular equipment will not be purchased in the future. Gym managers should be able to serve their clientele better with similarly-simple analyses.

**3037 Board #83 May 31 3:30 PM - 5:00 PM**

**Utilizing Technological Devices to Enhance Prevention of Type II Diabetes Mellitus**

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(No relevant relationships reported)

**PURPOSE:** To evaluate the inclusion of technology, a Fitbit Flex and smartphone, into the popular lifestyle modification program: the Diabetes Prevention Program - Group Lifestyle Balance Program (DPP - GLB). The DPP - GLB Program has shown great success in reduction of progression toward T2DM. However, it was unknown how integrating technology would affect overall program outcomes, which included the attainment of 150 minutes of physical activity (PA) per week and weight loss trending toward 7%.

**METHODS:** Men and women over the age of 40, and at risk for prediabetes, were recruited. The study included an initial four weeks of baseline PA testing, followed by 12 weeks of lifestyle intervention. Individualized weight loss and PA goals were set. Participants self-randomized to the control (N = 11) or the technology group (N = 13). Session participation was high. Technology participants missed 8.3% of sessions, while control participants missed 18.2% of sessions.

**RESULTS:** Participants were aged 66.24 (SD = 7.38) years. At baseline, 21% of participants were overweight, and 79% were obese. Using a generalized estimating
promote health outcomes in adolescents. And activities to promote active lifestyle behaviors in middle school adolescents. In middle school making this a critical age to promote a physically active lifestyle. Significant declines negligibly impacts and is negligibly affected by their fitness goal. However, more usage of wearables. These results suggest that how individuals use their wearable Conclusion

Background:

Wearable devices, such as Fitbits, Apple Watches, and numerous fitness devices, have become an increasing trend in those attempting to improve and/or monitor their physical activity. These devices incorporate various features that may elicit behavior change, however there is limited information on which features are utilized most. In addition, there is limited information on whether the usage of wearables varies by fitness goals. The present study observes wearable users and examines any correlative relationships between wearable usage and individual fitness objectives.

Methods

Consenting males and females ages 18 and older who owned any variation of wearable devices were given a 15-minute survey containing questions regarding the type of wearable owned, wearable usage, fitness activity, fitness goals, and opinionated questions. Descriptive statistical analysis using means and frequencies were utilized to describe the sample. Spearman correlation analyses were used to determine the relationship between the participant’s reported fitness goal and reported usage of various wearable features. All analyses were conducted using IBM SPSS Version 25.

Results

Of the participants to complete the survey (n=33), the majority were female (78%) and were between 18 and 24 years old (51.5%). Most participants worked out 3-4 times a week (37%) and used their wearable daily (87.9%). Participants reported that their primary fitness goal was to lose weight (42.4%), build muscle (21.2%), lose fat (18.2%), and improve mobility (18.2%). The most prevalent features used were the virtual rewards/badges (69.7%), exercise alert notifications (62.5%), and goal-based challenges (42.5%). The correlation analyses showed a weak correlation between the fitness goal and reported device utilization (r=1.0 on all utilization variables).

Conclusion

Our preliminary analyses show weak correlations between reported fitness goal and usage of wearables. These results suggest that how individuals use their wearable device (which impacts the exposure to embedded behavioral change techniques) negligibly impacts and is negligibly affected by their fitness goal. However, more research is needed to further evaluate the relationship between these variables.

board #84 May 31 3:30 PM - 5:00 PM
the correlational relationship between fitness goals and wearable usage: an observational double-blind study
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board #85 May 31 3:30 PM - 5:00 PM
the effects of a pilot translational health in-school program on physical fitness and health outcomes
natasha cruz, emily w. flanagan, gina zito, arlette perry, FACSM. University of Miami, Miami, FL. (Sponsor: Arlette Perry, FACSM)
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board #86 May 31 3:30 PM - 5:00 PM
perceived quantity of physical activity as a reflective measure in muscle and bone strength
kirstie huynh1, karen serrano videos, kirsty espartero1, rebekkah reichert1, maria alvarez2, priscilla franson1, arianna mazzarini1, andrew denys1, vanessa yingling, FACSM1. California State University, East Bay; Garden Grove, CA. California State University, East Bay, Hayward, CA. (Sponsor: Vanessa Yingling, FACSM)
(no relevant relationships reported)

perception plays a powerful role in shaping health outcomes. An active lifestyle, provides mechanical load needed to strengthen and maintain both muscle and bone health. Many recommendations on the quantity of physical activity needed for health benefits exist however it is unclear if individuals perception of their activity habits relates to muscle and bone strength benefits. PURPOSE: To determine if those who perceived that they get the right amount of exercise or more than necessary amount of exercise, have greater muscle and bone strength.
METHODS: 79 participants, 41 females and 38 males (age: yrs 29.2 ± 10.8, height (cm) 166.5 ± 9.2, body fat % 24.6 ± 9.3) performed a relative grip strength (RGS) test using a hand grip dynamometer, 1 repetition maximum leg extension test (IRM), and a vertical jump test using a Vertec (PP). Bone Strength Index (compression) (BSi) and polar Strength-Strain Index (SSiP) were measured using peripheral Quantitative Computed Tomography (pQCT). A questionnaire stated “Do you feel you get too much exercise, too little exercise, or about the right amount of exercise?” Welch’s t-tests were used to test for significant differences in muscle and bone strength based on perception of exercise quantity (Above and Below).
RESULTS: 41 participants perceived they got the “right amount of exercise or above” (Above) and 29 participants reported that they got below the right amount of exercise (Below). Perception of the Above group resulted in greater muscle function tests compared to the Below group. Average PP: 11.5% (p=0.004), BHS: 5.7% (p=0.004). “Right amount of exercise or above” resulted in greater bone strength (SSiP) at both the radius (11.7% (p=0.055) and tibia (13.3% p=0.02).
CONCLUSIONS: Participants’ perception on quantity of exercise reflected their bone and muscle strength. Those who perceived that they get the appropriate or a higher amount of exercise had greater bone and muscle strength values compared to participants’ who perceived they exercised less. Perception of getting the “right amount of exercise or above” compared to “below right amount of exercise” was a good indicator of greater bone and muscle strength.
(51.5%), advanced (33.3%) or beginner (15.2%) proficiency in exercise. Descriptive statistics with means and frequencies were used to identify trends in social media use and exercise frequency. The relationship between social media use and exercise frequency was assessed though Spearman Correlation and Chi-Squared procedures. All analyses were conducted using IBM SPSS Version 25.

**Results:** Participants reported exercising once a week (3.0%), 1-2 times per week (24.2%), 3-4 times per week (39.4%), 5 or more times per week (30.3%), or not currently exercising (89.6%). The preferred exercise type was aerobic (69.7%), followed by resistance (21.2%) and balance (9.1%). No participants reported posting their exercise to their social media accounts but 27.3% follow a fitness model or blog. There was a strong correlation between exercise frequency and following a fitness model or blog (r=0.3, p<0.05) but the direct relationship was nonsignificant (χ²=5.4, p=0.03).

**Conclusion:** Our results suggest that there is a correlation between people who follow fitness models or exercise and exercise frequency. Our research also suggests that there may be an underlying mediating variable driving this relationship. We plan to conduct a focus group to ask specific questions regarding social media’s influence on exercise. Future research should look at the mediating relationship between social media use and exercise frequency.

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### 3042 Board #88 May 31 3:30 PM - 5:00 PM

**Incarcerated Young Women’s Exercise and Sleep Behaviors: A Needs and Feasibility Study**

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(Inclusive of supplemental report)

Incarcerated young women (ages 16 to 21 y.o.) are at high risk for future drug abuse. Both regular exercise and adequate restorative sleep have been shown to reduce drug use and other harmful behaviors. Existing programs for incarcerated youth to reduce future drug use do not address healthy lifestyles or incorporate Positive Youth Development models. Implementing such a program requires understanding these young women’s current physical activity and sleep attitudes and behaviors.

**PURPOSE:** Determine whether wearable technology can be applied in a close custody setting. Establish current attitudes and behaviors related to sleep and physical activity of incarcerated young women. **METHODS:** Incarcerated young women completed an anonymous survey concerning physical activity and sleep attitudes and behaviors, using a 5-point agreement response scale. 46 of approximately 75 young women consented to participate. Descriptive statistics are presented. A convenience sample of 9 young women wore a Fitbit for a week.

**RESULTS:** No regular physical activity program is provided for these young women. However, the majority felt that they were “built for exercise” and “have the skills for exercise.” There was strong agreement of incarcerated youth’s current physical activity and sleep attitudes and behaviors. Future research should look at the mediating relationship between social media use and exercise frequency. Future research should look at the mediating relationship between social media use and exercise frequency.

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### 3043 Board #89 May 31 3:30 PM - 5:00 PM

**Listening To Music While Exercising Increases The Risk For Noise-Induced Hearing Loss**

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(Inclusive of supplemental report)

Music has an ergogenic effect on exercise performance, improves motivation, decreases exertion, and delays the onset of fatigue. However, loud sound levels from music can cause permanent damage to the inner ear resulting in noise-induced hearing loss (NIHL).

**PURPOSE:** The purpose of this study was to assess the risk of NIHL among students utilizing campus recreational facilities and examine whether music used as a motivator was associated with increased risk for NIHL.

**METHODS:** One hundred and nineteen students were recruited from the main fitness center on college campus. Physical activity level was recalled using a modified short version of the International Physical Activity Questionnaire. Music intensity levels were assessed by a sound pressure level mannequin with a built-in microphone. Thirty second samples were taken in 5 second intervals using participant’s personal listening devices. Average, minimum, and maximum sound levels were recorded in decibels (dBA). The estimated risk for NIHL was established based on the average sound level and duration of exposure using NIOSH criteria. Participants indicated whether music was a motivator during a workout. Descriptive statistics were performed for all variables. Chi-square analyses evaluated relations between risk for NIHL, gender, and music as a motivator. T-tests assessed the difference in average loudness level and gender.

**RESULTS:** Participants were college students (51.3% males, 48.7% females). Majority of participants (89.1%) used music as motivation while exercising (93.4% male and 84.5% female, p<0.05). Twenty four percent of participants were at risk for NIHL, approaching statistical significance for gender (25.5% males vs 15.7% females, p=0.056). The average sound levels for the participants were 88.8±10.3 dBA and statistically significant for gender (90.9±10.6 dBA for males, 86.5±9.4 dBA for females, p=0.017).

**CONCLUSIONS:** Every fourth college student listening to music while exercising was at risk for NIHL. NIHL is an avoidable cause of permanent hearing impairment. Recommendations for safe use of personal listening devices during workouts include keeping volume at a safe level, below 85 dBA, and limiting time spent using the device during workouts.

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### 3044 Board #90 May 31 3:30 PM - 5:00 PM

**Connected Health Exercise Consultation Case Study: A Weight Management Strategy Post Gastric Bypass Surgery**

Frank Paul1, Regis Fernandes1, Minako Katayama1, Matthew Burns1, Donna Cataldo2, Robert Setailed2. 1Mayo Clinic, Scottsdale, AZ. 2Arizona State University, Phoenix, AZ. (No inclusive of supplemental report)

Weight regain is not uncommon post gastric bypass surgery (GBS). A connected health (CH) platform has the potential to improve adherence to lifestyle recommendations to support long-term weight management.

**Purpose:** Describe the process of delivering a CH intervention to support in-person exercise consultations in a case study example. Methods: A sedentary 59-year old female (18-years post GBS) with a BMI=37.9 kg/m² was assessed at baseline, 12 and 24-weeks with the 6-minute walk test (6-MWT), 17-item Block Brief Dietary Fat Intake Screener and the 10-item Block Fruit-Vegetable-Fiber Screener. An activity monitor worn on the wrist tracked the daily physical activity (PA) level and a chest strap Heart Rate monitor recorded structured exercise sessions over the 24-week period. Bluetooth technology downloaded PA and SE related to a smartphone using a fitness application with CH capability. The CH intervention consisted of two 30-minute in-person exercise consultations (Week 1 and 4) plus six follow-up telephone calls (Weeks 5-24) with individualized feedback and guidance from a clinical exercise physiologist. Short-term progressive PA and SE goals were negotiated over the 24-week period with an initial prescription (Weeks 1-4) of 8,000+ steps/day and SE on 2nd days/week (60-90 minutes/week). Results: The mean daily step count was 12604 and 14630 steps/day and the mean SE minutes were 106 and 90 minutes/week for Weeks 1-12 and Weeks 13-24 respectively. Baseline, 12, and 24-week 6-MWT distances were 514.6, 567.7, and 630.9 meters respectively and daily values for total fat were 87.1, 75.1, and 72.7 grams, fruit/vegetable servings were 4.8, 2.6, and 4.4/day and dietary fiber were 12.5, 7.1, and 10.2 grams respectively. Body weight was 94.6, 80.6, and 71.6 kg respectively. Conclusion: In this case study example, the subject demonstrated adherence to using wearable technology to track PA related behavior and participate in this CH intervention. Future directions: CH may provide a process to remotely deliver weight management support between in-person clinical visits. Research is required to evaluate the impact of CH interventions in a bariatric patient population. Supported by Mayo Clinic and Arizona State University Project Honeybee.
mass index (BMI) of 26.4 ± 4.7 kg/m² and women (n = 212, 39.7 ± 13.3 years of age, 164.2 ± 8.1 cm in height, 69.8 kg in weight, and an average body mass index (BMI) of 26.03 ± 6.5 kg/m²) who reported being staff members from Biola University. Participants completed the International Physical Activity Questionnaire (IPAQ), using the Survey Monkey® platform. Workers were grouped by type of job, administration, staff and facilities. Total daily sitting time and metabolic equivalent (MET) minute activity-specific (leisure, household, occupational, and transport) and total weekly PA were calculated. RESULTS: A Multivariate Analysis of Variance MANOVA revealed significant (p < 0.05) main effects for job type, total minutes of PA per week, and grand total PA per week. Post-hoc analyses revealed facilities had significantly greater minutes of work PA and total weekly PA than staff and administration. There was no significant (p > 0.05) difference between job types in quantity of leisure, transport, and household PA. An independent t-test was employed to evaluate gender differences for total minutes of work PA and overall minutes of weekly PA. Significant (p < 0.05) differences were observed for gender and total work PA, but not for overall PA. Men were significantly more active at work than women. CONCLUSION: Mean weekly minutes of overall PA exceeded minimal weekly recommendations among all job titles and sexes.

3046 Board #92 May 31 3:30 PM - 5:00 PM
Physical Therapy Students Knowledge And Attitudes of Nutrition
Jordan D. Day, MS, Eric Jones, PhD, Dustin Joubert, PhD, Sarah Drake, MS, RD, LD, Todd Whitehead, PhD, Stephen F. Austin State University, Nacogdoches, TX. (Sponsor: Thomas J. Pujol, FACSM)
(No relevant relationships reported)

PURPOSE: Physical therapy has incorporated health promotion as a part of practice, which includes nutrition. A search of university curriculum within the state of Texas revealed no nutrition courses within entry-level doctoral physical therapy programs or at prerequisite level. Furthermore, little research has been conducted on the knowledge and attitudes of nutrition in physical therapists. Therefore, the purpose of the present study was to determine knowledge and attitudes of nutrition in current physical therapy students. METHODS: Subjects included doctoral physical therapy students from across the range of years of study in professional preparation programs. This research was conducted online (Qualtrics), which included a Nutrition Knowledge Test (NKT) (32 possible points) and an attitude scale (55 possible points). The survey was disseminated by doctoral physical therapy program directors to students and analyzed using ANOVA. RESULTS: A complete sample of n = 605, the mean NKT score was 22.43 ± 3.45 (70.1%). Though there was no correlation between attitudes and knowledge of nutrition (.026, p= .526), physical therapy students revealed high regard for nutrition with the mean attitude score being 47.13 ± 4.32 (85.7% agreement) with positive nutrition statements. There was also a significant difference in NKT scores when comparing groups who had taken a nutrition course and those who had not, 22.81 ± 3.56 and 21.66 ± 3.46 (p<.001), respectively. Those individuals who had completed 3 or more nutrition courses showed the largest improvement on the NKT (7%). Additionally, the Midwestern region presented with the most students’ programs having a nutrition course, held the highest NKT scores (22.67 ± 3.19), highest regard towards nutrition (47.44 ± 4.22) and were most satisfied with level of understanding of nutrition (69.8%). It is important to note that though there was an increase in NKT scores with increase in nutrition courses, the difference was only 2.36 points on the NKT. CONCLUSION: Based on relatively small changes in NKT and desires expressed during this survey, integrating nutrition competencies within current required courses may be the most appropriate intervention.

3047 Board #93 May 31 3:30 PM - 5:00 PM
Relationship Between Socialization and Weight Changes Using Among Individuals That Use Wearable devices
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(No relevant relationships reported)

Over the past few years, the use of fitness-tracking wearable devices, or wearables, has increased. They have many features that allow users to monitor their activity, measure pulse rate, and communicate their progress with other users. Accessible and streamlined user interfaces assist individuals in weight management while sharing their results with others in their social groups. Prior research has shown evidence for a positive association between weight loss and in-person socialization during workouts. However, research on virtual socialization within wearable devices and changes in weight is limited.

PURPOSE: To investigate the relationships between socialization and changes in body weight after wearable use.

METHODS: Individuals that owned a wearable device were eligible for this observational study. Surveys were completed electronically via Qualtrics Online Survey Platform. Participants were accessed the survey through social media, email, and in-person recruitment (n=33, 78.8% Female, 51.5% aged 18-24 years, 56.3% White, 27.07±6.7 kg/m2). Data was analyzed using SPSS Version 25. Chi-square tests and Spearman correlations were used to evaluate the relationship between changes in weight and in-person socialization (e.g. work out buddies) or device socialization (e.g. interactions with likes, comments, messages on social media, or leaderboards, etc.).

RESULTS: Participants reported both an increase (33.3%) and a decrease (66.7%) in weight since using their wearable. There was prevalent use in the various socialization techniques (in-person = 42.4%, likes and comments = 30.3%, and leaderboards = 27.3%). In accordance with previous studies, there was a moderate association between in-person socialization and weight loss (r = -0.49, p = .02). There were no significant associations between changes in weight and usage of leaderboard features (r = -0.18, p = .40) or likes and comments features (r = -0.07, p = .77).

CONCLUSIONS: Our analysis did not find a significant relationship between reported weight change and virtual socialization. However, there was a moderate relationship between reported weight change and reports of working out with a partner. Due to the small sample size, no definite conclusions can be drawn but future research should continue to investigate in-person versus virtual socialization on weight outcomes.

3048 Board #94 May 31 3:30 PM - 5:00 PM
Exercise is Medicine Programs: Public versus Private Healthcare Provider Interest and Needs
Aidan M. Murray1, Emi B. Hayashi2, Richard W. Christiana3, Gina M. Besenyoi4, Cancas State University, Kansas City, KS. Appalachian State University, Boone, NC. (Sponsor: Craig A. Harms, FACSM)
(No relevant relationships reported)

Purpose: Park Prescriptions (ParkRx) incorporating healthcare provider referrals for park-based physical activity (PA) are a type of Exercise is Medicine (EIM) program to improve patient physical and mental health through outdoor PA. This study explored public vs private healthcare provider 1) PA counseling practices, 2) knowledge/interest in ParkRx, and 3) barriers and resources needed to implement ParkRx programs. We anticipate private providers to be more receptive to ParkRx.

Methods: An e-survey was administered in Spring/Summer 2018 to healthcare providers in Kansas, Missouri and North Carolina. Participants were recruited via flyers, emails, community-healthcare partnerships, and snowball sampling techniques. Modified validated survey items examined PA counseling practices, knowledge/interest in ParkRx programs, and barriers/resources needed to implement independent t-tests explored study objectives including differences by public (i.e., Hospital, HMO, VA) versus private (i.e., consultant, solo/group) practice.

Results: Providers (n=223) were mostly public (57.4%) versus private (42.6%). The majority of providers ask about patient PA habits (75.0%) in a list of all check-ups (N=5, N=5, SD=3.5). However, private providers asked about PA habits and provide verbal counseling more often than public providers, t(168.4)=2.10, p=0.038 (N=168.10)=3.20, p=0.002 respectively. Very few providers give written PA prescriptions (10.8%). Few providers knew about ParkRx programs (13.9%), but 81.6% expressed interest in ParkRx programs, and barriers/resources needed to implement ParkRx programs. We provide more information to public providers, t(181.9)=2.40, p=0.017. Each implementing ParkRx, public providers place greater importance on evidence of park-based PA t(221)=2.40, p=0.017, evidence of patient interest t(221)=2.30, p=0.022, a patient portal with PA resources t(221)=2.84; p=0.005, and incorporation into EHR electronic (t=1.798)=2.55, p=0.001.

Conclusions: Healthcare providers underutilize written PA prescriptions and awareness of EIM programs such as ParkRx is limited. EIM initiatives should target both public and private healthcare providers, but remain cognizant of differences in implementation needs.

3049 Board #95 May 31 3:30 PM - 5:00 PM
The Effects of Sit To Stand Workstations on Perceived Leisur
Constance Haynes, Cara Daniels, Larissa Boyd, Melissa Powers. University of Central Oklahoma, Edmond, OK.
(No relevant relationships reported)

With the increase in sedentary behaviors, workplaces are using new ways to improve activity by giving employees the option to stand while working. However, research has not fully examined the impact of workplace wellness initiatives on participants' perceived freedom to participate in leisure activities. PURPOSE: The purpose of this study was to evaluate the effects of a sit-to-stand (STS) workstation intervention on leisure function over 12 months. METHODS: Faculty and staff volunteers from a university (N=24) were randomly assigned to a control group (n=13) or STS group (n=13). STS participants were required to stand at the desk for a minimum of two hours per workday. The Leisure Diagnostic Battery (LDB)-Function was used to assess perceived freedom in leisure. The LDB includes a 25-item survey regarding social comfort, environment, decision making, and communication with others. A

Abstracts were prepared by the authors and printed as submitted.
repeated measures ANOVA was used to analyze results. RESULTS: Two outliers were removed from analysis. All assumptions were met. A significant difference occurred between groups (F = 5.14, p = .01). A significant time effect did occur from pre-test to 6 (p < .02) and pre-test to 12 months (p < .02). The main effect for group was not significant (p = .05). The CG decreased by .05 points from baseline to 6 months and increased by .09 from 6 to 12 months (p > .05). A dependent t-test revealed the STS group significantly decreased by .26 points from baseline to 12 months (p = .00). CONCLUSION: The STS group decreased feeling less free to engage in leisurely activities from baseline to 12 months. Similar to current research, this data demonstrates that workplace interventions may not improve leisure activity participation. However, this study only measured self-reported freedom in leisure. Future research should objectively measure leisure activity participation.

ACKNOWLEDGEMENTS: This project was funded by the University of Central Oklahoma, Research and Sponsored Programs office.

### 3050 Board #96 May 31 3:30 PM - 5:00 PM Associations Between Neighborhood-level Measures Of Socioeconomic Status And School-reported Health-related Physical Fitness.
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**PURPOSE**
We previously reported pervasive musculoskeletal fitness deficits and high obesity prevalence at a proxy predominantly Hispanic elementary school in Corpus Christi, Texas. It’s unclear whether these are linked with neighborhood level measures of socioeconomic status (SES). This study investigated associations between school-reported health related physical fitness and neighborhood-level measures of SES, i.e., area deprivation index (ADI), median household income, park density, and number of park amenities that support physical activity (PA).

**METHODS**
The study sample consisted of 41 elementary and middle schools in Corpus Christi Independent School District (student enrollment is 79% Hispanic). Percentages of students who achieved healthy fitness zone (HFZ) classification on FitnessGram® outcomes in 2016-2017 was generated from Texas Education Agency database. School zip codes, corresponding median household incomes, park density, and park amenities that support physical activity were retrieved using Google search engine, US Census Bureau American FactFinder tool, and Geographic Information System (GIS) mapping tools, respectively. ADI was obtained using Neighborhood Atlas. Park density was the ratio of the number of parks to land area (in square kilometers) of respective zip codes. Land area was measured using GIS tools. Linear regression models and resulting standardized beta coefficients informed the magnitudes of associations between outcomes. Statistical significance was set at p < .05.

**RESULTS**
Median household income was negatively associated with the percentage of students who achieved HFZ on the measure of cardiorespiratory fitness (β = -.406; p = .006; 95% CI [-.514, -0.298]) and ADI (β = -.420; p = .004; 95% CI [-.517, -.323]) were positively and negatively associated with the percentage of students who achieved HFZ classification on BMI, respectively.

**CONCLUSION**
The current findings suggest that park authorities should invest in and ensure equity in the number park amenities that support physical activities across neighborhoods with low and high deprivation indices. The association between median household income and cardiorespiratory fitness warrants further investigation.

### 3051 Board #97 May 31 3:30 PM - 5:00 PM Medical Students’ Knowledge and Attitudes to Physical Activity Counseling
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**PURPOSE:** Physical activity (PA) counseling in the health care setting is regarded as a promising avenue to increase population level PA. Equipping future physicians with the necessary knowledge is crucial. The aim of this survey was to assess the knowledge on and attitude towards PA and health, as well as PA counseling at a large medical school.

**METHODS:** A 15-item online survey was conducted. The study has been approved by the University Ethics Committee.

**RESULTS:** 145 students (106 females, 73%) returned the questionnaire. 118 (81%) reported not knowing the WHO PA recommendations. Only 15 (10.3%) respondents could identify the recommendations correctly. 108 (74%) reported having learnt anything on the health effects of PA. 106 (73%) wished more information on this topic. 97% and 96% of respondents considered PA to be important or very important in the prevention and therapy of chronic diseases respectively. 99% judged PA counseling to be physicians’ task. Weekly reported PA was as follows: 9 (6%) no exercise, 19 (13%) > 1 hr, 47 (32%) 1-2 hrs, 41 (28%) 2-4 hrs, and 29 (20%) > 4 hrs. 32 (22%) respondents were in the entry phase of their studies, 87 (60%) in the midphase and 26 (18%) in their final, practical year. Gender was not associated with the importance of PA in prevention and therapy, with physicians’ PA counseling role and with perceived need for more information on PA and health. High overall PA volume was only associated with physicians’ PA counseling role (Spearman’s r = .224, p > .01). The importance of PA in therapy was associated with the importance of PA in prevention (Spearman’s r = .402, p = .001) and PA in therapy (Spearman’s r = .406 p > .01) respectively.

**CONCLUSIONS:** Medical students are interested in learning about the health effects of PA, consider PA important in the prevention and therapy of chronic diseases, and see PA counseling as physicians’ task, with no difference between males and females and students according to their study phase. Also no association was found between respondents’ PA and health related views and their volume of PA. A self-selection bias in respondents cannot be ruled out.

### 3052 Board #98 May 31 3:30 PM - 5:00 PM Comparison Of Energy Expenditure Of Overground And Motorized Treadmill Running In Healthy Chinese Young Adults
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**PURPOSE**
Overground and motorized treadmill running are popular types of exercise training. Compared to motorized treadmill running, overground running has no external motor and depends on subject’s own motor to acceleration and deceleration. However, it is still unexplored for the difference of cardiometabolic demands of overground running when compared with treadmill running at the same speed. The purpose of this study was to compare the oxygen consumption at the same speed of overground and treadmill running in Chinese young adults. METHODS: 40 healthy Chinese young adults (21 male, 24.8±2.04 years; 19 female, 23.8±1.95 years) volunteered to participate in the study. After the anthropometric data collection, body composition assessment, 6 min running bout energy costs of different speed (7km/h, 8km/h, 9km/h). The purpose of this study was to compare the oxygen consumption at the same speed of overground and treadmill running in Chinese young adults. METHODS: 40 healthy Chinese young adults (21 male, 24.8±2.04 years; 19 female, 23.8±1.95 years) volunteered to participate in the study. After the anthropometric data collection, body composition assessment, 6 min running bout energy costs of different speed (7km/h, 8km/h, 9km/h) of overground and treadmill running were measured. The energy costs of subjects were measured by a portable gas analyzer (MetamaxTM 3B, German). Overground trials were completed in an indoor sports stadium, and treadmill (Rodyl RL300E, Sweden) running were completed in the same stadium to minimize environmental influences on performance. The variables including heart rate, oxygen consumption (VO2) and RPE were collected within 6 minutes during each overground and treadmill running test. RESULTS: The gross overground running metabolic energy cost of male at 7km/h, 8km/h and 9km/h was higher when compared to the treadmill testing mode (0.242 ± 0.02 vs. 0.244 ± 0.02 ml/kg/m, P<0.01; 0.234 ± 0.02 vs. 0.215 ± 0.02 ml/kg/m, P<0.01; 0.231 ± 0.02 vs. 0.217 ± 0.02 ml/kg/m, P<0.01; 0.223 ± 0.02 vs. 0.213 ± 0.01 ml/kg/m, P<0.01; 0.228 ± 0.02 vs. 0.207 ± 0.01 ml/kg/m, P<0.01) at speed of 7 km/h, 8km/h and 9km/h. CONCLUSIONS: The results demonstrate that, for all experimental velocities in men and women, the energy cost of overground running is higher than the treadmill running. It is critical that these differences are taken into account when prescribing training intensities on whether the overground running or the treadmill running to a training protocol.

**ACKNOWLEDGEMENTS:** This work was supported by National science and technology program of China(Grants No.2013FY114700)

### 3053 Board #99 May 31 3:30 PM - 5:00 PM Comparison of Progressive Single and Multiple Sets of Resistance Training on Muscle Strength and Power
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Controversial research findings have yet to determine whether single or multiple sets of resistance training protocol is more effective than the other. PURPOSE: To compare the effects of low volume progressive single set and traditional multiple sets of resistance training on muscle strength, power, and field tests in the upper and lower
3054 Board #100 May 31 3:30 PM - 5:00 PM

Effects of a Multifactorial Exercise Intervention on Falls Risk Factors: Comparing Age and Falls History

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In the US, older adults experience an estimated 29 million falls per year resulting in 7 million injuries. Multifactorial exercise interventions (INT) are effective in reducing falls risk. Yet, it remains poorly understood how age and previous history of falls impacts INT aimed to reduce falls risk.

PURPOSE: To compare the effects of a multifactorial exercise INT on time (pre, post), age group (50-59, 60-69, 70-79, ≥80 years), and faller status (fallers [1 or more falls in past year], non-fallers) on right & left leg strength (RLS & LLS), foot & hand reaction time (FRT & HRT), 30 second sit-to-stand (STS), and timed up and go (TUG).

METHODS: One hundred eighty-three older adults (71.0±6.6 years, 1.7±.1 m, 3054 pounds, 25.5±3.8 kg) participated in a multifactorial INT, Stay Active and Independent for Life (SAIL). Participants met for 1h, 3x/week for 10 weeks; exercises included aerobic, balance, strength, and stretching exercises. RLS & LLS (normalized to body mass), FRT & HRT (ms), STS (number of repetitions) and TUG (s) were assessed pre- and post-INT. A 2 (time) x 4 (age group) x 2 (faller status) MANOVA was conducted to assess differences among factors. Post-hoc analysis was conducted for significant interactions (α < 0.05).

RESULTS: Main effects were attained for time (p < 0.05). Participants were stronger (RLS, pre=24.0±9.8, post=28.1±9.9; LLS, pre=23.0±8.0, post=27.0±9.9) and improved leg endurance (STSG, pre=12.3±3.2, post=14.5±4.0) after INT. FRT was faster from pre (306.6±49.8) to post (299.6±43.6). For age group, 60-69 had greater RLS and LLS (1.26±10.26, 0.92±0.99) than 70-79 (2.5±0.9, 2.48±0.9). In 60-69 (14.3±3.9) group, STS was higher than 70-79 (12.9±3.4) and 80-90 (11.6±3.8). TUG scores were faster for 60-69 (7.00±1.52) compared to 70-79 (7.73±1.54) and 80-89 (9.08±2.12). No other statistically significant differences were found (p > 0.05).

CONCLUSION: In line with previous literature, SAIL was effective at reducing falls risk factors, supporting SAIL to be an effective INT. Multifactorial INT are an effective strategy to combat falls as they target multiple risk factors. Outcomes of 60-69 age group suggest INT should be adjusted for advanced age. However, including falls efficacy and quality of life may give more insight into improvements. Supported by grant from Potomac Health Foundation.

3055 Board #101 May 31 3:30 PM - 5:00 PM

Virtual Reality Exercise on College Students' Mood and Rating of Perceived Exertion

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PURPOSE: This study examined differences in college students’ mood and rating of perceived exertion (RPE) during immersive virtual reality (VR), non-immersive VR, and traditional biking sessions.

METHODS: Forty-nine college students (34 females; M = 23.6) completed three separate 20-minute biking exercise sessions: 1) immersive VR biking on VirZoom, VR bike using PlayStation 4; 2) non-immersive VR biking on Gamercize bike using Xbox 360; and 3) traditional biking on Spirit Fitness XBU55. Their mood was assessed via the Brunnel Mood Scale (anger, confusion, depression, fatigue, tension, and vigor) during each session. RPE was evaluated by the Borg Rating of Perceived Exertion every 4 minutes. Repeated measures ANOVA was used to compare the mean differences in mood and RPE among these 3 exercise sessions.

RESULTS: Overall, significant differences were observed between biking sessions for mean RPE [F (2, 98) = 3.58, p = 0.03, η2 = 0.07] and all mood variables [F (2, 96) = 278.56, p < 0.05, η2 = 0.87-0.85], except for tension (p > 0.05). Post hoc Bonferroni comparisons indicated immersive VR had significantly higher RPE compared to non-immersive VR (1.09 ± 0.21 vs 1.5 ± 0.66, p < 0.01); non-immersive VR had significantly higher confusion compared to immersive VR (1.51 ± 0.69 vs 1.26 ± 0.33, p = 0.01) and traditional biking (1.51 ± 0.69 vs 1.20 ± 0.4, p < 0.01), respectively; immersive VR had significantly lower depression compared to traditional biking (1.07 ± 0.18 vs 1.34 ± 0.68, p = 0.03); both immersive VR (1.86 ± 0.72 vs 2.47 ± 0.87, p < 0.01) and non-immersive VR (1.81 ± 0.74 vs 2.47 ± 0.87, p < 0.01) had significantly lower fatigue compared to traditional biking; immersive VR had significantly higher vigor compared to non-immersive VR (3.70 ± 0.93 vs 1.30 ± 0.47, p < 0.01) and traditional biking (3.70 ± 0.93 vs 1.15 ± 0.38, p < 0.01), respectively; immersive VR had significantly lower mean RPE compared to traditional biking (10.18 ± 1.84 vs 12.86 ± 2.13, p < 0.01).

CONCLUSIONS: Findings suggest a commercially-available VR-based exercise bike (VirZOOM) may be a motivating interesting and enjoyable physical activity promotion tool for healthy young adults.
Depressive symptoms have been associated with less weight loss in some behavioral weight loss interventions (BWLI), and although it has been speculated that adding moderate-to-vigorous physical activity (MVPA) may improve outcomes, the result of interventions for body weight reduction is not rare disappointing. Adjustments in daily life physical activities and in sedentary time in response to exercise may undermine the negative energy balance caused by the interventions, reducing their efficacy.

**Purpose:** To determine the effects of an interdisciplinary program (IP) to treat obesity on sedentary and physical activity (PA) time.

**Methods:** A total of 14 obese women (39.3±5.77 years and BMI 34.1±2.99) participated in a 16-week program consisting of 3 sessions/week lasting 2 hours each. Physical exercise was carried out for 1 hour in every session, followed by psychological, nutritional or physical therapy intervention. For sedentary time and PA determination participants wore an accelerometer for seven consecutive days before and during the last week (LW) of IP. The difference between Pre and LW was determined using one-way ANOVA. The Pearson’s correlation test was also performed. Significance was set at 5%. The protocol was approved by Unifesp Ethics Committee (#2.579.851).

**Results:** Following IP, body weight change ranged from -5.90 to +2.40 Kg. However, the program failed (p>0.05) in promoting a significant mean reduction on body weight (Pre 94.06±8.35; Post 93.07±8.56 Kg). Neither the time (min/day) spent sedentary (Pre: 568±63; LW: 600±75), in light (Pre: 257±47; LW: 267±64) or moderate/vigorous (Pre: 24±10; LW: 24±14) PA nor the number of steps/day (Pre: 36,392±1,530; LW: 6,808±2,874) changed in LW compared to the period pre-intervention (p>0.05). The correlation between changes in body weight and changes in time in sedentary (-0.068), light (-0.233), moderate/vigorous (-0.292) PA and steps/day (-0.289) was not also significant (p>0.05).

**Conclusion:** Even though we did not find a significant correlation between variation in body weight and variation in time sedentary/active, the lack of change in sedentary and PA time despite the addition of 3 sessions of exercise/week suggests the occurrence of a compensation to minimize the increase in daily energy expenditure caused by exercise, contributing to the resistance to body weight reduction. Our results also demonstrate a failure in adopting a more active lifestyle after participating in an IP.

**Financial Support:** Fapesp 2015/06630-1, 2017/04528-0 and CAPES.
RT session Rest After 30 min 60 min
No water 11.3±1.5 12.3±1.1 12.3±1.2 12.5±1.0
Water 11.5±0.6 1.5±1.2 1.3±1.2 1.8±1.1

* Significant difference between no water and water sessions (p<0.05).

** Significant RT session by time interaction/difference in relation to Rest (p<0.05). Results are presented in mean and standard deviation.

CONCLUSION: WI during RT may be beneficial to reduce the negative impact of RT on arterial stiffness. This was evidenced by the maintenance of PWV values after WI session and increased values after NFI. From this investigation alone we cannot determine whether WI is influencing the PWV measurement or which physiological mechanisms were influenced by WI.

### 3061 Board #107 May 31 3:30 PM - 5:00 PM
#### Outcomes On Physical Activity Levels By Minimal Contact Intervention At A University Setting: Preliminary Results

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(NO relevant relationships reported)

**PURPOSE:** To compare the effects of an intervention program of minimal contact using WhatsApp® and Fitbit® over the levels of physical activity on a university population.

**METHODS:** We designed a 12-week intervention program of minimal contact on a university population. Participants were randomly assigned into two groups: intervention (IN) and control (CO). From a total of 177 participants, 19 (11 men, 8 women, aged 18 - 32) completed the program and had the complete accelerometry information measured with the wGT3X-BT® accelerometer. The program consisted of messages sent by WhatsApp® every week based on The Canadian 24 hrs movement: sweat, step, sleep and sit. All the messages were based on the motivational self-determination theory. The participants also wear a portable Fitbit Flex 2 for 12 weeks. We evaluated the moderate to vigorous physical activity (MVPA) levels and sedentary behaviors in minutes/day and percentage of weekly wearing time by accelerometer using the IPAQ criteria. We compared the outcomes by group (t-test, U Mann-Whitney) and time (paired T-test, Wilcoxon).

**RESULTS:** Both groups met the recommendations of MVPA in high proportion (N=83.3%, CO=85.7%, >150 min/w). There were no significant differences in MVPA nor sedentary levels between groups at baseline and after 12 weeks. MVPA (in time and percentage) and time in sedentary activities decreased, however, the percentage of sedentary activities increased in IN group but decreased in the CO group. Nonetheless, these differences were no significant. Sedentary behaviors were very high in both groups. Independently of the intervention and the assessment moment, subjects spent more of the 60% of the wearing time on sedentary activities (Table).

**CONCLUSIONS:** This intervention was not effective to increase MVPA levels or decrease sedentary behaviors. Probably more time is needed to improve the entire 24 hrs movement component and/or the minimal contact should be more supervised in this sample.

| Table I. MVPA and sedentary behavior compared by group and time. |
|-----------------|-----------------|-----------------|-----------------|
|                 | Intervention (n = 12) | Control (n = 7) | Intervention (n = 12) | Control (n = 7) |
| **MVPA (min/day)** | 46.7±21.9 | 50.1±23.4 | 0.755 | 45.9±21.1 | 49.7±18.5 | p = 0.698 |
| **MVPA (%)** | 5.6±2.5 | 5.8±3.0 | 0.966 | 5.5±2.6 | 5.7±2.4 | p = 0.862 |
| **Sedentary (min/day)** | 536±67.5 | 573.1±64.7 | 0.257 | 529.5±76.0 | 558.8±67.7 | p = 1.0 |
| **Sedentary (%)** | 63.6±5.1 | 66.1±6.8 | 0.383 | 64.6±7.8 | 64.2±6.1 | p = 0.904 |

Data expressed as mean ± standard deviation. There were no significant differences for pre vs post assessments (p>0.05). MVPA: Moderate to vigorous physical activity; (min/day): Average daily time on that activity; (%) : Percentage of the whole week spent on that activity.
an exercise programming that is designed for the active-duty firefighter population to maintain the beneficial adaptations in health and fitness and (2) including exercise science majors in relevant community experiential learning service activities.

### 3064 Board #110 May 31 3:30 PM - 5:00 PM Effects of a Weight Management Intervention on Holiday Weight Change and Body Image in Inactive Overweight Midlife Postmenopausal Women

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(No relevant relationships reported)

**INTRODUCTION:** The holiday season is linked to weight gain which has also been related to distress and self-attitudinal aspects of body image (BI) inclusive of physical appearance and perceptions about physical fitness and health. The aim of a weight management intervention on holiday weight change and BI in midlife females has not been investigated.

**PURPOSE:** This study aimed to examine the effects of an 11-week weight management intervention on holiday weight change and BI in inactive overweight postmenopausal women. **METHODS:** Females (n=18; 54.7±3.9 yrs; BMI=30.5±4.5 kg/m²) completed an 11-week weight management program (supervised exercise with nutrition education) with three phases: 1) Pre-Holiday (PreH; 5 weeks), 2) Holiday Period (HP, Thanksgiving 2017 through New Year’s Day 2018; unsupervised social support only), and 3) Post-Holiday (PostH; 6-weeks). Weight and BI [Multidimensional Body-Self Relations Questionnaire subscales] were assessed at four times: 1) Baseline (B1); 2) Follow-up 1 (F1; post PreH); 3) Baseline 2 (B2; post HP; baseline for PostH); and 4) Follow-up 2 (F2; final measure after PostH). Data analysis utilized one-way repeated measures ANOVAs and Pearson’s correlations.

**RESULTS:** Weight change was highly variable from B1 (F2: range=6.0 to 5.1 kg) although no significant changes occurred (B1=79.5±12.7 kg; F1=79.2±12.4 kg; p=0.33; ESB1-F2=0.03). Corrantly, Appearance Evaluation (B1=2.4±0.6; F1=2.5±0.8; B2=2.6±0.9; F2=2.7±0.8; p=0.01; ESB1-F2=0.65), increased. No changes in the subscales of Body Areas Satisfaction, Overweight Preoccupation and Self-Classified Weight subscales were detected (all p≥0.05). Change in weight was related to change in both Fitness and Health Orientation (B1 to F2; r=0.56; p=0.03; and r=0.54; p=0.02; respectively), but it was not related to changes in Appearance Evaluation (r=-0.22, p=0.37).

**CONCLUSIONS:** Our preliminary study suggests that the 11-week weight management intervention attenuated holiday weight gain while positively influencing body image in overweight midlife females.

### 3065 Board #111 May 31 3:30 PM - 5:00 PM Association between Quadriceps Strength and Self-Reported Physical Activity in Individuals with Knee Osteoarthritis

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Limited quadriceps strength is common with knee osteoarthritis (OA) and may lead to activity avoidance and low physical activity (PA) levels. **PURPOSE:** To investigate the association between quadriceps strength and self-reported PA in individuals with knee OA. Secondary analyses evaluated the association between a change (Δ) in quadriceps strength and self-reported PA following a 4-week physical therapy intervention designed to improve lower extremity strength. **METHODS:** Ninety individuals with radiographic knee OA were enrolled in the current study (43% male; Kellgren-Lawrence grade: 2-4). Assessments occurred at baseline, post intervention, and 4 weeks after intervention completion. At each testing visit, participants completed the Physical Activity Scale for the Elderly (PASE), the Western Ontario and McMaster Universities Arthritis Index pain subscale, and a quadriceps maximal voluntary isometric contraction (MVIC) performed at 70° of knee flexion measured Kellgren-Lawrence grade: 2-4). Assessments occurred at baseline, post intervention, and 4 weeks after intervention completion. At each testing visit, participants completed the Physical Activity Scale for the Elderly (PASE), the Western Ontario and McMaster Universities Arthritis Index pain subscale, and a quadriceps maximal voluntary isometric contraction (MVIC) performed at 70° of knee flexion measured.

**Purpose:** To investigate the association between quadriceps strength and self-reported PA following a 4-week physical therapy intervention designed to improve lower extremity strength. **METHODS:** Ninety individuals with radiographic knee OA were enrolled in the current study (43% male; Kellgren-Lawrence grade: 2-4). Assessments occurred at baseline, post intervention, and 4 weeks after intervention completion. At each testing visit, participants completed the Physical Activity Scale for the Elderly (PASE), the Western Ontario and McMaster Universities Arthritis Index pain subscale, and a quadriceps maximal voluntary isometric contraction (MVIC) performed at 70° of knee flexion measured.

**RESULTS:** A total of 97 female college students (20.40 yrs) were invited to join the EDI-3 estimate, and 23 of them were judged to have high risk of eating disorder. The 23 students were randomly divided into two groups, the HIIT group (n=12) and the control group (n=11). The HIIT group performed 12 weeks HIIT program particularly designed for them: vehemently pedaling bike for 30 seconds and then resting for 10 seconds, repeating the circle for three times. The training was carried out every other day during the 12 weeks. In contrast, no intervening was taken for the control group during the 12 weeks. Before and after 12 weeks, BMD of total body of all subjects was detected by DEXA, and bone composition was measured by BIA. Results: for female college students with high risk of eating disorder could make their BMD and body composition to improve obviously.

### 3066 Board #112 May 31 3:30 PM - 5:00 PM Effect Of Hiit On Bmd And Body Composition For College Female Students With Eating Disorder

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(No relevant relationships reported)

**Purpose:** To study the effect of high intensity interval training (HIIT) on bone mineral density (BMD) and body composition for college female students with high risk of eating disorder for improvement of physical status. **METHODS:** A total of 97 female college students (20.40 yrs) were invited to join the EDI-3 estimate, and 23 of them were judged to have high risk of eating disorder. The 23 students were randomly divided into two groups, the HIIT group (n=12) and the control group (n=11). The HIIT group performed 12 weeks HIIT program particularly designed for them: vehemently pedaling bike for 30 seconds and then resting for 10 seconds, repeating the circle for three times. The training was carried out every other day during the 12 weeks. In contrast, no intervening was taken for the control group during the 12 weeks. Before and after 12 weeks, BMD of total body of all subjects was detected by DEXA, and body composition was measured by BIA. Results: for female college students with high risk of eating disorder could make their BMD and body composition to improve obviously.
Although minimal statistical power limits the conclusions that can be drawn from these preliminary data, results indicate both RT and IT improve spine bone mass, while RT may provide a broader osteogenic stimulus in young adult women with lower than average bone mass. Data collection is ongoing.

**3068 Board #114 May 31 3:30 PM - 5:00 PM**

**The Feasibility and Efficacy of a Behavioral Intervention to Promote Appropriate Gestational Weight Gain**

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(No relevant relationships reported)

Nearly half of all women gain above gestational weight gain (GWG) recommendations and physical activity (PA) has been shown to decrease during pregnancy. Much work remains in understanding how to promote appropriate GWG and PA during pregnancy.

**PURPOSE:** This study assessed the feasibility and efficacy of a pilot behavioral intervention on GWG and PA behaviors. **METHODS:** Women (n=45) 14-20 weeks gestation enrolled in a behavioral intervention. Physicians 'prescribed' the intervention to low-risk patients. The intervention included self-monitoring, support, and optional walking groups. Process evaluation measures regarding usage and acceptability of study components were obtained. PA was objectively measured at baseline and 35 weeks. The percentage of participants with appropriate GWG was calculated. Control data was obtained from the same clinic where participants were recruited. **RESULTS:** Overall, the intervention was acceptable to participants; attrition was low (6.7%). Participants reported a lack of discussions about the study with their physician. Results showed no significant difference between intervention and control participants in the percentage who gained excess weight (p=0.37). There was a significant decrease in moderate-to-vigorous PA in intervention participants (p<0.0001).

**CONCLUSION:** The pilot intervention was acceptable and satisfactory for participants and our physicians. The reduction in sedentary behavior has been associated with improvements in metabolic health. Because a disproportionate number of working hours for office-based employees are spent engaged in sedentary behavior, an increase in workplace activity is substantiated.

**Overall, the intervention was acceptable to participants; attrition was low (6.7%).**

**Participants reported a lack of discussions about the study with their physician.**

A reduction in sedentary behavior has been associated with improvements in metabolic health. Because a disproportionate number of working hours for office-based employees are spent engaged in sedentary behavior, an increase in workplace activity is substantiated. **PURPOSE:** The purpose of this study was to determine if the use of a sit-to-stand workstation (STS) effected blood lipid profiles following a 12-month intervention. **METHODS:** Participants of the study included volunteer faculty and staff of the University of Central Oklahoma who were randomly assigned to a control group (CG) or an intervention group (IG). A STS was provided to the IG with participants being instructed to stand at least 2 hours every work day. Blood lipid profiles were used to measure high-density lipoprotein cholesterol (HDL), total cholesterol (TC), triglycerides (TG), and lipoprotein(a) (Lp(a)). Independent-samples t-tests were used to examine group differences on baseline characteristics. Both within-group (paired-samples t-tests) and between-group (ANCOVA with baseline scores as covariate) changes scores were analyzed. **RESULTS:** No significant baseline differences were found between groups. Significant changes were found for HDL and TG. **CONCLUSION:** The pilot intervention was acceptable and satisfactory for participants and our physicians. The reduction in sedentary behavior has been associated with improvements in metabolic health. Because a disproportionate number of working hours for office-based employees are spent engaged in sedentary behavior, an increase in workplace activity is substantiated.

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MEDICINE & SCIENCE IN SPORTS & EXERCISE®

3072 Board #118 May 31 3:30 PM - 5:00 PM
Exergaming Intervention in Sedentary Middle-Aged Adults Improves Cardiovascular Endurance, Balance and Lower Extremity Functional Fitness
Daniel Rosney, Sr.,1 Peter Horvath1. Temple University, Philadelphia, PA. 1State University of New York at Buffalo, Buffalo, NY.

(Purpose: To compare balance, cardiovascular health and functional fitness in relation to exercise tests in sedentary adults before and after exergaming (n = 12, 56±4 yrs, 162±10.9 cm, 79±21.9 kg, 39.6±7.7% fat mass).

Methods: Subjects initially underwent balance, cardiovascular endurance and functional fitness tests before engaging in exergaming for 20 min/3d/wk. After 8 weeks, balance, cardiovascular health and functional fitness tests were repeated.

Results: Exergaming improved Single-Leg-Stand time (3.2±0.4s to 7.9±1.4s, p < 0.05), Sit-to-Stand repetitions (1.42±1.7 to 16.6±1.3, p < 0.05) and YMCA 3-Minute Step Test heart rate recovery (103±7.9 to 95±3.2, p < 0.05) while eliciting an habitual increase in VO2max from the treadmill 6-minute walk test (T6MWT). PA and PASE were measured by the IPAQ and PAAI at W4 and W8 of intervention. All Ps wore pedometers to measure objective PA throughout the intervention. The 2-SD-band method was used to compare BL data with W2, W4, W6, and W8 data. Results: Self-reported PA increased from BL in P2, P3, P4, and P5 by 9.5, 2.9, 11, and 7.8 hrs, respectively. Statistically significant increases were noted in PA in 4 Ps: P1: Resting HR (BL-W8-W6-W4-W2) [9.3 b/min]; Resting SBP (BL-W8-W6-W4-W2 [82 mmHg]; HRR (BL-W8-W6-W4-W2 [12.0±3.4 mmHg]; distance traveled in T6MWT (BL-W4-W6-W8 153.7 m), VO2max (BL-W6-W8 1.7±1.0 mL/kg.min); P2: resting SBP (BL-W4-W6-W8 [97 mmHg]); HRR (BL-W6-W8 [104]); post-walk HR (BL-W2-W4-W6-W8 [68.6 b/min]), post-walk SBP (BL-W2-W4-W6-W8 [22.5 mmHg]); P4: resting HR (BL-W6-W8 [5.8 b/min]); weight (BL-W8-W6-W2 [0.5 kg]); post-walk HR (BL-W2-W4-W6-W8 [113.8 b/min]), post-walk SBP (BL-W4-W6-W8 [194.4 mmHg]); distance traveled in T6MWT (BL-W2-W4-W6-W8 [53.7 m]). PASE increased from BL in P1, P2, and P5: 40, 100, 360, 30, respectively. Conclusions: The results suggested that text-messaging may be effective in increasing nursing students’ PA, PF, and PASE.)

3073 Board #119 May 31 3:30 PM - 5:00 PM
Effects Of Yoga And Tai Chi On Mental Health, Pain, And Balance In College Students
shiqi Yu, Jingle Xu, Tara Bridgeman, Cecile Craft, Gloria Duke, Sarah Sass, Xuanliang Dong, Yong Tai Wang, FACSM, Danita Alfred. University of Texas at Tyler, Tyler, TX. (Sponsor: Yong Tai Wang, FACSM)

Email: 976478974@qq.com

(No relevant relationships reported)

Psychological disorders affect up to 50% of college students. Mind-body exercises such as tai chi and yoga have been effective for decreasing mental distress and pain and improving balance, but little is known about these outcomes in the college-aged population.

Purpose: This primary aim of this study was to determine the effectiveness of yoga and tai chi on mental health, pain, and balance in college students.

Methods: Participants included 46 undergraduate students (13 males, 33 females; age: M = 23.9 years, SD = 7.4) enrolled in a yoga class (10) and a tai chi class (16) for the control group (15). Measures of depression, anxiety, stress, pain, and balance were administered at baseline (before the classes began) and at the middle (weeks 1) and end of the semester (14 weeks). A repeated-measures ANOVA was used with time (baseline, mid, end) and Group (yoga, tai chi, control) to examine the effects of the interventions. In addition, focus group interviews were conducted at the end of study.

Results: At baseline, the yoga group had higher anxiety and depression scores than the tai chi group. No other differences were apparent at baseline. Over time, yoga group showed decreased anxiety and depression from baseline to 14 weeks, and in depression from baseline to 7 weeks. Though no other significant differences were noted, there was a pattern of decreasing means across all measures of mental health and pain and improvement in balance in the yoga and tai chi groups. Additionally, focus group findings revealed students favored yoga over tai chi. Tai chi benefits included brief learning the sequential steps. Yoga was the “bright spot” in the week and more students felt it decreased stress, minimized potential for anxiety attacks, served as a disconnect from the external world and provided an activity to connect with friends. Conclusion: The preliminary results suggest that implementation of yoga is acceptable and feasible in college students and has the potential of playing a protective or preventive role in promoting mental health.)

3074 Board #120 May 31 3:30 PM - 5:00 PM
The Impact of Text Messaging on Baccalaureate Nursing Students’ Physical Activity: Single Case Design
Ashley Shuzhu He-Remick, Hardin Simmons University, Abilene, TX. (Sponsor: Dennis G O’Connell, FACSM)
Email: sxh05@acu.edu

(No relevant relationships reported)

Purpose: Find the effect of text messaging on physical activity (PA), physical fitness (PF), and physical activity self-efficacy (PASE) of nursing students.

Methods: A single-case design, concurrent 4-randomized baselines across subjects, and an 8-week text-messaging intervention were used. Participants (Ps) were selected based on results from PA health risk factors, the International Physical Activity Questionnaire (IPAQ), the Physical Activity Appraisal Inventory-Adolescence and Young Adult Version (PAAI). Selected Ps had high or low PA and PASE, and low or moderate PA health risk. Ps (P1-P5: 1 male, 4 female, mean age = 21) were randomized to 5, 7, 10, or 13 day baselines (BL) and completed 3 or 4 BL PF tests and 4 PF retests in week 2 (W2), 4 (W4), 6 (W6), 8 (W8) of intervention. PF tests were resting and post-walk HR and BP, weight, height, BMI, waist-hip ratio (WHR), hand grip strength, VO2 max from the treadmill 6-minute walk test (T6MWT). PA and PASE were measured by the IPAQ and PAAI at W4 and W8 of intervention. All Ps wore pedometers to measure objective PA throughout the intervention. The 2-SD-band method was used to compare BL data with W2, W4, W6, and W8 data. Results: Self-reported PA increased from BL in P2, P3, P4, and P5 by 9.5, 2.9, 11, and 7.8 hrs, respectively. Statistically significant increases were noted in PA in 4 Ps: P1: Resting HR (BL-W8-W6-W4-W2) [9.3 b/min]; Resting SBP (BL-W8-W6-W4-W2 [82 mmHg]; HRR (BL-W6-W4-W2 [12.0±3.4 mmHg]; distance traveled in T6MWT (BL-W4-W6-W8 153.7 m), VO2max (BL-W6-W8 1.7±1.0 mL/kg.min); P2: resting SBP (BL-W2-W6-W8 [99 mmHg]); HRR (BL-W6-W8 [104]); post-walk HR (BL-W2-W4-W6-W8 [68.6 b/min]), post-walk SBP (BL-W2-W4-W6-W8 [22.5 mmHg]); P4: resting HR (BL-W6-W8 [5.8 b/min]); weight (BL-W8-W6-W2 [0.5 kg]); post-walk HR (BL-W2-W4-W6-W8 [113.8 b/min]), post-walk SBP (BL-W4-W6-W8 [194.4 mmHg]); distance traveled in T6MWT (BL-W2-W4-W6-W8 [53.7 m]). PASE increased from BL in P1, P2, and P5: 40, 100, 360, 30, respectively. Conclusions: The results suggested that text-messaging may be effective in increasing nursing students’ PA, PF, and PASE.)

3075 Board #121 May 31 3:30 PM - 5:00 PM
Effects Of Sit-to-stand Desk And Treadmill Workstations On Sedentary Behavior And Physical Activity
Diego J. Arguello1, Gregory Cloutier1, Alvin Morton2, Dinesh John1. 1Northeastern University, Boston, MA. 2University of Tennessee Knoxville, Knoxville, TN.
Email: arguello.d@husky.neu.edu

(No relevant relationships reported)

Purpose: To compare the efficacies of treadmill and sit-to-stand workstations in decreasing daily sedentary behavior (SED) during a 12-month, cluster-randomized trial with an intent to treat design in sedentary overweight office workers.

Methods: Sixty-six office workers (7 male, 59 female, age ± SD = 45.3 ± 12.3 y, BMI ± SD = 32.5 ± 7.5 kg/m²) were cluster randomized to one of 3 groups: (i) seated desk control (C) (N=21), (ii) sit-to-stand desk (D) (N=23), or (iii) treadmill desk (T) (N=22). Change in total daily SED, standing and time wearing dual-axis accelerometers adhered to the dominant thigh at baseline (B), month-3 (M3), month-6 (M6) and month-12 (M12). Inclusion in analyses required ≥ 4 valid accelerometer wear days (i.e., ≥ 10 h. of wake wear time). Missing mean daily SED, standing and stepping time were imputed using multiple imputation. Conclusions: SED significantly decreased (P<0.05) after 12 months in the D group compared to the C and T groups. The greatest decreases were observed at month-12, with a mean of 946 min/wk decrease in SED in the D group. Significant decreases were also observed in standing time and step counts. The findings suggest that sit-to-stand and treadmill workstations may be effective in reducing SED in sedentary office workers.)
hours were imputed using multiple-imputation. Between and within group differences in mean daily wake-time spent SED, standing, and stepping after M3, M6 and M12 were analyzed with random intercept mixed linear models accounting for repeated measures and clustering effects. Bonferroni corrections were used during pairwise post-hoc comparisons to correct for multiple hypotheses testing. Results: Mean monitoring time (i.e., mean sensor wear days and daily time) did not significantly vary between or within groups. There were no significant within group changes in mean daily SED time during the study period. Significant increases in time spent SED were observed at all three time points. The difference in mean daily SED time was 0.50 h between group A and group B at M12 (p = 0.019, Cohen’s D = 0.50). No significant between group differences in SED, standing or stepping time were observed at M3, M6, or M12. Conclusion: Workstation-based workplace interventions may result in moderate short-term daily reductions in SED and increased physical activity among seated office workers. Sustaining these short-term behavioral improvements may not be achievable through passive environmental modifications alone, and may require additional active behavior change strategies.

3076 Board #122 May 31 3:30 PM - 5:00 PM Impact Of 12 Week Pedometer Based Intervention Long Term Increase In Physical Activity Inpreviously Sedentary Adults
Venkata K. Puppala1, Elise Nelton1, Amberly Braman1, Kwang Woo Ahn1, Scott J. Strath1, Mobin Malik1, Michael E. Widlansky1, 1Medical College of Wisconsin, Milwaukee, WI. 2University of Wisconsin, Milwaukee, WI. Cleveland Clinic, Cleveland, OH.

PURPOSE: Sedentary life style increases the risk of cardiovascular disease. In previous studies we have demonstrated that 12 week pedometer based interventions aimed at increasing physical activity by 10% each week to achieve a goal of 10,000 steps/day resulted in increase in moderate physical activity (MPA) among sedentary adults at the end of 12 weeks. We wanted to study if this increase in MPA has been sustained in the long term in these sedentary adults.

METHODS: A total of 55 adults aged ≥ 50 years were randomized to be in three groups. Group 1 with no intervention, Group 2 received pedometer only and Group 3 with pedometer plus interactive motivational website which provides strategies to increase their physical activity by 10% each week for 12 weeks. A 7-day log of duration and intensity of physical activity using an accelerometer (Actigraph GT3X) were obtained in all the three groups at baseline, 12 and 52 weeks. Data was analyzed with repeated measures ANOVA including group, time, and interaction between group and time was conducted to account for repeated measurements over three time points. False discovery rate control under dependency of Benjamini and Yekutieli was employed to adjust for dependent multiple tests.

RESULTS: There is no significant change in physical activity at the end of 12 weeks or 52 weeks in the control group. There is a statistically significant increase in amount of time spent in MPA, and amount of time spent in bouts (10 minutes of MPA) at M3, M6, and M12. The active recovery intervals were 50 seconds during the first week and two standard aquatic upper body, lower body, and full body aerobic exercises, most lasting 10-30 seconds and used combinations of 8-12 different exercises. Twenty-five standard aquatic upper body, lower body, and full body aerobic exercises, most of which utilized aquatic dumbbells or hand paddles, were used in an HIIT protocol during each exercise session. The HIIT intervals during the first week were 10 seconds and increased by 5 seconds each week ending with 30-second HIIT durations during the fifth week. The active recovery intervals were 50 seconds during the first week and decreased by 5 seconds each week ending with 30-second recovery durations during the fifth week. RESULTS: Significant improvements in body composition, submaximal and peak heart rate, submaximal VO2peak and peak VO2peak occurred from pre- to post-program. CONCLUSION: To our knowledge, this is the first study to evaluate the effectiveness of standard aquatic aerobic exercises in an HIIT protocol. Improvements in cardiopulmonary fitness and exercise economy were observed in all the three groups. This form of exercise may be more tolerated in obese individuals or patients with physical limitations for land-based exercise.

Table 1. Data are mean ± SD.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline</th>
<th>5 weeks</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Composition (% body fat)</td>
<td>32.55 ± 5.57</td>
<td>30.55 ± 6.31</td>
<td>0.004</td>
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<tr>
<td>GXT VO2 Peak (mL/kg/min)</td>
<td>30.53 ± 4.38</td>
<td>31.95 ± 5.08</td>
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<td>GXT Stage 1 VO2 (mL/kg/min)</td>
<td>15.72 ± 2.18</td>
<td>14.11 ± 2.30</td>
<td>0.013</td>
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<td>GXT Stage 1 HR (bpm)</td>
<td>138.91 ± 5.58</td>
<td>136.64 ± 5.22</td>
<td>&lt;0.001</td>
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<tr>
<td>GXT Stage 2 VO2 (mL/kg/min)</td>
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<td>19.25 ± 3.50</td>
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<tr>
<td>GXT Stage 2 HR (bpm)</td>
<td>169.18 ± 5.72</td>
<td>164.45 ± 5.56</td>
<td>&lt;0.001</td>
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<tr>
<td>HR Peak (bpm)</td>
<td>198.91 ± 3.45</td>
<td>192.00 ± 5.22</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

3077 Board #123 May 31 3:30 PM - 5:00 PM Barefoot Running As A Treatment For Plantar Fasciitis In The Runner: A Case Series
Cassie Oddy1, Alexandra Walker2, Peter Francis3, 1Leeds Beckett University, Leeds, United Kingdom. 2University of St. Mark and St. John, Plymouth, United Kingdom.

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(No relevant relationships reported)

PURPOSE: Plantar fasciitis is the most common running related injury associated with the foot and represents ~8% of all running injuries. The median recovery time for plantar fasciitis is ~5-months. Following the failure of conservative management for a patient with plantar fasciitis, we trialled an alternate day treatment strategy of barefoot running on a grass surface (10 - 15 minutes). This approach was successful in reducing pain intensity after 4-sessions. Three patients sustained this improvement up to session 6 and one patient reverted to their original pain score (4). The two male patients demonstrated an immediate and sustained reduction in pain. The two male patients initially remained unchanged or increased pain intensity before improving.

DISCUSSION: The results of this emerging case series suggest that this intervention is at least well tolerated in runners with chronic plantar fasciitis. The fact that the intervention contains the activity known to worsen symptoms may suggest this approach, then, is without promise. However, it is not possible to infer cause and effect from a case series and the improvements shown in this series may be due to other factors such as the passage of time or a reduction in fear avoidance behaviour.

3078 Board #124 May 31 3:30 PM - 5:00 PM Aquatic High Intensity Interval Training Improves Cardiorespiratory Fitness of Sedentary Adults
Brittany B. McDaniel, Mildred R. Naquin, Bovorn Sirikul, Robert R. Kraemer, FACSM, Southeastern Louisiana University, Hammond, LA. (Sponsor: Dr. Robert R. Kraemer, FACSM)

Email: rkraemer@selu.edu

(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine the effects of five weeks of aquatic high intensity interval training (HIIT) on cardiorespiratory fitness and body composition in sedentary young adults. METHODS: Eleven participants [9 female (20.0 ± 0.71 yr), 2 male (23.5 ± 2.12 yrs)] completed 18 sessions: A) a pre-program testing session; B) a familiarization session; C) 15 exercise sessions; and D) a post-program testing session. The participants completed 3 sessions per week for 5 weeks. Each session consisted of a 5-minute warm-up, 25 minutes of exercise, and a 5-minute cool-down. The exercise portion consisted of 25 exercise intervals lasting 10-30 seconds and used combinations of 8-12 different exercises. Twenty-two standard aquatic upper body, lower body, and full body aerobic exercises, most of which utilized aquatic dumbbells or hand paddles, were used in an HIIT protocol during each exercise session. The HIIT intervals during the first week were 10 seconds and increased by 5 seconds each week ending with 30-second HIIT durations during the fifth week. The active recovery intervals were 50 seconds during the first week and decreased by 5 seconds each week ending with 30-second recovery durations during the fifth week. RESULTS: Significant improvements in body composition, submaximal and peak heart rate, submaximal VO2peak and peak VO2peak occurred from pre- to post-program. CONCLUSION: To our knowledge, this is the first study to evaluate the effectiveness of standard aquatic aerobic exercises in an HIIT protocol. Improvements in cardiopulmonary fitness and exercise economy were observed in all the three groups. This form of exercise may be more tolerated in obese individuals or patients with physical limitations for land-based exercise.
transplant recipients (TX, 13.5 ± 3.4 yr; 152.0 ± 21.1 cm; 52.2 ± 20.5 kg) and 33 healthy controls, matched for sex, pubertal stage, regular physical activity and attended school (CON, 13.1 ± 3.2 yr; 157.2 ± 17.7 cm; 49.0 ± 15.9 kg) completed a cycling or treadmill spiroergometry, a motor coordination and a maximal hand grip strength test. HRQL was determined with a validated questionnaire and activity of daily life was recorded as steps per hour with a physical activity monitor. Thirteen patients out of TX (12.9 ± 3.4 yr; 152.1 ± 21.5 cm; 53.8 ± 22.2 kg) participated in a 6-week exercise video game intervention. They were instructed to exercise 3x/week at home during 30 minutes and were contacted weekly for adherence. All tests were repeated after the intervention.

RESULTS: Cardiovascular fitness (VO2peak: 28.6 ± 7.8 vs. 41.7 ± 8.5 mL·min⁻¹·kg⁻¹; P < 0.001), motor coordination (MQ2: 59.7 ± 17.5 vs. 105.8 ± 14.9; P < 0.001), physical activity (steps/h: 458 ± 181 vs. 687 ± 280; P = 0.001) and HRQL (75.0 ± 16.1 vs. 85.2 ± 7.58; P = 0.017) were significantly reduced in TX compared to CON. Maximal hand grip strength was similar in both groups. After six weeks of exercise training, daily physical activity significantly increased from 481 ± 176 to 602 ± 226 steps/h (P = 0.043). However, compliance turned out to be low and cardiovascular fitness, motor coordination and HRQL remained unchanged. CONCLUSION: Cardiovascular fitness, motor coordination, physical activity and HRQL are markedly reduced in pediatric renal transplant recipients. Despite low compliance, six weeks of active video gaming provided a stimulus for an increase in daily physical activity in these patients, but did not improve fitness.

Numerous studies have shown that dual-task demands involving exercise lead to a decline in performance on one or both tasks, but the direct effects of exercise intensity and type are less known. PURPOSE: To examine the dual-task performance of reaction time while standing or walking or fast-paced walking on a treadmill while completing tasks of varying complexities. METHODS: Using within-subject and a repeated measures design a total of 32 participants (Mage=21.03±2.79; Female=17) performed six different conditions involving Go/No-Go (GNG) movement tasks while treadmill standing/walking/fast-pace walking (2 task - congruent/incongruent x 3 intensities). Dual-task reaction time was measured during GNG movement task required subjects to strike virtual stimulus that is green while avoiding the red target. The directions were then reversed to create an incongruent condition. All participants performed 3 minutes of each exercise condition on a Motek-instrumented V-gait treadmill integrated with a 180° virtual reality projection screen which created the environment of GNG task. RESULTS: A repeated measures ANOVA with a Greenhouse-Geisser correction showed that mean reaction time differed significantly between exercise conditions, F (3,425, 106.177) = 14.157, p<0.01. Post hoc tests using Bonferroni correction revealed that Go-task while walking condition was faster than Go-task while standing an average of .039 (p<.01), NoGo-task while standing an average of .074 (p<.01), NoGo-task while fast-paced walking an average of .031 (p<.01). There were no significant differences between Go-task while walking, fast-paced walking and NoGo-task while walking. CONCLUSIONS: This novel research methodology suggests that walking-induced physiological arousal may lead to improved dual-task performance over a standing position (Schaefer et al., 2010).

Further study with group comparison is warranted.

There is evidence that aerobic exercise training improves cognitive control including working memory, attention, and goal management via improved brain perfusion, exercise-induced neurogenic factors, and structural adaptations. There is also evidence that cognitive training itself has beneficial effects on cognition via plasticity in neural networks and structural adaptations. However, it is unclear if these adaptations are found equally in those who experience increases in maximal aerobic capacity versus those who do not. PURPOSE: Determine cognitive adaptations associated with older adults performing 8 weeks of training on a video game (BTT) that combined cognitive and physical training. It was hypothesized that positive cognitive adaptations would be greater in participants increased maximal aerobic capacity as compared who did not. It was also hypothesized that participants would show an improvement in cognitive function after the intervention regardless of whether maximal aerobic capacity improved or not. METHODS: Fifteen lightly active older (67.6 +/- 4.4 yrs) participants completed 8 weeks of training, 3 days per week (24 sessions total) on BBT. Physical task difficulty was adaptive in the game based on real-time heart rate measurements. Cognitive task difficulty was adaptive and included task switching, selective attention and working memory challenges. Participants were assigned to either a maximal aerobic capacity responder group (Responders) who increased VO2 max (n=7) or a non-responder group (Non-Responders) that did not increase VO2 max (n=8). Cognitive assessments included behavioral and neural measures of working memory, sustained attention and goal management. RESULTS: Analysis of Covariance (ANCOVA) did not reveal any differences in post-test cognitive variables between Responders and Non-Responders. However, when groups were combined, Paired T-Tests showed improvements in the following cognitive variables: Reaction Time Variability in working memory tasks (p<.05) and Impulsivity in attention-based tasks (p<.05). CONCLUSION: Participants who increased maximal aerobic capacity did not experience greater improvements in cognitive control variables as compared to participants who did not. However, the group as a whole did improve measures of cognition.

3080 Board #126 May 31 3:30 PM - 5:00 PM Effect of Dual-Task Performance Among Young Adults
Yeohak Jung, Brett Baker, Preeti Chopra, Darla M. Castelli. University of Texas at Austin, AUSTIN, TX. Email: yeohak.jung@utexas.edu

(No relevant relationships reported)

3080 Board #126 May 31 3:30 PM - 5:00 PM
Implementation of Exercise Training Programs in Dialysis Patients
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(No relevant relationships reported)

PURPOSE: To determine the effect of functional exercise guided by a kinesiologist in addition to the basic exercise program of cycling during dialysis on dialysis treatment adequacy (Kt/V) and physical performance of dialysis patients. METHODS: 29 dialysis patients participated in the study. We tested their condition with 6-minutes walking test (6MWT), 10 repetitions sit-to-stand test (STS10), handgrip strength test (HG) and with measurement of their Kt/V. We randomized patients in two groups - one experimental (EXP) and one active control group (CON). The exercise program for both groups was formed three times per week over the course of two months. The EXP group attended a guided functional exercise before the dialysis procedure and after that performed a cycling session during dialysis. CON participated in equal intradialytic exercise program as EXP without prior functional exercise. After two months we repeated the baseline tests. RESULTS:

27 patients completed the study. Both groups have a significant increase in 6MWT (EXP: 510.8 ± 68.69 m vs. 561.6 ± 94.98 m; P=0.002), CON: 456.86 ± 78.86 m vs. 487.07 ± 76.16 m; P=0.002). Changes were significant in EXP (STST10 (EXP: 27.94 ± 5.98 vs. 17.46 ± 4.52 p<0.001), CON (31.40 ± 7.80 vs. 26.13 ± 8.85 p=0.000)) compared with baseline values. In HG there was a significant difference only in EXP (30.46 ± 8.4 kg vs. 36.00±9.76 kg; p=0.000), with no significant difference in CON (baseline: 26.14 ± 4.87 kg vs. 26.79 ± 4.26 kg; p=0.295) when comparing with their baseline values. Both groups also increased their VO2 max and physical performance of dialysis patients improved with Kt/V increased in EXP (p=0.006) and CON from 1.59 ± 0.81 (p=0.001) When comparing both groups, we can see a greater increase in EXP in STS10 (p=0.004) and in HR (p=0.000) compared to CON. There were no statistically significant difference between groups in 6MWT (p=0.035) and in Kt/V (p=0.00). CONCLUSION: Both types of exercise are effective in improving aerobic endurance and strength of lower limbs. However we believe that, if we want to improve various motor skills, cycling during dialysis alone is not enough. Our research showed us that functional training led by kinesiologist in dialysis centre is practical, feasible and effective in improving the physical function of hemodialysis patients combined with well established practice of intraendialytic cycling.

3082 Board #128 May 31 3:30 PM - 5:00 PM
Maximal Oxygen Uptake Responders Versus Non-Responders Show Differing Cognitive Responses to Movement-based Video Game Training
Christian Thompson1, Brigid Larkin1, Josh Volponi2, Alexander Simon3, Joaquin Anguera2, Adam Gazzaley2. 1University of San Francisco, San Francisco, CA. 2University of California - San Francisco Medical Center, San Francisco, CA. Email: jthompson@usfca.edu

(No relevant relationships reported)

3083 Board #129 May 31 3:30 PM - 5:00 PM
Sex Differences In The Acute Effect Of Stair-climbing On Postprandial Blood Glucose Levels
Jeff Moore, Hannah Salmon, Cameron Vinoskey, Jochen Kressler. San Diego State University, San Diego, CA. (Sponsor: Michael J. Buono, FACSM)

(No relevant relationships reported)
identical meal combined with either 1 min, 3 min, or 10 min of stair-climbing, all ending 28 min after subjects finished the meal. Fingerstick blood glucose measurements were taken at baseline and every fifteen minutes thereafter for one hour.

RESULTS: All results were normalized for body weight. There was no difference in post-exercise PPG at 30min for any of the trials in men ($F = 0.43, p = 0.69$ to 0.29). In women there was a significant difference in post-exercise PPG at 30min for the 10min trial ($F = 0.57, p = 0.04$ to 0.29, $p < 0.001$) but not for the 1min or 3min trials. No difference was seen between and for post-exercise PPG at 30min ($p = 0.65$, $n = 0.15$).

CONCLUSIONS: Men and women showed a similar responses in PPG following moderate intensity stair-climbing of various durations.

INTRO: In the United States, obesity affects about 12.7 million children and adolescents, with minority and low-income populations at an increased risk. Development of a positive association and regular engagement in physical activity at a young age promotes the cessation of these habits in adulthood. School-based physical activity programs benefit communities as well as students and schools. The implementation of a physical activity based service learning program provides a mutually beneficial partnership between pre-service teachers and the elementary students. PURPOSE: The purpose of this study was to determine the effect of a 9-week fitness intervention and education program for under-serviced 5th grade students. METHODS: Club Fit! consists of a 9-week program with bi-weekly 60-minute exercise sessions. Physical Education Teacher Education Pre-service teachers (n=21) served as mentors to 5th grade students (n=35) enrolled at a local elementary school. The pre-service teacher/mentor to student/mentee ratio was 1:1 - 1:2. Pre-service teachers alternated leading fifteen lessons focused on health and skill-based physical fitness components, such as paddle tennis, yoga, jumping rope, and locomotor skills. Basic educational concepts from the components of physical fitness were incorporated, including comparing heart rate before and after activity and distinguishing between muscular strength and endurance. Each session concluded with journal questions reflective of the day’s concepts and activities. Prior to the program, pre-service teachers trained to use the FitnessGram assessment protocols and Healthy Fitness Zone standards (HFZ). Four FitnessGram Performance Standards were assessed pre- and post-program: Back Saver Sit and Reach, One Mile Run, Curl-Ups, and Push-Ups. Paired t-tests were used to assess the pre and post values for all four FitnessGram Performance Standards. RESULTS: Students improved performance in all measured FitnessGram components. Back Saver Sit and Reach (Left: $p = 0.0022$; Right: $p = 0.00319$); One Mile Run ($p = 2.279E-7$); Curl-Ups ($p = 0.00261$); Push-Ups ($p = 0.00159$). CONCLUSION: Students improved in all four FitnessGram components and HFZ standards were met for all comparable components. The fitness intervention increased levels of health-related fitness.

Due a growing number of new cases of dementia and the lack of pharmacological treatment for prevention of dementia, the study of non-pharmacological interventions becomes more necessary. Although Mild Cognitive Impairments (MCI) patients begins to show mobility decreases, especially in dual-task (DT), some studies have found differences in the mobility tests: 8-foot up and go (8UG) in ST and DT (motor and cognitive tasks). Ten participants were randomized and allocated to an experimental group (EG = 5), with multimodal physical training, including aerobic exercises, strength, balance and stretching; or in a control group (CG = 5).

After three months of intervention, both groups were reevaluated. An independent t-test and effect size (ES) analysis were performed through the deltas (post-pre) of the groups. RESULTS: The EG presented improvements in general mobility (SMD=0.71 [moderate], 95%CI=0.06, 1.37) and in all mobility tests compared to the CG (TS UG: SMD=0.62 [moderate], 95%CI=0.05, 1.90; coefficient of variability (CoV) UG: SMD=0.14 [trivial], 95%CI=-1.10, 1.38; DT UG: SMD=1.12 [large], 95%CI=0.23, 2.48; cost of DT (CDT) UG: SMD=1.09 [large], 95%CI=0.26, 2.44).

CONCLUSION: MT has a positive effect on mobility in elderly patients with MCI, mainly in DT, contributing to the preservation of functional mobility in this group. Supported by CNPq (301483/2016-7) and FAPERJ (E-26/ 203.193/2016).

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Interest during immersive VR (3.5 ± 0.4) than non-immersive VR (2.1 ± 0.5) and traditional biking (1.7 ± 0.4). Specifically, immersive VR compared to non-immersive VR and traditional biking, respectively, observed significantly greater novelty (3.7 ± 0.4; 2.2 ± 0.7; 1.3 ± 0.4), challenge (3.7 ± 0.4; 2.9 ± 0.6; 2.3 ± 0.7), attentional demand (3.2 ± 0.6; 1.5 ± 0.7; 1.5 ± 0.5), exploration intention (3.7 ± 0.5; 2.5 ± 0.5; 1.9 ± 0.6), and instant enjoyment (3.1 ± 0.6; 2.2 ± 0.7; 1.3 ± 0.4). Noteworthy, non-immersive VR was observed to be significantly higher than traditional biking in all 5 subscales of situational interest.

**DISCUSSION:** Observations suggested immersive VR biking to promote greater steps and situational interest over non-immersive VR and traditional biking, with non-immersive VR observed superior to traditional biking for situational interest, suggesting VR biking may be an attractive exercise modality in this population. Future experimental designs assessing these outcomes are warranted.

**3088 Board #134 May 31 3:30 PM - 5:00 PM Effects of Resistance Training on Physical Fitness and Arterial Compliance in Normotensive Obese Women**

Caitlyn Harweger, Paige Davis, Cory Mahan, Bryan Smith, Amy Givan, Bharath Sagar Selvaraj, Mason Plater, Cassidy Stout, Eneko Larumbe-Zabala, Maria Fernandez-del-Valle, Southern Illinois University Edwardsville, Edwardsville, IL, Texas Tech University Health Science Center, Lubbock, TX. (No relevant relationships reported)

**Purpose**
The purpose of this study was to determine the short-term effects of resistance training (RT) on arterial compliance and physical fitness in obese women with normal blood pressure.

**Methods**
A total of 16 participants (10 control/6 intervention) were included in the analyses (age: 23.5±4.1 years; body mass index: 33.6±2.9 kg/m²). Pre- and post-intervention assessments included cardiorespiratory tests, arterial stiffness assessments, and leg press (LP) and bench press (BP) one repetition maximum tests (1RM). Training consisted of seven strength exercises performed at an intensity of 80% 1RM until 550 time for weeks 7 through 12. The obese continuous moderate intensity group exercised the treadmill exercise training program. The PB high intensity interval group exercised a high level of enjoyment with the program, which may help to foster long-term adherence.

**Conclusions**
Short-term high intensity RT had positive effects on muscle strength in obese women with normal blood pressure with no negative effects on arterial compliance.

**3089 Board #135 May 31 3:30 PM - 5:00 PM Weekly Activity Maintained While Adding Training Among Post Bariatric and Obese Participants**

David L. Wenas, Kristen Byrne, Brittany Rood, Elizabeth Edwards, Jeremy Akers, Trent Hargens, FACSM, James Madison University, Harrisonburg, VA. (No relevant relationships reported)

It is suggested that a barrier to weight loss during exercise training is associated with increased compensatory sedentary activity (CSA). While studies report a positive association between physical activity and improved weight loss in post bariatric (PB) and obese individuals, the effectiveness for the different types of physical activity interventions and CSA reported is often equivocal. **Purpose:** To evaluate if vigorous or moderate continuous exercise regimens maintain or increase energy expenditure of individuals during exercise training. **Methods:** Eight PB individuals [7 female, 1 male; Body Mass Index (BMI) = 34.95 ± 7.6] and ten obese individual [7 female, 3 male; BMI = 38.99 ± 6.5] participated in a supervised 12 week three days per week treadmill exercise training program. The PB high intensity interval group exercised at 80% of their age adjusted heart rate reserve (HRR) for 4 minute intervals interspersed with 4 minute recovery periods at 50% of the HRR for weeks 3 through 6. Exercise was increased to 6 minute bouts at the same HRR intensity and recovery time for weeks 7 through 12. The obese continuous moderate intensity group exercised for 20 minutes at 60% HRR for weeks 3 through 6 and 20 minutes at 65% HRR for weeks 7 through 12. Both exercise interventions included a 2-week run-in to avoid injuries. Energy expenditure (MET-hrs) was measured using micro activPALs for the pre-exercise week and weeks 3, 9 and 12. **Results:** Overall, there were no significant differences between groups for any MET-hrs for any week. MET-hrs increased (p <.05) from the pre-exercise week (212.1 ± 4.96) during the intervention (week 3: 221.87 ± 8.01; week 9: 218.22 ± 11.19), and remained elevated post-intervention (week 12: 216.35 ± 7.5). Post-intervention MET-hrs had decreased from week 3, but were not significantly different from week 9 MET-hrs. There was 85% confidence for all training sessions for both groups. **Conclusion:** Post-Bariatric surgery patients increased METs from vigorous intensity exercise intervention similar to obese individuals in moderate continuous exercise training. Although METs for week 12 declined for both groups, it remained above baseline and appears there was no evidence of CSA for either group.

Supported by Sentara RHM Hospital and CHBS

**3090 Board #136 May 31 3:30 PM - 5:00 PM Efficacy of a Virtual Reality Fitness Program for Enhancing Muscular Fitness and Body Composition**

Kenneth Delcastillo, Andrew Alto, Ramon Belliard, Brad Schoenfeld. Lehman College, Bronx, NY. (No relevant relationships reported)

**PURPOSE:** The purpose of this study was to compare the effects of a time-efficient virtual reality (VR) training system versus a traditional exercise (TE) program on measures of muscular fitness, body composition, and enjoyment.

**METHODS:** Nineteen untrained young men (height: 175.8±4.2 cm; weight: 81.9±15.8; age: 23.3±3.9) were randomly assigned to 1 of 2 experimental groups: A virtual reality (VR) protocol consisting of a computer-guided exercise-based program using a cable pulley resistance that took a half hour to complete (n = 10), or; a traditional exercise (TE) protocol, consisting of a combination of resistance training and cardiorespiratory training that took 1.5 hours to complete (n = 9). The training intervention lasted 8 weeks. Testing was carried out pre- and post-study for changes in measures of maximal muscle strength (1 repetition maximum [1RM] for the bench press and leg press), upper body muscular endurance (50% of 1RM for the bench press), and body composition (fat free mass, skeletal muscle mass, and body fat percentage) assessed via multifrequency bioelectrical impedance analysis. The level of enjoyment of the respective exercise programs was assessed post-study using the modified 8-item Physical Activity Enjoyment Scale.

**RESULTS:** Main effects for time were observed for 1RM bench press (F = 71.030; p < 0.001), 1RM leg press (F = 64.021; p < 0.001), upper body muscular endurance (F = 43.059; p < 0.001), lean body mass (F = 5.345; p = 0.034) and skeletal muscle mass (F = 6.969; p = 0.017). No main effects for time were noted with respect to changes in body fat. A time-group interaction was observed for tests of 1RM leg press (p = 0.004) and upper body muscular endurance (p = 0.033), with TE showing significantly greater increases compared to VR. No between-group differences were noted for any other outcome variable.

**CONCLUSIONS:** Despite greater improvements in some performance-related measures for TE, our findings suggest that the specific VR program studied is a viable strategy to improve muscular fitness and lean mass while requiring a limited time commitment in a young, untrained population. Moreover, participants in VR reported a high level of enjoyment with the program, which may help to foster long-term adherence.

**3091 Board #137 May 31 3:30 PM - 5:00 PM Student Engagement in Classroom Physical Activity Breaks**

Jeanne Barcelona,1 Yen Chen,2 Darla Castelli1. Wayne State University, Detroit, MI,1 University of Texas at Austin, Austin, TX. (No relevant relationships reported)

**Purpose:** Students are sedentary for approximately 92% of the day. Classroom physical activity (PA) breaks are known to decrease sedentary behavior (SB). However, little consideration has been given to the environmental and behavioral factors influencing how students engage in classroom PA breaks. Therefore the purpose of this study was to understand how perceived classroom climate and sedentary behavior impact students’ total moderate to vigorous physical activity (MVPA).

**METHODS:** Students (n=112) housed in 1st and 2nd grade classrooms across two school districts participated in a one-day study protocol using a classroom climate survey and accelerometers to investigate student engagement in a five minute classroom PA break. Descriptive statistics, bivariate correlation analyses between variables and mediation analyses using linear regression were conducted to explore direct and indirect effects.

**Results:** Over half of the students were females (56.3%) and second graders (51.8%). Correlations were found between perceived classroom climate to sedentary behavior (r = -.31, p = .001) and total MVPA (r = -.34, p <.001). Sedentary behavior was negatively correlated with total MVPA (r = -.71, p < .001). The mediation model explained 27% of the total MVPA variance (p < .001). Perceived classroom climate had a direct effect on sedentary behavior (B = -.04, SE = .01, t = -3.09, p <.05). Sedentary behavior had a direct effect on total MVPA (B = .45, SE = .06, t = 7.69, p < .05). Student perceived classroom climate did not have a significant direct effect on total MVPA (r = -.09) but did have significant indirect effect through sedentary behavior (indirect effect = .02, bootstrap SE = .007, 95% bootstrap CI = .005, .030), meaning that a participant who scores 1 point higher on perceived classroom climate survey, on average, .02 minutes higher on total MVPA through sedentary behavior.
Purpose: Lagree Fitness exercise offers high-intensity, low impact workouts that combine resistance, endurance, core, and cardio training. These classes are offered as alternatives to traditional weight bearing resistance training; however, it is unknown whether this training method has osteogenic effects on bone similar to traditional resistance training. To provide such insight, we assessed changes in bone after six months of the high-intensity training using the Lagree Fitness Megaformer in men and women.

Methods: 31 healthy participants began a 6 month, 3x per week, 25 minute group lead, Lagree Fitness training course on the Megaformer. The data from 19 women and 4 men (45.1 ± 20.9 years of age), weight (150.5 ± 41.5 lb), height (66.5 ± 6.5 in) were analyzed; eight participants did not complete the course and were excluded from data analysis. All participants completed a lumbar spine, bilateral hip, and total body scan on a GE Lunar iDXA-dual-energy x-ray absorptiometer at baseline and within 10 days of completing 72 training sessions.

Results: There were no significant osteogenic effects on lumbar spine bone mineral density (BMD) (P = .102), femoral neck BMD (P = .519), or total hip BMD (P = .481) in this sample. There was also no significant changes in total body bone mineral content (BMC). While there were no statistically significant changes in total body BMC (P = .186), total arm BMC (P = .125) and total leg BMC (P = .111), there were apparent positive increases that may be promising and suggests the possibility for further data collection with a larger sample. There were similar positive effects on total arm BMC (P = .292) with statistically significant increases in total leg BMC (P < .035). The increase from baseline of total arm lean mass (LM) (P < .009) was significant, and increases in total body LM (P = .069) approached significance. Change in total leg LM (P = .382) was not significant.

Conclusion: In the absence of weight bearing exercise, high-intensity exercise on the Lagree Fitness Megaformer provided significant increase in total leg BMC, and promising increases in BMC and BMD across other body regions. However, there were no significant osteogenic effects on the hips and lumbar spine typically of importance in osteopenic populations.

PURPOSE: To examine the effects of differences in exercise intensity provided in the exercise classes on the establishing exercise habits and changes in self-efficacy of exercise and health-literacy related to behavioral changing such as health and exercise habits.

METHODS: We recruited 27 participants (volunteers) in this intervention (exercise classes). Participants were 20-64-year-old healthy Japanese women who have not been having exercising regularly habits, confidence in physical fitness, and athletic ability. They separated randomly moderate- to vigorous-intensity (2-8 METs) exercise class (MV group, n=14) and low- to moderate-intensity (2-4 METs) exercise class (LM group, n=13). We instructed 90 min/session some exercises 24 sessions (twice a week for 3 months) and lectured about association with health and physical activity (exercise) for both groups.

RESULTS: There were 4 participants (28.6%) in MV group and 5 participants (38.5%) in LM group who dropped-out. The establishing exercise habits after the 1-yr from the end of intervention were not significantly different between two groups (20%, 50%). Self-efficacy (11.8 ± 2.5 – 11.5 ± 3.4 points, 8.8 ± 3.5 – 9.4 ± 2.7 points) and health-literacy (18.3 ± 2.9 – 18.5 ± 2.1 points, 16.5 ± 4.0 – 17.0 ± 5.1 points) did not significantly different from baseline and differ significantly interaction between the two groups.

CONCLUSION: It was concluded that exercise intensity contributed little to increasing self-efficacy, health-literacy and establishing exercise habit. It may be important to definite goal setting (goal contents) or social support to improve them.
Quality of life (QOL) is an important aspects of overall well-being in older adults. QOL is associated with functional, physical, and psychological health; all of which can be improved with increased physical activity. A high fall risk is associated with low physical function and QOL. One in four older adults experiences a fall each year, making it necessary to focus public health interventions towards decreasing fall risk and improving QOL in older adults. Bingocize® is a health promotion program designed to promote health, health knowledge, physical activity, and social engagement among older adults. PURPOSE: The purpose of this study was to determine the effects of the new version of Bingocize® on QOL and fall risk in community-dwelling older adults (N=36; mean age 73.63 ± 6.97). METHODS: Participants were clustered and randomly assigned to (a) experimental (n=19; participating in Bingocize® program, which included the bingo game, exercise, and health education) or (b) control (n=17; only played bingo). Each group completed a 12-week intervention that consisted of two 45-60 minute sessions per week. Pre and post data assessments included the TUG, 30-second chair stand, 4-staged balance, handgrip strength, WHOOQOL-BREF, PANAS, and a health knowledge quiz. A mixed design analysis of variance (ANOVA) was used to compare intervention effects. Associations were significant at p<0.05. RESULTS: There were no significant interactions for any of the variables, with the exception of positive affect (PA) (F (1,34) = 5.66, p = 0.02, power = 0.64) and handgrip strength (F (1,34) = 8.31, p = 0.007, power = 0.80). There was also a significant main effect for time for health knowledge. Post hoc analysis using independent samples t-tests were conducted on PA, 8.92 (t(33)) = 2.39, p = 0.028, two-tailed and handgrip strength (t (34) = 2.85, p = 0.007, two-tailed). CONCLUSION: Participating in the Bingocize® health promotion program can produce a meaningful and detectable change in handgrip strength and PA in community-dwelling older adults.
by 22.4% for the ABH, 17.1% for AbDM, 17.7% for FHB, and 8.8% for FDB. No changes were noted in the CON group. CONCLUSION: The foot exercise protocol significantly increased the volume of intrinsic foot muscles in a healthy and physically active population of recreational runners. This study was financed in part by the Coordenacao de Aperfeicoamento de Pessoal de Nivel Superior - Brasil (CAPES) - Finance Code 001, FAPESP 2015/14810-0.

Purpose: Aerobic training has been shown to have a beneficial effect on GlycA, which is a marker of inflammation. However, it has not been previously reported if an intervention with aerobic training and increasing non-exercise physical activity can further reduce GlycA. Thus, the purpose of the present study is to determine the impact of the combination of aerobic training and increasing non-exercise physical activity on GlycA levels compared to aerobic training alone in obese adults. Methods: Obese adults (N=30) were randomized to an aerobic training, (AERO), aerobic training and increasing non-exercise physical activity, (AERO-PA) or a control (CON) group for 6 months. Both exercise groups performed supervised aerobic training (50%-75% VO2 max) at a dose of 12 kcals per kg per week. Along with exercise training, the AERO-PA group had the goal of increasing non-exercise physical activity ~3,000 steps above baseline levels. Archived blood samples were obtained at baseline and at follow-up and subsequently analyzed by Liposcience for GlycA after the completion of the study (LabCorp, Morristown, NJ). ANCOVA was used to evaluate the change in GlycA across the intervention groups with adjustment for the baseline value. Person correlations were run to evaluate the change in GlycA with weight, body composition, fitness and subsequent analyzed by LipoScience for GlycA after the completion of the study. Results: No significant group effect was found. Significant increases in leg press (MD = 54.89 kg ± 7.41; τ2 =.749; p < .0001) and chest press (MD = 7.33 kg ± 3.46; τ2 =.518; p < .0001) strength, as well as in leg press (MD = 106.89 W ± 24.73; τ2 =.358; p < .0001) and chest press power output (MD = 52.12 W ± 13.51; τ2 =.299; p < .0001) were observed in the entire sample. There was also a significant decrease in Berg scores for the sample (MD = -1.68 ± .551; τ2 =.192, p <.009). No other differences were detected across the training period. Conclusion: Strength and power training produced similar improvements in measures of strength and power in individuals diagnosed with PD. Although Berg scores decreased significantly following training, these declines were not considered clinically significant. We postulate that the lack of improvement in balance and functional movement scores for either intervention may be due to the failure to include movement-specific drills in the training protocol. Future research should continue to examine the differential effects produced by strength and power training in PD patients and should include a functional training phase designed to elicit improvements in balance and daily function.

The Affordable Care Act of 2010 contained incentives for worksites to develop workplace wellness programs and employee wellness programs, which have shown positive outcomes to companies in various dimensions of wellness. Historically, studies have examined one dimension of wellness and typically within a corporate setting. PURPOSE: To evaluate the effectiveness of an educational wellness intervention on overall well-being based on the eight dimensions of wellness in university faculty and staff. METHODS: Employees (N = 12, 72.7% female; 81.8% white) underwent an 8-week intervention called the Employee Wellness Institute. Employees met once a week with each session highlighting one of the eight dimensions of wellness. Demographics, anthropometrics, physical activity, nutrition, and overall wellness were pre and post intervention. Statistical analysis utilized a paired t test and Cohen’s d for effect size. RESULTS: Within each dimension of wellness there was an average increase of 8% in Physical, 3% in Emotional, 3% in Social, 2% in Occupational, 4% in Spirituality, 6% in Environmental, 6% in Intellectual, and 5% in Financial. Of all dimensions of wellness, the largest increase was seen in Environmental and the smallest increase was seen in Physical. CONCLUSION: Data supports the hypothesis that employees would improve their proficiency within the 8-dimensions of wellness as well as physical activity, although not all improvements were statistically significant. Within a short 8-week intervention, employees increased their overall wellness up to 9% in some dimensions. If the employees had access to a year-round program that continuously strive to improve their wellness, or if more employees had access to such a program, the overall wellness of an entire faculty/staff of a university may improve. Thus, future research and practice efforts should implement and evaluate year-long worksite wellness programs for university employees.

**Purpose:** Loss of motor function is a cardinal symptom associated with Parkinson’s disease (PD), with many studies indicating that muscular strength and power decrease as the illness progresses. Although literature supports the efficacy of resistance training to improve motor function in persons with PD, no study has compared the impact of strength and power training. The primary purpose of this study was to compare the impact of strength and power training on measures of strength, power, balance and functional movement in PD patients. METHODS: Thirty-five participants diagnosed with mild to moderate PD were randomized into a 12-week strength or power training program (2 times per week). Measures of muscular strength (1RM), peak power (PP), balance (Berg balance assessment, dynamic posturography, modified falls efficacy scale), and functional movement (timed up-and-go) were assessed before and after training. RESULTS: No significant group effect was found. Significant increases in leg press (MD = 54.89 kg ± 7.41; τ2 =.749; p < .0001) and chest press (MD = 7.33 kg ± 3.46; τ2 =.518; p < .0001) strength, as well as in leg press (MD = 106.89 W ± 24.73; τ2 =.358; p < .0001) and chest press power output (MD = 52.12 W ± 13.51; τ2 =.299; p < .0001) were observed in the entire sample. There was also a significant decrease in Berg scores for the sample (MD = -1.68 ± .551; τ2 =.192, p <.009). No other differences were detected across the training period. CONCLUSION: Strength and power training produced similar improvements in measures of strength and power in individuals diagnosed with PD. Although Berg scores decreased significantly following training, these declines were not considered clinically significant. We postulate that the lack of improvement in balance and functional movement scores for either intervention may be due to the failure to include movement-specific drills in the training protocol. Future research should continue to examine the differential effects produced by strength and power training in PD patients and should include a functional training phase designed to elicit improvements in balance and daily function.

**Purpose:** Power and strength training produce similar improvements in performance in individuals with Parkinson’s disease. Nicholas P. Cherup, Kirk B. Roberson, Andrew N. Livingston, Keri L. Strand, Emma R. Michiels, Jessica Kuhn, Francisco A. Lopez, Joseph F. Signorile. University of Miami, Miami, FL. (Sponsor: Kevin Jacobs, FACSM) (No relevant relationships reported)
Both cardiorespiratory and muscular fitness are important for overall health and may benefit academic related outcomes in children. However, few intervention studies have examined the impact of an intervention that has emphasized both components on academic or cognitive outcomes. Furthermore, school recess may be an ideal time to promote physical activity and fitness and has been a relatively understudied setting in relation to these outcomes. PURPOSE: To evaluate the preliminary efficacy of a 3-month recess-based combined fitness intervention (INT; consisting of both aerobic and muscular fitness activities) on cognition (inhibition and working memory), classroom behaviors (engaged and off-task behaviors), fitness (cardiorespiratory and muscular), and moderate to vigorous physical activity (MVPA) in elementary school children.

METHODS: Schools (n=2) were randomized to either the INT (n=27, sex: 66.7% male, age: 8.8±0.1 years) or control group (CON; n=27, sex: 42.3% male, age: 9.4±0.1 years). Baseline and post-intervention measures included a flanker test (inhibition), list sorting test (working memory), classroom behavior observation (on- and off-task behaviors), cardiorespiratory fitness (20-meter shuttle run test), muscular fitness battery (muscular fitness), and accelerometry (MVPA). Process evaluation measures were recorded daily, weekly, and post-intervention. ANCOVA models were adjusted for baseline score, age, and other covariates. An independent samples t-test was used to compare percent of time spent in MVPA during recess between schools.

RESULTS: Percent of time spent in MVPA during recess was significantly higher in the INT compared to the CON group (INT=41.7±2.1%; CON=30.4±0.2%; p<0.001). No other significant differences were observed. Although participant enjoyment and INT acceptability was high, the average participation in INT sessions was 19.4% (ranging from 0 to 95.6%).

CONCLUSION: This pilot study demonstrated some preliminary support that offering a combined fitness program is feasible and can increase percent of time spent in MVPA during recess. Future research is warranted to determine if the INT can impact academic or cognitive outcomes.

Supported by: University of Massachusetts Amherst Graduate School Dissertation Research Grant

**F-57 Free Communication/Poster - Maternal and Child Health**

**Board #150**

**May 31 2:00 PM - 3:30 PM**

**The Associations between Maternal Body Mass Measures and Macronutrient Intake on Insulin Sensitivity Measures during Late Pregnancy**

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(NO relevant relationships reported)

**PURPOSE:** To determine associations between maternal body mass measures (body mass index [BMI], gestational weight gain [GWG]) and macronutrient intake (protein, carbohydrate [CHO], fat) on insulin sensitivity (IS) and fasting glucose (GLU) in late pregnancy in normal weight (NW, n=87), overweight (OW, n=67) and obese (OB, n=31) women.

**METHODS:** Participants were recruited early in pregnancy (<10 wk). A 100-gram oral glucose tolerance test (OGTT) was done following an overnight fast at 30 wk to calculate the metabolic clearance rate of glucose (MCR, mg kg\(^{-1}\) min\(^{-1}\)). Dietary intake of animal (AP) and plant (PP) protein (g kg\(^{-1}\) d\(^{-1}\)), fat (g) and CHO (g) were estimated using 3-d food records. Correlations between GLU and MCR with AP, PP, fiber, fat, CHO, GWG, and early pregnancy BMI were assessed using Pearson correlations.

**RESULTS:** Multiple linear regression was used to model MCR and GLU with the independent variables. Data are mean ± SD. MCR (NW: 10.1 ± 8.8; OW: 6.7 ± 1.1; OB: 4.7 ± 0.9 mg kg\(^{-1}\) min\(^{-1}\), p < 0.0001) and PP (NW: 0.39 ± 0.12; OW: 0.32 ± 0.09; OB: 0.27 ± 0.09 mg kg\(^{-1}\) min\(^{-1}\), p < 0.0001) differed between groups. Fastling GLU was higher in OW compared to NW (F, 1.27; p=0.3026) did not associate with infant %BF, but maternal age (r = -0.21, p = 0.047) and BMI (r = -0.41, p < 0.0001) were associated with MCR; and PP (β = -30, p = 0.008) and fat (β = -0.41, p < 0.0001) were associated with GLU. In OB, PP (β = 5.8, p = 0.011) and fat (β = -0.02, p = 0.005) were independently associated with MCR; and PP (β = -44.6, p = 0.003) and CHO (β = -0.03, p = 0.043) associated with GLU.

**CONCLUSIONS:** Higher fat intake and BMI, and low PP intake in OW pregnant women is associated with lower IS. Higher fat and CHO intake, and low PP intake in OB pregnant women is associated with decreased IS. Thus, to improve insulin regulation and glucose metabolism, OW and OB pregnant women may benefit from increasing PP intake and ensure optimal macronutrient intake.

**3105 Board #151**

**May 31 2:00 PM - 3:30 PM**

**Maternal Exercise and DHA Levels During Pregnancy Influences Infant Body Composition**

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(NO relevant relationships reported)

**RESULTS:** Nearly 14% of U.S. children aged 2-5 years are obese. Evidence indicates that obesity develops in utero and is affected by several maternal factors. Maternal exercise is shown to reduce the risk of obesity in offspring. However, previous studies restricted their exercise exposure to aerobic training; thus, the effects of other common exercise modes on infant body composition are unknown. Maternal diet, specifically DHA levels, is also suspected to affect infant size. Maternal DHA is shown to improve infant birth weight and decrease fat mass. However, it is unclear as to whether this association is affected among exercising mothers.

**PURPOSE:** To determine the relationships between different maternal exercise modes and maternal plasma levels of DHA on infant body composition.

**METHODS:** Thirty-six healthy, low-risk, women with a singleton pregnancy (<16 weeks) were randomized to one of four intervention groups: aerobic (n=13), resistance (n=4), circuit (n=6) (aerobic + resistance) or non-exercising control (n=13) group. Participants exercised 3x/week for 50 minutes at moderate intensity for ~20 weeks. Maternal plasma was collected at 16 and 36 weeks of gestation and analyzed for DHA levels using liquid chromatography/mass spectrometry. At one month of age, infant body composition was assessed via skinfold technique. ANCOVA models were performed to determine independent associations between maternal exercise mode, maternal DHA levels, and infant percent body fat (%BF).

**RESULTS:** Infants born to aerobic- or circuit-trained mothers had significantly lower %BF compared to infants born to resistance-trained mothers (p=0.045, p=0.048), respectively. After controlling for infant sex, 16-week maternal DHA levels, and fasted state, maternal exercise exhibited no effect on infant %BF (F, 0.57; p=0.6865). Maternal DHA levels at 16 weeks (F, 1.30; p=0.2887), 36 weeks (F, 1.13; p=0.3742) or across pregnancy (~20 weeks) (F, 1.27; p=0.3026) did not associate with infant %BF, after controlling for maternal exercise mode, sex, and fasted state.

**CONCLUSION:** The current data supports the relationship between maternal exercise modes with aerobic activity on infant body composition. The data suggests that exercise mode may be a more important modulator of infant body composition than maternal DHA levels.

**3106 Board #152**

**May 31 2:00 PM - 3:30 PM**

**The Effects of Exercise Mode During Pregnancy on Maternal Metabolism**

Samantha Michelle McDonald, Christy Isler, Kelly Haven, Edward Newton, Linda E. May, Cody Strom. *East Carolina University, GREENVILLE, NC.* Email:mcdonalds18@ecu.edu

(NO relevant relationships reported)

Maternal metabolism is the strongest predictor of fetal growth and development; thus, it is imperative that women maintain a healthy pregnancy to ensure optimal health of their offspring. Evidence demonstrates that chronic exercise training exhibits potent metabolic effects (e.g., insulin sensitivity), indicating a healthier metabolic profile. In healthy pregnancies, however, the effects of prenatal exercise and various modes of exercise on maternal metabolism remain unclear.

**PURPOSE:** To determine the effects of exercise mode on maternal metabolism during pregnancy, in a sample of healthy women with singleton pregnancies. METHODS: At 16 weeks gestation, healthy pregnant women were randomized to one of four intervention groups: aerobic (AT), resistance (RT), circuit (CT) and non-exercising control (CON). Supervised exercise sessions consisted of 50 minutes of moderate-intensity (40-59% VO\(_{2\text{peak}}\)) exercise, three times per week. Fasting blood samples were collected via venipuncture and fingerstick at 16 and 36 weeks of gestation to assess maternal glucose and lipid profiles. ANOVA models were performed to determine the effects of exercise mode on maternal glucose, total cholesterol (TC), triglycerides, and other lipid measures.

**RESULTS:** In OW, GLU correlated with BMI (r = 0.37, p = 0.001) in NW, with fat (r = -0.29, p = 0.025) and BMI (r = 0.31, p = 0.016) in OW, and with PP (r = -0.41, p < 0.003) in OB. Most parsimonious models in OW: fat (β = -0.001) and BMI (β = -0.41, p < 0.0001) were associated with MCR; and PP (β = -30, p = 0.008) and fat (β = 0.14, p = 0.002) associated with GLU. In OB, PP (β = 5.8, p = 0.011) and fat (β = -0.02, p = 0.005) were independently associated with MCR; and PP (β = -44.6, p = 0.003) and CHO (β = -0.03, p = 0.043) associated with GLU.

**CONCLUSIONS:** Higher fat intake and BMI, and low PP intake in OW pregnant women is associated with lower IS. Higher fat and CHO intake, and low PP intake in OB pregnant women is associated with decreased IS. Thus, to improve insulin regulation and glucose metabolism, OW and OB pregnant women may benefit from increasing PP intake and ensure optimal macronutrient intake.
(TG), high-density lipoprotein (HDL), low-density lipoprotein (LDL) and lactate (LT) at 36 weeks and the change from the 2nd to 3rd trimester. RESULTS: Seventeen pregnant women had complete metabolic data. Prenatal exercise had no effect on glucose or lipid profiles at 36 weeks (glucose: p=0.48; TC: p=0.29; TG: p=0.48; HDL: p=0.25; LDL: p=0.79; LT: p=0.96) or their change between the 2nd and 3rd trimesters (glucose: p=0.45; TC: p=0.87; TG: p=0.63; HDL: p=0.65; LDL: p=0.81; LT: p=0.37).

Similarly, no effects were found for exercise modes at 36 weeks (glucose: p=0.76; TG: p=0.41; HDL: p=0.24; LDL: p=0.49; LT: p=0.69) or across pregnancy (glucose: p=0.68; TC: p=0.40; TG: p=0.32; LDL: p=0.61; LT: p=0.70), with the exception of HDL at 36 weeks. CT mothers exhibited lower HDL levels compared to controls (p=0.04).

CONCLUSIONS: In healthy pregnancies, prenatal exercise and various modes of exercise do not appear to positively nor negatively affect maternal metabolism. Further research should include larger samples and more rigorous assessments of glucose and lipid metabolism (e.g., HbA1C, HOMA-IR, CRP).

3107 Board #153
May 31 2:00 PM - 3:30 PM
Effects of Evidence-Based Materials and Local Resources on Knowledge/Beliefs and Physical Activity Levels During Pregnancy

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(No relevant relationships reported)

PURPOSE: Physical activity (PA) during pregnancy is safe and effective for improving maternal and infant health; however, only 23% of pregnant women exercise in accordance with guidelines, and this number is likely even lower in rural Kentucky. The purpose of this study is to determine the impact of evidence-based educational materials and access to local resources on PA levels and knowledge/beliefs about PA during pregnancy. METHODS: Women were recruited from a rural obstetric clinic (8-12 weeks gestation). PA levels were assessed using a fitness tracker and the Pregnancy Physical Activity Questionnaire. Knowledge/beliefs about PA during pregnancy were assessed via surveys. Stage of readiness to exercise was assessed using the transtheoretical model. Participants were randomly assigned to an intervention (IG) or control group (CG). The IG received evidence-based educational information regarding PA during pregnancy and free access to six local fitness facilities. All baseline assessments were repeated during late pregnancy (32-39 weeks). To assess obstetric outcomes, a survey was emailed to each participant after delivery. RESULTS: 63 women enrolled in the study (age=29.7±4.9 years, pre-pregnancy BMI= 26.2±6.3 kg/m2, household income=$78,589, average step count in 1

3109 Board #155
May 31 2:00 PM - 3:30 PM
Evidence-based Educational Brochures Influenced Beliefs And Improved Knowledge Regarding The Benefits Of Exercise During Pregnancy

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PURPOSE: Women who are pregnant report receiving little or no advice about physical activity during pregnancy from their provider. The purpose of this study was to assess the effectiveness of an evidence-based educational brochure on both immediate and two-week retention of knowledge about exercise during pregnancy. METHODS: Thirty-two women of childbearing age (age: 25.5 ± 4.0 years, body mass index: 29.5 ± 6.5 kg/m2) completed a survey before exposure to an evidence-based educational brochure regarding exercise during pregnancy. Post surveys were taken immediately after viewing the educational brochure and again 2-weeks later.

RESULTS: After exposure to educational brochures, survey scores on both surveys were significantly higher immediately-post and two-weeks post compared to baseline survey scores (Survey 1 (assessing beliefs) – pre: 79.2±8.9%, post: 92.6±7.4%, 2-weeks post:92.0±6.5%, p < 0.001; Survey 2 (assessing knowledge) – pre: 65.3±16.4%, post: 81.3±14.9%, 2-weeks post:78.8±12.4%, p < 0.001]). No significant differences detected between immediate post and 2-weeks post for either Survey 1 (p = 0.72) or Survey 2 (p = 0.52), suggesting the information was retained.

CONCLUSION: An evidence-based educational brochure is effective for improving and retaining information regarding exercise during pregnancy. Health care providers should consider providing patients with this information in order to improve knowledge and patient-provider communication on this topic.

3110 Board #156
May 31 2:00 PM - 3:30 PM
Maternal Water Exercise And Its Effects On Weight Gain And Fetal Outcome: A Meta-analysis

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(No relevant relationships reported)

Physical activity during pregnancy is known to bring benefits not only for the mother but also for the fetus. Water-based exercises have been recommended as an adequate modality of exercise during pregnancy, however, no meta-analysis has analyzed the effects of water exercise programs on maternal weight gain and fetal outcomes including birthweight. PURPOSE: To conduct a systematic review and meta-analysis of randomized controlled trials to investigate the effects of prenatal water-based exercise on maternal weight gain and fetal outcomes. METHODS: Eligible trials were identified through a structured search of MEDLINE, EMBASE, ISI Web of Science, Scopus, and SportDiscus up to October 2018. Data were retrieved comparing standard care plus prenatal water exercise (at least once a week) for at least one of the following outcomes: maternal weight gain, gestational age at delivery, and/or fetal birthweight. Study selection and data extraction were performed by two independent reviewers. Random-effects meta-analysis was conducted for mean difference between exercise and control groups (PROSPERO registration: CRD42016039473).

RESULTS: Our search yielded 1846 publications of which 1562 were assessed for eligibility. In total, 9 studies were eligible and included in the meta-analysis. Pregnant
women who engaged in a water exercise program showed a significant difference in total maternal weight gain (5 RCTs, n=561, OR = 1.00 [95% CI -1.55, -0.45]; p = 0.001) compared to standard care only. No significant effects on gestational age at delivery (8 RCTs, n=1442, OR = 0.04 [95% CI -1.02, 1.10], p = 0.94) and birthweight (8 RCTs, n=1427, OR = 2.30 [95% CI 8.84, 17.40]) were found. CONCLUSION: Water exercise during pregnancy controls maternal weight gain without influencing the duration of pregnancy or baby weight. Health care providers can consider suggesting water-based exercises during pregnancy to promote appropriate weight gain.

Weight loss interventions have a positive “ripple effect” on untreated partners, but ripple effects in pregnancy are unknown. PURPOSE: To determine whether prenatal lifestyle interventions that reduced gestational weight gain in pregnant women had a positive “ripple effect” on untreated partner weight. METHODS: To determine whether prenatal lifestyle interventions that reduced gestational weight gain in pregnant women had a positive “ripple” effect on untreated partner weight. RESULTS: 122 partners (100% male, 23% Hispanic, 82% married, 48% obese) were randomized to intervention (N=59) or usual care (N=63). There was no intervention or by time interaction effect on partner weight (P=0.7935). Partner weight trended higher, but weight changes were not statistically significant (P=0.1204) from study-entry to 35 weeks’ gestation (Mean 0.19 kg; 95% CI -0.73 to 1.24) or to 12 months postpartum (Mean 0.82 kg; 95% CI -0.84 to 1.12 kg). CONCLUSIONS: There was no evidence of a ripple effect on partner weight. Partner weight gain was 0.82 kg from pregnancy to 12-months postpartum. Partners of pregnant women appear not to experience sympathy weight gain. Supported by National Institutes of Health Award Number R01HL118208.

PURPOSE: to investigate the overall effects of HIIT and MICT on insulin resistance as well as subgroups analyses in i) population: healthy (H), overweight/obese (O), metabolic syndrome (MetS), type-2 diabetes (T2D); ii) age: < 30 y, 30-50 y, > 50 y; iii) training duration: < 5 wk, 5-10 wk, > 10 wk; iv) men ratio: < 0.4, 0.4-0.6, > 0.6; and v) type of exercise: cycling vs running. METHODS: randomized controlled trials were included through a systematic search in PubMed. After the selection, 17 studies were included. Small-study effects were analyzed through countour-enhanced funnel plots and the Egger’s test. The standardized mean difference (Cohen’s d) was the outcome used, it was calculated with the random-effects model, applying the DerSimonian-Laird estimator for the between-study variance ($\bar{I}^2$). Effect sizes (ES) were calculated with the random-effects model, applying the DerSimonian-Laird estimator for the between-study variance ($\bar{I}^2$). Effect sizes (ES) were classified: large ES for O (d = 1.77, p = 0.01), moderate ES for H (d = -0.46, p = 0.5) and small ES for T2D (d = -0.25, p = 0.3). RESULTS: the overall effect presented a medium ES (d = 0.53, p = 0.035), with a $\bar{I}^2$ of 0.5. Positive and negative ES represent a favorable effect for HIIT and MICT, respectively. RESULTS: the overall effect presented a moderate ES ($d = 0.35$, $p = 0.035$), with a $\tau_2 = 0.85$ and significant small-study effect ($p = 0.01$). The population subgroup had a large ES for O ($d = -1.77$, $p = 0.02$), trivial ES for H ($d = 0.5$ and MetS ($d = 0.5$), and small ES for T2D ($d = 0.5$). The age subgroup had a large ES for 30-50y ($d = -0.87$, $p = 0.09$), and trivial ES for < 30y ($d = 0.5$) and > 50y ($d = 0.5$). The training duration subgroup had a large ES for < 5 wk ($d = 0.9$, $p = 0.055$), trivial ES for 5-10 wk ($d = 0.6$, $p = 0.6$), and small ES for > 10 wk ($d = 0.6$, $p = 0.6$). The men ratio subgroup had a large ES for > 0.6 ($d = -1.43$, $p = 0.03$), and trivial ES for < 0.4 ($d = 0.9$) and 0.4-0.6 ($d = 0.8$). The type of exercise subgroup had a large ES for cycling ($d = 0.83$, $p = 0.02$) and trivial with duration of 4 to 12 weeks can be cautiously recommended to effectively enhance the balance function, gait speed, motor ability of lower extremities, and activities of daily life of post-stroke patients.

BACKGROUND: Alzheimer’s Disease (AD) is the worldwide leading cause of senile dementia and affects Approximately 5-6.5 million Americans. It is a health-care issue which is accelerating at a rapid pace. While categorized as a disorder which cannot be cured or slowed, a convincing body of evidence has revealed protective effects of physical activity in mitigating symptoms and delaying progression of the disease. PURPOSE: To investigate the effects of physical activity interventions on cognitive function and Activities of Daily Living (ADLs) in patients with AD. Based on these results, the design of exercise programs for individuals affected by AD are suggested. METHODS: A Meta-Analysis was performed to analyze the effectiveness of different exercise modalities in ameliorating cognitive and functional symptoms of AD. Seven specific inclusion criteria were developed to include studies which contained exercise programs designed to improve or maintain aerobic fitness, strength, ADL performance or any combination of thereof.

RESULTS: Fourteen studies, which included 769 patients diagnosed with AD who were 65 years of age or older met the inclusion criteria for the analysis. Calculations for Effect Size (ES) and Confidence Interval (CI) showed that exercise interventions had a moderate positive effect on cognitive function (ES=0.52; CI=0.15-0.89), and a large positive effect on performance of ADLs (ES=0.76; CI=0.19-1.33; p=0.001). Furthermore, interventions that included an aerobic component (Aerobic Training and Multimodal Training) positively influenced cognitive function, while interventions that included resistance and functional training (Resistance Training and Multimodal Training) improved performance in ADLs.

CONCLUSION: While a large variability was found in study design, intervention, duration, and assessment measures, exercise was usually shown to have positive effects on measures of decline in AD. Exercise programs should be incorporated in the management of AD patients. The choice of exercise modality should include both aerobic and strength-functional components to achieve maximum benefit in cognitive function and ADLs performance. Multimodal Training, which includes activities across the metabolic spectrum, shows the greatest promise as an exercise intervention in AD.
ES for running (p = 0.5). CONCLUSIONS: despite a medium overall ES, the effects of HIIT and MICT on insulin resistance vary considerably. HIIT may be superior to MICT in improving cardiometabolic health in an overweight/obese population, men, and cycling exercise.

### 3115 Board #161 May 31 2:00 PM - 3:30 PM

**An Alternative Model For A Meta-analysis On Exercise And Blood Pressure In Older Adults**

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(No relevant relationships reported)

**PURPOSE:** Using a traditional random-effects model, a recent meta-analysis by Herr et al. (2018) reported statistically significant reductions in both resting systolic blood pressure (SBP) and diastolic blood pressure (DBP) as a result of aerobic, resistance, and combined aerobic and resistance exercise in adults with a mean age of 65 years and older. However, a recently proposed and alternative method, the inverse heterogeneity model (Ihvet), has been shown to provide more robust findings. The purpose of this study was to apply the Ihvet model to these previous meta-analytic findings.

**METHODS:** Data from 41 randomized controlled trials representing 96 groups (52 exercise, 44 control) were pooled using the Ihvet model. In addition, absolute and relative differences between the Ihvet and random-effects model were calculated. Data were reported using the mean difference (exercise minus control) with non-overlapping 95% confidence intervals considered statistically significant.

**RESULTS:** Using the Ihvet model, statistically significant reductions in resting blood pressure were found as a result of aerobic exercise (SBP: -4.7 mmHg, 95% CI: -7.7 to -1.8; DBP: -2.0 mmHg, 95% CI: -3.13 to -0.89); SBP but not DBP for resistance training (SBP: -7.0 mmHg, 95% CI: -10.5 to -3.4; DBP: -1.2 mmHg, 95% CI: -2.7 to 0.31), and both SBP and DBP for combined aerobic and resistance training (SBP: -5.5 mmHg, 95% CI: -8.3 to -2.7; DBP: -3.7 mmHg, 95% CI: -4.8 to -2.7). When compared to the random-effects model, findings from four of the six mean differences in blood pressure were smaller, ranging from -0.82 to -0.19 mmHg (6.1% to 41.0%) while all six 95% CIs were wider, ranging from 0.24 to 1.56 mmHg (11.5% to 36.8%).

**CONCLUSIONS:** These findings suggest that with the exception of changes in DBP as a result of resistance training, exercise (aerobic, resistance, combined aerobic and resistance) reduces resting SBP and DBP in older adults. Importantly, these findings are generally smaller than those previously reported, a factor that could have practical implications. Future studies should consider using the Ihvet model when conducting an aggregate data meta-analysis.

### 3116 Board #162 May 31 2:00 PM - 3:30 PM

**The Effect Of Qigong On Chronic Obstructive Pulmonary Disease: A Systematic Review And Meta-analysis**

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(No relevant relationships reported)

**PURPOSE:** This review aims to investigate the effect Qigong on chronic obstructive pulmonary disease (COPD).

**METHODS:** All randomized controlled clinical trials published in English or Chinese and involving the use of Qigong by patients with COPD were searched in PubMed/ MEDLINE, Cochrane Library, Embase, PsycINFO, Cambase databases, CNKI, and WanFang databases from their respective inception to June 2018. The meta-analysis was conducted using the Revman 5.3. The quality of the included trials was assessed using the Jadad rating scale. Two researchers independently completed the inclusion, data extraction, and quality assessment.

**RESULTS:** Fourteen RCTs with 1274 COPD patients met the inclusion criteria. The meta-analysis revealed that the FEV1, FVC1, FEV1/FVC% and 6MWD was significantly enhanced in the experimental group (FEV1 mean difference [MD] = 0.29, 95%CI: 0.09 to 0.48; FEV1% MD: 6.09, 95% CI: 3.15 to 9.04; FEV1/FVC% MD=4.20, 95% CI: 1.88 to 6.51; 6 months: MD=57.52, 95% CI: 17.48 to 97.57) than the control group. There was no significant difference in FVC between the experimental group and the control group (P > 0.05).

**CONCLUSION:** Qigong exercise can improve the lung function and exercise ability of COPD patients. However, future research with better quality RCTs needs to explain the mechanism of the positive effect of Qigong on COPD. (This study was supported by Fundamental Research Funds for the Central Universities at SWU Grant 1709240.)

Myofascial pain syndrome (MPS) is one of the most common neuromuscular system diseases and is also easily misunderstood in pain clinic. And kinesio taping has been gradually used by physiotherapists or pain clinicians in the pain clinic as a clinical support treatment for MPS. However, no evidence-based medical data is available to support the advantageous effect of kinesio taping on MPS over other treatments at post-intervention and follow-up. PURPOSE: To evaluate the effectiveness of kinesio taping for managing MPS in terms of pain intensity, pressure pain threshold, range of motion (ROM), muscle strength and disability. METHODS: PubMed, EBSCO, ScienceDirect, Web of Science, Cochrane Library and Physiotherapy Evidence Database. Databases were searched from database inception to January 2018. Randomised controlled trials (RCTs) that used kinesio taping as the main treatment protocol for participants diagnosed with MPS were included. Two reviewers independently screened articles, scored methodological quality by using Cochrane risk-of-bias tool and extracted data. The primary outcomes were pain intensity, pressure pain threshold and ROM at post-intervention and follow-up. The secondary outcomes were muscle strength and disability at post-intervention and follow-up. RESULTS: Meta-analyses of 15 RCTs involving 713 patients, showed that kinesio taping was more effective than other treatments in improving pain intensity (mean difference [MD] = 0.94 cm, 95% confidence interval: [CI]: -1.52 cm, 0.63 cm, p = 0.003) and ROM (standardised mean difference [SMD] = 0.32, 95% CI: 0.12 to 0.52, p = 0.002) at post-intervention. Kinesio taping was also superior to other non-invasive techniques in relieving pain intensity at follow-up (MD = -0.68 cm, 95% CI: -1.22 cm to -0.13 cm, p = 0.02). CONCLUSION: The latest evidence statistically supports the use of kinesio taping over other treatments for relieving the pain intensity and range of motion of patients with myofascial pain syndrome. Post-intervention. Kinesio taping is also widely used in China and other non-invasive techniques in relieving pain intensity at follow-up. However, no significant superiority of kinesio taping was found in pressure pain threshold, muscle strength and disability.

**PURPOSE:** To evaluate improvements in VO2max in sedentary adults aged 18-55 comparing sprint interval training (SIT) vs high-intensity interval training (HIIT) vs continuous cardiovascular training (CCVT).

**METHODS:** A systematic literature search (key terms: HIIT, endurance, interval training, SIT, and VO2) was conducted of electronic databases (PubMed, Scopus, Sport Discus, Science Direct, Web of Science, Google Scholar) to ascertain appropriate studies. The inclusion properties for the studies were: sedentary individuals between the ages of 18-55 free of comorbidities other than being overweight or obese; included a continuous training group; completed a pre and post VO2max graded exercise test. These search criteria yielded 20 studies evaluating HIIT protocols totaling 527 subjects in the interval group and 214 subjects in the CCVT group. There were nine studies studying a SIT protocol with 111 total subjects in the interval group and 85 subjects in the CCVT group. The studies were conducted with non-overlapping 95% confidence intervals considered statistically significant.

**RESULTS:** Statistic and effects sizes were calculated using *G*Power software (Heinrich-Heine-Universität Düsseldorf) with a post-hoc two-tailed designed t-test with a error at .05. Training, regardless of type, increased VO2max. HIIT increased VO2max by 11.42%, whereas SIT increased it by 10.53%, followed by CCVT with an increase of 7.36%. Cohen’s d provided effect sizes comparing HIIT, SIT, and CCVT training groups. Both HIIT and SIT had large Cohen’s effect sizes at 1.03 and 0.80, respectively, compared to a moderate effect size of 0.506 for the CCVT group. CONCLUSIONS: Both HIIT and SIT are valid options for increasing the VO2max in sedentary individuals with a relatively small commitment time needed. This could have implications for participant adherence to the protocol. Both HIIT and SIT had significantly positive effects on the participant’s VO2max compared to the CCVT group. However, CCVT also improved their VO2max. Therefore, any sustained physical activity is beneficial for sedentary adults to improve VO2max.
Various interventions have combined aerobic exercise with strength, power or balance training and the direct effect on balance in older adults. The specific effect of aerobic exercise on balance is unclear. PURPOSE The purpose of this study was to analyze the effect of aerobic exercise on balance in older adults. METHODS The systematic search was made on academic scientific bases: Academic Complete Search, ProQuest, PubMed, Science Direct and Sport Discuss, using the Boolean phrase: (aerobic exercise OR aerobic training) AND (adult* OR aging* OR senior* OR older adult*) AND (balance*) NO (diet or nutrition) NO (Animal) And random*. The inclusion criteria were: publications in English or Spanish, full text, older adult (people and women), people over 50 years, experimental and quasi-experimental studies, treatment focused on aerobic exercise and dynamic or static balance indiscriminately of the type of test. We analyzed 4496 studies and only 11 investigations met the inclusion criteria, obtaining 56 effect sizes (TE) in 590 subjects. The moderator variables were age, sex, level of physical activity, health condition, N per study, duration of the session and exercise modality. RESULTS The overall effect size for the experimental conditions was TE= 1.083, (p = 0.05) (95% CI: 0.63 - 1.53, Q= 679.07, p = 0.00, I² = 99.55); the effect size of the control group was TE= 0.056, (p = 0.685) (95% CI: -0.14, 25 - Q = 11.48, p=0.009, F= 73.88). There were no differences in differences between the control groups of TE (n=16) and experimental group (n=40) (F= 2.73, p= 0.104). The Cochran’s Q test for the experimental group presents variables that indicate that the calculated effect sizes have high heterogeneity according to Borenstein, et al. (2009). In addition, the Egger test was applied and this gave the following data t = 4.55, gl = 1.7; p = 0.0005, this means that there is a publication bias.

CONCLUSION: Aerobic exercise (AE) exerts a positive effect on the balance of older adults; therefore, AE training is a valid procedure that detected a publication bias.

The change in body weight and body composition may increase health risks such as those associated with metabolic syndrome. PURPOSE: The purpose of this study was to examine the diet of division III football players in and off season and to identify the differences between skilled and unskilled players. METHODS: Twenty-two players [18.9 ± 0.79 yr] completed in (F, Fall) and off season (S, Spring) testing. Data included height, weight, body composition and a 24 hour diet recall using the 5-pass method. Nutrition data were analyzed using Food Processor software. In and off season data were compared using a paired sample t-test. Repeated measures ANOVA was used to test for differences between skilled and unskilled players. This study was approved by the Linfield College Institutional Review Board. RESULTS: All players gained weight (F: 86.1 ± 13.1 kg; S: 92.0 ± 12.8 kg, p = 0.033) by spring. The weight gain was associated with an increase in percentage body fat (F: 13.8 ± 4.6; S: 16.3 ± 4.4, p = 0.028). All players decreased total calorie intake in the spring (F: 5553 ± 1922 kcal; S: 3972 ± 1384 kcal, p = 0.0008). There were no differences in the macronutrient distribution (%kcal) at either time point (Fat: F: 37.3 ± 5.9%; S: 37.3 ± 9.1%; Carbohydrate: F: 47.5 ± 6.8%; S: 46 ± 11.0% Protein: F: 15.2 ± 3.8%; S:16.8± 4.5%). The player’s relative muscle mass (kg) was lower in the off season (F: 23.6 ± 1.36; S: 18.7 ± 0.97; p = 0.036). Sodium and cholesterol consumption decreased from F to S but remained above the daily recommended intake for all players. There were no differences in total calories, macronutrient composition, relative protein intake, sodium or cholesterol between the skilled and unskilled players. A majority of the players’ meals were consumed at the college dining hall. CONCLUSION: Body weight and percent body fat increased from F to S with an associated increased caloric intake during the season. The players consumed large amounts of calories with a high percentage of fat during the season. All players decreased caloric intake in the off season. The change in body weight and body composition may increase health risks in the long run. It is important for players to make dietary choices to maximize performance and reduce long term health risks within the constraints of eating at the college dining hall.

In Division III, coaches cannot require athletes to report summer workouts, but can suggest what should be done to be ready the upcoming season. Coaches also cannot cut an athlete based on knowledge of a lack of summer workouts. PURPOSE: To determine whether athlete intentions lead to efficacious outcomes in DIll athletes over summer break. It was hypothesized that due to lack of accountability, body composition intentions over summer break would not be achieved. METHODS: Fifty-one student athletes (32 women, 19 men; 20 ± 1 years old) had their body composition assessed in May in addition to their intention(s) regarding body composition changes over summer break (increase muscle mass and/or decrease body fat mass or no change). Body composition was again assessed in August of the following school year. RESULTS: Only an intention to increase muscle mass or decrease body fat mass led to no significant change in either variable. When athletes had the combined intention of increasing muscle mass and decreasing fat mass, a significant decrease in body fat percentage was observed (-1.8 &lambdachain; 2.3%; p = 0.017). Independently, the increase in muscle mass (+1.33 &lambdachain; 2.3kg; p = 0.063) and decrease in fat mass (-1.1 &lambdachain; 2.2kg; p=0.094) were not significant. CONCLUSIONS: Thus, it is suggested in order to achieve a decrease in fat mass, that has a significant impact on percent body fat, this intention should be combined with the intention to increase muscle mass. Additionally, singular intentions did not evoke intended body composition changes.
Proper hydration is vital to peak athletic health and performance. Although hydration status is relatively simple to monitor, regular hydration testing is rarely implemented in sport regardless of competition level. Consequently, many athletes enter competition unawares of their hydration status, preventing opportunities to begin in an optimal state of readiness. PURPOSE: To evaluate the effect of hydration testing and simple feedback on pre-game hydration status of collegiate basketball players. METHODS: Twenty men’s collegiate basketball players from a single NCAA Division II university participated in this study during the 2016-17 (N = 14) and 2017-18 (N = 12) seasons. In Season 1, players’ urine specific gravity (USG) and body weight (BW) were assessed 1-2 hours prior to the start (PRE) of eight pairs of regular season conference games (16 games total) played on consecutive days (Fri & Sat). In Season 2 (10 games), players’ USG was assessed 4-5 hours before game time, at which time they were provided feedback about their hydration status. USG was reassessed 1-2 hours prior to game time along with BW. USG was measured using a hand-held clinical refractometer. Hydration status was defined as: hyperhydrated (HYP; USG < 1.005), euhydrated (EUH; 1.005 ≤ USG < 1.020), moderately hypohydrated (MOD; 1.020 ≤ USG < 1.025), and severely hypohydrated (SEV; USG ≥ 1.025). BW was measured using a digital scale, with players wearing similar clothing each time. RESULTS: Pre hydration status, based on proportional distribution, was significantly different between Season 1 and Season 2 (P < 0.001). In Season 1, 41.4% of players were EUH while in Season 2, only 20.5% were EUH. While 27.1% of players were SEV at PRE in Season 1, no players were SEV at PRE in Season 2. There was no change in PRE USG from Fri (1.018 ± 0.008) to Sat (1.019 ± 0.008) in Season 1 (P = 0.077), but PRE USG on Sat (1.010 ± 0.005) was significantly lower than on Fri (1.011 ± 0.006) in Season 2 (P = 0.015). CONCLUSION: The implementation of hydration testing and simple feedback significantly improved pre-game hydration status of collegiate basketball players compared to hydration testing alone. Athlete monitoring, combined with proper feedback and education, can be used effectively to optimize athletic readiness.
**Purpose:** To determine whether meeting overall calorie intake impacts the number of days an athlete has concussion-related symptoms following diagnosis.  

**Methods:** Fourteen Division I collegiate athletes with a mean age of 20.14 (SD=1.027) who were diagnosed with a concussion were randomly placed in a control group (n=7) or intervention group (n=7). In both groups, daily calorie intake was compared to total daily caloric needs and the individual was coded as met or did not meet energy needs. Concussion related symptoms were assessed using the Sports Concussion Assessment Tool (SCAT5) Symptom Evaluation Form. For the intervention group, four single serving packets of a carbohydrate supplement were provided following immediate impact at the suspicion of a concussion or within 30 to 60 minutes of diagnosis (two servings immediately at suspicion or following diagnosis of concussion, and one serving every other hour within the first 4 hours following the initial servings), and two single serving packets during daily concussion protocol evaluation until the athlete reported no symptoms. A 2x2 Factorial ANOVA was conducted on the total number of days of concussion symptoms with respect to daily average calories being met (AvgCalories) and comparing the control and intervention groups (ControlIntervention).

**Results:** Statistically significant differences were found in a number of days of concussion symptoms between those who met average daily calorie needs and those who did not, F(1, 14) = 7.826, p<.05. No statistically significant difference was seen in the number of days of concussion symptoms between athletes who were in the control group and the intervention group, F(1, 14) = 0.936, p=.356. Although a statistical significance was not observed in the number of days of athlete symptoms, an average decrease in the number of days was observed in the intervention (M = 4.43, SD = 2.37) when compared to the control (M = 8.57, SD = 5.09), t(14) = 2.357, p = .151.

**Conclusion:** In this population, athletes that meet their daily calorie needs had fewer days that they experienced concussion related symptoms compared to the subjects that did not meet their caloric needs. This preliminary research suggests that it is beneficial to assure that individuals are aware of their caloric needs and strive to meet them following the diagnosis of a concussion.

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<th>Q3</th>
<th>Q4</th>
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<td>18 (56.2%) b</td>
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<td>18 (56.2%) a</td>
<td>11 (42.3%) a</td>
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Data expressed as percentages (%). Different letters denote significant differences between nutrients within quartiles (p<0.05).
RESULTS: (1) The energy expenditure figure of training group was 0.66±0.10 kcal/kg/km, which was observably lower than those of marathon group (1.22±0.32 kcal/kg/km) and cross-country group (1.20±0.18 kcal/kg/km); however, there was no obvious difference between the marathon group and cross-country group (p=0.05). (2) The calorie of supplement intakes was 756.7±338.80 kcal/kg/km, which was significant lower than the calories of energy expenditure (2331.61±939.30 kcal/kg/km) in 22 amateurs. However, there was a positive correlation between energy expenditure and supplement intake among the three groups (r=0.78, p<0.01). CONCLUSIONS: (1) The energy expenditure level during daily training was obviously lower than which during competition in amateur runners. (2) The nutrition intake didn’t meet the demand of energy cost during long distance running although the runners had followed the principle of the “more energy cost, the more supplement will need”.

INTRODUCTION: The effects of diet and exercise are well studied in connection with human health. However, the relationship between the human gut microbiome (HGM) and exercise is not well understood. PURPOSE: The purpose of this study was to examine possible changes to the HGM diversity and composition resulting from an 8-week intervention of cardiovascular exercise (CVE). METHODS: Twenty-seven participants (20 F and 7 M) aged 18-25 years were recruited. Inclusion/exclusion criteria were determined using the AHA/ACSM pre-screening questionnaire along with screening for historical factors that might impact the microbiome. Fecal samples with screening for historical factors that might impact the microbiome. Fecal samples were collected from each participant at the beginning and end of the intervention. HGM richness and composition that correlated with the beginning and the end of the CVE intervention showed significant changes in each subject’s HGM, community richness and composition were compared to the prior week to understand week-to-week changes, demonstrating a significant shift (p = 0.0002) in composition at week 11, when the CVE program stopped and microbial compositions abruptly returned to baseline values. Interestingly, in week 8, some individuals seem to have returned to a composition similar to baseline. Reasons for this anomaly are unclear. Additionally, each individual’s community richness and compositions were compared to the prior week to understand week-to-week changes, demonstrating a significant shift (p = 0.0002) in composition at week 8, indicating settlement into a novel HGM composition. The week to prior week community richness showed significant decreases in weeks 7-9 (p = 0.02). This was followed by a significant increase in week 12 (p = 0.017). CONCLUSION: The CVE intervention showed significant changes in HGM richness and composition that correlated with the beginning and the end of the CVE intervention. These changes indicate that exercise has a clear impact on the HGM and further studies are needed to uncover the underlying mechanism.
in EOD operators. A secondary purpose was to evaluate the associations between VITD and biobehavioral correlates (i.e., body composition, mood). METHODS: In 72 EOD operators (80% Caucasian), VITD was measured using a blood test (25-hydroxyvitamin D3). Body fat percentage (BF%), bone mineral content (BMC), maximal volume of oxygen uptake (VO2max), muscular strength (one-repetition max; back squat, bench press), blood lipids, blood pressure, posttraumatic stress disorder symptoms, and depression symptoms were also assessed. Pearson product-moment correlation coefficients were used to evaluate associations between VITD and biobehavioral characteristics. RESULTS: Mean ± SE were as follows: age = 34.2 ± 0.8 y; BF% = 17.6 ± 0.4; VITD = 39.0 ± 1.0 ng/mL; and VO2max = 47.9 ± 0.7 ml/kg/min. Associations with VITD were: BF% (r = -0.33) and android fat (r = -0.36), both p < 0.1; VO2max (r = -0.24), blood triglycerides (TGs; r = -0.30), and diastolic blood pressure (DBP; r = -0.25), all p < 0.05. No correlations were observed with strength, BMI, other blood lipids, or behavioral health. CONCLUSION: EOD operators in this study were generally healthy with respect to VITD levels and all other measures. The negative association between VITD and BF% is consistent with accruing data in both military and athletic populations. It also reflects the prevailing hypothesis that in overweight individuals, VITD can become sequestered within fat tissue. Inverse relationships with android fat, TGs, and DBP are in line with reports that VITD deficiency is linked to cardiovascular disease risk factors. Future studies will evaluate VITD status with neurocognitive function and genetic variants of stress physiology.

### 3134 Board #180 May 31 2:00 PM - 3:30 PM Influence Of Vitamin D Status On The Post-exercise Hepcidin And Interleukin-6 Response In Trained Athletes
Alexandra L. Shill, Molly Collinson, Mark Palmer, William D. Fraser, Jonathan Tang, Richard J. Burden, Nicolette C. Bishop, Loughborough University, Loughborough, United Kingdom. 1University of East Anglia, Norwich, United Kingdom. 2English Institute of Sport, Loughborough, United Kingdom. (No relevant relationships reported)

**PURPOSE:** Iron deficiency and reduced iron status have potential negative performance implications for athletes, particularly endurance runners. Hepcidin has a key role in iron homeostasis and is known to be influenced by interleukin (IL)-6. Emerging research from clinical populations indicates that vitamin D supplementation can reduce both circulating hepcidin and IL-6 levels hence could improve iron availability and increase performance. Exercise is known to increase both IL-6 and hepcidin levels, but the influence of vitamin D status on this response is unknown.

**METHODS:** Twenty trained participants (24 ± 4 years; 184.3 ± 6.5 cm; 79.8 ± 7.5 kg; 55.7 ± 6.5 mL/min/kg) divided into 3 activity groups (endurance runners n=6; team sports n=8; resistance trained n=6) gave informed consent to take part in this study. Following an overnight fast, participants completed a sub-maximal and graded treadmill test to volitional exhaustion. Venous blood samples were collected pre, post, 1 h and 3 h post-exercise. Blood was analysed for serum total 25-hydroxy vitamin D levels, but the influence of vitamin D status on this response is unknown.

**RESULTS:** Pre-exercise vitamin D values were similar between groups (90.2 ± 32.5 nM, p=0.563). Hepcidin increased significantly after exercise (F1,66 = 38.61, p<0.001) with values peaking at 3 h post-exercise (pre 17.13 ± 2.12 mg/mL; 3 h post-exercise 38.44 ± 2.32 mg/mL). Increased IL-6 concentration increased significantly in response to exercise (F1,66 = 44.11, p<0.001). There were no significant differences in IL-6 levels when comparing groups (p=0.121 and p=0.409). Iron (p=0.529 and p=0.297) and IL-6 (p=0.709 and p=0.175). There was a significant negative correlation between peak hepcidin and relative VO2peak (r = -0.468, p=0.038). There was a trend for a negative relationship between vitamin D values and % change in hepcidin from pre-exercise to 3 h post-exercise (r = -0.431, p=0.058) and a trend for a positive relationship between vitamin D and peak IL-6 values (r=0.410, p=0.072).

**CONCLUSIONS:** Higher serum Vitamin D levels have the potential to reduce the post-exercise hepcidin response and therefore could have positive implications on athletes’ post-exercise iron status.

### 3135 Board #181 May 31 2:00 PM - 3:30 PM Evaluation of Vitamin K Intake and Its Relation to Bone Mineral Density
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(No relevant relationships reported)

Vitamin K is a required nutrient important in bone health. Some researchers have reported that vitamin K can help to prevent bone fractures. PURPOSE: To explore whether a relationship exists between vitamin K intake and bone mineral density (BMD) among athletes, 18 to <35 years of age and ≥35 years of age. METHODS:

This was a cross-sectional study, where 198 athletes were measured for total body BMD (TBMM), lumbar spine BMD (LBMD), and dual femoral neck BMD (FNBMW) with dual-energy X-ray absorptiometry (DXA). Athletes also completed a food frequency questionnaire (FFQ) to determine their average daily intake of Vitamin K intake, as phylloquinone (also known as vitamin K1). Athletes were separated into two age groups: 18 to <35 years of age (57 women; 42 men) (28.10±3.86 years of age) and ≥ 35 years of age (60 women; 39 men) (46.21±8.80 years of age). Pearson correlation models were used to correlate all three BMD sites with vitamin K intake. Alpha levels were set a priori at p<0.05. RESULTS: In the 18 to <35 years of age group, mean vitamin K intake was 370.75±265.82 mcg/day. Significant correlations were reported between all three BMD sites and vitamin K intake in this age group (n=99): TBMM r= -0.254, p<0.05; LBMD r= -0.248, p<0.05; FNBMW r= -0.278, p<0.05. In the ≥35 years of age group, mean vitamin K intake was 406.27±267.99 mcg/day. There was no significant correlation between vitamin K intake and any of the three BMD sites in the ≥ 35 years of age group (n=99). CONCLUSION: Our results demonstrate that the average vitamin K intake in these athletes was over 300% of the Dietary Reference Intakes (DRI), where 97.1% of female athletes and 79.2% of male athletes met and exceeded their respective DRI (90 mcg/day for women, 120 mcg/day for men). It is unclear, however, why a negative relationship existed between vitamin K intake and BMD in athletes 18 to < 35 years of age, and no relationship existed in athletes ≥ 35 years of age. A prospective study should be conducted to better elucidate these relationships. This study was not funded.
which was significantly (p=0.05) lower than dairy (75.2%), fruits (72.6%), and grains (77.0%). Children consumed a high amount (84.2%) of the fats/sweets served to them. Children described the snack food as yummy (85.3%), okay (6.0%), or yucky (8.4%).

CONCLUSIONS: The results indicate that snack menus meeting recommended dietary standards may not match what children are served or consuming for snack, potentially contributing to long-term health consequences.

RESULTS: Mean age, BMI, and CRP levels were 10.8±1.1 yrs, 20.7±5.1 kg/m², and 0.26±0.50 mg/L. Multinomial logistic regression with covariates of BMI percentile, maturation, and physical activity was used to evaluate CRP category relation with cruciferous vegetable intake.

Subclinical chronic inflammation, measured by C-reactive protein (CRP), is strongly linked to cardiovascular disease (CVD) in adults. CRP has been shown to be elevated in some children and is considered a potential risk factor for early onset CVD.

Strategies to reduce chronic inflammation among children is paramount. In adults, higher cruciferous vegetable intake has been associated with lower inflammation.

PURPOSE: To examine the relation between cruciferous vegetable intake and CRP among preadolescent girls.

METHODS: Among girls aged 9-12 yrs (N=296), cruciferous vegetable intake was measured by the Youth/Adolescent Questionnaire and categorized as >0.25, 0.26-0.50, >0.50 servings per day. Fasting serum CRP (mg/L) was measured by the Beckman Coulter AU5812 Clinical Chemistry Analyzer. Girls with CRP values >10mg/L were excluded. CRP levels were categorized by normal, moderately increased risk, and high risk for CVD according adult cut-offs (CRP <1, ≥1-3, >3 mg/L).

Multivariate logistic regression with covariates of BMI percentile, maturation, and physical activity was used to evaluate CRP category relation with cruciferous vegetable intake.

RESULTS: Mean age, BMI, and CRP levels were 10.8±1.1 yrs, 20.7±5.1 kg/m², and 1.3±1.8 mg/dL, respectively. The proportion of girls in the normal, moderate, and high risk CRP categories were (N=296): 218 (69.2%), 50 (17.0%), and 18 (6.1%). Averaged cruciferous vegetable intake was 0.27±0.3 servings/day. Low cruciferous vegetable intake (>0.3 servings/day) was significantly associated with a CRP level of 1-3mg/L (RR=3.5, 95% CI 1.11-11.3, P=0.04).

CONCLUSION: It is concluded that the developed instrument demonstrated good psychometric qualities, becoming a viable option for evaluating children’s body image.
CONCLUSIONS: Cruciferous vegetable intake among girls aged 9-12 years was low overall. The lowest intake was associated with the CRP risk category considered to confer a moderate-to-high risk of CVD among adults. Enrichment of the diet with cruciferous vegetables is an intervention strategy that should be tested in girls to reduce inflammation and CVD risk early, regardless of BMI status.

Supported by National Institute of Child Health and Human Development (HD074565) and the National Cancer Institute (P30CA023074)

F-62 Free Communication/Poster - Education and Funk
Friday, May 31, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

3141 Board #187 May 31 2:00 PM - 3:30 PM
Pathology Classification And Exercise Adherence: A JTA Educational Approach To Providing Community-Based Exercise Programs
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Pathology Classification and Exercise Adherence: a JTA Educational Approach to Providing Community-Based Exercise Programs

CONCLUSION: There was no significant difference between exercise adherence for gender (F(1,1) = 0.299, p = 0.585), or for pathology (F(1,4) = 3.223, p = 0.146). Pathology classification was found to be significant predictor of exercise adherence (F(1,31) = 4.560, p = 0.041). CONCLUSION: While pathology classification was a statistically significant predictor of exercise adherence, only 10% of the variance in adherence could be predicted from this model (adjusted R² = 0.100). Necessary future research in this area should consider larger and more diverse samples, longer duration exercise programs, and following-up with subjects after program conclusion. Furthermore, the Lyndon HFIP was facilitated in conjunction with a senior-level, undergraduate programs, and following-up with subjects after program conclusion. Furthermore, this area should consider larger and more diverse samples, longer duration exercise programs, and following-up with subjects after program conclusion.

3142 Board #188 May 31 2:00 PM - 3:30 PM
Program Directors’ Perspectives On Coaes-mediated Caahep Accreditation For The Exercise Sciences
Carlton R. Insley, III1, Susan M. Muller2, Sidney R. Schneider2, William Coale3. Salisbury University, Salisbury, MD.
1Committee on Accreditation for the Exercise Sciences, Indianapolis, IN. (Sponsor: Walt Thompson, FACSM, FACSM)
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Reported Relationships: C.R. Insley: Other (please describe); Not sure if this constitutes a required disclosure. The authors Insley and Muller volunteer services at the CoAES (ACSM). The author Coale is a part-time employee at the CoAES (ACSM).

For viability, college medical faculty must provide quality programs in an enrollment-competitive market. Accreditation, credentialing, and licensure contribute to health practice prosperity. Kinesiology-related domain programs (exercise science, exercise physiology, etc.) have incomplete achievement in program accreditation, credentialing, and licensure.

PURPOSE: To assess Program Directors’ perspectives on CoAES-mediated CAAHEP accreditation for the Exercise Sciences.

METHODS: A 19-question survey was developed and validated by an expert committee. Upon IRB approval, an exploratory study was conducted by researchers were anticipating no response bias when contacting program Directors’ perspectives, and enabling CoAES insight to forward a more positive approach to community-based exercise opportunities.

F-63 Free Communication/Poster - Education and Funk
Friday, May 31, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

3143 Board #189 May 31 2:00 PM - 3:30 PM
Retrieval Practice Improves the Recall and Transfer of Learning of Physiology Information.
John L. Dobson. Georgia Southern University, Statesboro, GA.
Email: jdobson@georgiasouthern.edu

RESULTS: The SRR strategy facilitated significantly greater recall than the SSSS strategy (21.35 ± 1.08 vs. 17.35 ± 0.86, p<0.05), and both the SRSR and SJSJ strategies lead to significantly greater recall and transfer of learning with physiology information. A second purpose was to compare recall and transfer of physiology information following retrieval practice versus a judgment of learning task (JOL) that may be easier for students to implement on their own.

METHODS: Participants were randomly assigned to learn three short (~500 words) physiology texts using each of the following strategies: 1) studying a text four consecutive times (SSSS), 2) studying and then retrieving a text two consecutive times (SRRR), and 3) studying a text four consecutive times while completing multiple JOL during the second and fourth repetitions (SJSJ). Recall and transfer of learning were both assessed one week after the participants learned the texts, and the results were analyzed using repeated measures ANOVAs. RESULTS: The SRSR strategy facilitated significantly greater recall and transfer of learning compared to the SRRR strategy (21.35 ± 1.08 vs. 17.35 ± 0.86, p<0.05), and both the SRRR and SJSJ strategies lead to significantly greater recall and transfer of learning compared to the SSSS strategy (21.35 ± 1.08 vs. 17.35 ± 0.86, p<0.05) and SSSS strategy (21.35 ± 1.08 vs. 17.35 ± 0.86, p<0.05). CONCLUSION: These results demonstrate that retrieval practice enhances both recall and higher order thinking about physiology information and that covert retrieval, as experienced in a JOL task, may provide similar benefits.

Clinical exercise science programs require rigorous academic preparation often taught in traditional classroom and lab settings. However, employers also require students to develop strong interpersonal professional skills necessary to be successful in the field. Incorporating situated learning in the exercise science classroom provides opportunities for students to develop social interaction, theory application, critical thinking, and problem solving skills. A greater sense of classroom community is understood to significantly enhance students’ internalization of learning and the development of these desired professional skills.

PURPOSE: The purpose of this research is to explore students’ perceptions of overall classroom community, connectedness, and learning in both a situated and traditional classroom environment.

METHODS: 53 undergraduate exercise science students (age [yrs] = 22.21 ± 2.96, males = 35.8%; females = 64.2%) who had participated in either a situated learning course or a traditional learning course completed Rovai’s (2002) Classroom Community Survey at the end of the semester. A one-way ANOVA was performed to commercially identified Kinesiology-related programs (undergraduate and graduate) with published e-mail addresses, offered responses. Utilizing descriptive statistics, response analyses were performed in context of survey items. RESULTS: The following data graphs represent salient features of survey results:

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determine if there were any significant differences between the two groups ($\alpha = 0.05$).

RESULTS: The results demonstrated significant differences between the groups across all three variables of overall classroom community ($p < 0.00$, connectedness ($p < 0.02$), and learning ($p < 0.00$). The situated learning group demonstrated significantly higher mean scores. CONCLUSIONS: Students’ perceive higher levels of overall classroom community, connectedness, and learning when participating in a situated learning experience. Incorporation of these types of learning environments in exercise science degree programs may enhance professional skill development and successful employment within the field.

3145 Board #191 May 31 2:00 PM - 3:30 PM
Contemporary Conflict Management in the Sports Medicine Setting
Rodiel Kirby Baloy1, Katelyn Davenport2, Charles Lindberg2, Elizabeth Tinch2. 1The College of St. Scholastica, Fort Hays State University, Duluth, MN. 2Fort Hays State University, Hays, KS.
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(No relevant relationships reported)

Purpose. Conflict management is an important aspect in the administration and organization of sports medicine teams. Health care professionals attempt to exert personalities, influences, biases that may create points of misunderstanding within everyday team operations. Methods. This review gathers contemporary information and theories towards conflict and conflict management, including definitions of current terminology and current concepts. This study also identifies opportunities that team members may utilize when dealing with conflict. Four main types of conflict are discussed and are juxtaposed with sports medicine scenarios. These types include: goal related conflict, affective conflict, procedural conflict, and cognitive conflict. A review of recent literature also provides strategies for dealing with conflict and creating commitment within team members. Results. Potential effects and benefits of various conflict management approaches are discussed. Evidence is then presented to further understand and appreciate the elements involved with conflict when intertwining healthcare professionals in a sports medicine setting. Conclusion. In conflict management, recognizing that all team members have differing viewpoints can serve as a resolution point which encourages team members to embrace their differences. Finally, a case study summarizes the theories for conflict management.

3146 Board #192 May 31 2:00 PM - 3:30 PM
The Promotion Of Physical Activity By Craft Breweries In Knoxville, Tennessee
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(No relevant relationships reported)

A growing body of research supports a positive relationship between physical activity (PA) and alcohol consumption within various sample populations. Anecdotally, producers of craft beer appear to specifically market to active consumers via sponsorship competitions, charity biking, and hosting of regular PA events (e.g., group runs). Currently, no empirical data exists regarding the promotion of PA promotion by craft breweries. PURPOSE: Determine the prevalence and type of PA promoted by craft breweries located in a single community. METHODS: Operators of 13 craft breweries located in Knoxville, TN were solicited to complete an electronic survey: A response rate of 77% was attained. Census tract data was tabulated for each brewery location. DESCRIPTIVE STATISTICS AND FREQUENCY SCORES WERE COMPUTED TO QUANTIFY THE PROMOTION OF PA ACROSS SURVEYED CRAFT BREARIES. RESULTS: A response rate of 77% was achieved. Participating breweries (N=10) were located in areas that are populated by predominantly white (80.9±14.0%), young-to-middle aged adults (35±5y), and that generally consist of a higher proportion of renter-occupied housing units (63.1±18.8%). All respondents indicated that the respective establishment hosted at least one type of PA event. Over an average month, 25 group runs (mean=14±10), 18 group fitness classes (6±3), and 16 group biking events (3±1) were held across seven, three, and five breweries, respectively. In nine of the ten breweries, patrons attending active events are eligible for one or more of the following promotions: $1USD off all beers (50%), discounted first beer (30%), discounted two beers (10%), and one free beer (20%). CONCLUSIONS: A majority of craft breweries in Knoxville, TN host one or more of these promotions multiple times per month, with specific beer promotions for participating patrons. These data provide preliminary evidence for the promotion of PA by craft breweries within a community setting. Further research is necessary to determine the impact and reach of such events, as well as operators’ motivations to pair the promotion of PA with the consumption of craft beer.

3147 Board #193 May 31 2:00 PM - 3:30 PM
Effects of Exercise Habits on Working Memory of College Students
Yuan Yang1, Tian Li2, Shoufu Yan3. 1Capital University of Physical Education and Sports, Beijing, China. 2YueZhiJian Education Institute, Beijing, China.
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(No relevant relationships reported)

PURPOSE: Working memory is the process of storing information by human body and processing by way of thinking. Relevant studies have shown that exercise have positive impacts on working memory of human body, but previous studies mostly focused on the forms of exercise, and the subjects were mostly children or elderly people. So, this study aimed to explore whether exercise can affects the working memory of college students by comparing who have the exercise habit with who have been sedentary.

METHODS: 12 students from the Capital University of Physical Education and Sports were taken as subjects. According to the exercise habits, 6 subjects with exercise habits were divided into exercise group and 6 subjects with sedentary were divided into control group. The E-prime software was used to program the 2-Back task to measure the working memory of subjects. The experimental procedure was divided into four blocks. The first and third blocks were simple tasks, the second and fourth blocks were complex tasks. The SPSS23.0 was used to analyze the experimental data.

RESULTS: The behavior data were analyzed with 2 (exercise habit group) * 2 (task type) repeated measurement ANOVA to investigate the responsiveness of different exercise habits to 2-Back task. The results showed that for accuracy, the main effect of task type was not significant F(1,10)=2.923, p=.118, and the interaction effect between task type and group was significant F(1,10)=6.245, p=.032, indicating that the subjects with exercise habits had higher accuracy than those who with sedentary, but there was no difference in accuracy when performing simple and complex tasks. For the response time, the main effect of task type was not significant F(1,10)=125.73, the interaction effect of task type and group was not significant F(1,10)=488.831, indicating that there was no difference in response time between subjects in the process of two tasks, and there was no significant difference in the reaction time between subjects with exercise habits and sedentary.

CONCLUSION: Exercise habits may have positive effects on working memory of college students, especially on accuracy of completing working memory process, and the related brain mechanisms need to be further studied.

F-63 Free Communication/Poster - Musculoskeletal and Ultrasound
Friday, May 31, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2
3148 Board #194 May 31 3:30 PM - 5:00 PM
Reduced Cardiorespiratory Fitness and Greater Body FatnessWill Develop A Consequence of Chronic Ankle Instability
Michael J. Turner, FACSM, Aregash Theodros, Anyeaa King, James Joyner, Tricia Hubbard-Turner, FACSM. UXCL Charlotte, Charlotte, NC.
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(No relevant relationships reported)

Our laboratory has recently reported significant declines in daily physical activity (PA) performed in humans and mice as a result of Chronic Ankle Instability (CAI), which will likely accelerate the development of unhealthy characteristics. PURPOSE: To assess the impact of CAI on cardiorespiratory fitness and body composition. METHODS: Thirty-four subjects participated in the study. Seventeen subjects with CAI were matched for sex (10 females, 7 males/group), age (22 ±2.6±y and 22 ±2.3±y, Mean±SD), height (167±8cm and 168±8cm), and weight (70±5.3kg and 66±7.5kg), to subjects with no history of ankle injury, respectively. Subjects reported to the Health Risk Assessment Lab for one session. Subjects completed the foot and ankle ability measure (FAAM and FAAMSport) and the NASA physical activity questionnaire. Subject’s body composition was assessed by DEXA. Afterward, subjects performed a treadmill maximal exercise test. Every minute of the treadmill test the subjects rated their exertion using the Borg RPE scale (6-20 scale). For the treadmill test we used a two-minute progressive test until volitional fatigue was attained. RESULTS: No differences were observed between groups for age (p=0.86), height (p=0.79), and weight (p=0.15). Body composition was different (p=0.0002) between the CAI and Control group (33±9.6±% and 24±6.8±%, respectively). VO2max (ml/kg/min) was significantly different (p=0.0001) between CAI and Control groups (30±2.4±8 and 49±2.7±5, respectively). Time to maximal exercise test completion (p=0.02) and VENmax (p=0.008) were different between groups. Maximal
HR was not different (p=0.96) between groups however resting HR was different (p=0.0001) between the CAI and Control groups (77.3±7.5 bpm and 64.9±8.1 bpm, respectively). By 1 month post-ACLR, FAAMSport (p=0.0001) and NASA (p=0.0001) were all observed to indicate differing activity levels between the groups. CONCLUSIONS: CAI in college-aged adults results in significantly reduced PA and cardiorespiratory fitness levels accompanied by significantly greater body fatness. Our findings suggest these serious negative health outcomes will rapidly develop as a consequence of the reoccurrence of this musculoskeletal injury as a young adult.

1314 Board #195 May 31 3:30 PM - 5:00 PM Early Brace Progression Following Anterior Cruciate Ligament Reconstruction Leads to Improved Knee Range of Motion
Lauren N. Erickson, Kathryn C. Lucas, Cale A. Jacobs, Darren L. Johnson, Mary L. Ireland, FACSIM, Brian Noehren, FACSIM. University of Kentucky, Lexington, KY.
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(No relevant relationships reported)

Loss of passive knee extension (KE) following anterior cruciate ligament (ACL) reconstruction is a common deficit after surgery, and has been associated with prolonged pain, quadriceps weakness, and gait impairments. Recent literature indicates that it is also predictive of an increased risk of osteoarthritis due to altered knee kinematics. Post-operative bracing may limit the ability to achieve full knee; however, the effects of various brace progressions have received little attention.

PURPOSE: To determine the time to achieve baseline KE and knee flexion (KF) after ACL reconstruction following an early versus delayed brace progression. METHODS: 18 ACL-reconstructed subjects were allocated into an early brace progression (n=9; 4F, 5M; 21.2 ± 4.9 y; 27.6 ± 5.1 kg/m²) or delayed brace progression (n=9; 3M, 6F; 22.8 ± 5.6 y; 24.4 ± 3.0 kg/m²) group. The delayed group was weight bearing as tolerated (WBAT) with a post-operative brace locked in full extension for ambulation for 4 weeks. After 4 weeks, the brace was unlocked with a transition to a hinged knee sleeve at 2 months. The early group was WBAT with the post-operative brace locked in full extension for 1-2 weeks. Subjects were gradually weaned from crutches at 1-3 weeks with complete discontinuation of the brace at 3-6 weeks. KE and KF were measured with a goniometer. Independent t-tests were used to compare differences between groups (α<0.05).

RESULTS: There were no significant differences between groups for baseline KE (early: 5.7 ± 2.2°; delayed: -4.6 ± 3.5°; p=0.43) and KF (early: 142.6 ± 5.2°; delayed: 142.4 ± 8.6°; p=0.97). There were significant differences between groups post-surgery in time to achieve baseline KE (early: 12.8 ± 9.3 days; delayed: 40.4 ± 16.6 days; 68.4% difference; p=0.001) and KF (early: 31.6 ± 8.8 days; delayed: 55.6 ± 13.8 days; 43.2% difference; p=0.001). No subjects were noted to have increased knee laxity. CONCLUSIONS: Early brace progression was more effective than delayed brace progression in reducing the time to restore baseline KE and KF. Early restoration of knee motion following ACL reconstruction may limit post-operative complications, knee stiffness, anterior knee pain, delay in strength recovery, and gait impairments. Adjustment of post-operative brace protocols can have a profound impact on clinical outcomes.

1315 Board #196 May 31 3:30 PM - 5:00 PM The Detection of Knee Joint Sounds under Different Loading Conditions using Vibroarthrography
Kristin Kalo1, Rainer Sus2, Daniel Niederer3, Volker Gross2, Winfried Banzer, FACSIM1, Lutz Vogt1. 1Goethe University Frankfurt, Frankfurt am Main, Germany; 2University of Applied Sciences, Giessen, Germany.
Email: kalo@gr.unibi-frankfurt.de
(No relevant relationships reported)

Crepitus of the knee may mirror structural changes of the joint during motion. Although the magnitude of these sounds increases with greater cartilage damage, it is unclear whether knee joint sounds also reflect joint loading. PURPOSE: To reveal whether the magnitude of knee joint sounds differs across dynamic loading conditions using vibroarthrography. METHODS: Twelve healthy volunteers (26 ± 3.59 years, 7 females) participated in the randomized-balanced crossover study. Knee joint sounds were recorded (linear sampling, 5512 Hz) by means of two acoustic sensors (microphones), one placed on the medial tibial plateau and one on the patella. Two activities of daily life (standing up from and sitting down on a bench; descending stairs) and three open kinetic chain (OKC) knee extension-flexion cycles (passive movement, 10 % and 40 % loading of the individual one repetition maximum) were performed. Each participant carried out three sets of five repetitions and three sets of 15 steps downwards (stairs), respectively. For data analysis, the mean noise volume for each loading condition was determined. The resulting values were expressed as relative difference to the individual OKC passive movement value. Friedman two test and Bonferroni-Holm adjusted post-hoc test were performed to detect differences between conditions.

RESULTS: The OKC passive movement sound ranged from 0.0001 to .003 a.u. (± 43.6 - 69.3 dB) at the medial tibia and from .001 to .003 a.u. (± 60.6 - 87.7 dB) at the patella. Significant differences between joint sound amplitudes for all movements, both measured at the medial tibial plateau (Chi²=27.0, p<0.001) and at the patella (Chi²=75.0, p<0.001) were obtained. The corresponding median differences for the tibia sensor were: stand/sit: 236 %, stairs: 675 %, OKC40: 291 %, OKC10: 75 %, OKC: 384 %; and for the patella sensor: stand/sit: 158 %, stairs: 260 %, OKC40: 75 %, OKC: 78 %. CONCLUSION: Overall, the larger the supposed knee joint loading was, the louder was the recorded knee crepitus. Consequently, vibroarthrographically assessed knee joint sounds can differ across knee joint loading conditions. Future studies should further support these findings using inverse dynamics as a measurement of knee joint loading.

1316 Board #197 May 31 3:30 PM - 5:00 PM Glenohumeral And Hip Range Of Motion Are Associated In Softball: Implications For Performance And Injury
Mallory Faherty, Carolyn Killelea, Morgan Skidmore, Robert Zarzour, Timothy Sell, FACSIM. Duke University, Durham, NC. (Sponsor: Timothy Sell, FACSIM)
(No relevant relationships reported)

Effective ball release during throwing requires coordination between the upper extremity (UE) and lower extremities. Deficits in UE and lower extremity (LE) range of motion (ROM) have been associated with decreased throwing performance and musculoskeletal injury. PURPOSE: To determine the association between glenohumeral and hip ROM in softball athletes. METHODS: 28 NCAA Division I female softball athletes participated (Age: 18.8 ± 1.5 years, Height: 168.1 ± 6.8 cm, Weight: 70.6 ± 9.3 kg). ROM tests included: glenohumeral internal rotation (GIR) and external rotation (GER), hip internal rotation (HIR) and external rotation (HER). All ROM tests were completed bilaterally and an average of three trials was utilized for data analysis. ROM measurements were analyzed individually, as well as a total ROM for the UE (TGROM) and LE (THROM). Data was stratified by pitcher vs. position players, dominant (DOM) vs. non-dominant (NDOM) UE and LE. Normality was assessed using a Shapiro-Wilk test. Correlations between UE and LE ROM were analyzed utilizing Pearson correlations or Spearman-Rho correlations, as appropriate. Significance was set a priori at p < 0.050. RESULTS: Pitchers demonstrated significant correlations between DOM GIR and DOM HIR (Correlation: 0.845, P = 0.017), as well as between DOM GIR and DOM HER (Correlation: 0.790, P = 0.034). Pitchers also demonstrated correlations between DOM GIR and DOM THROM (Correlation: 0.770, P = 0.043), as well as DOM GIR and NDOM THROM (Correlation: 0.785, P = 0.036). Position players did not demonstrate any significant correlations between glenohumeral and hip ROM. CONCLUSION: Pitchers demonstrated significant correlations between glenohumeral and hip ROM, while position players did not. The positive correlation in pitchers may indicate that effective pitch performance is dependent on efficient coordination between the glenohumeral joint and hip. Proper hip ROM is necessary for an athlete to effectively transfer energy to the glenohumeral joint. Changes in hip ROM may lead to adaptations in glenohumeral ROM, both positive and negative; future research should focus on understanding these possible adaptations.

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Results: There were significant differences between the 5-6 mo. vs 6-7 mo groups \((p=0.04)\) and the 5-6 mo vs 8-9 mo groups \((p=0.04)\) for subjective function \((P=0.04)\). There were significant differences between the 5-6 mo vs 8-9 mo groups \((p=0.07)\) and the 6-7 mo vs 8-9 mo groups \((p=0.04)\) for MVIC Extension \((P=0.14)\). No differences were seen between groups for MVIC for knee extension \((P=0.14)\) or flexion \((P=0.97)\) or knee flexor LSI \((P=0.60)\) (Table 1).

Conclusions: There are significant differences which demonstrate progressively increasing subjective function and knee extension symmetry when tested at later timepoints from surgery. However, the observed values are low suggesting even at 9-months post ACLR patients are demonstrating deficits that may be improving.

Table 1: Between Group Differences: Median (IQR)

<table>
<thead>
<tr>
<th></th>
<th>5-6</th>
<th>6-7</th>
<th>7-8</th>
<th>8-9</th>
<th>P-Value</th>
<th>Effect Size ((d'))</th>
</tr>
</thead>
<tbody>
<tr>
<td>IKDC</td>
<td>79.7*</td>
<td>79.7</td>
<td>79.7</td>
<td>89.1</td>
<td>.019</td>
<td>0.04*</td>
</tr>
<tr>
<td>MVIC Extension (Nm/kg)</td>
<td>1.46</td>
<td>1.60</td>
<td>1.59</td>
<td>1.15</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MVIC Flexion (N/kg)</td>
<td>7.73</td>
<td>7.77</td>
<td>7.76</td>
<td>6.61</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MVIC Extension LSI (%)</td>
<td>60.0*</td>
<td>67.9</td>
<td>67.7</td>
<td>76.7*</td>
<td>.002</td>
<td>0.07*</td>
</tr>
<tr>
<td>MVIC Flexion LSI (%)</td>
<td>89.5</td>
<td>84.2</td>
<td>85.8</td>
<td>84.3</td>
<td>.07</td>
<td>-</td>
</tr>
</tbody>
</table>

* Significant difference between 5-6 and 6-7 month groups. ** Significant difference between 5-6 and 8-9 month groups.  

PURPOSE: Lacrosse officials come from different backgrounds, ages and training levels, but all function as athletes while refereeing. Anecdotal evidence shows that mild-to-severe musculoskeletal pain is common in this population. We need to understand the scope of the problem to help keep these adults active over the long-term and engaged in the sport. The purposes of this study were to: 1) determine the prevalence, location and impact of musculoskeletal pain, and 2) identify physical or training-related correlates of pain. METHODS: A specific anonymous survey was developed and distributed to members of the national US Lacrosse Officials Development Program and 1,441 were returned complete. Respondents were 52.0 ± 12.9 yrs, 79.5% male and 63.5% represented east coast regions. 51.1% never played lacrosse, and 37.8% of former players participated through post-collegiate years. Pain sites and severity (0-10 numerical pain rating), previous injuries and current impact of pain on officiating abilities were captured. RESULTS: Pain was present in 18.1% - 40.1% of officials primarily at the foot, shoulder, back and knee. Pain severity during rest and exercise averaged 4.3 - 4.6/10 pts, respectively. A total of 437 officials reported diagnoses of osteoarthritis (OA); knee 48.7%, hip 10.5%, spine 10.1%, shoulder 8.0% and 247 reported OA in more than one joint. Correlates of these pain symptoms included former lacrosse injury (22.6% have long-term pain today) and weight gain in last five years \((r = .053-.186; \text{all } p<.05)\). Current participation in running as a sport was inversely related to pain symptoms. Officials with any diagnosis of OA more often reported frequent or continual difficulties with a) running the entire field distance, b) starting and stopping on the field, c) keeping pace, d) focusing on multiple actions at once, and e) enjoying the officiating duties than officials with no OA \((\text{Mann Whitney }U\text{ tests all }p<.0001)\). COMCLUSION: Officials are unrecognized athletes, and many may benefit from clinical care support at the field before, during and after games to help manage musculoskeletal pain, especially during regulation games or tournaments. Pain relief may translate to better engagement in lacrosse officiating duties, improved player safety and enjoyment of the officiating role.

Clinical cooling, compression is often applied in combination with ice. Amongst practitioners, elastic wrap is the most common type of external compression, while plastic wrap has become increasingly popular because it can be discarded without returning it to the treatment facility. However, few studies have investigated the magnitude of tissue cooling among different types of external compression applied to an ice bag. PURPOSE: To evaluate and compare the cooling effectiveness of wetted ice bag applied with elastic wrap compression or held in place with plastic wrap but with no added compression on intramuscular and skin surface temperatures. METHODS: Ten male participants (36±9 y/o) received ice packs made with wetted ice applied simultaneously to a standardized area on the anterior aspect of the quadriceps for 30 minutes. The ice pack was secured with low compression (plastic wrap) to the right anterior thigh and high compression (elastic wrap) to the left anterior thigh. Skin and intramuscular (1 and 2 cm plus one-half skinfold measurement) temperatures of the vastus lateralis were measured continuously during a 10-minute baseline period, 30-minute treatment period, and a 60-minute recovery period. RESULTS: Intramuscular temperatures decreased from baselines of 35.1 ± 1.1°C at 3 cm and 34.4 ± 1.3°C at 1 cm, to 23.1 ± 4.9°C at 3 cm and 17.8 ± 5.2°C at 1 cm by the end of the elastic compression treatment. Intramuscular temperatures decreased from baselines of 35.4 ± 0.9°C at 3 cm and 34.4 ± 0.9°C at 1 cm, to 24.5 ± 6.7°C at 3 cm and 17.9 ± 4.4°C at 1 cm by the end of the plastic wrap control treatment (Fig. 1). Although the mean difference between compression treatments was 45.1 ± 8.3 mm Hg \((P = 0.0001)\), no difference was observed between treatments in terms of the magnitude of reduction in skin and intramuscular temperature at both 1 cm \((P = 0.475)\) and 3 cm \((P = 0.421)\) regardless of compression pressure. CONCLUSIONS: The magnitude of temperature reduction was comparable using either elastic wrap with high compression or plastic wrap with minimal compression. Plastic wraps are a practical alternative for clinicians as they may be disposed of by the patient or athlete without having to stay at the treatment facility.
showing excellent reliability, these results show that age does affect the accuracy of the measurement of the TP muscle size assessed by ultrasound imaging; however, it would also be beneficial to be able to assess quality of muscle tissue.

**3156 Board #202 May 31 3:30 PM - 5:00 PM**

**No Differences in Sub-Cortical Motor Region Activity for Knee Motor Control Following Anterior Cruciate Ligament Reconstruction**

Christopher Ballance¹, Dustin Grooms², James Onate¹. ¹The Ohio State University, Columbus, OH. ²Ohio University, Athens, OH.

Email: ballance.4@osu.edu

(No relevant relationships reported)

**PURPOSE:** Emerging research has indicated that anterior cruciate ligament reconstruction (ACL-R) is associated with neuroplasticity. It has been speculated that these findings may have future implications on rehabilitation and ACL-R outcomes. However, most of this research has focused on cortical plasticity rather than sub-cortical plasticity. The purpose of this project was to determine the effects of ACL-R on sub-cortical portions of the cortical-subcortical motor loop. METHODS: A healthy group of active participants (n=16, age-23.2±3.5 years, height=1.7±0.1 m, weight=69.7±14.3 kg) and a left ACL-R group (n=15, age-21.7±2.7 years, height=1.7±0.1 m, weight=70.4±15.8 kg, 38.1±27.2 months’ post-surgery) were locally recruited. Functional magnetic resonance imaging (fMRI) and T1 structural imaging were performed to analyze brain activation during a unilateral left (involved) 45° knee extension/ extension at a rate of 1.2 Hz for 4 blocks of 30 seconds interspersed with 30 seconds of rest. The right putamen and right sub-thalamic nuclei (STN) served as seed regions, and the two groups were contrasted using a mixed-effects general linear model with a priori cluster threshold of p<.05. RESULTS: Compared to the control group, the ACL-R group displayed no differences in right putamen and right STN activation during the unilateral motor task. CONCLUSION: These results indicate that ACL-R may not influence the motor control loop at the sub-cortical level. Therefore, motor control and motor learning, as it relates to the subcortical structures, may not be affected by ACL-R. As a result, neurorehabilitation after ACL-R should use priming techniques to target specific cortical regions that previous studies have indicated as being affected as ACL-R.

**3157 Board #203 May 31 3:30 PM - 5:00 PM**

**Performance and Return to Sport Following Latissimus Dorsi and Teres Major Tears in Professional Baseball Pitchers**

Kevin Ma¹, Brandon Erickson², Peter Chalmers¹, John D’Angelo¹, Anthony Romeo³. ¹MLB, New York, NY. ²Rothman Orthopaedic Institute, Tarrytown, NY. ³University of Utah, Salt Lake City, UT.

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(No relevant relationships reported)

**Purpose:** Determine the performance and return to sport (RTS) rate in professional baseball pitchers following LD/TM tears treated operatively and non-operatively, and to compare RTS rate and performance between pitchers who sustained a LD/TM tear and matched controls. The authors hypothesize there is a high RTS rate in professional baseball pitchers following LD/TM tears with no significant difference in RTS rate or performance, specifically related to primary outcome performance variables: WHIP ((walks +hits/innings pitched), fielding independent pitching (FIP), and wins above replacement (WAR)) between cases and controls for both operative and non-operative treatment. **Methods:** All professional baseball pitchers who sustained a LD/TM tear between 2011-2016 were included. Demographic and performance data (pre and post injury) for each player was recorded. Performance metrics were then compared between cases and matched controls within both operatively and non-operatively treated. **Results:** Overall, 120 pitchers had a documented LD/TM tear; (42 (35%) where major league players). Most players (107 (89.2%)) were treated non-operatively. Average age was 21.2 years old. Four were competitive athletes, 4 were recreational athletes and 1 has ceased sport participation.

**3158 Board #204 May 31 3:30 PM - 5:00 PM**

**Characterizing the Prevalence of Cam-Type Hip Impingement in Women’s Professional Ice Hockey Players**

Cordelia W. Carter, Darryl Whitney, Matthew Kingery, Samuel Barou, Guillen Gonzalez-Lomas. NYU-Langone Medical Center, New York, NY.

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(No relevant relationships reported)

**Purpose:** Recent studies have demonstrated an increased prevalence of femoroacetabular impingement (FAI) in elite men’s ice hockey players, yet little is known about the hips of players in the National Women’s Hockey League (NWHL). The primary purpose of this study was to determine the prevalence of radiographic cam-type FAI in women’s professional ice hockey players. The secondary purpose was to analyze the relationship between the presence of cam deformity and hip ROM, clinical impingement signs; and age of menarche.

**Methods:** Clinical, radiographic and demographic data were collected for NWHL players during pre-participation physicals. Alpha angles were measured on 45° Dunn radiographs, with alpha angles >55° defined as cam-positive. Spearman correlations were performed to analyze the relationship between alpha angle and both ROM measurements and menarcheal age. Players were grouped into those with and without cam lesions and group differences were assessed using the student’s t-test.

**Results:** Twenty-seven athletes were included. Nineteen (70%) had alpha angles >55°; 14 (52%) had bilateral cam deformity. Average menarcheal age was 13.9±1.5 years. There was a significant association between age of menarche and alpha angle (right hips, p=0.01; left hips, p=0.04). There was no significant association between alpha angle and either hip ROM or clinical impingement signs.

**Conclusion:** This study suggests that elite female ice hockey players have a higher prevalence of cam-type morphology than the general population. The positive association between alpha angle and age of menarche lends additional support to the etiological hypothesis of the cam lesion resulting from activity-related stress at the proximal femoral physis; players with earlier menarche (and therefore earlier physical closure) seem to be less vulnerable to the development of cam deformity of the proximal femur. Thus, professional women’s ice hockey players have a high risk of developing cam-type morphology of the proximal femur, although each player’s age of menarche may mediate her individual risk for cam lesion development.

**3159 Board #205 May 31 3:30 PM - 5:00 PM**

**Clinical Outcomes of Ultrasound-Guided Percutaneous Patellar Tendon Scraping**

Evan Plunkett, Michael Baria, Meghan Miller, Robert Magnusen. Ohio State University, Columbus, OH.

(No relevant relationships reported)

**Purpose:** To report the clinical outcomes of patients with patellar tendinopathy treated with ultrasound-guided percutaneous patellar tendon scraping.

**Methods:** Design: Retrospective case series Setting: Academic sports medicine clinic Patients: Nine patients with patellar tendinosis (total of 10 tendons). Six patients had primary patellar tendinosis and three had persistent pain despite surgery. Mean age was 21.2 years old. Four were competitive athletes, 4 were recreational athletes and 1 has ceased sport participation.

**Interventions:** All patients underwent ultrasound-guided patellar tendon scraping using a 14-gauge needle, followed by a brief rehabilitation period before returning to sport.

**Main Outcome Measures:** Patient reported outcome measures (PROM), including the Victoria Institute of Sport Assessment Questionnaire-Patellar Tendon and Lower Extremity Functional Scale; time to return to sport and; adverse events.

**Results:** All patients with primary patellar tendinosis met the minimal clinically important difference (MCID) for their PROM with 1 patient experiencing a symptom recurrence. The average time to return to competitive sport was 2.67 weeks. In the post-surgical group, one of the three patients experienced a significant clinical improvement durable for 16 months. No adverse events were reported for any patient.

**Conclusions:** Ultrasound-guided percutaneous patellar tendon scraping may result in improved patient-reported outcome scores and facilitate a safe, rapid return to sports in cases of primary patellar tendinopathy. Results were less reliable for persistent pain after surgery.
Several shoulder injuries. However, data are lacking regarding the long-term effects of shoulder injuries and considerations with respect to gender. PURPOSE: To determine the long-term effects of shoulder injuries on shoulder ROM and strength and examine gender differences in collegiate overhead athletes. METHODS: 35 male (age:20.3±1.2yr, mass:84.1±9.7kg) and 25 female (age:19.6±0.8yr, mass:70.8±10.9kg) overhead athletes fully participating in NCAA division I baseball, softball, volleyball, or tennis were recruited and divided into injury history group and healthy group depending on the existence of a history of shoulder injury. Active ROM of shoulder internal rotation (IR), external rotation (ER) and horizontal adduction (HAD) were measured using a digital inclinometer. Isometric shoulder IR and ER strength were assessed using a hand-held dynamometer and normalized by body mass. A two (group) by two (gender) factorial ANOVA was used to evaluate the dominant shoulder ROM and strength. Cohen’s d effect sizes were calculated to assess the magnitude of differences. RESULTS: Females showed significantly lower IR ROM (p<0.000), IR strength (p=0.000), and ER strength (p=0.01) in the injury history group versus the healthy group, whereas there were no group differences in males (p>0.05). Additionally, male overhead athletes had lower IR (p<0.000), HAD ROM (p=0.000), and greater IR strength (p<0.04) compared to female overhead athletes. CONCLUSION: The results of this study indicate that shoulder injuries may have longer-lasting effects in female overhead athletes compared to male athletes. Furthermore, male overhead athletes demonstrated larger differences in posterior shoulder tightness and rotator cuff strength imbalances compared to female overhead athletes. This study may have significant implications for protocols aimed at preventing shoulder reinjury for specific genders in overhead sports.

Skin Combatibility with 3d Printed Splints And Casts
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Purpose: 3D printed limb orthotics offer hygienic advantages over traditional technology because no padding is needed. We investigated biocompatibility and chemical profile of 3D printed material in contact with skin. Methods: Patient-specific 3D printed ABS polymer casts from multiple sources of feedstock were evaluated according to ISO 10993 standards used by FDA for review of biocompatibility. The effect of post-processing with acetone vapor was evaluated as an independent variable. Cytotoxicity testing using L929 fibroblast reactivity, sensitization by Kligman Maximization methods in Guinea Pigs and irritation evaluation by intracutaneous injection in New Zealand White Rabbits of 3D print extractions were conducted under GLP conditions. In addition, mass spectrometry of filament feedstock and 3D printed casts was performed on solvent extractions using DART methods. Results: Finished casts met criteria for permanent contact with skin

Acute and Longitudinal Effects of Pitching on Passive Range of Motion in Division I Athletes
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Purpose: To assess passive range of motion (ROM) measurements acutely over time and how this acute change alters over the course of a baseball season.

Methods: Seven healthy male NCAA Division I baseball pitchers were measured prior to the start of the season. Each pitcher was assessed for passive shoulder and elbow ROM, with measurements taken after each pitching bout during the season.

Initial/Repeat Triamcinolone Acetonide Extended-Release (TA-ER) Reduces Osteoarthritis Knee Pain Regardless of Prior Intra-Articular Corticosteroids (IACS)
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and limited contact with mucosal membranes. Mass spectrometry findings indicated that changes in ABS polymer occurred with 3D printing and post-processing in both surface and internal chemistry. However, these chemical changes did not compromise biocompatibility assessed under ISO 10993. CONCLUSIONS: Patient-specific 3D printed, ABS orthotics met industry standards for biocompatibility for extended patient skin contact despite changes in material chemistry from feedstock. Therefore, testing and adherence to specific manufacturing controls is necessary to assure patient safety. Mass spectrometry assessment of composition of ABS polymers may serve to continually monitor product quality of 3D printed medical devices in accordance with 21 CFR §820.30. This work was supported in part by a CERSI grant to University of Maryland from the US FDA (U01FD005946A). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the NIH or FDA.

**F-64 Free Communication/Poster - Breast Cancer**

**3166 Board #212 May 31 3:30 PM - 5:00 PM Impact of Aerobic and Resistance Exercise on Global Shoulder Function in Breast Cancer Survivors**

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**Purpose:** Treatment strategies for breast cancer including surgery, radiation, endocrine therapy and chemotherapy have contributed to improving survival rates. However, the implementation of surgical and radiation therapies precipitates and upper musculoskeletal effects in the upper extremity (UE), including decreased shoulder range of motion (ROM), weakness, and chronic pain, with 67% of breast cancer survivors (BCS) reporting upper extremity problems. The purpose of this exploratory analysis of a randomized, controlled trial was to investigate the effects of a 16-week aerobic and resistance exercise intervention on the functional mobility of the UE in BCS.

**Methods:** BCS were randomized to the Exercise (EX; N=50) or Control (CON; N=50) groups. The EX group underwent moderate-to-vigorous aerobic and resistance exercise intervention on the functional mobility of the UE in BCS.

**Results:** Included BCS were 53.5 ± 10.4 years old, Hispanic white (55%) with body mass index 33.5 ± 5.5 kg/m². Participants were treated with surgery (79% mastectomy) and both chemotheraphy and radiation therapy (76%), including breast alone (55%) or breast + nodal radiation (45%). At baseline, EX and CON did not differ on functional mobility measures (p > 0.05). Post-intervention, the EX group experienced statistically significant improvements in active ROM (shoulder flexion, external rotation at 0°/90°), isometric strength (shoulder flexion, external rotation, internal rotation and horizontal adduction) and DASH/PSS scores when compared to their baseline measures (p < 0.001) and to the CON group (p < 0.001). The CON group did not experience any changes (p > 0.05).

**F-64 Free Communication/Poster - Breast Cancer**

**3165 Board #211 May 31 3:30 PM - 5:00 PM Accuracy of Ultrasound Imaging of the Lisfranc Joint Complex**

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(No relevant relationships reported)

Lisfranc injuries account for 1 in 55,000 injuries yearly and are associated with poor outcomes and high complication rates. Superficially connecting the medial cuneiform and second metatarsal, the dorsal Lisfranc ligament is easily visualized with ultrasound. Ultrasound can provide quick, cost effective diagnosis but is not currently standard in clinical practice.

**PURPOSE:** This study sought to compare measurement accuracy of the dorsal Lisfranc ligament using ultrasound, external software, and gross anatomic dissection, with an additional anatomic study of the joint complex. **METHODS:** Ultrasound images of 22 embalmed cadaveric feet (13 male, 9 female, 79.5 ± 13.3 years) were obtained using a 1-6.1MHz linear array. Dorsal Lisfranc ligament length and joint space were measured and compared between methodologies. Images were also re-measured using ImageJ software. Specimens were dissected to evaluate dorsal, interosseous, and plantar Lisfranc ligaments. Joint complex morphology was documented. **RESULTS:** Ultrasound (8.39 ± 1.26 mm) and ImageJ measurements (8.26 ± 1.76 mm) of the dorsal Lisfranc ligament did not differ significantly, but both were significantly different (p < 0.05) than gross dissection (10.8 ± 1.84 mm). There were no significant differences in dorsal joint space measurements between ultrasound (2.19 ± 0.49 mm) and ImageJ (2.05 ± 0.52 mm), but both were significantly different (p < 0.05) than dissection measurements (1.04 ± 0.24 mm).

The dissected dorsal and interosseous ligaments had consistent morphology, whereas the plantar ligament demonstrated a Y- and a fan-shaped variant. A connection between the interosseous and plantar ligaments was present in 64% of dissections. **CONCLUSION:** The dorsal Lisfranc ligament is easily visualized on ultrasound with 23% of the ligament not clearly visible at the peripheral bony attachments. While visually represented on ultrasound, measurements were consistent. Radiographic joint space measurement remains the diagnostic gold standard. Further research should focus on using ultrasound to measure both bony and ligament integrity. Ligament echogenicity provides additional diagnostic information to assess more subtle joint injuries. Additionally, the plantar Lisfranc ligament variability may impact the stability of the joint in some patients.
3167 Board #213 May 31 3:30 PM - 5:00 PM

Body Composition, Strength And Physical Function In Short- And Long-Term Breast Cancer Survivors

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No relevant relationships reported

Purpose: The current study aimed to compare body composition, strength, and physical function between short-term (ST: <4 yrs, n=17; age=57±9 yrs) and long-term (LT: >4 yrs, n=24; age=62±7 yrs) BCS. METHODS: Body composition [lean mass (LM), fat mass (FM)] was assessed using dual-energy X-ray absorptiometry. Lower body strength was assessed using the Bodex leg extension/flexion system at 60° isometric knee extension. Upper body strength was assessed using one repetition maximum chest press. Physical function was measured using the continuous-scale physical function performance test. Independent t-tests were used to compare ST and LT-BCS. Significance was accepted at p<0.05. RESULTS: Time since treatment completion was 18.1±10.0 yrs for ST and 11.8±6.9 yrs for LT. There were no differences in body weight, LM, FM, and upper and lower body strength between groups. Total physical function (ST:64±14; LT:73±11 U) and the functional domains for endurance (ST:66±15; LT:75±12 U) and balance (ST:65±15; LT:75±12 U) were significantly lower in ST-BCS. CONCLUSION: Our findings indicate that without exercise, body composition and strength do not improve whereas physical function improves over time following treatment. Funding: ACSM Doctoral Student Grant; NSCA Doctoral Graduate Student Research Grant.

3169 Board #215 May 31 3:30 PM - 5:00 PM

Relationship Between Accelerometer Output And Oxygen Consumption In Patients With Breast Cancer After Chemotherapy Treatment

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No relevant relationships reported

Purpose: Currently used accelerometer cut-points to identify different intensities of physical activity are validated in the healthy population. These cut-points may not be applicable to patients with cancer due to lower fitness levels or different energy expenditure in rest. We aimed to examine the relationship between oxygen consumption and accelerometer output during different controlled activities in women with breast cancer shortly after completion of chemotherapy treatment.

Methods: Forty women aged 50.4 (SD 9.5) yrs who completed chemotherapy treatment for breast cancer two to four months ago participated in this laboratory study. A cardiopulmonary exercise test was conducted to assess peak oxygen consumption (peakVO2). Oxygen consumption in rest was assessed while lying supine for 6 minutes. Subsequently, nine activities with different intensities were performed while wearing an accelerometer on the right hip, and during which oxygen consumption was assessed. The relationship between oxygen consumption (expressed as percentage of peakVO2 and Metabolic Equivalent of Task (MET) value) and accelerometer output (in counts per minute (cpm)) was studied with linear regression analyses.

Results: PeakVO2 was 21.5 (SD 6.1) mL/kg/min. Oxygen consumption in rest was 3.1 (SD 0.6) mL/kg/min. The accelerometer output corresponding to the cut-points for low versus moderate (40% peakVO2) and moderate versus vigorous (60% peakVO2) intensity physical activity were 100 and 1868 cpm, respectively. The analyses based on MET values resulted in a cut-point of 1172 cpm to distinguish between low and moderate intensity physical activity (3 MET) and a cut-point of 2869 cpm to distinguish between moderate and vigorous intensity physical activity (6 MET).

Conclusions: The accelerometer cut-points to distinguish different physical activity intensities were lower than cut-points validated in the general population (i.e. 1952 cpm for moderate and 5724 cpm for vigorous activity). This finding was irrespective of the method used to express oxygen consumption (%peakVO2 versus MET). This study demonstrates that the use of accelerometer cut-points validated in the general (healthy) population underestimate the physical activity intensities in patients with breast cancer after chemotherapy treatment.

Abstracts were prepared by the authors and printed as submitted.
In the earlier OptiTrain randomized controlled exercise trial, we found beneficial effects of two different exercise programs on health and treatment related outcomes. PURPOSE: The aim of this study was to report on cancer-related fatigue (CRF), quality of life (QoL), symptoms, muscle strength, cardiovascular fitness, body mass and physical activity levels of women with stage I-IIA breast cancer who had been involved in the OptiTrain exercise RCT, 24 months from baseline. METHODS: The original 16-week, supervised exercise program was a three-armed, randomized controlled trial comparing the effects of a combined program of resistance training and high intensity aerobic exercise (RT-HIIT) to usual care among 240 women with breast cancer undergoing chemotherapy. At 24 months, 117 and 155 participants participated in the in-clinic tests and completed the self-report questionnaires, respectively. We assessed CRF, QoL, symptoms, muscle strength, estimated cardiopulmonary fitness, body mass and objectively measured sedentary behaviour and physical activity. Analyses included mixed linear effects model analyses. RESULTS: RT-HIIT reported lower levels of total CRF (1.37, 95% confidence interval CI [-2.70, -0.04], effect size ES = -0.38), cardiopulmonary CRF (-1.47, 95% CI [-2.75, -0.18], ES = -0.44), physical symptoms (-0.23, 95% CI [-2.70, -0.00], ES = -0.29) but higher muscle strength (12.09, 95% CI 3.77, 20.40, ES = -0.51) than UC at 24 months. Whereas AT-HIIT reported lower total symptoms (-0.23, 95% CI [-0.42, -0.03), ES = -0.29), symptom burden (-0.30, 95% CI [-0.60, -0.01, ES = -0.08 (no effect)) and body mass (-2.15, 95% CI [-3.71, -0.60, ES = -0.28) than UC at 24 months. CONCLUSIONS: The RT-HIIT group from the OptiTrain exercise RCT reported lower levels of total and cardiopulmonary CRF, and physical symptoms but higher muscle strength at 24 months, whereas, the AT-HIIT group reported lower total symptoms, and body mass at 24 months. The clinically relevant ES in muscle strength in the RT-HIIT is particularly encouraging given the importance of muscle strength as a predictor of many relevant health outcomes. While these results are promising, effect sizes range from small to medium and the results must therefore be interpreted with caution.

Effects Of Exercise Training During Breast Cancer Chemotherapy On Fitness Outcomes At 1-Year Follow-up

Andria R. Morielli1, Ki Yong An1, Dong-Woo Kang1, Christine M. Friedenreich1, Donald C. McKenzie2, Karen Gelmon3, John R. Mackey4, Robert D. Reid5, Kerry S. Courneya1.

1University of Alberta, Edmonton, AB, Canada. 2Alberta Health Services, Calgary, AB, Canada. 3University of British Columbia, Vancouver, BC, Canada. 4University of British Columbia & British Columbia Cancer Agency, Vancouver, BC, Canada. 5Cross Cancer Institute, Edmonton, AB, Canada. 6University of Ottawa Heart Institute, Ottawa, ON, Canada.

PURPOSE: To determine the effects of different doses and types of exercise during breast cancer chemotherapy on fitness outcomes at 1-year follow-up and to investigate the associations of physical activity during the follow-up period with fitness outcomes. METHODS: The Combined Aerobic and Resistance Exercise (CARE) Trial was a multicenter trial in Canada that randomized 301 breast cancer patients initiating chemotherapy to 3 days/week of supervised exercise consisting of: (1) a standard dose of 25-30 minutes of aerobic exercise (STAN, n=96), (2) a higher dose of 50-60 minutes of aerobic exercise (HIGH, n=101), or (3) a combined dose of 50-60 minutes of aerobic and resistance exercise (COMB, n=104). At 1-year post-intervention, patients completed objective measures of aerobic fitness, muscular strength, and muscular endurance. Physical activity was collected via questionnaire at 1-year follow-up and patients were categorized as meeting (1) aerobic only, (2) strength only, (3) combined, and (4) neither exercise guideline.

RESULTS: We obtained fitness data on 263 (87.4%) patients and self-report data on 284 (94.4%) patients at 1-year follow-up. Analyses of covariance showed that COMB was superior to HIGH for upper body muscular endurance (8.8 reps; p = 0.036) and border-line superior to HIGH for lower body muscular strength (5.1 kg; p = 0.05); and border-line superior to STAN for upper body muscular endurance (4.4 reps; p = 0.09). Moreover, meeting the combined exercise guideline at follow-up was associated with (1) better VO2 peak (2.1 ml/kg/min; p = 0.002), upper body strength (2.8 kg; p = 0.017); and upper body endurance (13.4 reps; p = 0.004) compared to meeting neither guideline, (2) better upper body endurance (8.6 reps; p = 0.026); and lower body endurance (15.2 reps; p = 0.020) compared to meeting the aerobic only guideline and (3) better VO2 peak (1.7 ml/kg/min; p = 0.041); and lower body endurance (20.1 reps; p = 0.036) compared to meeting the strength only guideline. CONCLUSIONS: Performing combined aerobic and strength exercise during breast cancer chemotherapy resulted in longer-term improvements in muscular endurance and strength compared to aerobic exercise alone. Moreover, performing combined aerobic and strength exercise during follow-up was strongly associated with better fitness outcomes.

In/f_lammatory and Affective Responses to Acute Resistance Exercise of Varying Loads in Postmenopausal Women.

Ciaran M. Fairman1, Maryam B. Lustberg2, Maryc L. Haynam1, Anna Kimber1, John Beall3, Josh Barrels3, Michael Lantz2, Sarah Johnson2, Carl Marsh3, William J. Kraemer, FACSM2, Brian C. Focht, FACSM2.

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Resistance exercise (RE) is increasingly recognized as a powerful behavioral intervention that can improve key metabolic and cardiovascular risk factors among aging women. The manipulation of RE variables, such as repetitions and load, may illicit differing physiological and psychological responses to acute bouts of RE. Although differential responses to acute RE may influence training adaptations and subsequent motivation for regular RE participation, the effects of acute RE upon these outcomes in postmenopausal (PMW) have yet to be evaluated. PURPOSE: To determine the effects of RE intensity on physiological, affective, and motivational outcomes in PMW.

Board #219 May 31 3:30 PM - 5:00 PM

Effects Of Exercise During Chemotherapy On Hospitalization And Chemotherapy Completion: The OptiTrain Breast Cancer Trial

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PURPOSE: Prevention of chemotherapy adverse effects may aid in reducing the number of women being admitted to the hospital. Moreover, the importance of sustaining full dose chemotherapy-intensity has been demonstrated. We previously showed that a 16-week exercise program in patients with breast cancer undergoing chemotherapy was beneficial to prevent physiological and self-reported health-related deteriorations. Here, the aim was to examine the effects of exercise on hospitalization and chemotherapy completion rates.

METHODS: 240 women scheduled for chemotherapy were randomized to 16-weeks of resistance and high-intensity interval training (RT-HIIT), moderate-intensity aerobic and high-intensity interval training (AT-HIIT) or to usual care (UC). Chemotherapy completion rate is reported as the mean relative dose intensity (RDI; mg/m² week), which represents the actual received dose intensity as a fraction of the dose intensity of the originally planned chemotherapy regimen. Lymphocyte and thrombocyte concentrations were measured prior to each chemotherapy session. All data were extracted from medical records.

RESULTS: A significantly lower proportion of participants in the RT-HIIT group (3%) were hospitalized compared to participants in the UC group (15%) over the course of chemotherapy (p=0.049). In total, 22% of the participants in RT-HIIT, 28% in AT-HIIT, and 26% in UC required a dose adjustment with no significant between group differences (p=0.49). Among those that required dose adjustment, median relative dose intensity was 80% (IQR=75-87) in the RT-HIIT group, 75% (IQR=75-80) in the AT-HIIT group, and 77% (IQR=73-82) in the UC group (p=0.25). No significant differences were found between groups for lymphocyte or thrombocyte concentrations.

CONCLUSIONS: A 16-week exercise intervention consisting of resistance and high intensity interval training during chemotherapy may have significant implications for the cost of cancer care due to reduced hospitalization rates, but had no effect on chemotherapy completion rates.

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Inflammatory and Affective Responses to Acute Resistance Exercise of Varying Loads in Postmenopausal Women.

Ciaran M. Fairman1, Maryam B. Lustberg2, Maryc L. Haynam1, Anna Kimber1, John Beall3, Josh Barrels3, Michael Lantz2, Sarah Johnson2, Carl Marsh3, William J. Kraemer, FACSM2, Brian C. Focht, FACSM2.

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Resistance exercise (RE) is increasingly recognized as a powerful behavioral intervention that can improve key metabolic and cardiovascular risk factors among aging women. The manipulation of RE variables, such as repetitions and load, may illicit differing physiological and psychological responses to acute bouts of RE. Although differential responses to acute RE may influence training adaptations and subsequent motivation for regular RE participation, the effects of acute RE upon these outcomes in postmenopausal (PMW) have yet to be evaluated. PURPOSE: To determine the effects of RE intensity on physiological, affective, and motivational outcomes in PMW.

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Inflammatory and Affective Responses to Acute Resistance Exercise of Varying Loads in Postmenopausal Women.

Ciaran M. Fairman1, Maryam B. Lustberg2, Maryc L. Haynam1, Anna Kimber1, John Beall3, Josh Barrels3, Michael Lantz2, Sarah Johnson2, Carl Marsh3, William J. Kraemer, FACSM2, Brian C. Focht, FACSM2.

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Resistance exercise (RE) is increasingly recognized as a powerful behavioral intervention that can improve key metabolic and cardiovascular risk factors among aging women. The manipulation of RE variables, such as repetitions and load, may illicit differing physiological and psychological responses to acute bouts of RE. Although differential responses to acute RE may influence training adaptations and subsequent motivation for regular RE participation, the effects of acute RE upon these outcomes in postmenopausal (PMW) have yet to be evaluated. PURPOSE: To determine the effects of RE intensity on physiological, affective, and motivational outcomes in PMW.
METHODS: Thirteen PMW (Age: 59.2±3.1; BMI 29.6±4.5) participated in the study. Each participant completed 3 experimental conditions in a randomly assigned order. The low-load condition involved 3 sets of 20-15 reps at 55%–64% 1 repetition maximum (RM), with 60 seconds of rest between sets. The moderate load involved 3 sets of 8–12 reps at 65%–75% IRM, with 90 seconds of rest between sets. The heavy load involved 3 sets of 3–6 reps at 80–90% IRM, with 120 seconds of rest between sets. Assessment of inflammatory markers (IL-6, TNF-α) were obtained prior to, immediately after, and 30 minutes after each condition. Affecive and motivational outcomes were assessed prior to, during, and at multiple timepoints following each condition.

RESULTS: Results revealed no significant (p > 0.05) differences in inflammatory markers or affective responses as a function of RE load. Furthermore, there was no significant differences (p > 0.05) in intention or self-efficacy between experimental conditions.

CONCLUSIONS: CONCLUSION: Acute bouts of RE at 55–64% IRM, 65–75% IRM and 80–90% IRM yielded comparable inflammatory and affective responses in PMW. The similar responses to the varying loads of acute RE observed in this investigation may have valuable practical implications for RE prescription among PMW.

**Board #221**
**May 31 3:30 PM - 5:00 PM**

**Blood Pressure Abnormalities Among NCAA Athletes**

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![No relevant relationships reported](image)

Although an athlete is routinely exposed to rigorous physical training programs leading to improved cardiopulmonary function, more recently, there has been concern with athletes presenting with hemodynamic abnormalities commonly associated with morbidity and mortality within the general population. PURPOSE: To quantify blood pressure (BP) abnormalities among NCAA Division I and II collegiate athletes. METHODS: Following written informed consent, 217 (131 male, 86 female) athletes (mean ± SEM; age = 20.0 ± 0.1 yr; h = 178.7 ± 1.1 cm; wt = 86.9 ± 1.8 kg) underwent supine, hyperventilation, and standing BP s using a manual, hand-held sphygmomanometer as part of a preexercise evaluation prior to CPET. Supine BPs were subsequently evaluated using ACC/AHA criteria, with data analyzed by gender and race (50 African American, 167 White). RESULTS: MANOVAs (Wilks’ Λ) indicated a significant main effect across gender (F11, 15 = 14.987, P < 0.001), but not race (F11, 15 = 2.239; P = 0.011). Post hoc analyses indicated that, overall, males exhibited a higher incidence of elevated BP (BPsys ≥ 121.0 ± 0.9 vs 113.8 ± 1.1; BPdias ≥ 70.1 ± 0.9 vs 74.4 ± 0.7, P < 0.0001) than females, respectively. Among the 45.6% of total athletes diagnosed with elevated BP, 74.7% were males (BPsys ≥ 124.9 ± 0.7, BPdias ≥ 77.8 ± 0.7) as compared to 25.3% of cases documented among females (BPsys ≥ 122.0 ± 1.1; BPdias ≥ 76.9 ± 1.2). Of equal concern, was the hypertension indicated in 7.6% of male athletes (BPsys ≥ 142.8 ± 1.1; BPdias ≥ 84.0 ± 1.9), with none reported among females. CONCLUSION: Findings indicated that 50.2% of NCAA Division I and II athletes in this study were diagnosed, based on ACC/AHA guidelines, with either elevated BP (BPsys ≥ 120-129 mm Hg and BPdias ≥ 80 mm Hg) or Stage 1 or II hypertension (BPsys ≥ 130 mm Hg and BPdias ≥ 90 mm Hg). These findings support the need for early detection, follow-up screening, and non-drug treatment of elevated BP in the athletes’ health, particularly with respect to potential cardiovascular risk.

**Board #222**
**May 31 3:30 PM - 5:00 PM**

**Cardiac Etiology of Exercise Induced Hypoxemia within Elite Athletes**

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![No relevant relationships reported](image)

PURPOSE: Exercise induced hypoxemia (EIH) is common finding within a group of elite athletes. It is generally thought, that the causality lies in the pulmonary. We report a group of 8 elite athletes with severe EIH (SpO2 below 92%) examined for the origin of the EIH. The task was to perform differential diagnoses to locate the shunt into the pulmonary circulation or cardiac shunts. METHODS: Eight consecutive national level endurance athletes (cycling, running and rowing) with severe EIH (SpO2 reproducibly <92) has been examined with pulmonary circulation or cardiac shunts.

CONCLUSIONS: Four athletes presented pulmonary etiology of the hypoxemia. Four athletes have presented cardiac origin with right to left shunt causing EIH. Current transesophageal echocardiography discovered one atrial septal defect and three patent foramen ovale (PFO). One athlete with present PFO underwent successful catheterization closure of the PFO. Follow up exercise testing and stress echo confirmed no signs of shunt and no signs of presence of EIH in that patient. Also, performance measures of that athlete improved significantly. One athlete with present PFO-ASD underwent unsuccessful catheterization closure due to anatomical challenges.

**Board #223**
**May 31 3:30 PM - 5:00 PM**

**Metabolic And Cardiovascular Effects Of Body Weight Support Treadmill Walking In Healthy Older Adults.**

Robert S. Van Zant, Wick Colchagoff, Anya Cox, Benjamin Eggleston, Andrea Griffith, Linda Harrison, Amie Newberry, Blake Price. The University of Findlay, Findlay, OH.

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![No relevant relationships reported](image)

Purpose: Body weight supported treadmill training (BWSTT) has been proven to be effective for gait re-education for patients experiencing neurologic and musculoskeletal impairments. Recently our lab showed no significant difference in cardiovascular and metabolic effects of BWSTT in healthy young adults at clinically appropriate levels of body weight support (BWS). The purpose of this study was to determine the effects of BWSTT on cardiovascular and metabolic function in older (50-80 years) healthy adults. METHODS: A total of 20 subjects (50% female, 58.3±7.3 yr, 172.6±9.0 cm, 84.2±22.4 kg, 28.1±5.4 kg/m²) provided their informed consent for study participation. Each subject completed 3, 5-minute treadmill walking trials at a self-selected pace, with 0%, 15%, and 30% BWS, performed in a single-blind randomized fashion. Subjects rested for a minimum of 5 minutes between each trial, and did not begin a subsequent trial until HR was verified to be < 5 bpm of HR rest. Heart rate using a Polar Beat HR monitor, blood pressure (BP) via auscultation, rate of perceived exertion (RPE) using the Borg ratio scale, and oxygen uptake (VO2) using continuous indirect calorimetry, were measured at rest, and during the 3 walking trials. Mean data from minutes 3, 4, and 5 were then analyzed for difference by repeated measures ANOVA using SPSS statistical analysis (Version 24). RESULTS: At rest, HR was 70.8±2.8 bpm and BP was 126.8±12.2 / 84.3±7.3 mmHg. There was no significant difference in VO2, HR or BP following each condition. CONCLUSION: In contrast to previous findings in younger adults, 30% BWSTT elicits a significant reduction in VO2 and tidal volume in older adults at self-selected walking speeds.

**Board #224**
**May 31 3:30 PM - 5:00 PM**

**The Combined Effects of Whey Protein and Aerobic Exercise on Glycemic Responses**

Todd Castleberry1, Ryan Gordon2, Matthew Sokolowski3, Emily Zunibro1, Christopher Irvine, Aubrienn Henderson2, Matthew Bristebo1, Vic Ben-Ezra3, Texas Christian University, Fort Worth, TX. 2Texas Woman’s University, Denton, TX. 3Texas Christian University, Fort Worth, TX.

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![No relevant relationships reported](image)

Purpose: An acute bout of aerobic exercise has been shown to improve glycemic responses in both healthy people and those with type 2 diabetes. More recent literature exploring the effect of whey protein ingestion in healthy, sedentary men. The current study was designed to evaluate the combined effects of acute aerobic exercise and whey protein on glycemic responses.

PURPOSE: The purpose of this study was to evaluate the combined effect of acute aerobic exercise and whey protein on plasma glucose, insulin, gastric inhibitory polypeptide (GIP), glucagon like peptide-1 (GLP-1), and glucose following glucose ingestion in healthy, sedentary men.

METHODS: Eleven males (mean ± SD; age; 24.3 ± 5.4 years; BMI: 26.0 ± 5.3 kg/m²; HBA1C: 5.2 ± 0.2%; VO2max: 38.3 ± 6.1 ml/kg/min) completed four randomized trials:
no exercise and no whey protein (R); acute treadmill exercise (EX; 70% VO₂ max for 60 min) performed 12–14 hrs prior to a 75 g oral glucose tolerance test (OGTT); 50 g of whey protein (W) administered as a 30 min preload prior to an OGTT; and EX combined with W (EXW). Plasma samples from the OGTTs were analyzed for insulin, glucagon, GIP and GLP-1 using multiplex kits. Glucose was measured using enzyme-electrode technology. All variables are represented as incremental area under the curve (iAUC).

RESULTS: Glucose and insulin responses are presented in Table 1. GIP, GLP-1, and glucagon increased for both W and EXW compared to R (p < .01) and EX (p < .03).

### Table 1. Participant glucose and insulin iAUC between trials

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>EX</th>
<th>W</th>
<th>EXW</th>
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<tr>
<td>Glucose</td>
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<tr>
<td>(mmol x 120 min)</td>
<td>116.8 ± 105.3</td>
<td>155.7 ± 92.9</td>
<td>-21.1* ± 103.6</td>
<td>16.2* ± 118.1</td>
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<tr>
<td>Insulin</td>
<td></td>
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<tr>
<td>(pmol x 120 min)</td>
<td>40922 ± 32078</td>
<td>34176 ± 22624</td>
<td>78956 ± 36162</td>
<td>63182 ± 51780</td>
</tr>
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</table>

* p < .01 vs R; * p < .01 vs EX

CONCLUSION: Postprandial glucose responses are reduced following the consumption of 50 g of whey protein prior to a 75 g glucose challenge. Additionally, 50 g of whey protein increased plasma GIP and GLP-1, which has been shown to stimulate insulin secretion. Based on these findings, the combination of acute aerobic exercise and whey protein provides the most benefit compared to exercise or whey alone.

LESS THAN THIRTY-PERCENT OF OLDER ADULTS (>55y) MEET THE PHYSICAL ACTIVITY REQUIREMENTS OUTLINED BY CENTERS FOR DISEASE CONTROL AND PREVENTION. PHYSICAL ACTIVITY HAS BEEN REPORTED TO REDUCE THE RISK OF DISEASES/SYNDROMES SUCH AS CHRONIC DISEASE TYPES, DIABETES, SIMILARLY TO WHITMORE AND DEPRESSION, AND CANCER—HIGHLIGHTING ITS IMPACT AS A MODIFIABLE, HEALTH-RELATED FACTOR. CONSEQUENTLY, IT MAY BE CLINICALLY USEFUL FOR PHYSICIANS TO BE ABLE TO ASSESS PHYSICAL ACTIVITY IN THEIR PATIENTS. Thus, the PURPOSE of this study was to evaluate the validity of the Community Health Activity Model Program for Seniors (CHAMPS) questionnaire compared to a more objective measure of physical activity using accelerometry. METHODS: In 58 adults (≥58y) we assessed physical activity via questionnaire (CHAMPS) and 7-day accelerometry (Actical); and body composition (bioelectrical impedance). For accelerometry, subjects were advised to continue their habitual activity level. Pre-established cut-points for accelerometry interpretation were: sedentary (<100 counts/min; light physical activity (100-431 counts/min); moderate-to-vigorous physical activity (MVPA) (>431 count/min). accelerometer cut-points used for activities 2000 kcal/wk. Mean values for accelerometry were: wear time: 890.8±112.3 min/day; 14.8±1.9 h/day; counts/min: 110±59.3; accelerometer MVPA = 56.7±21.9 min/day. CHAMPS MVPA was significantly correlated with accelerometer counts/min (r = .40, p = .003) and accelerometer MVPA (r = .29, p = .035). CHAMPS MVPA was inversely correlated with body fat percentage (r = -.33, p = .015). CONCLUSION: These preliminary data suggest that the CHAMPS questionnaire may provide clinicians with a suitable estimation of their patients’ habitual physical activity level.

Bilateral asymmetry (BA) is defined as any significant differences in functional or anthropometric measures between contralateral limbs. BA in muscle function has previously been observed in persons with multiple sclerosis (PwMS), with higher levels of asymmetry in lower limb strength having a negative impact on walking capacity and quality of life. Previous methods used with PwMS have not allowed for the assessment of BA during bipedal movements. PURPOSE: The aim of the current study was to assess the levels of BA in power output in PwMS during submaximal cycling compared to healthy controls. METHODS: Eight PwMS and 6 controls completed a cycle ergometer graded exercise test (GXT) at a self-selected cadence. Peak torque (PT) produced by each leg was assessed at 50%, 60%, and 70% of peak power output (PPO) to determine level of BA. Subjects additionally completed a 25-fm walk test (25FWT), six-min walk test (6MWT), and maximal voluntary contractions (MVCs) of the knee extensors. Group comparisons were assessed at each %PPO using a mixed factorial ANOVA. RESULTS: Non-significant effects were found for the Group x %PPO interaction (p = .28) and %PPO (p = .49) variables. Compared to controls, PwMS did not show any significant differences in BA at any %PPO. When collapsed across groups, the % difference in peak torque was found to have a weak to strong correlation with the 25FWT (r = .45, 0.60, and 0.79, all p < .01), 6MWT (r = -.41 p = .014, -.63 p = .002 and -.73 p = .00), MVC (r = .27 p = .35, .47 p = .09, and .80 p = .00) and EDSS (rho = -.38 p = .18, 0.27 p = .35, .02 p = .94) at 50, 60, and 70% of PPO respectively. CONCLUSION: No significant differences were found for cycling peak torque asymmetry between PwMS and controls. Despite non-significance, PwMS displayed a between limbs difference of ≥10% for peak torque at all levels of %PPO whereas controls all had differences <10%. Furthermore peak torque asymmetry was found to correlate moderately well with MS outcome measurements when collapsed across groups. Future research is needed to determine the viability of assessing BA with cycling PT measures.
FE duration was significantly lower in the MS group compared to the Non-MS group (161.1±42.7 vs. 226.2±83.7 min; respectively; p < 0.009). PT significantly decreased PRE to POST-REC but significantly increased POST-REC from PRE for both limbs within each group (p < 0.05). The MS group showed a significant PT difference between limbs at PRE (Δ 4.3± 5.8 N; p < 0.05) and REC (Δ 3.9± 7.14 N; p < 0.05), while the Non-MS group showed no limb difference. PRE PT was significantly correlated to FE duration in the Non-MS group (r = 0.55; p < 0.003), but there were no significant correlations between PRE PT and FE duration in the MS group (p > 0.11). CONCLUSION: The MS group fatigued more quickly than the Non-MS group, however there was no fatigue asymmetries between limbs. The fatiguing exercise attenuated PT differences between limbs in the MS group but not in the Non-MS group. Strength was not related to FE duration in the MS group, but was in the Non-MS group. The lack of a relationship between strength and fatigue in MS patients may help guide rehabilitation to improve ADLs.

3182 Board #228 May 31 3:30 PM - 5:00 PM
Benefits Of Whole Body Vibration Exercise For Non-specific Chronic Low Back Pain: An Assessor-blind, Randomized Controlled Trial
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Email: qiang897@163.com

(No relevant relationships reported)

PURPOSE: The purpose of this study was to confirm the benefits of whole body vibration (WBV) exercise for pain intensity and functional disability in patients with non-specific chronic low back pain (NSCLBP). METHODS: This was a 2-arm single-blind randomized controlled trial. Eighty-nine NSCLBP patients met the inclusion criteria, they were randomly allocated to either the WBV exercise group (n=45) or the control group (n=44). The WBV exercise group received WBV exercise three times a week for 12 weeks. The control group received general exercise protocol three times a week for 12 weeks. Primary outcome measures were pain intensity and functional disability measured by the visual analog scale (VAS) scores and Oswestry Disability Index (ODI). The secondary outcome measures included lumbar joint position sense, quality of life (Short Form Health Survey 36, SF-36) and overall treatment effect (Global Perceived Effect). RESULTS: A total of 84 NSCLBP patients completed the 12-week study program. After 12 weeks, compared with the control group, the mean VAS and ODI scores decreased by additional 1 point (95% CI, -1.22, -0.78; P<0.001), 3.81 point (95% CI, -4.98, -2.63; P<0.001) based on adjusted analysis in the WBV exercise group. And the WBV exercise group provided additional beneficial effects for in terms of lumbar joint position sense (P<0.05), SF-36 (P<0.05), and Global Perceived Effect (P<0.012). CONCLUSIONS: The study demonstrated that WBV exercise could provide more benefits than general exercise for relieving pain and improving functional disability in patients with NSCLBP.

3183 Board #229 May 31 3:30 PM - 5:00 PM
The Synergic Impact of Sarcopenia and Dynapenia on Depressive Symptoms in Korean Older Adults

(No relevant relationships reported)

The Synergic Impact of Sarcopenia and Dynapenia on Depressive Symptoms in Korean Older Adults

Purpose: To examine the synergistic impact of low appendicular skeletal muscle mass (ASM) and low muscle function (MF) on the risk of depressive symptoms in community-dwellers of Korean older adults. Methods: Data obtained from a total of 446 participants aged 65 years or older were recruited. Seven CP participants completed post-exercise experiments after performing resistance training twice a week for three months. Muscular strength (torque, work, and power) at 90, 150, and 210°/sec were assessed using the Humac Norm Isokinetic Dynamometer. Results: The current findings suggest that both sarcopenia and dynapenia are independently and additively associated with an increased risk of depressive symptoms in elderly Korean adults, highlighting an urgency of an intervention targeting at both muscle mass and function for a healthy aging. This study was supported by the National Research Foundation funded by the Korean Government (NRF-2018R1D1A1B07048210 and NRF-2017R1A2B407357).

3184 Board #230 May 31 3:30 PM - 5:00 PM
Effect of Resistance Training on Muscular Function and Functional Mobility in Adults with Cerebral Palsy
Tiffany N. Raczyński, Victoria B. Kott, Pooja Pal, Areum K. Jensen. San Jose State University, San Jose, CA.

(No relevant relationships reported)

Cerebral Palsy (CP) is a non-progressive neurological disorder due to damage in the brain leading to musculoskeletal dysfunction and immobility. Physical deconditioning of individuals with CP appears to accelerate muscle atrophy and osteoporosis; thus, adults with CP are more prone to fall and fracture. The lower state of balance and functional mobility is also related to the higher risk of fall in the general public, and resistance training is known to improve overall muscular strength and functional mobility. However, equivocal results were reported whether resistance training has a positive effect on muscular function and balance in CP population.

PURPOSE: To determine the influence of resistance training to muscular strength and balance in adults with CP who already developed muscle atrophy and osteoporosis. METHODS: Twenty adults with and without CP were recruited. Seven CP participants completed post-exercise experiments after performing resistance training twice a week for three months. Muscular strength (torque, work, and power) at 90, 150, and 210°/sec were assessed using the Humac Norm Isokinetic Dynamometer. Behavioral mobility was assessed from the Berg Balance Test, and limits of stability test using the Biodex balance system. RESULTS: CP group had significantly lower knee extensor peak torque (e.g., 11.8±2.3 CP vs. 68±12.5 control, ft-lbs, P<0.05), and lower knee flexor peak torque (e.g., 6.3±1.6 CP vs. 41.8±7.9 control, ft-lbs, P<0.05) compared to control. After 3 months of training, CP group did not show statistical differences in muscular strength [e.g., extensor peak torque (27.5±17.0 pre vs. 31.5±24.2 post, ft-lbs, P>0.05), and flexor peak torque (9.3±5.6 pre vs. 15.0±10.9 post, ft-lbs, P>0.05), but there were no significant changes in functional mobility (18.0±19.5 pre vs. 24.4±21.6 p>0.05) on Berg Balance test. However, individuals who improved peak torque in knee flexors and extensors also improved postural stability via the Berg Balance test. CONCLUSIONS: These preliminary findings suggest that muscular strength influences functional mobility in adults with CP only after exercise training.
CONCLUSION: These findings suggest that central obesity rather than BMI appeared to influence muscular strength in CP adults. In addition, less fat in the legs rather than the total body may contribute for higher leg muscular strength in adults with CP. Supported by Central RSCA and Undergraduate Research Grant, SJSU.

3186  Board #232 May 31 3:30 PM - 5:00 PM
Effects Of Fatigue On Isometric And Isokinetic Dorsiflexion Strength Asymmetry In Multiple Sclerosis
Cameron Owens1, Davis Lantis2, Gregory Cantrell1, Debra Bemben, FACSMM, Christopher Black, FACSMM, Daniel Larson1, Rebecca Larson1, 1University of Oklahoma, Norman, OK. 2St. Ambrose University, Davenport, IA. Northern State University, Aberdeen, SD.

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(No relevant relationships reported)

Multiple Sclerosis (MS) is an autoimmune disease affecting the central nervous system. MS is characterized by a variety of symptoms, with fatigue being the most commonly reported symptom. Strength asymmetry (SA) of knee extensor/flexors has been documented in previous research in individuals with MS. However, SA of the dorsiflexors in MS patients has yet to be fully investigated in a fatigued state.

PURPOSE: The aim of this study was to measure SA of the dorsiflexors during isometric/isokinetic maximal voluntary contractions (MVC/MVIC, respectively) before and after a fatigue test (FT).

METHODS: Thirteen individuals with MS (8 Female, F), 5 Male (M), Age = 50.3 ± 9.1 yrs. and an expanded disability status scale (EDSS) score of 3.5-6.5. 23 Non-MS (8 F and 5 M, Age = 50.8 ± 8.5 yrs.) participated in a three visit study. Visit 1 consisted of equipment and test procedure familiarization. The following two visits consisted of either a FT test at 30% of MVC or at 30% of MVIC. Prior to, and immediately following the FT, MVC or MVICs were performed. During each visit both legs were tested with a 15 minute break between assessments. The order of test (MVC or MVIC) and leg (left or right) was randomized. All MVIC's were performed at 60%.

RESULTS: SA was calculated as the difference between limbs Pre and Post FT. Measurements of peak tension (PT), voluntary contraction time (VCT), and muscle tension maintaining capacity (MTMC) during MVC and MVIC between legs (within) and between groups were not statistically different (p>0.05).

CONCLUSIONS: The large ES for MVC PT and MVIC VCT highlights the possibility of fatigue affecting SA and VCT differently between MS and Non-MS. In future studies, a larger sample size should be used to improve the statistical power of the analyses.

3187  Board #233 May 31 3:30 PM - 5:00 PM
Safety And Feasibility Of Strength Training In Patients With Duchenne Muscular Dystrophy
Donovan J. Lott1, Tanja Taivasvuo2, Hyun J. Park3, Korey A. Cooke4, Zahra Moslemi2, Abhinandan Batra2, Sean C. Forbes2, Barry J. Byrne2, Glenn A. Walter2, Krista Vandenborne1, 1University of Florida, Newbury, FL. 2University of Florida, Gainesville, FL. 3University of Florida, Newbury, FL. 4Phillips Laboratory, Columbus, OH.

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(No relevant relationships reported)

Duchenne muscular dystrophy (DMD) is a rapidly progressive and currently incurable neuromuscular disease. Understanding the role of exercise is important for these patients as high-intensity or eccentric actions can be damaging in DMD yet a lack of loading may exacerbate muscle dysfunction. Thus, maximal exercise may be safe and potentially delay the loss of muscle function in DMD, no study has systematically examined the potential of strengthening exercise to improve muscle function or attenuate disease progression.

PURPOSE: To examine the safety and feasibility of a pilot, in-home strengthening intervention consisting of knee extensor (KE) and flexor (KF) exercise in DMD.

METHODS: Eight ambulatory boys with DMD (9.3 ± 0.8 yrs., BMI 19.0 ± 4.6 kg/m²) of corticosteroid therapy were recruited to undergo 12 weeks of isometric exercise training of the bilateral KE and KF. Exercise prescription consisted of 4 sets x 6 reps, 3x/week at a target intensity of 50% maximal volitional contraction (MVC). At baseline (BL), MVC testing and training familiarization were done for one week on site. Exercise equipment (custom built chair, laptop, and load cell) was subsequently shipped allowing for in-home training and supervision via live video conferencing for each session. Safety outcome measures to assess muscle damage included magnetic resonance proton transverse relaxation time (T₂) of KE and KF, pain assessment, and creatine kinase levels at BL, 1, 6, and 12wks. Peak strength (KE and KF MVC) and time to ascend/descend 4 steps were also assessed at BL and 12wks. RESULTS: The 7 boys who completed the strength training program had an adherence of 84.9 (90.0%) for the exercise sessions. The safety measures did not indicate signs of muscle damage

significant change in mean T₂; KE=2.3 (3.6%) and KF=0.4 (4.0%). Peak torque increased by 20.6% for KE (p=0.01) and 14.3% for KF (p=0.05), and the time to ascend (13.2%) and descend (22.7%) steps improved after exercise training.

CONCLUSION: This in-home, 12-week supervised strength training program was safe, feasible, and improved strength and function in boys with DMD. Future research is required to optimize the strengthening protocol and further explore its potential efficacy and clinical application.

The prevalence of chronic low back pain (CLBP) in young adults is increasing; however, the biological mechanism of CLBP in this population remains unknown.

PURPOSE: To observe the characteristics of muscle tone and stiffness (MTS) of relevant muscle groups in young adults with CLBP, in order to provide reference for rehabilitation and prevention of CLBP.

METHODS: Twenty six subjects with CLBP (age: 22±2 years, 14 males and 12 females) were recruited as the experimental (E) group, while 29 healthy subjects (age: 25±2 years, 16 males and 13 females) were recruited as the control (C) group.

The degree of pain (Visual Analogue Scale/Score, VAS) was recorded, and the MTS (indicating F-Density, F-Logarithmic Decrement and S-Stiffness) of three muscle groups (para-spatial, hamstring and tensor fascia lata muscles) was assessed using the Myoton-3 equipment. Group differences were determined by using independent sample t-tests; within the E group, MTS was compared between gender and degree of pain (VAS) using ANOVA.

RESULTS: Compared with C group, the E group’s MTS of all three muscles were significantly higher (p<0.05), and the differences were 11.4%, 10.0% and 14.9% respectively; E group showed bilateral imbalance in all three muscles, while C group did not show imbalance. With the E group, compared with female subjects, male subjects had higher MTS of tensor fascia lata and para-spatial muscles (p<0.05), and the differences were 12.8% and 20.0%, respectively; in addition, the MTS values of tensor fascia lata, hamstring and para-spatial muscles in the subjects with moderate pain (VAS 4-7) were higher than those with mild pain (VAS 1-3) (p<0.05), and the differences were 12.7%, 14.9% and 22.2% respectively.

CONCLUSIONS: MTS is associated with considerable increase of hamstrings, para-spatial muscle and tensor fascia lata in young patients with CLBP; Young CLBP patients had significant bilateral MTS imbalance of all these muscles; Young male CLBP patients had higher MTS in para-spatial muscle and tensor fascia lata than female patients; The more painful, the higher of the MTS in young CLBP patients.

Cerebral Palsy (CP) is a neurological disorder caused by lesions in the brain and is characterized by impaired motor function, musculoskeletal deformity, and atrophy. Individuals with CP appear to develop osteoporosis at an earlier age compared to general population. Bone weakness has adverse effects on the muscular system, which in turn affects movement and function, contributing to a reduced quality of life. This in-home, 12-week supervised strength training program was safe, feasible, and improved strength and function in boys with DMD. Future research is required to optimize the strengthening protocol and further explore its potential efficacy and clinical application.
training (architectural angle; 64±5° CPT vs. 70±2° CPost degree; P<0.05). While control group showed a strong linear relationship between femoral neck BMD and knee extensor peak torque (R²>0.83). CPT showed no relationship (R²=0.01). After 3 months of training, CP participants who exhibited higher BMD appeared to develop greater muscular strength (R²=0.26). CONCLUSION: These findings suggest that short term resistance training improved skeletal strength in CP adults without alterations in skeletal architecture. Skeletal strength appeared to play a role in enhanced muscular strength in adults with CP only after exercise training.

### 3190 Board #236 May 31 3:30 PM - 5:00 PM Effects Of Eccentric Training Combined To Neuromuscular Electrical Stimulation On Electromechanical Delay Of Peroneal Muscles In Individuals With Functional Ankle Instability Ziwen Pei, Jian Chen, Danyang Li. Wuhan Sports University, Wuhan, China. (No relevant relationships reported)

The electromechanical delay (EMD) represents the time required by the muscles to provide a protective response to an injurious mechanism. Individuals with functional ankle instability (FAI) have shown longer EMD times for the peroneal muscles (EMD-P) than ankles of healthy individuals; which is thought to increase the risk of the recurrence of ankle sprains. However, there’s currently no noninvasive treatment to shorten EMD-P. PURPOSE: The aim of this study was to investigate the effects of eccentric training combined with neuromuscular electrical stimulation (NMES) on the EMD times of peroneal muscles during eccentric muscle action in individuals with FAI. METHODS: This was a three-arm, single-blinded randomized controlled trial. Thirty-nine volunteers (21 ± 3yrs) with FAI were randomly assigned to control (CON; n = 13), eccentric training (ECT; n = 13), or eccentric training combined with neuromuscular electrical stimulation group (ECT+NMES; n = 13). The control group received conventional rehabilitation training (CRT), involving strength and balance training. The ECT group performed isokinetic concentric and eccentric training of the peroneal muscles based on CRT. The ECT+NMES group received NMES simultaneous to the isokinetic training. Both groups trained 3 days/week for 8 weeks. The EMD-P was calculated when peroneal muscles contracted eccentrically at 90°/s using the isokinetic system before and after training. A one-way ANOVA was used to look at the difference in EMD-P between the 3 groups at pre-training. No significant differences existed for EMD-P among the groups before training (P = 0.295, P > 0.05). Compared with pre-training, the EMD-P was significantly shorter in the ECT group (133 ± 8 vs. 127 ± 8 ms, P < 0.05) and ECT+NMES groups (135 ± 11 vs. 119 ± 9 ms, P < 0.05). However, no change occurred in CON (134 ± 7 vs. 135 ± 10 ms, P > 0.05). The ECT group showed a significant lower EMD-P Compared with CON after training (127 ± 8 vs. 135 ± 10 ms, P = 0.027), whilst EMD-P was shorter after training in ECT+NMES group compared with ECT (119 ± 9 vs. 127 ± 8 ms, P < 0.05). CONCLUSION: Eccentric training effectively shortened the EMD-P in individuals with FAI compared with conventional treatment. However, ECT, combined with NMES further enhanced the reduction in EMD-P. Therefore, ECT+NMES could be an effective treatment for FAI.

### 3191 Board #237 May 31 3:30 PM - 5:00 PM Passive Hallux Adduction Decreases Lateral Plantar Artery Blood Flow In Low Arch Feet Aaron W. Johnson1, Julia L. Dunbar1, Sarah T. Ridge1, Dustin Brunening1, Kathryn Brewerton1, Jonay Gifford1, Daniel Hoopes2. ‘Brigham Young University, Provo, UT. 2Revere Health Orthopaedic Surgery, Provo, UT. (Sponsor: Pat Vehrs, FACSM) (No relevant relationships reported)

PURPOSE: Due to the vital role that blood flow (BF) plays in maintaining tissue health, compromised BF can affect tissue healing. An adducted hallux, as often seen with hallux valgus, may contribute to plantar fasciopathy. The purpose of this study was to compare BF within the LPA before and after passive hallux adduction (PHA). METHODS: Forty-five healthy volunteers (20 female, 25 male; age = 24.8 ± 6.8 yr; height = 1.7 ± 0.1 m; body mass = 73.4 ± 13.5 kg) participated in this study. Blood velocity and vessel diameter measurements were obtained using ultrasound imaging (L8-18 transducer, GE Logiq S8). The LPA was imaged deep to abductor hallucis for 120 seconds; 60 seconds at rest followed by 60 seconds of PHA. Maximal PHA was performed by applying pressure to the medial side of the proximal phalanges of the hallux. BF was then calculated in mL/min, and measurements before and during PHA were compared. Arch height index (AHI) was assessed for all volunteers.

RESULTS: Log transformed data was used to run a paired t-test between BF measured before and during PHA for the overall volume of BF in the LPA. PHA decreased BF by 22% lower compared to before (P = 0.250 ± 0.063 mL/min, p < 0.001), with an initial decrease of 60%. As AHI decreased, there was a greater negative ABF. As baseline BF increased, there was also a greater negative AHF.

### 3192 Board #238 May 31 3:30 PM - 5:00 PM A Randomized Controlled Trial Comparing Physiotherapy And Extracorporeal Shockwave Therapy In Treatment Of Plantar Fasciitis Jade Chee1, Charles Kon1. ‘Singhealth, Singapore, Singapore. 1Changi General Hospital, Singapore, Singapore. (No relevant relationships reported)

Purpose: Plantar fasciitis is postulated to arise from chronic overload. First line treatment includes non-steroidal anti-inflammatory drugs, orthotics, physical therapy and stretching exercises. Patients who do not respond to the above after a 6-month period can be considered for extracorporeal shock wave therapy (ESWT). In this study, we evaluated the outcomes of conventional physiotherapy alone versus physiotherapy together with ESWT over a 6-month period for patients diagnosed with plantar fasciitis.

Method: Patients with heel pain who presented to the Specialist Orthopaedic Clinic from April 2017 to Apr 2018 were assessed for eligibility criteria. Enrolled patients were randomized into 2 arms: physiotherapy alone, or physiotherapy together with ESWT. Clinical and functional outcomes were evaluated using the SF 36 score, the American Orthopaedic Foot-Ankle Society (AOFAS) hindfoot score, as well as the Visual Analog Scale (VAS) at baseline, 3 months, and 6 months. Results: A total of 20 subjects were recruited. 1 dropped out of the study, and 5 defaulted follow-up. Results from the remaining 20 subjects were analysed. No significant difference in SF 36 score was found at 3-month follow-up (physician functioning p=0.806, physical limitations p=0.624, body pain p=0.075, general health p=0.879, vitality p=0.119, social functioning p=0.419, emotional limitations p=0.958, mental health p=0.770). The differences in AOFAS and VAS at 3-month follow-up were not statistically significant (p=0.026 for AOFAS, p=0.202 for VAS).

CONCLUSIONS: Our preliminary findings of decreased BF through PHA indicate conditions that elicit PHA (e.g. wearing narrow-toed shoes) may affect BF and tissue health.
patients in the virtual exercise group reported less difficulty with function related to sports and recreation than usual care patients (intervention 75.6 [SD 19.2] vs usual care 61.5 [20.3]; p=0.006). Patients in the virtual exercise group reported high likelihood of recommending the program to others (mean score 9.1 ± 2.1) on a scale of 0-10.

CONCLUSIONS: Among patients receiving TKA, the virtual exercise program increased MVPA in the first 6-weeks after surgery and resulted in measurable gains to physical function for sports and recreation activities at 12-weeks.

**F-67 Basic Science World Congress/Poster - Sleep and Cardiometabolic Effect**

**Board #240** May 31 3:30 PM - 5:00 PM
Impact Of Anxiety-state On Moderate Continuous And 3-km Time-trial Exercise After 36h Of Sleep Deprivation
Carina Faggiani Dias, Marcos Mônico Neto, Sérgio Tufik, Hanna Karen Moreira Antunes. UNIFESP, Santos, Brazil. Email: carinafaggian@hotmail.com

**No relevant relationships reported**

**Board #241** May 31 3:30 PM - 5:00 PM
Effects Of Bariatric Surgery On Cardiac Autonomic Parameters During Sleep
Roger Peixoto1, Marília Correia1, Raphael Dias1, Luís Vicente2. 
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**No relevant relationships reported**

**3196 Board #242** May 31 3:30 PM - 5:00 PM
Oxygen Desaturation in Sleep Apnea is Inversely Associated with Vascular Changes Following Exercise Training
Devon A. Dobrosielski1, Hyunjung Park1, Susheel Patil2, Christopher Papandreou1. 1Towson University, Towson, MD. 2Johns Hopkins School of Medicine, Baltimore, MD. 3Rovira I Virgili University, Reus, Spain. Email: ddobrosielski@towson.edu

**No relevant relationships reported**

**PURPOSE:** Obstructive sleep apnea (OSA) is characterized by reductions in nocturnal mean O2 saturation (meanSpO2) that may increase cardiovascular disease morbidity. The extent to which exercise confers cardioprotection in overweight adults with different meanSpO2 profiles is not known. The purpose of this study was to examine the association of meanSpO2 with vascular function changes following exercise training in adults with and without OSA. **METHODS:** At baseline, participants underwent overnight polysomnography to determine the presence and severity of OSA. Tiltle-based cut-off points were used to categorize meanSpO2 and apnea hypopnea index (AHI). Body fat was analyzed using dual energy X-ray absorptiometry. Vasoactivity of the brachial artery was measured using flow-mediated dilation (FMD), while microcirculatory function was assessed via the total shear stress area under the curve (SSAUC) response during FMD. Body fat and vascular measures were repeated upon completion of a 6 week (3 sessions/wk; 1 hr/session) exercise training program. **RESULTS:** Thirty (age: 49±9 years; BMI: 32.0±3.8 kg/m²; 18 men; 12 women) adults with and without OSA completed the study. At baseline, adults in the highest tertile of meanSpO2 were younger than those in the lowest tertile (43±9 yrs vs 53±7 yrs, p=0.017), yet no differences in vascular measures, AHI or total body fat percentage were observed across the tertiles. No changes in brachial artery diameter or FMD were observed across tertiles following exercise. However, the change in SSAUC in the highest tertile of meanSpO2 was greater, compared to the lowest tertile (13.6±3±1589 A.U. vs. -18±10870 A.U.; p=0.041). Forward stepwise linear regression revealed that the highest tertile of meanSpO2 was a significant predictor of the increased SSAUC with exercise, independent of age and baseline SSAUC. **CONCLUSIONS:** Severe oxygen desaturation during sleep was inversely associated with improvements in microcirculatory function following exercise training.
Sleep duration and quality have been associated with obesity risk. Most previous studies used body mass index (BMI) as a proxy of obesity and subjectively evaluated sleep. Older adults often suffer from poor sleep quality, high body fat, and low cardiorespiratory fitness (CRF), especially women after menopause. PURPOSE: To investigate if sleep duration and quality are associated with BMI, body composition, and CRF in older women. METHODS: Older women (n = 115; age: 65.6±8.42) wore an actigraph monitor for 7 days to measure sleep metrics. Total sleep time and sleep quality, which included wake after sleep onset, activity counts during sleep, sleep onset latency, and number of awakenings, were determined using manufacturer provided software. BMI was calculated, and a dual x-ray absorptiometry scan was performed to assess body composition. A graded exercise test was used to measure CRF. Data was collected in two locations (n=89 and 26, respectively). Pearson product correlations were used to determine associations and study location was controlled for.

RESULTS: Total sleep time negatively associated with lean mass and fat free mass (r = -0.28, p=0.012; r = -0.28, p=0.012), but positively associated with percent body fat (r=0.26, p=0.025). There were no associations between sleep metrics and CRF.

CONCLUSIONS: Our data indicates longer total sleep time was associated with less lean mass but greater body fat in older women. This suggests in older women longer total sleep time may be linked with less physical function and worse health condition. Further examination of the association between sleep with physical function and biomarkers in this population is recommended.

Overweight and obesity and having an abnormal lipoprotein profile are associated with increased risk of cardiovascular disease (CVD). Increased sedentary time, decreased physical activity (PA), and restricted sleep are risk factors for obesity and CVD. Calorie restriction is often used to induce weight loss. However, little information exists concerning how caloric restriction, sleep restriction, and PA interact, and their overall impact on CVD risk.

PURPOSE: To examine changes in body weight, PA, and lipoprotein particle concentrations and sizes following caloric restriction (CR) and sleep restriction (SR) intervention (CR+SR) compared to CR alone in overweight or obese adults. METHODS: 28 adults (age=44.5±5.8 years) were randomized into an 8-week CR or CR+SR group. Both groups consumed a diet equivalent to 95% of the individual’s resting metabolic rate. Participants in the CR+SR were instructed to restrict time-in-bed up to 90 minutes 5 days per week. Sedentary and PA time was measured utilizing a Sensewear Mini Armband. Fasting serum samples were collected for lipid and lipoprotein particle concentrations and sizes following caloric restriction (CR) and sleep restriction (SR) intervention (CR+SR) compared to CR alone in overweight or obese adults. RESULTS: On average participants were sedentary for 67.5±8.5 % of waking hours, daily feeding duration, sleep duration, and sleep timing.

CONCLUSIONS: The CR+SR did not result in increased PA as in the CR; however, weight loss and lipoprotein particle concentration or size changes for the two groups were similar. These results suggest that moderate SR on 5 days a week may not significantly alter lipoprotein metabolism during weight loss, which may partly be due to compensated sleep on the other 2 days of the week. Supported by AHA Grant 14BG12A0308076

PURPOSE: It has been estimated that women are at 40% increased risk for developing clinically significant sleep disturbances (such as insomnia) compared to men. Reproductive-related hormones, such as estradiol (E2), have been shown to play a key role in sleep-wake behavior in women, and pharmaceutical interventions which target the regulation of E2 have been shown to improve sleep in women. Importantly, body mass index (BMI) has been shown to be inversely associated with E2 levels in premenopausal women, and previous studies have also suggested that women who are overweight or obese are more likely to report clinically-significant sleep disturbances. Thus, this study aimed to examine associations between BMI, E2, and sleep disturbances in premenopausal women in order to identify a non-pharmaceutical, physical activity (PA) related modifiable target for the prevention of clinically significant sleep problems in women. METHODS: Following a two-tiered screening process, 28 healthy women (18-45y; mean age: 24.6y) who were medication-free and had regular menstrual cycles completed: (1) enrollment visit, including mood and sleep assessment and assessment of cardiorespiratory fitness via maximal oxygen consumption during exercise; (2) one-week sleep monitoring period (objective and subjective measures of sleep-wake behavior); and (3) saliva collection for the assessment of salivary E2 levels. Saliva collection occurred during the follicular phase of the menstrual cycle to control for ovarian cycle E2 fluctuations. RESULTS: Higher BMI was significantly associated with lower E2 levels (r = - 0.28, P < 0.014), and also longer objectively-measured sleep onset latency (SOL) duration (r = - .51, P = .004). Consequently, lower E2 levels were significantly associated with increased objectively-measured wake after sleep onset (WASO) duration (r = -.43, P < 0.03) and increased number of awakenings during the sleep period (r = -.48, P < 0.01). CONCLUSIONS: Results suggest that, in premenopausal women, higher BMI may be associated with increased sleep disturbances, and that this relationship may be mediated by E2 levels. It is therefore possible that regular PA, which has been shown to be inversely associated with BMI, may improve sleep via its positive effects on adiposity and associated regulation of E2.

PURPOSE: Reducing daily sedentary time, decreasing daily feeding duration, and increasing total sleep duration are important lifestyle targets for improving the metabolic health of adults undergoing weight loss. However, objective methods for simultaneous measurement of sedentary time, meal timing, and sleep in free-living adults are lacking and it is unclear how these variables are related in overweight adults or change in response to weight loss.

METHODS: Thirty-two overweight and obese adults were recruited to participate in an ongoing weight loss study (90% female; Age= 36.4±6.4y; BMI= 33.4±5.5 kg/m²). Participants simultaneously wore an activPAL accelerometer on the thigh and an Actiwatch on the non-dominant wrist for 7 days in a free-living environment to assess waking sedentary behavior and nighttime sleep, respectively. A cell phone application (MealLogger) was used to photograph and timestamp all caloric events during the 7-day period to determine daily feeding duration which was verified using a continuous glucose monitor. Assessments were performed at baseline and will be repeated at 12 weeks following completion of the weight loss intervention. Correlation analyses were performed on the time series data to determine associations among sitting time during waking hours, daily feeding duration, sleep duration, and sleep timing.

RESULTS: On average participants were sedentary for 67.5±8.5 % of waking hours, consumed energy over 11.0±1.9 hours during the day and slept for 7.2±0.7 hours at night. Sedentary time (as a percent of the waking day) was negatively correlated with sedentary duration (Spearman rho=-0.48, P=0.008) but was not related to later sleep timing (sleep midpoint), longer feeding duration, or timing of the last meal.

CONCLUSIONS: Using a novel set of methods, we show that higher levels of sedentary time during waking hours are associated with shorter total sleep duration in adults beginning a weight loss intervention, however cause and effect cannot be

Abstracts were prepared by the authors and printed as submitted.
established in this analysis. Our future studies are aimed at understanding whether reducing sedentary time leads to increased sleep duration (or vice versa) and measuring how sleep, activity, and meal timing change with weight loss.
Stress fractures (SF), common injuries among athletes, have been reported in up to 20% of track and field athletes. Typically, after a period of unloading and gradual return to weight-bearing activities, athletes return to unrestricted participation in their given sport 12-14 weeks after SF diagnosis. However, the time course of the recovery of mechanical competence of the bone is not well characterized, and re-injury rates are high. PURPOSE: To determine changes in bone microarchitecture and estimated bone strength over 12 months following tibial SF diagnosis. METHODS: We enrolled 30 women, ages 18-35 with a tibial SF (grade 2 or higher) for this prospective observational study. Participants completed a baseline visit within 3 weeks of SF diagnosis. At baseline, 612, 24, and 3 weeks following SF diagnosis, we collected high-resolution peripheral quantitative computed tomography images of the distal tibia, cortical thickness, trabecular thickness, bone volume/total volume, and total, trabecular, and cortical volumetric bone mineral density (vBMD) increased significantly by 0.50-2.28% (all p<0.0001) over the period of SF diagnosis in women and by 0.32-1.84% (all p<0.0001) in men. CONCLUSIONS: This preliminary view of data collected to date found that following BCT, both men and women mounted an adaptive response in tibial trabecular bone microarchitecture, indicative of de novo trabecular bone formation. The responses in tibial bone microarchitecture were of greater magnitude in women than in men, which may be due to lower average baseline values in bone microarchitectural properties in women, and therefore potentially greater loading stimuli. Other lifestyle and demographic factors may also influence the adaptive bone response to BCT and will be investigated in the larger sample following study completion.

Stress fractures are overuse injuries in bone tissue that are common during Army Basic Combat Training (BCT) when recruits undergo a period of heightened physical activity. The pathophysiology and mechanoadaptive biology that underlie stress fracture development and prevention continue to be characterized. Mechanoadaptation to BCT has been demonstrated in the tibial microarchitecture of female military recruits. Whether male military recruits are able to mount an analogous response to BCT remains to be determined. PURPOSE: To analyze preliminary data from a large prospective field study (427 men and women from a larger cohort of ~4000 recruits to be studied) with the goal of characterizing changes in tibial bone microarchitecture in male and female recruits as a result of 6-8 weeks of BCT. METHODS: We collected high-resolution peripheral quantitative computed tomography images of the distal tibia, (from the distal tibial plateau) before and after BCT and analyzed data on 303 male and 124 female recruits who volunteered and completed BCT. Linear mixed models were used to estimate the mean difference for each outcome from pre- to post-BCT, while controlling for race/ethnicity, age, and body mass index. RESULTS: Mean age of male (20.7 ± 3.4 y) and female (20.6 ± 3.8 y) recruits was similar. At the distal tibia, cortical thickness, trabecular thickness, bone volume/total volume, and total, trabecular, and cortical volumetric bone mineral density (vBMD) increased significantly by 0.50-2.28% (all p<0.0001) over the period in women and by 0.32-1.84% (all p<0.0001) in men. CONCLUSIONS: This preliminary view of data collected to date found that following BCT, both men and women mounted an adaptive response in tibial trabecular bone microarchitecture, indicative of de novo trabecular bone formation. The responses in tibial bone microarchitecture were of greater magnitude in women than in men, which may be due to lower average baseline values in bone microarchitectural properties in women, and therefore potentially greater loading stimuli. Other lifestyle and demographic factors may also influence the adaptive bone response to BCT and will be investigated in the larger sample following study completion.
Online nutrition education curricula framed around concepts of sports nutrition may improve accessibility as well as engagement, awareness, and adherence for active high school athletes.

Purpose: To examine the effects of an online sports nutrition curriculum on ferritin, soluble transferrin receptor (sTfR), and hemoglobin (Hb) biomarkers of iron status in high school athletes.

Methods: One hundred twenty-three male (n=66; m=17.1±1.3; f=24.1±3.3; m: 180.2±6.5; f: 159.6±6.4) and female (n=57; m=17.1±1.3; f=23.2±2.1; m: 179.3±6.4; f: 157.8±4.4) high school athletes were tested for ferritin, sTfR, and Hb concentrations before and after participating in seven online sports nutrition modules (~1 module per week) focused on macronutrients, micronutrients, performance, plate energy balance, nutrient timing, and supplements. Pre- and post-education prevalence of poor iron status for each biomarker was calculated, while individual subject’s iron status classification was tracked. Mixed factorial ANOVAs (time x sex) compared mean biomarker concentrations.

RESULTS: Prevalence of iron depletion (ferritin cutoffs) increased from 48% to 52% and decreased from 79 to 75%, low iron levels (sTfR cutoffs) decreased from 38% to 30% and increased from 29 to 33%, and anaemia (Hb cutoffs) decreased from 20 to 14% and 29 to 23% in males and females, respectively. Subjects classified as iron depleted (n=6) did not change, and one subject improved iron levels, while six subjects (6%) improved their classification from anaemic (n=25) to non-anaemic (n=19) pre- to post-education. There were no interactions (p>0.05) or main effect for time (p>0.05) for ferritin (pre 238 ± 100 to post 201 ± 145), sTfR (pre 19.2 ± 6.4 to post 19.2 ± 6.4), or Hb (pre 13.5 ± 2.0 to post 13.3 ± 1.6). There was no main effect for sex (p>0.05) for sTfR (m: 19.2 ± 5.3, f: 19.6 ± 6.4), but male exhibited higher (p<0.05) concentrations of ferritin (m: 32.4 ± 10.7, f: 23.8 ± 10.6) and Hb (m: 13.8 ± 1.7, f: 13.2 ± 1.7).

Conclusions: Females present a greater risk of poor iron status, suggesting a need to focus on dietary iron in young female athletes. Participating in the online sports nutrition curriculum did not improve mean concentrations of ferritin, sTfR, or Hb, but did improve anaemia classifications for six subjects (n=3 males, n=3 females).

Acknowledgments: This study was funded by the Nebraska Beef Council.
Reducing background inflammation in athletes may be a medical and performance objective. Data describing the relationship between erythrocyte membrane fatty acids (EMFA) and low grade inflammation in soccer players are absent from the literature. EMFA reflects dietary fat intake in the weeks preceding the blood test. PURPOSE: To investigate the strength and reproducibility of the relationship between EMFA and inflammation in a group of professional soccer players. METHODS: We conducted an observational study, collecting venous blood samples measuring high-sensitivity C-reactive protein (CRP) and EMFA in the early season (T1) and late season (T2). A total of 47 blood samples were collected from 29 different athletes, with 25 athletes tested at T1, and 22 athletes at T2. A cut off point of >5 mg/L was set to minimise the effect of acute inflammation, and these samples were removed from the analysis. Linear relationships between biomarker variables were examined using Pearson correlation tests. RESULTS: At T1, we report significant positive correlations between CRP and the following EMFA variables: Omega6/Omega3 ratio and the Arachidonic Acid: Eicosapentaenoic Acid (AA: EPA) ratio (0.566, p=0.003, and 0.582, p=0.002 respectively) and significant negative correlations with the Omega 3 index and the anti-inflammatory factors (AAIF: 0.405, p=0.011, and 0.465, p=0.018 respectively). However, at T2, the relationship between EMFA variables and inflammation had attenuated, with no strong linear correlations observed. The correlation analysis of all the blood samples collected (n=47) showed significant correlations between the Omega-3 Index, the AAIF and CRP (r=0.319, p<0.028, and -0.29, p=0.040 respectively). CONCLUSION: There is a relationship between inflammation and EMFA variables in professional athletes, but the strength of this relationship appears to depend on the sampling occasion. Future research should explore augmenting EMFA as an anti-inflammatory strategy.

Limited nutrition knowledge is prevalent among all types of athletes, which is correlated with negative health outcomes. Eating disorder (ED) etiology is the most documented, dire issue facing athletes, especially those in lean-endurance sports (LES) such as gymnastics and tennis. Primary contributor to ED in LES is athletes’ lack of nutrition knowledge of carbohydrates (CHO), fats, and weight management (WM). PURPOSE: To assess NCAA Division II (DII) athletes’ knowledge in distinct domains: (1) CHO, (2) fats, and (3) WM. METHODS: The Macronutrient and Energy Metabolism Expertise Survey (MEMES) was created through modification of Morgan’s NET Survey. Changes included different domains (e.g. WM questions vs. Etiology) and expanding number of questions (5 to 10). An expert panel confirmed the face and construct validity of the MEMES before it was piloted. Athletes signed informed consent and then voluntarily completed the MEMES via Qualtrics in a designated computer lab on one test date. Email reminders were sent 1 month, 1 week, and 1 day prior to test date. The criterion for “Adequate Knowledge” (AK) was set at 86% for each domain and total score correct. Pearson product moment correlations were calculated between variables (e.g. percent correct, gender, sport). RESULTS: Eighty-eight males and eighty females completed the MEMES (33% return rate). Male scores significantly higher on CHO (p = 0.017) and athletes (n = 16) who reported having access to a Registered Dietitian (RD) scored significantly higher on the CHO and fat domains (p = 0.00 and 0.01, respectively). The majority (26%) reported “experience as an athlete” as their primary source for nutrition knowledge. The least cited source was a RD (9%). Also, the athletes lacked knowledge: the mean total score was 14% correct out of 0 or 36%, falling below the established AK of 86%. The mean of correct scores were 29%, 33% and 4% for CHO, fats, WM, respectively. CONCLUSION: The results suggest that athletes are at a high risk of health consequence ncess such as ED. Likewise, they are likely to be misinformed about sound sports nutrition by relying on their self-knowledge rather than a professional advice from a RD. This challenges the notion that experience as an athlete is a source of nutrition knowledge.
G-18  Thematic Poster - Behavioral Aspects of Exercise

Saturday, June 1, 2019, 9:00 AM - 11:00 AM
Room: CC-102A

3257  Chair: Erica M. Taylor, FACSM. Columbus State University, Columbus, GA.

(No relevant relationships reported)

PURPOSE: Healthy-mind exercise is an exercise of a low-medium intensity and benefit to both physically and mentally. The exercise is composed of Tai Chi, Healthy Qi Gong and Yoga. The hypothesis of this experiment was that the healthy-mind exercise intervention is superior to the conventional physical rehabilitation methods in Shanghai compulsory detoxification and rehabilitation centers on the effect of fitness and quality of life.

METHODS: A total of 100 male individuals of illicit drug dependent who met the inclusion criteria were recruited and randomly assigned to two groups. In the experimental group (n=50), subjects practiced three times of healthy-mind exercise in the morning, noon and evening for 20 minutes for each exercise session. The total time of the exercise was 60 minutes. The control group was treated with the conventional rehabilitation method (n=50). The contents of the exercises in control group included recreational gymnastics, gesture exercise, the times of daily practice, duration of each session, total duration of a day and the repetitions per week were the same as those of the experimental group. Outcomes of fitness, quality of life for drug addiction questionnaire (QOL-DA) were measured at the baseline, 3-month and 6-month. Data analysis was applied with SPSS 19.0. A two-way repeated measures analysis of variance (ANOVA) was applied to test whether the treatments were different after 6 months.

RESULTS: At baseline, no statistically significant differences were observed between two groups in terms of demographic outcomes, fitness and the scores of QOL-DA. After 6 months of exercise intervention, there were significant differences found in systolic (F(2, 98) =11.7), diastolic (F(2, 98) =9.3), heart rate (F(2, 98) =3.0), vital capacity (F(2, 98) =3.0), flexibility (F(2, 98) =3.5), aerobic endurance (F(2, 98) =15.0). The results of QOL-DA showed that there were significant differences between experimental group and control group in physical function (F(2, 98) =10.32), psychological function (F(2, 98) =10.32), symptom function (F(2, 98) =10.32), social function (F(2, 98) =10.32) and total score (F(2, 98) =10.32). CONCLUSIONS: This study proved that the healthy-mind exercise was suitable for substance dependent individuals.

3258  Board #1  June 1 9:00 AM - 11:00 AM

The Physical and Mental Rehabilitation Effect of Healthy-mind Exercise Intervention on Individuals of Illicit Drug Dependent
Dong Zhu1, Mei Jiang2, Ding Xu3, Shanghai University of Sport, Shanghai, China. 1Shanghai Drug Administration, Shanghai, China. Email: zhudong@hotmail.com

(No relevant relationships reported)

3259  Board #2  June 1 9:00 AM - 11:00 AM

Confirmation of Self-Reported Ambulatory Exercise Bouts During Ecological Momentary Assessment
Lindsay P. Toth, Lucas F. Sheridan, Kelley Strohacker, FACSM. The University of Tennessee, Knoxville, TN.

(No relevant relationships reported)

Ecological momentary assessment (EMA) is a method of self-report (SR) that can be used to examine how fluctuations in physical activity (PA) behavior are related to affective, contextual, and cognitive antecedents. Concurrent objective PA monitoring is recommended when EMA is used to supplement retrospective SR questions about PA. The objective PA data could be useful for confirming that SR bouts of ambulatory exercise occurred as described (timeframe, duration, intensity). To date, such a confirmation process has not been described in the literature. PURPOSE: Assess the use of accelerometer to confirm EMA of ambulatory exercise. METHODS: Participants (N=29, 24±10 yrs) completed four mobile surveys for 14 d (8% response rate) denoting exercise type and duration over the preceding 4 h. Throughout the 14 d period, participants wore an ActiGraph GT3X+ (AG) on the hip (14±3 h/d). To confirm EMA reported exercise bouts, survey meta-data (date, time-stamp) and bout durations were used to guide visual inspection (VI) of AG data within the corresponding 4 h time blocks by two independent reviewers (inter-observer agreement=94%, and after deliberations=100%). The Croster 2-Regression Model (C2RM) was applied to AG counts to determine a min-to-min coefficient of variation (CV). SR bouts were confirmed when the C2RM CV ranged between 1% and 10% continuously and step counts were above 500 steps per 10 h epoch for the approximate SR duration. Descriptive statistics and t-tests analyses were conducted. RESULTS: 93 of 128 bouts were confirmed, and the average SR bout duration (29±20min) was slightly greater than VI bouts (25±20min). Ten bouts were unable to be confirmed due to AG non-wear. In the 25 remaining unconfirmed cases, no continuous bouts matching the SR durations were observed. CONCLUSIONS: Processing AG data using C2RM allowed intuitive and reliable VI for confirmation of continuous ambulatory exercise bouts reported via standard EMA survey items. Feasibility of applying this process may be limited by large sample sizes.

3260  Board #3  June 1 9:00 AM - 11:00 AM

Feasibility Of A Novel Video Game-Based EMG Biofeedback System In Patients With Knee Osteoarthritis
Eileen Krepkovich1, Colby Magnuni2, Susan Salibia2, Matthew Lichter1, Aaron Olowin1, Neal Richardson3, Joseph Hart, FACSM1. 1Barron Associates, Inc., Charlottesville, VA. 2University of Virginia, Charlottesville, VA. (Sponsor: Joseph Hart, FACSM)

(No relevant relationships reported)

PURPOSE: Rehabilitation through qua driceps strengthening is a well-established treatment for patients with osteoarthritis (OA) of the knee. Electromyography (EMG) biofeedback units provide an interactive mechanism to increase motivation during exercise, but conventional systems are expensive, and their simplistic interface may not be engaging to the user. The purpose of this study was to compare technology acceptance and knee extension tone production using EMG biofeedback presented to patients from within a video game interface.

METHODS: A novel virtual world game system (“KneeBRIGHT”) was developed that integrated electromyography (EMG) biofeedback and guided patients through qua driceps strengthening routines. Feasibility testing was completed with 19 patients with a prior diagnosis of knee joint osteoarthritis (1.9 ± 3 yrs. 19 kg, 10.5 ± 0 m). Participants conducted 2 testing sessions on separate days. During the first session, participants performed 3 sets of lower body exercises with emphasis on maximal muscle activation, endurance, and motor control/precision. These exercises were conducted with a commercially available EMG biofeedback unit (Pathway MR-20, Prometheus Group, Dover, NH). During the second session, participants used the KneeBRIGHT game that was designed to match the exercise sets in the first session. For all sessions, knee extension tone was recorded during the isometric muscle activation exercises using a dynamometer, and patient engagement was assessed using the technology acceptance model (TAM) questionnaire. Peak tone and TAM scores obtained during the KneeBRIGHT and traditional biofeedback sessions were compared using paired t-tests.

RESULTS: Knee extension tone generated during KneeBRIGHT game exercise sessions was increased by an average of 2% compared to the tone generated during conventional EMG biofeedback sessions (2.14 N/m vs. 1.2 N/m, p=0.02). There was no significant difference in TAM scores between the sessions (3.42/4.0 vs 3.2/4.5, 0.25).

CONCLUSIONS: Patients exercising with the KneeBRIGHT game produced greater knee tone than patients exercising with the conventional system, and demonstrated positive levels of engagement.

3261  Board #4  June 1 9:00 AM - 11:00 AM

Exploring Qualitative Determinants of Regular Group Indoor Cycling Participation in a Diverse Sample of Adults
Alvin L. Morton1, Lyndsey M. Hornbuckle1, Miguel Aranda1, Derrick T. Yates2, Courtney L. Anderson1. 1University of Tennessee, Knoxville, Knoxville, TN. 2Georgia State University, Atlanta, GA.

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(No relevant relationships reported)

While U.S. adults generally do not acquire adequate levels of physical activity, non-Hispanic Blacks (NHB) obtain less physical activity than non-Hispanic Whites (NHW). Identifying reasons why NHB regularly participate in a given exercise modality may help tailor future recommendations in this population. Group indoor cycling (GIC) classes have gained popularity and are offered widely in fitness facilities. PURPOSE: To investigate the motivation for regular GIC class participation in a racially diverse sample.

METHODS: Women and men attending GIC classes at a rhythm-based cycling studio ≥ 1 day/week for the preceding three consecutive months were recruited. Participants completed a questionnaire that included two open-ended SR questions: 1) Why do you continue to regularly choose GIC classes for exercise? and 2) “How does the environment at this cycling studio motivate you to continue to choose GIC for exercise?” Three investigators independently analyzed data using established procedures for thematic analysis. Data from the two SR questions were reported in
Low cardiorespiratory fitness and accumulated fat mass have been widely associated with impaired cognitive performance in children, however, their influence on creativity remains unclear. The creativity is a component of cognition and is defined as the process of identifying the difficulty, formulating hypotheses about the deficiencies and solving the problems. Actually, the creativity has become an element key to cognition because contribute to personal and professional success of the subject. PURPOSE: Here, we compare creativity in children with different levels of cardiorespiratory fitness (CF) and fat mass (FM), as well as their relationship. METHODS: In this cross-sectional study, 3 children with age ranging from 10.1 to 11.9 years participated while attending two testing sessions. On the first testing session, all children had general anthropometric assessments and completed a graded shuttle run test to estimate cardiorespiratory fitness (VO2 max). On the second session, they perform theChildren’s Figural Creativity Test, scholar performance test and have the fat mass (FM). RESULTS: Between VO2 max (p=0.75) and FM (p=0.56) levels. In addition, no correlation was identified between CF and FM. Creativity was compared between groups by a paired t test and unpaired Mann-Whitney (P>0.005). Pearson or Spearman correlations were used to compare the associations between the variables. CONCLUSIONS: In conclusion, creativity is similar in children with different VO2 and FM level and there is not relationship between these variables. However, are necessary more studies with a robust creativity measurement technique , based in neurobiological markers (NIRS, fMRI).

CONCLUSIONS: While there were differences in sedentary behavior and cell phone use in Japanese versus American college students, the relationships between these variables was positive and significant regardless of group. This finding supports previous data indicating that elevated cell phone use is predictive of greater daily sedentary behavior and poor physical fitness. Furthermore, present results indicate that this relationship extends beyond American college students.

The field of cognitive enhancement has grown in popularity in recent years. Exercise and transcranial direct current stimulation (tDCS) are two approaches for which there is some evidence of transiently improved cognitive control. Yet, no research has systematically compared both approaches, so the degree to which these techniques influence similar mechanisms of improvement remains unknown. PURPOSE: We parametrically compared the acute effects of aerobic exercise and tDCS over left prefrontal regions on cognitive control. METHOD: 6 young healthy adults (22.4 ± 4.1 years old) completed two testing sessions. The first session included baseline measurements of cognitive control on a flanker inhibition task and an n-back working memory task, followed by a maximal graded exercise test. During the second session, participants were randomly assigned to either 20 minutes of running on a treadmill at moderate intensity ( 0. 0% of maximal heart rate) or 20 minutes of seated rest. After a 10-minute interval, participants were randomly assigned to receive 30 minutes of active tDCS (2 mA anode over left prefrontal cortex; cathode over right bicep) or sham stimulation as they completed the flanker and n-back tasks. We performed a baseline-corrected cognitive control performance as a function of Exercise (running vs. seated rest) and Stimulation (active vs. sham tDCS) using linear mixed effects models. RESULTS: Models revealed a main effect of Condition on n-back sensitivity (nonparametric signal detection A’=2.45, p=0.014), but no significant effects of Stimulation, and no interaction of Exercise and Stimulation. Specifically, the individuals who exercised were better able to discriminate n-back targets from nontargets compared to the seated group. We did not observe any effects of Exercise or Stimulation on flanker performance (accuracy and response times on incongruent or congruent trials). CONCLUSION: Whereas noninvasive brain stimulation produced no effects on cognitive control, acute aerobic exercise significantly improved working memory performance. This suggests that the neuroenhancement mechanisms impacted by short bouts of exercise and tDCS may be distinct. Further, this pattern hints that aerobic exercise may have broader effects on cognitive control than non-invasive brain stimulation.
fatigue with voluntary activation (VA%) calculated using the twitch interpolation method. Subjective measures included motivation (MS) and mood using the Brunel Mood Scale (BRMS). RESULTS: Average power output (W) was reduced with a main effect of hypoxia (p < 0.02) and significantly increased with a main effect of music (p = 0.001). When combined the interaction was additive (p = 0.002). Average MVC force (N) was reduced in hypoxia (p < 0.03) but VA% of the biceps brachii was increased with music (p < 0.02). MS and BRMS remained unchanged across all conditions (p > 0.06). Music reduced subjective scores of mental effort, breathing discomfort, and arm discomfort in hypoxia (p < 0.001). CONCLUSION: Music increased self-paced and maximal physical exertion through enhancing neural drive and diminishing detrimental mental processes, enhancing performance at both sea level and high altitude.

G-19 Thematic Poster - Endocrine Responses to Exercise and Occupational Stressors

Saturday, June 1, 2019, 9:00 AM - 11:00 AM
Room: CC-101B

The positive coupling hypothesis describes the hypothalamic-pituitary-adrenal and gonadal systems as parallel, cooperative processes that represent joint calibration to meet internal, and/or environmental, demands. We recently tested this hypothesis in Navy Special Warfare (NSW) personnel and found positive coupling between the adrenal hormones, cortisol (CORT) and dehydroepiandrosterone (DHEA), and the gonadal hormone, testosterone (TESTO).

PURPOSE: To test the positive coupling hypothesis in Explosive Ordnance Disposal (EOD) personnel; a specialized military population whose mission is to ensure that hazardous explosives are rendered safe for unit preservation and security.

METHODS: Active duty U.S. Navy EOD operators (N = 64; mean ± SD age: 34 ± 6.0 years) self-collected saliva samples in a non-deployed, free-living setting on 2 consecutive weekdays at wake, 30 min, wake + 6 min in m, 100, a nd 2100 (10 samples total). Exclusion criteria included use of any anabolic supplements within the last 3 months. Coupling hypotheses (associations between CORT, DHEA, and TESTO summary parameters) were tested with Pearson product-moment correlation analyses. Established summary parameters were determined for each hormone: highest morning value, area under the curve (with respect to ground [morning values]), and averages of morning and evening values, respectively.

RESULTS: DHEA was positively coupled with TESTO (r range: .50- .57, p < .05) and also with CORT (r range: .5- 3 p < .05) throughout the day. Positive coupling between CORT and TESTO was only observed in the evening (r =-3.2, p = 0.01). CONCLUSION: This study partially replicated our prior report in NSW personnel, which demonstrated that DHEA positively coupled with TESTO as well as CORT. The evening association of TESTO and CORT is also consistent with our previous findings and likely indicative of homeostatic processes. Unlike the previous study, however, the morning values of TESTO and CORT were not coupled in the present study. This inconsistency could potentially be explained by a warfighter’s specific operational demands. For example, positive coupling may be adaptive for duties that include direct engagement with the enemy. In contrast, uncoupling may be more conducive to ensuring unit safety and security.

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

3269 Board #3 June 1 9:00 AM - 11:00 AM

**Salivary Stress Biomarkers During the Lake Placid Ironman® Ultraendurance Event**


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(Bio)-nutritional status (total body water, FFM, and body fat (%)) and physiological stress responses (salivary cortisol, norepinephrine, HSP70) were measured throughout the race (n= 68). Subjects experienced significant stress with completion of the race (RPE 18±2). sIgA was decreased POST (41.71 ±20.46 μg·ml⁻¹) compared to PRE (55.11 ±28.51 μg·ml⁻¹) and Neutral Salts (37.76 ±27.02 μg·ml⁻¹) conditions. Post hoc tests. RESULTS: Subjects experienced significant stress with completion of the race (708.90 min finish time, ESQ IAPOST (20) vs. PRE (53, p < 0.05), POST RPE 18:2). sIgA was decreased POST (41.71 ±20.46 μg·ml⁻¹) vs. PRE (55.11 ±28.51 μg·ml⁻¹, p < 0.05) and vs. AMPOST (37.76 ±27.02 μg·ml⁻¹, p < 0.006. Salivary HSP70 was increased POST (6.01 ±3.69 ng·ml⁻¹ vs. PRE (2.48 ±1.91 ng·ml⁻¹, p < 0.0002).

CONCLUSIONS: Salivary HSP70 is a reliable biomarker for detecting stress during an ultraendurance event and is correlated with more common salivary stress marker sIgA.

Biomarkers such as salivary IgA (sIgA) have been established as valid, reliable, and non-invasive stress markers. sIgA concentrations have been reported to decrease following periods of high physiological stress, such as that experienced during ultra-endurance events. Heat shock protein 70 (HSP70), a molecular chaperone, has been assessed primarily as a plasma/serum stress biomarker. The role of HSP70 in saliva, how it responds to extremely stressful exercise events and its correlation to changes in salivary IgA remain unclear.

PURPOSE: To test the hypothesis that salivary HSP70 can be used as a salivary stress biomarker correlated to sIgA during an ultraendurance event.

METHODS: Thirty-three subjects competing in the Lake Placid Ironman triathlon participated (all data, mean± SD: 38± 8 yrs, 178.4± 8.9 cm, 76.3± 10.4 kg, 10.8± 3.8% body fat, finish time 708±90 min). Environmental symptoms questionnaires (ESQ) were administered before (PRE) and 1 hour after the race (POST). Hydration status was assessed primarily as a plasma/serum stress biomarker. The role of HSP70 in saliva, how it responds to extremely stressful exercise events and its correlation to changes in salivary IgA remain unclear.
Amassing evidence suggests that post awakening cortisol patterns are useful indicators of health status. Our lab established summary parameters of cortisol and reported excellent stability across 2 days of repeated sampling in U.S. Navy SEALs. To confirm the generalizability of our original findings, there is a need to replicate procedures in another military population with unique operational demands.

**PURPOSE:** To establish the summary parameters of daily cortisol patterns, the stability of repeated sampling, and the impact of salivary sampling compliance in U.S. Navy Explosive Ordnance Disposal (EOD) operators.

**METHODS:** Seventy active duty, male EOD operators (mean ± SD age = 34.9 ± 6.5 years), followed a swift recovery at Wake < 30 min. Approximately 17.4% (n = 12) were classified as negative-reactors (i.e., <0% change from Wake to Wake + 30 min). The three measures of magnitude and three measures of pattern were computed. The stability of each parameter was evaluated via correlational analyses and Cronbach’s alpha (α). Compliance was evaluated via actigraphy using two alternate compliance criteria. RESULTS: Average salivary cortisol concentrations increased at Wake + 30 min (mean ± SE reactivity = 3.9 ± 1.3 µg dL−1), followed by a swift recovery at Wake + 60 min. Approximately 17.4% (n = 12) were classified as negative-reactors (i.e., <0% change from Wake to Wake + 30 min). The three measures of magnitude demonstrated good stability across 2 days (r value range: 0.37 ± 0.08, p < 0.01; r range: 0.45 ± 0.62). Fifty-five percent of the sample was classified as compliant (defined as <15% deviation from target sampling times) across both days; this decreased to 31% when compliance was redefined to <5 min deviation. However, controlling for compliance did not convincingly influence any of the summary parameter estimations or their stability.

**CONCLUSIONS:** These findings demonstrate a thorough replication and refinement of our prior report, implying that these results are generalizable across diverse military populations. The noninvasive salivary sampling protocol used in this study yields stable estimations of daily cortisol patterns in specialized military men. This sampling protocol is recommended for use as an operational health surveillance instrument for chronically stressed military members.

**Individuals in occupations that wear personal protective equi pment (PPE) are exposed to rapid and uncompensable core temperature (Tc) acquisition, as which occurs when one is wearing PPE, on rate and magnitude of salivary cortisol appearance.**

**PURPOSE:** To determine the effects of rapid and uncompensable (Tc) acquisition on the rate and magnitude of salivary cortisol appearance.

**METHODS:** Fourteen male subjects (33.6 ± 12.1 years) performed an incremental treadmill test to a termination point in a control session (CON) and an experimental session (PPE). Salivary samples were collected using an oral swab stimulated method. Saliva samples were processed and analyzed for salivary cortisol concentration using a highly sensitive enzyme immunoassay. Heart rate (HR), thermal comfort scale (TCS) and thermal sensation (TS) were also recorded at each 0.5 C increase in core temperature (Tc).

**RESULTS:** There were significant differences in time to termination (TTT) (CON = 77.3 ± 12.6 min; PPE = 83 ± 6 min), pre-exercise HR (CON = 87 ± 13 bpm; PPE = 80 ± 10 bpm), post-exercise HR (CON = 161 ± 11 bpm; PPE = 198 ± 10 bpm), end-exercise Tc (CON = 33.8 ± 3.2°C; PPE = 391 ± 3.7°C), TCS (CON = 3.7 ± 0.6); TS (CON = 3.5 ± 0.3), and TCS (CON = 0.5; PPE = 0.3). There was also a 0.04° C/min increase in Tc during PPE and a 0.02° C/min increase in Tc during CON. Significant cortisol results showed a difference in the rate of cortisol appearance (CON = 0.002 µg dL−1 min−1; PPE = 0.018 µg dL−1 min−1). There was a significant difference in mean cortisol values between start of exercise and the end of exercise (p < 0.01). There was also a significant difference (p ≤ 0.05) between magnitude of salivary cortisol values at termination when comparing CON and PPE. CONCLUSION: Rapid and uncompensable Tc acquisition results in an elevated acute cortisol response. This will have implications for individuals who are employed in fields that are exposed to acute heat stress chronically. The acute effects of increased cortisol concentration are a decreased anabolic response, decreased cognitive performance, and decreased mood states. The chronic effects are many, but are mostly related to atherosclerosis development and subsequent cardiovascular disease.
Methods: A pre/post-test design was used to test the 6-week PAnMe intervention. Personalized exergame prescriptions were developed and progressed based on the social cognitive theory and exercise principal of adaptation. Fitness was measured by preferred gait speed (m/s). Symptom data were collected via the MD Anderson Symptom Inventory, Brief Pain Inventory, Pittsburg Sleep Quality Index, General Anxiety Disorder scale, and Center for Epidemiologic Studies Depression Scale. SE was measured by the PA Self-Efficacy scale (0–100%). Descriptive statistics and paired t tests were applied.

Results: A total of 10 HNC participants were recruited. Two participants dropped out due to recurrence. The mean age was 73 ± 10.7 years (n = 8). Seven (88%) were male. Three (38%) had oral cancer and 5 (58%) had laryngeal cancer. Three (38%) had a feeding tube and 2 (25%) had a tracheostomy. Four (40%) had stage III/IV cancer. Mean gait speed improvement was clinically significant (0.11m/s). There were positive improvements in 17 of 20 symptoms with significant decreases in pain (t = 2.34, p = 0.05), in fatigue (t = -3.64, p = 0.008) and in difficulty with voice/speech (t = -2.35, p = 0.05). Seven participants (88%) had 100% SE to do their personalized exergame prescription in the post test.

Conclusions: This study shows HNC participants overcame their PA barriers after the PAnMe intervention. It also supports the need for a larger randomized clinical trial for efficacy testing. The positive impact from PAnMe will shift PA interventions from a standardized protocol to a personalized, behavioral telehealth approach.

Prostate cancer is the most commonly neoplastic disease that affects men in the world. Androgen deprivation therapy (ADT) is the treatment regimen most used in advanced disease stages. Whereas the occurrence of late side effects induced by ADT seems well described, the long-term consequences of ADT in muscle function and fatigue have not been well documented.

PURPOSE: The purpose of this study was to assess fatigue, muscle strength, muscle thickness, and quality in prostate cancer survivors undergoing to ADT.

METHODS: Ten prostate cancer patients on ADT (ADT group) (28 ± 34 years, 7 ± 8 kg mass and 1.6 ± 0.07 m) and 10 healthy control subjects (CON) (21.2 ± 19.1 years, 77.94 ± 9.47 kg and 1.69 ± 0.07 m) participated in this study. Perceived fatigue was assessed through a 20-item Multidimensional Fatigue Inventory. Muscle thickness and quality (e.g., echo intensity) were assessed through B-mode ultrasound. Muscle strength and work capacity were assessed using an isokinetic dynamometer. One-way ANOVAs with Bonferroni post-hoc were used for comparisons between groups adjustment.

RESULTS: Muscle thickness was lower in ADT than CON (21.32 ± 3.20 vs. 22.67 ± 3.00 mm, p = 0.05). Peak torque, work capacity, and echo intensity (p = 0.05) were lower in ADT than CON (108.07 ± 30.36 vs. 110.23 ± 33.99 cm, respectively, p = 0.001). ADT showed greater echo intensity than CON (110.23 ± 18.3 vs. 108.07 ± 30.36 cm, respectively, p = 0.001). There were no differences between N-ADT and CON on muscle thickness, peak torque, work capacity, and echo intensity (p > 0.05). General fatigue was greater on both ADT and CON (11.10 ± 3.4 vs. 10.23 ± 1.2, p = 0.05). N-ADT (102.3 ± 11, p = 0.05) and CON (110.23 ± 30.36 cm, respectively, p = 0.001). ADT showed greater echo intensity than CON (110.23 ± 18.3 vs. 108.07 ± 30.36 cm, respectively, p = 0.001).

CONCLUSIONS: Therefore, it appears that the nature of ADT treatment has a deep negative effect on muscle function and fatigue when compared to patients not-undergoing ADT. Therefore, further research is needed to confirm these preliminary findings, in order to attenuate the decline of muscle function and fatigue in men undergoing ADT treatment.

Physical activity is a critical component of treatment for breast cancer survivors that prevents additional cancer recurrence, comorbid chronic disease and body composition changes. However, recommended physical activity guidelines are rarely met.

PURPOSE: This study examined how barriers and benefits of exercise differ between breast cancer survivors who are not engaging in any moderate or vigorous physical activity, those doing physical activity but not meeting physical activity guidelines, and those meeting recommended physical activity guidelines.

METHODS: 39 breast cancer survivors were recruited through the Susan Love/Army of Women, a national non-profit breast cancer organization, and completed the Exercise Barriers and Benefits Survey, the International Physical Activity Questionnaire and questions on resistance and stretching activities.

RESULTS: Multivariate ANOVAs examined whether exercise groups differed in types of exercise benefits and barriers they reported. 267 of the women (69.6%) did not meet recommended guidelines (150 minutes/week of aerobic activity, those doing physical activity but not meeting physical activity guidelines, and those meeting recommended physical activity guidelines).

CONCLUSIONS: Despite recommendations, the majority of breast cancer survivors do not meet physical activity guidelines. Understanding which barriers and benefits are relevant to different groups of exercisers is an important avenue to prescribing exercise in an at risk population. Personalized approaches may promote exercise initiation in those not currently exercising, while targeting different barriers may help those already exercising to meet recommended physical activity guidelines.
PURPOSE: Meta-analyses have shown beneficial effects of exercise on quality of life (Qol) and fatigue in breast cancer survivors. Methodological considerations, however, are drop-out after randomization to control caused by disappointment and contamination (controls adopting the behavior of the intervention group), since blinding in exercise trials is not possible. TwiCs (Trials within Cohorts) is an alternative for conventional randomized clinical trials and might overcome these disadvantages. We studied the 6-month effectiveness of a 12-week exercise program on the Qol and fatigue in inactive breast cancer survivors using the innovative TwiCs design.

METHODS: The UBMBRRA Fit study is nested within the UBMBRRA cohort, including patients at the radiotherapy department of the UMC Utrecht. Patients were asked consent for prospective collection of medical data and patient reported outcomes, and to be randomized to future intervention studies. For UBMBRRA Fit, we randomized 260 eligible inactive (<150 min/wk moderate to vigorous leisure time and sports activities) breast cancer survivors, 12-18m after author inclusion. Survivors randomized to the intervention group (n=130) were offered a twice weekly supervised moderate to high intensity aerobic and resistance exercise program. Survivors were also asked to be active for 30 min/day supported by a physical activity tracker. The control group (n=130) was not informed and received usual care (UC). To evaluate effects on Qol and fatigue by intention to treat ANCOVA regular cohort measurements (EORTC QLQ 30, MF1-20) were used.

RESULTS: Included breast cancer survivors aged 8 10 years and 8 130 accepted the intervention. Twis cas accrual was efficient and no contamination was observed (median change in physical activity from baseline in controls was 0). At baseline, Qol was comparable to Dutch reference values and no significant between-group changes were observed. Physical fatigue was significantly lower following the exercise intervention (effect size 0.2, p<0.05) compared to UC.

CONCLUSIONS: Physical exercise has beneficial effects on physical fatigue of inactive breast cancer survivors. Future instrumental variable analysis will show influence of non-acceptance on the intervention effect. The Twis cas design seems feasible for pragmatic trials.
contribute to the RBE in a way reminiscent to their role in adaptive immunity. In this study, in vivo lengthening contractions (LC) were used to model the RBE and the RBE mechanism was characterized using shear wave elastography (SWE) and shear modulus, and SWE correlates well with Young’s modulus. Shear wave changes should be useful for determination of muscle lesions or intrinsic changes. To date only a couple studies have observed SWE changes in an arm undergoing DOMS with varying results. Thus, the purpose of this study was to track the changes in biceps SWE changes in kilopascals (kPa), from baseline to 1 week post muscle damage protocol. METHODS: Standard ultrasound (US) imaging can help determine structural alterations within muscle and tendon; however, it offers limited information about the intrinsic mechanical properties of muscle. Because muscle is compressible, but transversely isotropic, the most accurate measure is the shear modulus, and SWE correlates well with Young’s modulus. Shear wave changes should be useful for determination of muscle lesions or intrinsic changes. To date only a couple studies have observed SWE changes using velocity as the variable of interest in muscle undergoing DOMS with varying results. Thus, the purpose of this study was to track the changes in biceps SWE changes (kPa), from baseline to 1 week post muscle damage protocol. RESULTS: All data were analyzed using a MANOVA with post hoc comparisons to determine significance between data points. VAS and SWE were significantly increased for the DOM group at 24 and 48 hours post exercise (p<0.001) with no significant difference between 24 and 48 hours for SWE (p=0.825), while VAS scores increased significantly from 24-48 hrs post (p=0.031). There was no significant difference between baseline VAS (p=0.196) or SWE (p=0.087) at 1 week. CONCLUSIONS: SWE values increased significantly from baseline to 24 hrs and stayed elevated at 48 hours, which is contrary to data from a published study showing a decrease after 24 hours in the brachialis. This could be due to muscle position. SWE measurements of the biceps in an extended position appears to follow VAS and muscle damage progression better than SWE measurements reported from DOMS in a resting position.

Exercise-induced muscle damage (EIMD) is a result of high-force eccentric contractions and can lead to significant alterations in the structure and function of skeletal muscles. Critical torque (CT) and the impulse above critical torque (I ACT) were assessed, and CT and I ACT were derived through voluntary and stimulated conditions. Fatigue patterns were assessed, and CT and I ACT were acquired through voluntary and stimulated conditions. In rats that were subjected to damage a minimal increase in T-cells was observed. Adoptive transfer of T-cells from rats that had previously done muscle-damaging LC did not confer damage protection to recipient rats. In conclusion, the RBE, but not the RBE was observed in rats, and T-cells infiltrate muscle damaged by LC, but they do not appear to contribute to the RBE in the same way that they drive adaptive immunity.

Rapamycin has been shown to have a dose-dependent effect on multiple signaling proteins in skeletal muscle cells that influence protein synthesis and calcium handling. However, it has been determined that if a low-sustained signal of rapamycin is introduced, muscle during recovery from an exercise-induced injury. PURPOSE: To determine if low-dose rapamycin affects the rate of isometric strength recovery, muscle ubiquitin levels, and markers of autophagy compared to saline control 14 days after exercise induced injury. METHODS: Mice were injected with either saline (SAL; 0.9%) or low-dose rapamycin (RAP; 10 µg/kg body weight) every other day for 2 weeks before and after a single bout of 10 eccentric contractions of the left anterior crural muscles. The recovery of strength of the anterior crural muscles was measured in vivo immediately, 7 days, and 14 days after injury induction. The magnitude of expression of beclin-1, ubiquitin, and ubiquitin tautomers and markers of autophagy in injured and contralateral TA muscles (i.e., primary anterior crural muscle) were analyzed via Western blot at 14 days after injury. RESULTS: Isometric twitch torque values did not differ between groups at any time point. No group differences in peak isometric torque were observed pre-injury, post-injury or 7 days after injury. However, at 14 days, RAP mice recovered to pre-injury peak isometric torque values (Pre= 2.3 ± 0.07 Nm; 14d= 2.25 ± 0.08 Nm) while SAL group showed significant loss at 14 days after pre-injury. At 14 days, RAP mice generated 1.8% higher maximal torque than SAL group (p = 0.04). Beclin-1 and free ubiquitin expression in TA muscles were significantly increased in both SAL (1.4 fold and 2.3-fold, respectively) and in RAP (2.2-fold and 8.6-fold, respectively) mice at 14 days after injury compared to the uninjured muscle. The increase in the free ubiquitin in the injured muscle was 3.3-fold greater in the RAP treatment compared to SAL (p = 0.001). There were no significant changes in the ubiquitin tautomers and proteins among the groups at 14 days post-injury. CONCLUSION: Chronic low-dose rapamycin treatment in mice enhances recovery of skeletal muscle from eccentric contraction-injury 14 days after injury and accentuates the upregulation of free ubiquitin.

Vastus Lateralis Muscle Quality Deteriorates More So Than Muscle Size During Knee Joint Immobilization
Michael Sahebi, Rob J. MacLennan, Nathan Becker, Ethan Davis, David Ogilvie, John McDorman, Ernest Vargas, Matt S. Stock. University of Central Florida, Orlando, FL. Email: sahebi2@knights.ucf.edu

Exercise-induced muscle damage (EIMD) is a result of high-force eccentric contractions and can lead to significant alterations in the structure and function of skeletal muscles. Critical torque (CT) and the impulse above critical torque (I ACT) have both been reported to decrease following EIMD. METHODS: Participants (males = 6 females = 4) completed 2 familiarizations and 6 experimental visits. Fatigue patterns were assessed, and CT and I ACT were derived at the 1st experimental visit. The 2nd experimental visit included an EIMD protocol consisting of 100 back squats. The 3rd, 4th, and 6th experimental visits were identical to the 1st CT and I ACT were acquired red through voluntary activation in CT and I ACT following EIMD. RESULTS: The participant’s ratings of muscle soreness were significantly elevated up to 4 days following EIMD (p<0.05). Dominant leg MVC was reduced up to 2 days (p<0.05) while non-dominant leg MVC was reduced up to 4 days (p<0.05) following EIMD. Mean CT was decreased up to 4 days following EIMD in the voluntary condition (p<0.05) while decreases lasted up to 2 days in the stimulated condition (p<0.05). IACT was not significantly different following EIMD in either conditions (p>0.05). No significant differences in CT and I ACT following EIMD (p>0.05) and these results are the same for twitch torque (p>0.05). EMG RMS and twitch torque both showed a significant reduction during the voluntary CT test (p<0.05). There were no changes in low-frequency ncy fatigue after the voluntary and stimulated conditions (p>0.05) or following EIMD (p>0.05).

CONCLUSIONS: Even though CT was lower following EIMD, IACT was not. Additionally, our results show no contribution of central or peripheral fatigue on torque production following EIMD. These findings suggest the loss in torque production following EIMD to be a factor of EIMD’s effect on muscular function and not the central and peripheral mechanisms of fatigue.
lateralis echo intensity and cross-sectional area. Two-way (time x limb) analyses of variance, effect size statistics, and linear regression were used to interpret the data.

**RESULTS:** Echo intensity showed a significant time x limb interaction \(^{p = .015}\). Cohen’s \(d = 0.39\). Declines in muscle cross-sectional area for the immobilized limb were less consistent, as no time x limb interaction was observed \(^{p = .29}\). There was, however, a significant association between the change in echo intensity and the change in cross-sectional area \(^{p = .37, p = .032}\).

**CONCLUSION:** In healthy female participants, two weeks of knee joint immobilization resulted in considerable changes in vastus lateralis muscle qa lity, whereas the atrophic response was less dramatic.

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**3287**

**Board #6**

**June 1 9:00 AM - 11:00 AM**

**The Effects of Betalain Supplementation on Indices of Muscle Damage**


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(No relevant relationships reported)

**Purpose:** Immediately following eccentric exercise, a pro-inflammatory and pro-oxidative state ensues to initiate the remodeling phase and subseque nt repair of damaged tissue. A continued pro-inflammatory and pro-oxidative state can lead to secondary muscle damage thereby prolonging the repair and regenerative process. Betalains are bioactive pigments that are reported to have anti-inflammatory and antioxidant properties. We therefore examined the effects of a betalain-rich concentrate (BRC) on indices of muscle damage following eccentric exercise in an effort to assess muscle recovery following supplementation.

**Methods:** In this counterbalanced repeated measures design, a total of 11 recreationally active males consumed 8 mg of BRC, containing 12.5 mg of betalains, 3 times per day for 3 days (initial testing day, 24 and 48 hr post-exercise), or nothing at all (control). The exercise protocol consisted of 30 maximal eccentric contractions of the elbow flexors. Each condition was separated by 2 weeks and the contralateral arm was used for the second testing session. Maximal voluntary isometric contraction (MVIC), arm circumference (AC), muscle soreness (MS), and range of motion (ROM) were measured pre, post, 24, and 48 hr following the eccentric exercise. Creatine kinase (CK) was measured pre, 24 and 48 hr following the eccentric exercise. Results: No significant differences or interactions were observed for any of the variables \((p > .05)\). There was, however, a post-exercise significant correlation with a corresponding large effect size for the main effect of MVIC \((p = .07, \eta^2 = 0.23)\). Conclusion: Betalain supplementation did not enhance skeletal muscle recovery following eccentric damage. However, we feel the large effect size may provide practical significance. Therefore, future studies should expand upon ours to include larger samples of recreationally active individuals using a more intense damage protocol.

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**3288**

**Board #7**

**June 1 9:00 AM - 11:00 AM**

**Pilot Data Suggest Negative Change In Bone Mineral Content Is Related To Self-report Musculoskeletal Injury In Infantry Marines**


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(No relevant relationships reported)

**Background:** Prevalence of musculoskeletal injury (MSK) is greatest in young Marines due to the high volume of vigorous exercise, especially in early training. Fitness and body composition are known to be related to injury risk; however, understanding changes in such factors over a training cycle and the risk of injury are not well understood.

**Purpose:** The purpose of this study was to measure changes in body composition and bone density over the 11-day infantry training and its relation to MSK.

**Methods:** Active duty, male, infantry soldiers \((n = 63)\) enrolled in the infantry training battalion located at School of Infantry-West (SOI-W) aboard Camp Pendleton were recruited to participate in this study. Pre- and post-SOI-W training (Day 1 and Day 0), Marines completed a whole body dual-energy x-ray absorptiometry (DXA); as well as, sleep, nutrition, and fitness questionnaires. Three months following graduation from SOI-W, a follow-up survey was sent regarding prevalence and type of MSK.

**Results:** Of the original Marines in the study \((n = 63)\), six Marines \((12\%)\) reported sustaining an MSKI within three months of completing SOI-W. Those that were injured showed decreased bone mineral content (BMC) in both the dominant and non-dominant leg as compared to the group average whom had an increase in BMC \((\text{injured vs. non-injured right leg: } \Delta -5.5\% \text{ vs. } \Delta +3.3\% \text{; injured vs. non-injured left leg: } \Delta -3.8\% \text{ vs. } \Delta +1.2\%)\). Additionally, of the injured Marines, 50% reported “poor” sleep qa lity on the Pittsburgh Sleep Quality Index and 60% reported “excessive sleepiness” on the Epworth daytime sleepiness scale at the follow-up time point. No differences in fitness levels or dairy consumption (milk, cheese, yogurt, ice cream) were present between injured and non-injured Marines at any time point.

**Conclusion:** These pilot data suggest that MSKI may be related to negative changes in BMC; as well as sleep qa lity and daytime sleepiness. Further work is needed to determine the relationship between MSKI and BMC and sleep to elucidate mechanisms or impact on injury risk.

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**G-34**

**Free Communication/Poster - Body Composition**

**Board #1**

**June 1 8:00 AM - 9:30 AM**

**Accuracy of Body Fat Estimation Using Circumferences and Air Displacement Plethysmograph on Male Navy Sailors**


(No relevant relationships reported)

**Purpose:** To assess the accuracy of BF% estimation on male U.S. Navy sailors obtained using circumference (Circ) and air displacement plethysmograph (ADP) technique s compared with BF% estimates using dual-energy X-ray absorptiometry (DXA) as the gold standard.

**METHODS:** Same-day DXA, Circ, and ADP measurements were recorded for 50 male subjects \((age: 33 ± 7 \text{yr} , height: 179 ± 9 \text{cm}, weight: 183 ± 18 \text{kg})\). Circumferences were taken using a retractable tape measure placed on the skin by trained researchers. Three measurements were taken and averages were calculated and entered into the equation. Compression shorts and swim caps were worn for ADP measurements and lung volumes were predicted. DXA was completed per manufacturer specifications.

**RESULTS:** Average BF% was 21.6 ± 4.4, 21.9 ± 4.8, and 26.2 ± 7.1 for DXA, Circ, and ADP, respectively. Differences between ADP and DXA were statistically significant \((p < .001)\). Compared with DXA, BF% estimates were accurate within ± 1% in 31.1% and 8% of subjects for Circ and ADP measurements, respectively. Circ underestimated BF% in 3% of subjects, while ADP underestimated BF% in 9.3% of subjects.

**CONCLUSION:** When comparing the accuracy of Circ and ADP with DXA, Circ had a nearly identical average and SD, while the average was 8% higher for ADP with a larger SD \((\text{SD} = 3\%)\). Circ was within ±1% of DXA in nearly 1 in 3 subjects, while ADP was as accurate in fewer than 1 in 10 subjects. ADP overestimated BF% in 80% of the subjects. Furthermore, the highest BF% overestimation for any individual was 7% for Circ in contrast to 11.5% for ADP. The results of this study suggest that in a male Navy population, use of circumference measurements to estimate BF% is more accurate than ADP and in close agreement with DXA measurements.

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**3314**

**Board #2**

**June 1 8:00 AM - 9:30 AM**

**The Influence of Gender and Body Composition on Pool-Based Anaerobic Power and Capacity**

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(No relevant relationships reported)

Recent evidence has shown that a tethered 30-second maximal swim (TST) is a valid and reliable measure of anaerobic power and capacity in swimmers. Consistent differences between males and females exist in both land-based and water-based measurements of force production, with land-based differences heavily influenced by body weight and muscle mass. However, the influence of body size and composition has not been investigated for the TST. **Purpose:** To explore gender differences in anaerobic power \((\text{F}_{\text{max}})\) and capacity \((\text{F}_{\text{max}})\) during a TST, and to explore the influence of body total body mass \((\text{TBMM})\), and body composition \((\text{percent body fat} \ (%\text{BF})\) and
fat free mass (FFM) on gender differences. **Methods:** Thirteen males (Age = 22.8 ± 3.1 years; BMI = 24.63 ± 2.5 kg·m²; %BF = 13.92 ± 5.1%) and fifteen females (Age = 20.67 ± 4.5 years; BMI = 23.36 ± 2.9 kg·m²; %BF = 25.80 ± 7.9%) completed a TST, as previously described in the literature. Body composition was assessed via air displacement plethysmography. Independent t-tests were used to determine absolute differences between males and females for FFM and FFMadj. Additionally, the influence of TBM, %BF, and FFM on gender differences for FFM and FFMadj during a TST was determined using stepwise linear regression analysis. Results: Males produced significantly higher FFM (p < 0.001) and FFMadj (p = 0.008), compared to females. However, when adjusted for measures of body composition, FFM was significant for FFM (p < 0.002) and FFMadj (p < 0.001), and gender was not significant (p = 0.694 and p = 0.136, respectively). Conclusions: Although gender differences were observed for mean and peak force production, results of the present investigation revealed that differences were significantly comparable for height-adjusted results, regardless of gender. Therefore, force production and sprint swimming performance may benefit from gains in muscle mass, although more research is needed in the form of training studies. Additional research should investigate the influence of the ratio of fat mass and fat free mass on buoyancy, body position, and the balance required to achieve optimal force production and sprint swimming performance.

**Fat-free Mass Index in a Diverse Sample of Male Collegiate Athletes**

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(FE)  Health/Exercise Evaluation (HFE), Health/Exercise Influence (HFI), Attention to Grooming (AG), Social Dependence (SD), Height Dissatisfaction (HD), Negative Affect (NA), and Investment in Ideals (II). For the analysis, BMI values ≤ 25.0 kg/m² were classified as “normal” (NW); values ≥ 25.0 kg/m² were categorized as “overweight” (OW).

Results: In SD, there was a significant main effect for gender, with females scoring higher in the factor of social dependence (p = 0.0138). There was a main effect for gender in HD, with males being more dissatisfied with their height than females (p = 0.0103). An interaction existed between gender and BMI for height dissatisfaction, with a greater gender disparity in HD in normal weight students (M>F) than in OW students, where differences almost disappeared. The main effect for gender in FE indicated that females view themselves as fatter than males (p = 0.001); not surprisingly, there was also a main effect in FE for BMI (p = 0.0038). A main effect for BMI existed in OAE (p = 0.001), with the only group showing differences was NW group (p = 0.0003). A BMI-SEX interaction existed in HFI (p = 0.008) indicating that OW males felt that health and fitness influenced feelings about their bodies more so than OW females; in NOR students, gender differences were very small.

Conclusion: The belief that females have more body image concerns than males is valid in some components of body image, and BMI attenuates some gender differences.

**Impact of Body Fat Percent on Heart Rate of Moderate-Intensity Aerobic Activity**

Wenhao Liu, FACSM, Istvan Kovacs, Austin McClinton. Slippery Rock University, Slippery Rock, PA.

(Purpose) To better understand the relationship between body fat percent (%BF) and aerobic capacity, this study examined how %BF would impact heart rate (HR), maximal HR% (%HRmax) and HR reserve (ΔHR%) when walking at 3.0 mph among young adults. **METHODS:** The three-site skinfold measure was administered to 130 university students (mean age: 20.8 ± 3.8; 102 males and 74 females) in the US and converted to %BF using the conversion tables by Jackson et al. The ACSM satisfactory ranges of %BF (18.9% - 22.2% for men and 20%-22.2% for women) were used to divide participants into three %BF groups: Normal, Lean, and Obese. HRmax was calculated with “220-age”, resting HR (after lying on the floor for five minutes) was measured using HR monitors (Sigma PC26 & , and HRR was calculated with “HRmax-resting HR”. Finally, HR at the end of a three-minute treadmill walking at 3.0 mph was measured, which was also used to compute %HRmax (HR + HRmax × 100%) and ΔHR [HR - Resting HR] × HRR × 100% of the walking. One-way MANOVA was also used to examine differences in HR, %HRmax, and ΔHR of the three-minute walking among the three %BF groups.

RESULTS: The slope of the linear line in Normal, Lean, and Obese group. No age difference (p > .70) was found among the three %BF groups (Normal 20.71±.90, Lean 20.94±2.79, Obese 20.95±1.50). However, significant differences (p values ranged from .000 to .003) were observed in HR, %HRmax, and ΔHR for the three-minute walking at 3.0 mph among the three %BF groups. Specifically, significant differences were identified in HR in all the three pairwise comparisons: Lean (♂ 10.72 ± 11.24 , and Normal 11.08 ± 11.24 , and Normal vs. Obese; in %HRmax in all the three pairwise comparisons: Lean (♂ 10.72 ± 11.24 , and Lean Normal 11.08 ± 11.24 , and Normal vs. Obese; in %ΔHR between Lean (♂ 10.72 ± 11.24 and Obese 30.22±6.97 and between Lean and Normal (♂ 10.72). **CONCLUSIONS:** The %BF classified with ACSM %BF ranges have significant impact on HR among young adults when walking at 3.0 mph, a moderate-intensity (3.5 MET) activity. Specifically, when walking at 3.0 mph, lean individuals demonstrate significantly lower HR, %HRmax, and %ΔHR than normal and obese individuals; and normal individuals show significantly lower HR and %HRmax than obese individuals.

**Anthropometric Characteristics Of NCAA Division III Swimmers**


There is an assumption among competitive swimmers that certain body types are predisposed to perform better. This assumption may be in part due to research on young swimmers that suggests that greater standing (SH) and seated height (SH), arm span (AS), and the surface areas of the arm and foot increase swimming speed. However, literature on these variables in adult swimmers does not exist. Further, despite literature supporting the negative correlation between body fat percentage (BF) and performance in a variety of sports, the literature on swimmers suggests BF...
is not a leading contributor to faster swimming speeds. There exists a need to explore the association between anthropometric characteristics and performance among adult competitive swimmers.

**PURPOSE:** To evaluate the association between anthropometric characteristics of National Collegiate Athletic Association Division III (DIII) male and female swimmers and performance determined by skinfold thickness for NCAA national competition.

**METHODS:** Subjects (20F) were subdivided for seasons and ANOVA for each variable.

**RESULTS:** Nineteen (35.2%; 11 [37.9%] male and 8 [32.0%] female) qualified for Nationals. With the exception of seated height and left hand length (p=0.05), both of which showed a positive association, regression analyses revealed that there were no statistically significant differences between anthropometric characteristics and qualification for Nationals. **CONCLUSIONS:** Results suggest that greater SH and left HL have a positive effect on swimming performance but there was no association between any other anthropometric variable and qualification for Nationals. These findings suggest that differences in swimming performance among DIII swimmers are likely due to other factors, such as biomechanical, intrinsic physiological and psychosocial attributes.

**The NFL scouting combine and college pro-days implement a battery of anthropometric and performance tests to assess college football players attempting to play in the NFL. As such, athletes commonly undergo specific training and nutrition regimens to optimize combine performance in order to increase their chances of signing with an NFL team.**

**PURPOSE:** To observe body composition changes following a training program of different lengths designed to prepare athletes for NFL combine and pro-day performance.

**METHODS:** Seventeen male collegiate football players (21.8 ± 0.4 y, 1.8 0.06m, 105.8 ± 15.9 kg) participated in a NFL combine preparation program. The combine preparation training consisted of existence training sessions per week and 6 days per week of exercise and combine test-specific training. Athletes participating in this program were also provided dietary counseling by a nutritionist to improve dietary habits. Pre- and Post-training body mass (BM), body fat percentage (BF%), fat mass (FM), total body water (TBW), and lean body mass (LBM) were measured via bioelectrical impedance analysis (BIA).

**RESULTS:** Since all athletes did not join the program on the same date we divided athlete data into two groups: (1) those that completed 7-9 weeks of training (n=10) and (2) those than completed 4-6 weeks of training (n=7). Data were analyzed by sequential Bonferroni correction to maintain significance of the model. **CONCLUSIONS:** Results: Athletes who completed 7-9 weeks of training program had significant increases in body mass (p=0.004; ∆0.117 min). Increased midaxillary fat storage significantly predicted decreased finish time (p=0.037, B=0.206 min) and (p=0.023, B=0.017 min). Increased midaxillary fat storage significantly predicted decreased finish time (p=0.023, B=0.166 min). When co-varied out, chest, midaxillary, and abdomen were significant (p < 0.05) predictors of 3200m performance. Increased chest and abdomen fat storage significantly predicted increased finish time (p=0.037, B=0.206 min) and (p=0.023, B=0.017 min). Increased midaxillary fat storage significantly predicted decreased finish time (p=0.023, B=0.166 min). When co-varied out, chest, midaxillary, and abdomen were significant predictors of 3200m performance in trained collegiate males, while skinfold thickness in the triceps, subcapular, suprailiac, thigh, calf, and biceps were not. **CONCLUSIONS:** Skinfold thickness in the chest, midaxillary, and abdomen were significant predictors of 3200m performance in trained collegiate males, while skinfold thickness in the triceps, subcapular, suprailiac, thigh, calf, and biceps were not. **CONCLUSIONS:** Appendicular fat storage may not be as important to performance as hypothesized in homogeneous well trained male endurance runners.

**PURPOSE:** To determine the predictive power of traditional skill sets including chest, midaxillary, triceps, subcapular, abdomen, suprailiac, thigh, calf, and biceps, on performance in a 3200m time trial for trained male distance runners.

**METHODS:** Participants were 22 members of a NCAA Division 3 men’s cross country team. Skinfold measurements were recorded for each of the nine-sites on each of the athletes using a skin caliper. The athletes then completed a 3200m time trial. This data was then used to run a multiple-regression to determine the importance of each site to time trial performance. **RESULTS:** The subjects had an average body fat percentage of 12.8%, ±4%, and an average 3200m time of 10:4 ±6. The regression analysis revealed that 8% of the variance in 3200m time trial performance was predicted by the model using the nine sites (biceps, suprailiac, thigh, chest, subcapular, abdomen, midaxillary, and triceps) as predictors (p=0.05). When co-varied out, chest, midaxillary, and abdomen were significant (p < 0.05) predictors of 3200m performance. Increased chest and abdomen fat storage significantly predicted increased finish time (p=0.037, B=0.206 min) and (p=0.023, B=0.017 min). Increased midaxillary fat storage significantly predicted decreased finish time (p=0.023, B=0.166 min). When co-varied out, chest, midaxillary, and abdomen were significant predictors of 3200m performance in trained collegiate males, while skinfold thickness in the triceps, subcapular, suprailiac, thigh, calf, and biceps were not. **CONCLUSIONS:** Skinfold thickness in the chest, midaxillary, and abdomen were significant predictors of 3200m performance in trained collegiate males, while skinfold thickness in the triceps, subcapular, suprailiac, thigh, calf, and biceps were not. **CONCLUSIONS:** Appendicular fat storage may not be as important to performance as hypothesized in homogeneous well trained male endurance runners.

**INTRODUCTION:** Laterality, or lateral dominance may lead to asymmetry in muscle mass and strength, which in turn could lead to differences in stability and balance. Muscular asymmetry and dynamic balance asymmetry have been independently linked with increased injury risk. For example, athletes with ≥4 cm anterior reach distance differences (AARD) were found to be at significantly higher risk to incur injuries. However, it is unknown if there is an association between muscle mass asymmetry and dynamic balance. Nor is it known if these factors change throughout the sports season (i.e., off-, pre-, and post-season). The purpose of this preliminary analysis was to analyze differences between lower body lean mass and dynamic balance in collegiate athletes and to examine if associations exist between the two variables during different seasons. Methods: NCAA Division II student-athletes were recruited in their respective off- or pre-season. Lean mass was assessed via dual energy x-ray absorptiometry. Dynamic balance was assessed via lower quarter Y Balance Test and AARD was calculated. Pearson correlation was used to examine associations. Results: Two athletes from six sports have been recruited (see table). There were no significant correlations (p > 0.05) between differences in lower body lean mass and AARD in either off- or pre-season (r=0.003 and r=0.001, respectively). 5% of athletes in off-season and 48% in pre-season exhibited >4cm AARD. Conclusion: In this preliminary report, no correlation was found between lower body lean mass asymmetry and dynamic balance asymmetry. Concerning was our finding that about half of the athletes showed dynamic imbalances, indicating higher injury risk. Further data collection will determine the extent of the changes in muscle mass and dynamic balance asymmetry over one full competitive season.

**PURPOSE:** To evaluate the association between anthropometric characteristics and qualification for Nationals competition controlling for gender.

**RESULTS:** Nineteen (35.2%; 11 [37.9%] male and 8 [32.0%] female) qualified for Nationals. With the exception of seated height and left hand length (p=0.05), both of which showed a positive association, regression analyses revealed that there were no statistically significant differences between anthropometric characteristics and qualification for Nationals. **CONCLUSIONS:** Results suggest that greater SH and left HL have a positive effect on swimming performance but there was no association between any other anthropometric variable and qualification for Nationals. These findings suggest that differences in swimming performance among DIII swimmers are likely due to other factors, such as biomechanical, intrinsic physiological and psychosocial attributes.
Oral contraceptives consumption has been identified as a usual strategy for birth control among athletes. Nevertheless, its impact on body composition and sports performance remains unknown due to the heterogeneity in the formulation of these products and individual factors such as the menstrual cycle, age or sports discipline.

**PURPOSE:** The aim of this study was to evaluate the effect of oral-contraceptive use on strength and body composition changes in trained women undergoing regimented resistance training (RT). **METHODS:** Twenty-three resistance-trained women (age 27.4±3.4 years; height 162.7±6.1 cm; body weight 60.5±7.8 kg; BMI 22.9±2.7 kg∙m⁻²) were randomized to either a non-oral contraceptive (n=11, NOC) or an oral contraceptive (n=12, OC) group. After a 5-week familiarization period, all participants performed four sessions of RT per week over the course of an 8-week non-linear program. Dual X-ray absorptiometry was used to measure lean body mass and fat mass. Muscle power was measured by the countermovement jump (CMJ) test using a jump contact mat, and maximal strength was assessed by the one-repetition maximum (1RM) test in the back squats (SQ) and bench press (BP).

**RESULTS:** OCC increased significantly lean body mass [1.4±1.0 (0.5, 2.3) kg; p=0.007], however, no changes were observed in the NOC group [0.7±1.0 (-0.2, 1.5) kg; p=0.074]. No significant changes were seen in regard to fat mass in both OC [0.4±1.6 (-0.7, 1.5) kg; p=0.437] and NOC [0.3±0.8 (-0.2, 1.0) kg; p=0.220]. Both OC and NOC increased upper-body 1RM [6.7±3.6 (4.4, 8.9) kg; p=0.001] and [4.8±1.8 (3.4, 6.1) kg; p=0.01], respectively; likewise, increased lower-body 1RM [11.9±4.7 (7.7, 16.2) kg; p=0.01] and [15.6±5.4 (11.7, 19.4) kg; p=0.01], respectively. No significant changes were found in CMJ in both OC and NOC [0.7±1.1 (-0.1, 1.6) cm; p=0.91] and [0.7±1.1 (-0.1, 1.6) cm; p=0.69], respectively.

**CONCLUSIONS:** OCC use in conjunction with RT produces similar increases in measures of strength and power compared to NOC in trained women and has potentially beneficial effects on lean body mass. Supported by University of Málaga (Campus of International Excellence Andalucia Tech).

**3323** Board #11 June 1 8:00 AM - 9:30 AM

**Relationships Of Waist Circumferences Measured At Different Anatomical Sites With Body Fat In Chinese Adults**

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(No relevant relationships reported)

In large-scale population surveys and public health screenings, the use of simple anthropometric indices has become popular for identifying individuals who are overweight and obesity. Waist circumference (WC) has been extensively investigated as an indicator of abdominal obesity and health risks among adults. However, standardized protocols for WC measurement have yet to be established.

**PURPOSE:** This study aims to determine relationships between body fat and different WC sites in Chinese adults. **METHODS:** A total of 213 Chinese adults aged 18-35years old participated in the study. WC was measured at five sites: immediately above the iliac crest (WC1), immediately below the lowest rib (WC2), midpoint between the lowest rib and the iliac crest (WC3), 1 cm above the umbilicus (WC4), and at the narrowest waist (WC5). Body fat mass (FM), body fat percentage (%BF), abdominal fat mass (FM in abdominal) and abdominal percentage fat (%BF in abdominal) were determined through dual-energy X-ray absorptiometry. Pearson correlation was used to analyze the relationships of WCs with FM, %BF, FM in abdominal, and %BF in abdominal. Levels of significance were set at P < 0.05.

**RESULTS:** For males, the measured WCs were strongly correlated with FM and FM in abdominal (p < 0.001), and significantly correlated with %BF and %BF in abdominal (p < 0.001). For females, the WCs were significantly correlated with FM, %BF, and %BF in abdominal (p < 0.001). For%BF in abdominal (p < 0.001). For females, the WCs were significantly correlated with FM, %BF, and %BF in abdominal (p < 0.001). For males, the measured WCs were strongly correlated with FM and FM in abdominal (p < 0.001), and significantly correlated with %BF and %BF in abdominal (p < 0.001). For females, the WCs were significantly correlated with FM, %BF, and %BF in abdominal (p < 0.001).

**CONCLUSIONS:** The WCs were correlated significantly with FM, %BF, FM in abdominal, and %BF in abdominal both in Chinese males and in Chinese females.

**3324** Board #12 June 1 8:00 AM - 9:30 AM

**Association Between Body Composition and Bone Mineral Density in Elite Collegiate Athletes**

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(No relevant relationships reported)

Individuals, such as collegiate athletes, that engage in increased levels of strenuous exercise often possess a lower body fat percentage (%BF) and increased fat-free mass (FFM). Additionally, repetitive progressive resistance training and participation in high-impact sports has been demonstrated to increase bone mineral density (BMD). Because collegiate athletes experience a high amount of repetitive loading, it may be expected that BMD would yield a relationship to body composition. **PURPOSE:** The purpose of this study was to examine the relationship between body composition and BMD in elite college athletes. **METHODS:** Male (n = 41) and female (n = 33) athletes (ages 18-21 years) from a range of sports, including baseball, football, softball, and volleyball, participated in the study. Total BMD and body composition (i.e., BF% and FFM) were measured using dual-energy x-ray absorptiometry. Pearson’s product moment correlations were used to assess all relationships between BMD, BF%, and FFM. **RESULTS:** In terms of males, Pearson’s product correlation demonstrated a significant moderate-to-strong positive association between BF% and BMD (r = 0.42, p < 0.01). BF% provided a significant positive low-to-moderate correlation with BMD (r = 0.35, p = 0.02). For females, BF% showed a moderately positive association with BMD (r = 0.48, p = 0.001), while BF% provided a non-significant inverse correlation with BMD (r = 0.16, p = 0.20). **CONCLUSION:** FFM in both male and female collegiate athletes was positively associated with BMD. However, males displayed a positive BMD and BF% relationship, while females a non-significant, inverse association. These findings may reflect the diversity of female athletes (i.e., various sports) that were included within the analysis. For instance, sports that require re a greater body mass to enhance performance and those that require re a leaner physique were both included within one group which may have affected the BMD and BF% relationship.
Multi-compartment models are emerging as a criterion method of analyzing body composition, thereby reducing the error associated with standalone laboratory measures. **PURPOSE:** The purpose of this study was to compare a 3-compartment model (3-C) with two gold standard lab measures (i.e., air displacement plethysmography (ADP) and dual-energy x-ray absorptiometry (DEXA)). **METHODS:** Sixty-nine male and forty-eight female athletes completed three body composition measures (i.e., DEXA, ADP, and bioelectrical impedance spectroscopy (BIS)). Body fat percentage (BF%) was calculated using a 3-compartment (3C) model, consisting of total body water (via BIS), body volume (via ADP), and body weight. For statistical analysis, a repeated measures ANOVA was used to compare ADP and DEXA against a 3-C model for all within gender comparisons. **RESULTS:** For males, results showed a significant mean difference when comparing 3-C (13.2±7.0%) and DEXA (16.3±9.5%) (P<0.01, ES=0.51), but no difference between 3-C and ADP (12.0±8.0%; P=0.09). For females, a significant mean difference was seen with 3-C (23.5±7.2%) and DEXA (28.0±6.9%) (P<0.01); however, there was no difference between 3-C and ADP (22.2±6.3%; P=0.34). **CONCLUSION:** DEXA may provide overestimates of BF% for both male and female athletes, while ADP provided no significant differences when compared to a multi-compartment model.

**Body Composition is a highly important metric in regards to overall physical activity as well as sport performance. Most body fat percentage (BF%) measurements are recorded using two-compartment models, such as skinfold analyses, bioelectrical impedance analysis, or more accurately, via hydrostatic weighing or air displacement plethysmography. However, research has suggested that three-compartment models, like dual energy x-ray absorptiometry (DEXA), may provide more accurate recordings of BF%. However, limited research exists in comparing BF% obtained via two- and three-compartment models in collegiate athletes. **PURPOSE:** To compare BF% recordings via DEXA and ADP in Division-I collegiate male and female athletes. **METHODS:** Seventy-eight athletes (Male: n = 45 [age = 18.4±1.0 y, height = 161.9±55.5 cm, weight = 77.3±32.5 kg]; Female: n = 33 [age = 18.0±0.7 y, height = 146.3±56.9 cm, weight = 55.9±23.8 kg]) from multiple sports underwent BF% testing via DEXA and ADP. Both tests were completed on the same visit under supervision by the same test administrator. Hydration status was measured before testing to ensure that all athletes were properly hydrated prior to the test. Athletes were instructed to dress in accordance to the recommended protocols for both tests. Individual paired sample t-tests were run for BF% comparisons for whole group, male athletes, and female athletes. **RESULTS:** A significant mean difference existed for all athletes between DEXA (21.6±10.5%) and ADP (14.8±7.4%) when comparing BF% (P<0.01, ES=0.53). When factored for gender, male BF% exhibited a significant mean difference between DEXA (16.3±9.5%) and ADP (11.8±8.0%) (P<0.01, ES=0.51). Additionally, a significant mean difference for BF% was found in the female athletes between DEXA (28.0±6.9%) and ADP (22.2±7.3%) (P<0.01, ES=0.92). **CONCLUSION:** These results, which are consistent with previous research, indicate significantly greater BF% values for DEXA when comparing athletic populations.
Body composition can significantly impact performance and injury risk, particularly in cross country, where a small build and low percent body fat are typically desirable. Body composition goals for an athlete may vary year-to-year, depending on training goals, years of competitive training, and access to specialized training staff. Tracking body composition throughout a collegiate career is important for optimal health and performance. PURPOSE: To evaluate changes in body composition across a first, second, third, or fourth year of competition in Division I cross country runners. METHODS: Pre and post season measures of body composition were evaluated in first season (N=25), second season (N=28), third season (N=13), and fourth season (N=10) Division I National Collegiate Athletic Association cross country runners (Total: N=64 male=25 female=21) between the years of 2014 to 2017. Total and regional body composition (fat mass [FM], percent body fat [%BF], lean mass [LM], bone mineral content [BMC], and armLM, legLM) was measured using dual-energy x-ray absorptiometry. RESULTS: First year runners significantly increased weight (Δ ± SD; 6.9 ± 2.2 kg; p<0.001), LM (4.2 ± 1.2 kg; p<0.001), BMC (0.03 ± 0.05 kg; p<0.008), and armLM (0.1 ± 0.3 kg; p=0.047). Second year runners increased weight (1.5 ± 1.8 kg; p=0.005), LM (1.2 ± 1.2 kg; p<0.001), armLM (0.1 ± 0.3 kg; p=0.019), and had a small but significant decrease in BMC (0.02 ± 0.03 kg; p=0.002). There were no significant changes in body composition in third or fourth year runners. CONCLUSIONS: First and second season Division I cross country runners experience significant changes in body composition, primarily increases in LM, while third and fourth year runners experience minimal changes. Changes are likely influenced by the addition of strength and conditioning and nutrition staff that are not available in high school. The first two seasons may be key times for developing body composition characteristics in runners that can maximize performance and minimize injury throughout their career.
Body composition assessment has become an integral part of the year-round training schedule for athletes. This may be especially important in women athletes due to the potential for disordered eating. Development of low-cost bioelectric impedance analysis devices (BIA) make them attractive for determining changes in body composition across a year-long training cycle. Despite underestimation, each method provided consistent measure by phase and can be used to effectively track changes across a season. Prediction errors were typically greater at greater DEXA %fat and body mass values.

### RESULTS

- **P=0.49; FM: 16.0 vs. 15.9 kg, P =0.93; BF% : 23.9 vs. 23.5% , P=0.78** were also not significant improvements, although not significant, among VO2, FFM, FM, and BF%. Further differences between BIA %fat and DEXA %fat (r = 0.66 to 0.90) indicated greater underestimation by SKF occurred at higher %fat and body mass values. A similar tendency was noted for differences between BIA %fat and DEXA %fat (r = 0.8 – 0.9).

**CONCLUSIONS:** All prediction techniques produced significantly lower estimates of %fat in college soccer players across a year-long training cycle. Despite improvements, although not significant, among VO2, FFM, FM, and BF%.

### CONCLUSIONS

- **The measured VO2max via GXT (43.7 vs. 44.0 ml/kg/min, P=0.57) was not significantly increased.**
- **FM: 16.0 vs. 15.9 kg, P =0.93; BF% : 23.9 vs. 23.5% , P=0.78** were also not significant improvements, although not significant, among VO2, FFM, FM, and BF%.

**A Matter Of Fat? Body Composition In Relation To VO2max Improvements In Division II Female Athletes**

Kallie LaValle, Joseph D. Ostrem. *Concordia University - St. Paul, St. Paul, MN.*

(No relevant relationships reported)

### PURPOSE

Body composition is a significant factor in the determination of relative maximal oxygen consumption (VO2max) (Kenney, Wilmore, & Costill, 2015). Historically, O2 consumption reported in ml/kg/min considers O2 consumption related to fat free mass (FFM). A training program that facilitates an increase in FFM and/or a decrease in fat mass (FM) and body fat percentage (BF%) would inherently increase relative aerobic capacity and may optimize performance throughout the competitive season (Castagna, et al, 2013).

The purpose of the study was to determine the relative aerobic capacity response via Graded Exercise Testing (GXT) in relation to body composition changes in female Division II collegiate athletes following a preseason conditioning program.

**METHODS:** Nine female college athletes (age = 20±1 yrs) participated in the study. Subjects performed a modified Balke GXT assessment on a treadmill to failure. Prior to performing the modified Balke GXT, subjects had their body composition assessed utilizing a Bod Pod (COSMED, Rome, Italy). All laboratory assessments were performed in the kinesiology lab at Concordia University - St. Paul, MN. Aerobic fitness and body composition were assessed before and after an 8-week preseason interval training program. Paired t-tests evaluated mean differences for pre- and post-training variables within body composition and GXT assessments.

**RESULTS:** The measured VO2max via GXT (4.7 vs. 4.0 l/min, P=0.7) was not significantly increased. Body composition comparisons (FFM: 51.3 vs. 51.8 kg, P=0.8; FM: 10.0 vs. 15.9kg, P =0.9; BF%: 23.9 vs. 23.5, P =0.4) were also not significantly affected over the 8-week preseason training period.

**CONCLUSIONS:** The 8 week preseason conditioning program showed improvements, although not significant, among VO2, FFM, FM, and BF%. Further studies with a greater number of participants could provide appropriate power to accurately determine the anthropometric and physiological changes experienced throughout the program.

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### Abstracts were prepared by the authors and printed as submitted.
LM than women. A sex x sport multivariate ANOVA, with the influence of height and weight removed by covariance, revealed that men had significantly greater regional BMD (p<0.005) than women in the arms, legs, pelvis, and total body. XA and SW had significantly lower BMD than CON which were lower than SOC, BS, and BB with no significant difference among the latter groups. The sex x sport interaction was not significant (p > 0.15), except for leg BMD where women swimmers (1.53 ± 0.081 g/cm²) had a significantly lower value than other groups (1.405 ± 0.151 gm/cc). BMD had a nonsignificant higher correlation with LM (r = 0.61) than with body mass (r = 0.56) when sex was held constant.

CONCLUSIONS: Regional BMD appears to be unique and dependent on sport participation and sport-specific training, but the pattern of bone development appears independent of sex. Men and women athletes in sports that require more intense ground contact and perhaps more resistance training have greater regional and total BMD, suggesting varying levels of bone stress are associated with training for different sports. The degree of stress on bones of the arms does not seem sufficient to differentiate between these sports or inactive individuals.

3338 Board #26 June 1 8:00 AM - 9:30 AM
Comparison of Abdominal Fat among Positions and Ethnicities in College Football Players
Brianne R. Morgan, Monica L. Hunter, Richard M. Schumacher, Laurel M. Wentz, Jerry L. Mayhew, William F. Brcueh, FACSM. 1Truman State University, Kirkville, MO. 2Appalachian State University, Boone, NC. 3A.T. Still University, Kirkville, MO.
Email: brm7215@truman.edu
(No relevant relationships reported)

Body types in American football vary dramatically, but the underlying premise is one of achieving greater size within any position. In order to reach the theoretical size required for a given position, players may perform extensive resistance training and consume large quantities of food with much concern for body composition. Recent investigation has suggested that the accumulation of abdominal or visceral fat may have serious long-term health consequences. However, limited information is available on the extent of abdominal fat accumulation in collegiate football players.

PURPOSE: To compare the level of android adiposity among Caucasian and African-American football players in different playing positions. METHODS: Backs (BA, n = 57) and linemen (LM, n = 11) were measured for body composition using dual-energy x-ray absorptiometry (DEXA). Android fat (AF) was identified as the region from the iliac crest to a height 20% distance below the chin. Ethnicity was categorized as Caucasian (CAU, n = 83) and African-American (A-A, n = 30) based on self-report. RESULTS: There was a significant difference (p<0.001) in % fat between linemen (27.4 ± 7.5%) and backs (16.6 ± 4.7%) but not between ethnicities (CAU = 22.1 ± 8.8% vs A-A = 20.4 ± 7.7%), with no significant interaction (p = 0.96). The same pattern was evident in AF with a significant difference between positions (LM = 3.03 ± 1.56 kg vs BA = 1.37 ± 1.75 kg), a non-significant difference between ethnicities (CAU = 2.32 ± 1.98 vs A-A = 1.63 ± 1.42 kg), and a non-significant interaction (p = 0.54). When body mass was held constant by covariance, there was no significant difference between positions (LM = 1.98 ± 2.26 vs A-A = 2.09 ± 1.84 kg), ethnicities (CAU = 2.23 ± 1.35 vs A-A = 1.79 ± 1.37 kg), or for interaction (p=0.14). AF was more highly correlated with body mass in LM (r = 0.90) than in BA (r = 0.28) and more highly correlated with body mass in A-A (r = 0.90) than CAU (r = 0.59).

CONCLUSIONS: These findings suggest that the amount of AF in college football players is largely related to body size. Accounting for difference in body size eliminates the difference between playing positions and ethnicities. Further research should compare athletes to nonathletes of different ethnicities and sizes to determine if similar patterns exist.

3339 Board #27 June 1 8:00 AM - 9:30 AM
Comparison of Various Body Composition Measures for Division-I Collegiate Male Athletes
Gina R. Hogan, Michelle L. Eisenman, Emily L. Langford, Ronald L. Snarr, Greg A. Ryan. Georgia Southern University, Statesboro, GA.
(No relevant relationships reported)

Estimates of body composition are critical for athletic populations as variations in body fat percentage may affect athletic performance, power, and general overall health. However, most laboratory and field-based devices estimate body composition using algorithms based upon and intended for general populations. Therefore, these algorithms may not be applicable to special populations, specifically male athletes. PURPOSE: The purpose of this investigation was to compare various field and laboratory measures of body composition in division-I collegiate male athletes against a criterion of air displacement plethysmography (ADP).

METHODS: Sixty-nine Division-I collegiate male athletes, from various sports, performed five body composition measures (i.e., bioelectrical impedance spectroscopy (BIS), hand-to-foot bioelectrical impedance analysis (HF-BIA), foot-to-foot bioelectrical impedance analysis (FF-BIA), three site skinfold (SF), and ADP). Each participant performed all measures on the same visit to the laboratory. A repeated measures ANOVA was used to determine differences between body composition measures against the criterion of ADP.

RESULTS: When compared to ADP (12.2 ± 1.1%), results indicated a significant mean difference with BIS (18.1 ± 6.6% ; p<0.01) and HF-BIA (18.5 ± 9% ; p<0.01). There were no statistical differences between ADP and FF-BIA (12.1 ± 6% ; p=1.0) or ADP and SF (13.2 ± 6% ; p=1.0).

CONCLUSION: Results indicate that field measures of body composition (i.e., FF-BIA and SF) may be applicable to athletic populations; whereas, laboratory measures (i.e., BIS and HF-BIA) may tend to overestimate body composition in male athletes. Therefore, new algorithms estimating body composition in athletes may be warranted for laboratory based devices.

In cross-sectional analyses, anthropometric measures are generally well correlated with clinical measures of adiposity such as those from dual-energy X-ray absorptiometry (DXA). However, it is unclear whether anthropometric measures are sensitive enough to accurately quantify longitudinal changes in central and whole-body adiposity in response to short term exercise interventions with minimal weight change.

PURPOSE: To examine the relative agreement between anthropometric and DXA measures of change in adiposity following a 6 week cycling exercise intervention. METHODS: Overweight/obese women (n=18, 24±4 yrs old, 8 White, 1% Black, 1% Other) participated in the exercise intervention. Anthropometric measures included body mass index (BMI) and natural waist (NW) circumference. DXA measures included absolute trunk fat (TrkFat), whole body absolute fat (TotFat), and percent fat (%Fat). Baseline anthropometric and DXA measures were compared using Pearson correlations, as were changes (Δ) in each measure across the intervention. RESULTS: Means±SD at baseline for each of the measures were: NW (89.8 ± 10.8 cm), BMI (30.5 ± 5.6 kg/m²), TrkFat (16293.3±5991.3g), TotFat (35826.4±9813.2g), %Fat (44±5.8%). Δ for each of the measures were: NW (-0.8±0.4 cm), BMI (-0.2±1.0 kg/m²), TrkFat (-3.0±2.0), TotFat (-8.6±3.0), %Fat (-0.8±1.3%). The association between baseline NW and TrkFat was much stronger at baseline (r=0.95, p≤0.001) compared to the correlation between post-intervention Δ (r=0.57, p=0.001). Similarly, correlations between baseline BMI and DXA measures were stronger (TotFat: r=0.90, p≤0.001; %Fat: r=0.68, p=0.001) than correlations between Δ measures (TotFat: r=0.68, p=0.001; %Fat: r=0.34, p=0.013).

CONCLUSION: Anthropometric measures may not accurately reflect Δ in body composition during short duration lifestyle interventions. This may be due to factors such as cumulative intra-rater measurement errors when assessing waist circumference and the inability of BMI to differentiate changes in lean and fat mass over time.

More direct measures (e.g., DXA) may be needed to accurately assess Δ in body composition, especially when these changes are of modest magnitude.

3341 Board #29 June 1 8:00 AM - 9:30 AM
Body Composition Characteristics and Knee Injury Prevalence of NCAA Division I Women's Soccer and Lacrosse
Gabrielle J. Brewer, Malia N.M. Blue, Katie R. Hirsch, Austin M. Peterjohn, Samantha A. Kelchner, Darin A. Padua, Abbie E. Smith-Ryan, FACSM. University of North Carolina - Chapel Hill, Chapel Hill, NC. (Sponsor: Dr. Abbie E. Smith-Ryan, FACSM)
Email: gbrewer@live.unc.edu
(No relevant relationships reported)

Body composition is directly linked to athletic performance and may influence injury risk and recovery. Female Division I soccer and lacrosse players are at a high risk for lower limb injuries specific to the knee joint throughout their competitive careers. Return to play criteria vary; evaluation of body composition may be an important element of clearance. PURPOSE: The purpose of this study was to characterize pre-season body composition and injury prevalence among female Division I soccer and lacrosse players using dual-energy x-ray absorptiometry (DXA).

METHODS: Sixty Division I Women’s Soccer (n=27) and Lacrosse (n=33) athletes (Mean±SD: age:19±1.4 yrs, height, 188±6.2 cm, weight, 70±20 kg), completed a whole body DXA scan to determine fat mass (FM), percent body fat (%Fat), lean mass (LM), segmental lean mass (right leg lean mass (RLM); left leg lean mass (LLM)), and bone mineral content (BMC). History of lower extremity injury (ACL and other knee injuries) throughout a career was self-reported using a validated qe stionnaire. Measurements were taken pre-season (August 2018).

RESULTS: Soccer and lacrosse
Players combined (n=6) demonstrated the following body composition characteristics: total body FM (12.3 ± 4.6 kg), total body LM (58.6 ± 13.2 kg), and BMI (2.6 ± 0.3). There were significant differences between body FM and segmental LM (LIM and RLM). Lacrosse athletes had higher %fat compared to soccer athletes: (mean difference [MD] ± SD): 2.5 ± 2.3%; p=0.034. Segmental leg BMI (LIM, RLM) was higher in both legs of soccer athletes (LIM MD: 0.08: 0.4 kg; p=0.004 RLM MD: 0.89 ± 5.2 kg; p=0.001). In the full sample, there was no significant difference (p=0.139) between LIM and RLM. When evaluating injured vs. non-injured athletes in the full sample, 45% of athletes reported a knee injury; %fat was significantly higher for athletes with no injury history (MD: 2.5 ± 0.8%; p<0.001).

CONCLUSIONS: These findings suggest that Division I soccer and lacrosse players who have returned to play following a lower extremity injury do not experience differences in segmental leg lean mass between the left and right leg. Based on the elite level of these teams, these data could portray optimal characteristics of successful athletes returned to play.

3342 Board #30 June 1 8:00 AM - 9:30 AM
Parental Socioeconomic Status and Skeletal Muscle Mass among Chinese College Students
Cong Huang1, Cheng Li1, Ying Tian1, Qiang Wang1, Zhengxue Song1, Zhejiang University, Hangzhou, China. 1Chonnam National University, Gwangju, Korea. 2Republic of 1Shenyang Normal University, Shenyang, China.
Email: hongman@yahoo.com

Purpose: The purpose of this study was to determine the association between parental socioeconomic status and skeletal muscle mass in college students.

Methods: A cross-sectional study including 21688 college freshmen (53% males; 18% females) was conducted in Shenyang, China. Data on body composition, height check-up, and self-reported qe. stionnaire were available from all participants. Skeletal muscle mass assessment was performed by bioelectrical impedance analyzer (TANITA-BC-30M 4). Information on parental socioeconomic status (educational levels, annual income, occupational status) was collected via qe. stionnaires. Educational levels were divided into 4 categories: primary school, middle school, high school, and ≥ college. Annual income was divided as ≤15000, 15000-29999, 30000-49999, and ≥50000 CNY. Occupational status was classified into 4 groups: non-employment, self-employment, blue-collar workers, and white-collar workers. Analysis of covariance was used to adjust the confounding effect of sex, age, ethnicity, hometown location, smoking status, alcohol use, sleep duration, and body mass index.

Results: Mean (standard deviation) body mass was 4.4 ± 0.3 kg in male students and 4.0 ± 0.3 kg in female students. Multivariate analysis showed that college freshmen with higher paternal (mean [95% confidence interval]: primary school, 42.4 ± 4.2; middle school, 45.8 ± 4.2; high school, 46.0 ± 0.8); and ≥ college, 46.4 ± 0.8) had higher skeletal muscle mass after adjustment for potential confounding factors. On the other hand, skeletal muscle mass was not associated with parental annual income and occupational status in this study.

Conclusions: Our study found a positive association between parental educational level and body muscle mass in Chinese college students. Further longitudinal studies on association of parental socioeconomic status with youth’ muscular mass and function are needed.

3343 Board #31 June 1 8:00 AM - 9:30 AM
Diagnostic Accuracy of Adipose Evaluation Indexes to Identify Obesity and Predict Osteoporosis in Chinese Adults
Wei Luo1, Lei Ai1, Yue Zhou1, Biao Sun1, 1Nanjing Sport Institute, Nanjing, China. 2Nanjing University of Science and Technology, Nanjing, China. 3Beijing Sport University, Beijing, China. 4Nanjing Sport Institute, Nanjing, China.

Purpose: To determine the relationship between body composition indexes and body fat percentage (BF%) and bone mineral density (BMD). Receiver operating characteristic curves detected BF%-defined obesity and BMD-defined osteoporosis. Diagnostic accuracy was assessed. Optimal cutoffs by sex and age group were determined by area under the curve, Youden index, and sensitivity.

Setting: Physical examination sites in Chinese urban areas.

Subjects: Representative samples from Han adults (22 1, mean 9.8 years, 20-9). Obesity prevalence increases from 2% (body mass index, BMI) to 26%

3344 Board #32 June 1 8:00 AM - 9:30 AM
The Relationship Between Body Composition with Peak Force and Anaerobic Power in Collegiate Baseball Players
Jeremy R. Pearson1, Tanuj Wadhia, Jacob T. Rauch, Justin Thiel, Jody C. Andersen, Jay O’ Sullivan, Eduardo O. De Souza. The University of Tampa, Tampa, FL.

Purpose: To determine weight change and hydration status of elite Puerto Rican wrestlers in preparation for the National Championship.

Methods: A prospective study in which four years of body composition data was analyzed to determine its association with peak force and anaerobic power for 40 collegiate baseball players (age: 21 ±1±1.0 years; height: 1.83 ± 0.05 m; body mass: 11.4 kg). Each subject performed a DEXA scan as well as a performance test of either a countermovement vertical jump (CJM) (r=0.8 and a Wingate test (WIN) (r=0.3). Pearson’s correlation coefficient was used to analyze the association between body composition parameters (i.e., TLBM, lower body lean mass [LBLM], body fat percentage [BF] and body mineral component [BMC]) with vertical jump peak force (CMJFF) and anaerobic power (i.e., absolute peak power [PP] and absolute average power [AP] on the Wingate test). RESULTS: TLBM was strongly correlated to WIN (PP: r=0.777; p<0.0001, AP: r=0.808; p<0.0001), but only moderately correlated to CMJ (CMJFP: r=0.488; p<0.0001). LBLM was also strongly correlated to WIN (PP: r=0.660; p<0.0001, AP: r=0.718; p<0.0001) but only moderately correlated to CMJ (CMJFP: r=0.60.3; p=0.002). BF had a weak correlation with WIN (r=0.49; p=0.049, AP: r=0.295; p=0.423) and no significant correlation with CMJ (CMJFP: r=0.022; p=0.865). BM was strongly correlated to WIN (PP: r=0.713; p<0.0001, AP: r=0.761; p<0.0001). Our data suggests a strong positive relationship between lean body mass, including bone, with anaerobic power but only a moderate relationship with peak force. Moreover, BM was strongly correlated to performance probably because athletes with more TLBM had greater BM. Surprisingly, there was no association between body fat percentage and performance.

3345 Board #33 June 1 8:00 AM - 9:30 AM
Weight Change and Hydration Status in Elite Puertorrican Wrestlers in Preparation for the National Championship
Enid C. Rivera-Velázquez1, Carmen Nevárez-Alonso2, Farah A. Ramírez-Marrero, FACSM1, Lucia del R. Martinez-Colón 1.

1University of Puerto Rico, Rio Piedras Campus, San Juan, Puerto Rico. 2University of Puerto Rico, Medical Sciences Campus, San Juan, Puerto Rico.

Purpose: To determine body weight change and hydration status of elite Puerto Rican wrestlers in preparation for the National Championship. METHODS: Wrestlers of the national adult pre-selection (15 men, 19 ages, 17 3.4 kg) were evaluated. Body weight (BW) and hydration status based on urine specific gravity (USG) were determined one week before, the day of the official weigh-in and one hour before on the day of the competition. Questionnaires were administered to evaluate methods used to “make weight”. Repeated measures ANOVA (post-Hoc Bonferroni) was used to identify changes in BW and USG between the measurement times. Independent sample t-test was used to detect differences between sex.

Results: Body weight decreased from 40.1 10.5 13.5 kg from the week.
before the competition to the day of the weigh-in, and then increased to $E_2$: 13.8 kg from weight-in to the day of the competition ($F = 27.33, p < .001$). USG increased significantly from 1 week before to the weigh-in (1.024±0.06 vs. 1.028±0.07 g/ml) and decreased on the competition day (1.025±0.07) ($F = 4.32, p < .019$). No differences were found between sex in relative weight change (%) and UGSM. More than 8% of the athletes were classified as significantly dehydrated (USG >1.020) during the evaluations. Fasting, exercise with plastic suits and fluid restriction, were among the most common weight loss methods reported. CONCLUSION: The results indicate that wrestlers of the national adult pre-selection of Puerto Rico did not accomplish adequate hydration status on the day of the competition, even though partial weigh gain was achieved. Education programs for adequate weight and hydration management is highly recommended.

Conclusions: The level of physical activity in children and adolescents has several negative implications for health, such as overweight and decreased physical fitness. PURPOSE: Describe and compare the body composition and physical fitness of schoolchildren according to the recommendation of physical activity, measured by accelerometer. METHODS: The sample consisted of 3 sets of children, 3boys and 3girls, from 9 to 11 years of age, participating in the Mixed-Longitudinal Project of Growth, Development and Physical Fitness from Ilhabela. The variables analyzed were: body weight (kg), height (cm), BMI (kg/m²), skinfolds (mm), circumference (cm), agility (shuttle run/ sec), flexibility (sit and reach), speed (50 meters/ sec) and upper (hand grip/ kg), lower limb (vertical jump/ cm), strength, and abdominal strength (rep). The measures followed the CELAFISCS standardization. Physical activity was measured objectively by means of an accelerometer (ActiGraph, GT3X). Schoolchildren were divided into two groups: a- reached the PA recommendation ($\geq 60$min/day), b- not reached the PA recommendation ($< 60$min/day). To verify data normality, Shapiro Wilk test was used. Comparison of the schoolchildren who did or did not reach the physical activity recommendation was made by test and Mann-Whitney U test. The level of significance was set at $p < .05$. RESULTS: Schoolchildren who reached the recommendation had significantly lower values compared to those who did not meet, respectively for adiposity (sum of 7 skinfolds) $8 \pm 10$ cm vs. $12 \pm 14$ cm; body weight $34.8 kg \pm 5.3 kg$ vs. $40.5 kg \pm 0.9 kg$; height $141.1 cm$ vs. $144.1 cm$; speed $10.1 sec.$ vs. $10.4 sec.$ and agility $12.6 sec.$ vs. $13.5 sec.$ $p < .05$. A significant difference was found in upper and lower limb strength and abdominal strength. CONCLUSION: Children who fulfilled the recommendation of physical activity presented a better body composition, speed, and agility than the children who were insufficiently active.

Table 1. Comparison of the mean values of body composition and physical capacity of schoolchildren, according to the recommendation of physical activity. Mixed-Longitudinal Project of Growth, Development and Physical Fitness from Ilhabela, 2015-2018, SP, Brazil

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value (mean ± SD)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body weight (kg)</td>
<td>34.3 ± 5.3</td>
<td>.001</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>141 ± 11</td>
<td>.01</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>17.1 ± 2.1</td>
<td>.001</td>
</tr>
<tr>
<td>Sum of 7 skinfolds (cm)</td>
<td>66.1 ± 15.2</td>
<td>.01</td>
</tr>
<tr>
<td>Upper limb strength (kg)</td>
<td>15.8 ± 5.2</td>
<td>.01</td>
</tr>
<tr>
<td>Flexibility (sec)</td>
<td>24.2 ± 6.5</td>
<td>.01</td>
</tr>
<tr>
<td>Speed (sec)</td>
<td>10.1 ± 1.2</td>
<td>.01</td>
</tr>
<tr>
<td>Abdominal strength (rep)</td>
<td>10.0 ± 7.5</td>
<td>.01</td>
</tr>
</tbody>
</table>

* significant difference between the values. Table 1. Student or Mann-Whitney test, p < .05.
**3349 Board #37 June 1 8:00 AM - 9:30 AM**  
**Anthropometry Among Non-sedentary Elderly**  
**Tendency Analysis Of Adiposity Over Three Decades**  
Já da Silva Junior1, Rafael Benito Mancini2, Carolina Gonzalez Beltran3, Tatiane Kosimenko Ferrari2, Timoteo Leandro Araujo1, Sandra M. Matsudo3, José da Silva Guedes2, Victor K. Matsudo1.  
1CELAFISCS, São Paulo, Brazil.  
2Univesidade do São Paulo- USP, São Paulo, Brazil.  
3UNIFMU Faculdades Metropolitanas Unidas, São Paulo, Brazil.  
*Univerdade Federal de São Paulo, São Paulo, Brazil.*  

**Purpose:** To analyze the adiposity tendency of non-sedentary elderly women over three decades. **Methods:** The study is part of the Mixed Longitudinal Project of Physical Fitness and Aging of SCS. Sample comprised female subjects, 60 years old and older, involved in a PA program totaling 66 individuals. It was measured subscapular, tricipital and suprailiac skinfold, To analyze the trend, the sample was divided into age groups: 60 to 69 years, 70 to 79 years and 80 years and over. **Statistical analysis:** Polynomial regression models were estimated. In the modeling process, the mean of each one of the anthropometric variables was considered as dependent variable (Y) and the years of evaluation as independent variable (X). For each anthropometric variable, the model that presented the highest statistical significance (p) and the best accuracy measure (r²) was selected. The trend was considered significant when the estimated model obtained p < 0.05. **Results:** Triceps skinfold presented a negative trend over the three decades analyzed. In the age group of 60 to 69 years, the mean triceps skinfold decreased 0.01 mm every year. In the age group of 70 to 79 years, there was a decrease of 0.09 mm every year. In the age group of 80 years and over, the mean decreased of 0.01 mm every year. In the age group of 60 to 69 years, the mean of 3 skinfolds increased 0.01 mm every year in the three age groups analyzed. In the age group of 70 to 79 years, the mean of 3 skinfolds increased 0.01 mm. In the age group of 80 years and over, the subscapular mean increased of 0.1 mm in each year; while suprailiac presented an increase of 0.01 mm every year; and the 3 skinfold mean increased of 0.01 mm every year. **Conclusion:** Elderly women of all age groups showed a tendency to increase central adiposity and decrease the peripheral region, suggesting that a centripetal fat redistribution occurs with aging.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Subscapular</th>
<th>Triceps</th>
<th>Suprailiac</th>
<th>Mean of 3 Skinfolds</th>
<th>Mean Decrease (mm/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-69</td>
<td>16.8</td>
<td>33.2</td>
<td>13.7</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>70-79</td>
<td>18.3</td>
<td>38.1</td>
<td>15.5</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>80+</td>
<td>19.5</td>
<td>40.4</td>
<td>17.0</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

**Conclusion:** Elderly women of all age groups showed a tendency to increase central adiposity and decrease the peripheral region, suggesting that a centripetal fat redistribution occurs with aging.

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**3351 Board #39 June 1 8:00 AM - 9:30 AM**  
**Effect of Moderate Intensity Physical Activity and Modality on Measures of Body Composition in Males**  
Brian Tyo, Kate Early, Clayton Nicks, Janes Davis, Cory Gibson, Columbus State University, Columbus, GA.  

**Purpose:** To determine the effect of moderate intensity physical activity using different exercise modalities on body fat percent (BF%) measured by ADP, whole body bioelectrical impedance (WBA), upper body bioelectrical impedance (UBA), and lower body bioelectrical impedance (LBA). **Methods:** Seventeen male participants (33.1 ± 8.5 years; 23.0% ± 8.0% body fat) were included in the study. Participants exercised using TW, LC, and AC (5-55% heart rate reserve) for 30 minutes on different days including a control condition. BF% was measured pre exercise (PreE), immediately post-exercise (PE15), 15 minutes post-exercise (PE30) and 30 minutes post-exercise (PE60).  

**Results:**  
- BF% measured by ADP was significantly less than PreE (p<0.05). Following AC, PE0 was significantly different from PE15 only.  
- Using LBA, after TW only BF% measured at PE0 and PE15 were significantly less than PreE (p<0.05). Following AC, PE0 was significantly different from PE15-P60, but not PreE (p=0.06). Using LBA, after TW only BF% was measured at PE10 and PE15 and BF% was significantly less than PreE (p<0.05).  
- Conclusion: BF% measured by ADP after exercise decreases with all modalities, but generally returns to PreE measures within PE15. WBA and UBA BF% are not affected by exercise modality over time. However, LBA BF% tends to decrease following TM but returns to PreE measures within 6 minutes.

**3352 Board #40 June 1 8:00 AM - 9:30 AM**  
**Comparison of Different Methods Used to Assess Body Composition in College Aged Athletes**  
University of New England, Biddeford, ME.  

**Purpose:** The purpose of this study was to compare the most common methods of measuring body composition that are currently being used today in order to determine: 1) how much of a difference exists between the different techniques, and 2) the relationship of the different methods of measuring body composition. **METHODS:** Thirty-nine healthy males (age=20±2 y; body weight=97.3±21.2 kg; height=1.79±0.06 m) had their body composition assessed five different ways. Prior to each testing day subjects completed a 10-12 hour fast, did not exercise, and had a Urine Specific Gravity of <1.02. Body composition assessments included skinfold (SF) thickness (Large Skinfold Caliper), Dual Energy X-Ray Absorptiometry (DXA;
GE Advanced Prodigy DXA Encore V17 Software, Ultrasound Thickness (US; BodyMatrix), Bioelectric Impedance (BIA; Tanita Body Composition Analyzer, BF-301) and Underwater Floating (UWW) Equipments. RESULTS: Body fat % for US was 1.18 ± 2.0%, BIA 23.64±7.74%, and DXA 24.98±8.63%. In comparison to DXA, % fat was significantly greater than US, SF, and UWW (p<0.001). In relation to the respect to DXA, correlations ranged from r = 0.76 ± 0.001 to r = 0.70 ± 0.001. CONCLUSIONS: These results suggest that a difference in body fat up to 7.36% can be observed between the different methods assessed. However, the relationship between the different methods is fairly strong. Due to the large variability observed in the different body composition methods assessed, it would suggest the need for developing recommended standard ranges based on the body composition assessment utilized.

**Biopondometry**

Biopondometry (BIS) has been used as an alternative to the more expensive and invasive dual-energy x-ray absorptiometry (DXA) to estimate body composition. PURPOSE: To determine the agreement between two BIS devices in comparison to DXA for measuring body fat percentage (%Fat), fat-free-mass (FFM), and fat-mass (FM). METHODS: Ninety-five subjects (n = 35; f = 60; 30 ± 15 years; 170 ± 15 cm; 2.6 ± 1kg) participated in the study. Both devices utilized whole body right side measurements, one device (BIS1) in supine and the other (BIS2) in standing position. Measurements were taken during a single visit following an 8 hour fast. RESULTS: Bland-Altman analysis revealed BIS1 significantly underpredicted values for %Fat (mean differences ± 95% limits of agreement: 3.09 ± 4.97%) and FM (2.85 ± 5.99kg) and significantly overpredicted FFM (1.15 ± 4.98kg) in comparison to DXA. When compared to DXA, BIS2 significantly underpredicted values for %Fat (1.69 ± 5.16%) and FM (1.81 ± 6.25kg). No significant difference was observed for DXA, US, or water (12.6±4.9; 14.7±5.0 %; p=0.011). CONCLUSIONS: The results suggest that a difference in body fat up to 7.36% can be observed between the different methods assessed. However, the relationship between the different methods is fairly strong. Due to the large variability observed in the different body composition methods assessed, it would suggest the need for developing recommended standard ranges based on the body composition assessment utilized.

**Impact of BMI Changes on the Estimated VO2max by Age and Sex**

<table>
<thead>
<tr>
<th>Age in Yr., Sex</th>
<th>BMI - 19 (kg/m²)</th>
<th>BMI - 2015 18 kg/m²</th>
<th>19 IMRW Time (min)</th>
<th>19 VO2max (ml/kg/min)</th>
<th>2015-16-V O2max (ml/kg/min)</th>
<th>Change (ml/kg/min)</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Male</td>
<td>16 18</td>
<td>19 10.6</td>
<td>5 8</td>
<td>9 1 0.8</td>
<td>0.82 - 1 %</td>
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</tbody>
</table>

**Conclusion**

SF determined %BF after exercise and fluid consumption. CONCLUSION: Acute exercise and fluid consumption impacted ADP determined %BF, but did not have a significant effect on %BF determined by DXA, US, and SF.

**Regional Differences in Bone Mineral Density Vary With Whole Body Z-scores in College Track Athletes**

James M. Smoliga, FACSM, Justin D. Waller, Kevin R. Ford, FACSM, High Point University, High Point, NC. Email: jsmoliga@highpoint.edu

PURPOSE: To determine if college track and field athletes with low BMD experience loss of BMD in the ribs (RIB) to compensate for musculoskeletal loading of the lower extremity. METHODS: 110 NCAA Division 1 track and field athletes (57 males, 53 females) underwent whole body and bilateral hip dual energy x-ray absorptiometry (DXA) scans. Whole body Z-scores and BMD for standard sub-regions, including RIB, were automatically computed by DXA software. Proximal, middle, and distal regions of the femur (FMAx, FMin, FMed) and tibia (TMAx, TMin, TMed) were objectively identified and BMD for each sub-region was computed. In the hip scans, femoral neck (Fhsk), Ward’s triangle

**Conclusion**

Track and field athletes are susceptible to musculoskeletal injuries due to a combination of insufficient recovery and excessive training. Stress fractures in these athletes are common, especially in distance runners, and are associated with decreased regional and whole body bone mineral density (BMD).

**Conclusion**

To determine if college track and field athletes with low BMD experience loss of BMD in the ribs (RIB) to compensate for musculoskeletal loading of the lower extremity. METHODS: 110 NCAA Division 1 track and field athletes (57 males, 53 females) underwent whole body and bilateral hip dual energy x-ray absorptiometry (DXA) scans. Whole body Z-scores and BMD for standard sub-regions, including RIB, were automatically computed by DXA software. Proximal, middle, and distal regions of the femur (FMAx, FMin, FMed) and tibia (TMAx, TMin, TMed) were objectively identified and BMD for each sub-region was computed. In the hip scans, femoral neck (Fhsk), Ward’s triangle
and long-term bone health in athletes.

Future research should explore the clinical implications of this finding for stress fracture risk in specific regions of the legs in athletes with the lowest whole body Z-scores. Future studies should examine relationships between DXA % Fat and all 8 US sites. Observations were combined from each center for both female and male athletes to yield a single database for each center per each sex, with 3 sets of 8 sites.

**METHODS:**

Three centers (Perth, Colorado, Lisbon) performed whole body DXA scans. The criterion and comparison methods used were DXA (62.5%), 4C (10.9%), ADP (9.4%), and SOTT (9.3%) for TBW by isotope dilution. The criterion method in male and female athletes.

**RESULTS:**

Significant correlations between DXA % fat and all 8 US sites (r= -3.0 - .87, p<0.01) were found. Using step down multiple regression analyses all 8 sites were entered into the analyses to predict DXA % fat. Three sites for females (lower abdomen (LA), medial calf (MC), distal triceps (DT); p<0.001, SEE=2.4-2.6%); and two sets of sites for males: LA, MC, and erector spinae (ES) (p<0.01; SEE=1.8-2.2%), and upper abdomen (UA), MC, ES (p<0.01; SEE=1.9%) were found to be the best predictors.

**CONCLUSIONS:** These findings show that DXA % fat can be predicted with low SEE's in both male and female athletes.

**PURPOSE:** To determine the recent prevalence of body composition criterion methods in validation studies of total body percent fat or fat free mass.

**METHODS:** A literature search was performed to identify studies between 2013-2019 ing the following key words: four component model, validation, body composition, and fat using Medline. Only human studies published in English were included. One person (L. Miliken) screened all articles and coded the results to identify the criterion and comparison methods used. For all studies where multiple component models were used, a further note was made regarding what methods were used in each study.

**RESULTS:** A total of 176 articles were identified, 128 measured total body composition or body volume articles and were included. Some studies used more than one criterion method. 10.9% of studies used a 2 component (2C) model, 3.6% used a 3C model and 10.8% used a 4C model as a criterion method. The most common 2C, 3C, and 4C models respectively were air displacement plethysmography (ADP) (8.0%), dual-energy x-ray absorptiometry (DXA) (8.0%) and ADP/DXA/total body water (TBW) (6.9%). 3.9% of studies used an inappropriate 3C or 4C model by using biopondence spectroscopy (BIS) in place of TBW by isotope dilution. The criterion methods used in order of prevalence were DXA (58.8%), 4C (10.9%), ADP (8.0%), and FMI (8.0%).

**CONCLUSIONS:** Body composition validation studies are dominated by DXA as a criterion method which may not be appropriate in all situations. Also, researchers are incorrectly using field methods rather than laboratory methods (most commonly using 4C for TBW) as part of the model in validation studies. The gold standard for body composition validation studies remains the 4C model with TBW determined by isotope dilution.

**RESULTS:**

There were significant main effects for BMD to differ between quintile groups. Pairwise comparisons revealed the upper quintile group had significantly lower ratios for these two parameters than all other quintile groups. CONCLUSION: Decreased BMD in RIB and all sub-regions of the legs, combined with elevated FMI and RIB ratios, suggest that BMD is lost from the ribs at a greater rate than it from specific regions of the legs in athletes with the lowest whole body Z-scores. Future research should explore the clinical implications of this finding for stress fracture risk and long-term bone health in athletes.

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Measurement of resting metabolic rate (RMR) is an important factor for weight management. Previous research has reported several variables to estimate RMR such as body size, percent fat (%BF), age, and sex; however, little is known regarding the effect of circumference measures in estimating RMR. PURPOSE: The purpose of this study was to develop a model to estimate RMR using waist circumference (WC), an easily obtainable measure, and cross-validate it to previously published models. METHODS: Subjects were 10 adult men and women, ages 18-65 yrs. RMR was measured through indirect calorimetry, %BF was measured through air displacement plethysmography, and fat mass and fat-free mass were determined from %BF and weight. Other variables collected were: weight, height, age, sex, ethnicity, body mass index, WC, hip circumference, calf-to-bi-hip ratio, waist-to-height ratio, and %BF estimated from bioelectric impedance analysis. Subjects were randomly divided into derivation and cross-validation samples. A multiple regression model was developed to determine the most accurate estimation of RMR in the derivation sample. Cross-validation sample was used to confirm the accuracy of the model and to compare the accuracy to published models. RESULTS: The best predictors for estimating RMR were body weight, r = 0.9, p < 0.01, age, r = -0.3, p = 0.12, and sex, r = 0.5, p < 0.01. Other factors failed to account for significant variation in the model. The derived equation for estimating RMR is: RMR (kcal/day) = 81 + 1.1 * weight - 43(age) + 228*sex, M = 1, F = 0, R² = 0.85, SEE = 13 kc aday. Cross-validation statistics were: R² = 0.54, p < 0.05, SEE = 199 kcal/day, and total error = 198 kcal/day. In published models, R² ranged from 0.3 to 0.75. EE ranged from 190 to 213 kcal/day. In published models, CONCLUSIONS: Cross-validation to published models for estimating RMR were similar to those of the derived model; however, the total error in the derived equation was lower than any of the previously published models. Several published models considerably overestimate RMR compared to the current model. The results of this study suggest that RMR can be reasonably estimated with easily obtainable measures which allow for estimation and implementation of RMR for weight management in clinical practice.

G-35 Free Communication/Poster - Fitness Assessment
Saturday, June 1, 2019, 7:30 AM - 11:00 AM
Room: CC-Hall WA2

3361 Board #49 June 1 9:30 AM - 11:00 AM Health and Fitness Differences Between Urban and Rural Costa Rican Older Adults Luis Solano-Mora1, Mba; Ca Salazar-Villanueva2, Luis E. Araya-Oregga2, Esmeralda da Valdivieso-Mora2, David K. Johnson3, Yamileth Chacón3 - Araya2, José Moncada-Jiménez4; 1National University, Heredia, Costa Rica; 2University of Costa Rica, San José, Costa Rica; 3University of Kansas, Lawrence, KS; 4University of California, Davis, CA. Email: jose.moncada@ucr.ac.edu

Costa Rica has one of the highest life expectancies in America, even higher than the United States. Studies addressing health and fitness in Latin American urban and rural older adults are scarce. PURPOSE: The purpose of the study was to test the hypothesis that older adults from rural areas present fewer negative health conditions and higher fitness than older adults from urban zones. METHODS: 296 participants aged 60 to 85. Population were rural (n=110) and urban (n=186). The study took place during 28 months. Urban participants lived in 40 municipalities. RESULTS: Significant differences were found between urban and rural older adults. CONCLUSION: This study suggests that Costa Rican older adults have better physical health and fitness compared to rural older adults.

3362 Board #50 June 1 9:30 AM - 11:00 AM A Comparison of Back Squat & Safety Squat Bar on Measures of Strength, Speed, and Power in NCAA Division I Male Baseball Players Richard Meldrum, Mark DeBeliso, FACSM; Southern Utah University, Cedar City, UT. (Sponsor: Mark DeBeliso, FACSM) Email: r.meldrum00@gmail.com

A Comparison of Back Squat & Safety Squat Bar on Measures of Strength, Speed, and Power in NCAA Division I Male Baseball Players Richard Meldrum, Mark DeBeliso, FACSM; Southern Utah University, Cedar City, UT. (Sponsor: Mark DeBeliso, FACSM) Email: r.meldrum00@gmail.com

Results. Squat 1 exercise variations are considered a cornerstone of resistance training (RT) programs. Understanding the effectiveness of differing squat exercise variations is important for coaches and athletes in order to optimizing the effectiveness of a RT program. PURPOSE: The current investigation examined a comparison of the standard Olympic barbell loaded back squat (BS) with a squat that performed a safety squat bar (SSB). METHODS: Twenty-eight Division I male baseball players (172± 1.1 years, 17.5± 5 m, 81± 3 kg) participated in a RT program comprised of two workout sessions a week for nine weeks, performing either a BS or SSB utilizing an autoregulatory progressive resistance periodization protocol, concurrent with their existing, season-specific, RT program. RESULTS: The BS group (n=14) utilized the SSB bar with the goal of minimizing stress on the shoulder and elbow joints during the execution of the squat. The non-pitchers (n=14) performed the Olympic barbell BS. Lower body strength (estimated 1RM squats kg), sprint speed (BS: sprint: secs), and vertical jump (VJ: cms) were assessed prior to and following the RT training period. RESULTS: The BS had a significant positive improvement from pre to post RT for both the BS (pre: 86.8± 8.0, post: BS: 80.0± 6.0, p<0.01), and the SSB groups (pre: 112.3± 4.9, post: 152.6± 22.0, p<0.05). The 54.86 m sprint did not improve significantly from pre to post RT for either the BS (pre: 7.12± 0.33, post: BS: 7.05± 0.26 or SSB groups (pre: 2.3± 0.17, post: 2.9± 0.20, p>0.05). When comparing gain scores between each group there was no significant difference between the BS and SSB groups for either BS: sprint or VJ (p>0.05). However, the estimated squat 1RM gain score for the SSB was significantly greater than the BS group (p<0.05) noting that the effect size of change from pre to post RT was small and indicated low effect sizes for the BS and SSB groups respectively. CONCLUSION: Given that both squat 1 modalities yielded approximately equal improvements in VJ and lower body strength, coaches and athletes can consider the SSB variation of the squat as a viable option for developing lower body strength and power.

3363 Board #51 June 1 9:30 AM - 11:00 AM Assessment of Bilateral Glenohumeral Posterior Capsule Tightness in Recreational Golfers Andrew Cannon, PT, SCS, MHS, CSCS, Jessica Wagner, Kevin Finn, FACSM, Merrimack College, North Andover, MA. Email: cannona@merrimack.edu

Assessment of Bilateral Glenohumeral Posterior Capsule Tightness in Recreational Golfers Andrew Cannon, PT, SCS, MHS, CSCS, Jessica Wagner, Kevin Finn, FACSM, Merrimack College, North Andover, MA. Email: cannona@merrimack.edu

Purpose. The current study examined glenohumeral posterior capsule mobility of the leading shoulder compared to the opposite shoulder in recreational golfers and non-golfers. METHODS. Participants were twenty-two recreational golfers (13 males, 7 females) mean age 38.6± 18 (SD=18.9) and non-golfers (10 males, 6 females) with a mean age of 32.1 years (SD=12.3). All participants had bilateral glenohumeral posterior capsule mobility measured as medial epicondyle distance from exam table in inches via side lying horizontal adduction of the non weight bearing upper extremity with scapula manually stabilized. Results. Golfers exhibited a statistically significant (P<.001) asymmetry of glenohumeral posterior capsule mobility in their leading shoulder compared to the non-golfer shoulder. Conclusions. The sample of golfers demonstrated an asymmetry in glenohumeral posterior capsule mobility leading to trail shoulder dominance.

3364 Board #52 June 1 9:30 AM - 11:00 AM Relative Periodization for Aging Adults: An In-Depth Review of Methods and Outcomes for Athletic Performance and Health Andrew Akers, Amanda Perini, Abigail Young, FACSM, Merrimack College, North Andover, MA. Email: r.meldrum00@gmail.com

Relative Periodization for Aging Adults: An In-Depth Review of Methods and Outcomes for Athletic Performance and Health Andrew Akers, Amanda Perini, Abigail Young, FACSM, Merrimack College, North Andover, MA. Email: r.meldrum00@gmail.com

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that was not seen in the non-golfing population. Clinical consideration should be given to this asymmetry in training and care of the golfing athlete especially as it relates to limitations in shoulder mobility and motion.

**CONCLUSIONS**

- Differences in sitting and side-lying tests were likely due to the difference in seated and side-lying tests: the left side was stronger than the right side for ER (seated: 7%; p = 0.044, side-lying: 9% p = 0.04) and the right side stronger than the left side for IR (seated: 7%, p = 0.008). Inter- and intra-tester ICCs are reported in Table 1.
- The left side was stronger than the right side for ER (seated: 7%, p = 0.044; right side: stronger than left side) and for IR (seated: 7%, p = 0.008). Inter- and intra-tester ICCs are reported in Table 1.
- Hip ER and IR strength testing had poor intra- and inter-tester reliability. The right/left difference in seated and side-lying tests suggests that tester hand dominance may be a confounding factor.
- These data highlight the need for more reliable hip rotation strength testing.

### Table 1

<table>
<thead>
<tr>
<th></th>
<th>IR</th>
<th>ER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seated</td>
<td>0.67</td>
<td>0.67</td>
</tr>
<tr>
<td>Side-lying</td>
<td>0.58</td>
<td>0.67</td>
</tr>
</tbody>
</table>

**CONCLUSIONS**

- The left side was stronger than the right side for ER (seated: 7%; p = 0.044, side-lying: 9% p = 0.04) and the right side stronger than the left side for IR (seated: 7%, p = 0.008). Inter- and intra-tester ICCs are reported in Table 1.
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- These data highlight the need for more reliable hip rotation strength testing.

## 3366

**Board #54**  June 1 9:30 AM - 11:00 AM

**Reliability and Validity of Hip Rotation Strength Tests: Systematic Error Due to Tester Hand Dominance**

Connor Fedge1, Tim Tyler2.


Email: conor fendge@gmail.com

(No relevant relationships reported)

**PURPOSE**

Manual muscle testing using hand-held dynamometry (HHD) is commonly utilized and for a more objective measure. Deficits in hip rotation strength have been linked to lower extremity pathology, but measurement reliability is unknown. The purpose of this study was to assess the reliability and validity of hip internal (IR) and external (ER) rotation strength in three positions.

**METHODS**

Right and Left Hip IR and ER strength was measured using HHD in 20 patients, (30 ± 12 years, 9 women, 11 men), using 3 tests (seated, supine, side-lying), at two different time points (Test 1, Test 2), by two different testers (A and B). Strength was reported as torque (N·m/kg). Interrater and intertester relative reliability were assessed using intraclass correlation coefficients (ICC).

**RESULTS**

- Torque was highest for the seated tests, followed by the supine (13% lower than seated), and side-lying (25% lower than seated).
- There was a systematic difference between left and right legs for the seated and side-lying tests: the left side was stronger than the right side for IR (Seated: 7%, p = 0.044, Side-lying: 9% p = 0.04) and the right side stronger than the left side for IR (Seated: 7%, p = 0.008).
- Inter- and intra-tester ICCs are reported in Table 1.

**CONCLUSIONS**

Hip ER and IR strength testing had poor intra- and inter-tester reliability. The right/left difference in seated and side-lying tests suggests that tester hand dominance may be a confounding factor. These data highlight the need for more reliable hip rotation strength testing.
Rock climbing has been increasing in popularity both recreationally and competitively. Indoor sport rock climbing is a type of climbing where the climber ascends a wall using artificial rocks (hand and foot holds) and is attached to a safety rope. Despite this increase in popularity of the sport, responses to physiological stress compared to climbing as an exercise to specific muscle groups are not well defined in literature. PURPOSE: The purpose of this study was to quantify the change in handgrip strength over a 30-minute bout of continuous climbing, specifically in intermediate sport climbers. An additional aim of this study was to quantify any change in forearm girth over a bout of climbing and compare it to the change in handgrip strength. METHODS: Ten intermediate rock climbers [Age: 25 ± 6 years; Height: 1.85 ± 0.2 m; Mass: 74.5 ± 3.2 kg; Body Fat %: 15.8 ± 5.7%; Years Climbing: 7.3 ± 4.9 years] consented to participate and completed baseline handgrip dynamometry and forearm tape measure. A climbing profile questionnaire included each participant's rock climbing experience and defined them as intermediate climbers. Each participant ascended one of two 5.9 YDS (Yosemite Decimal System) routes as many times as possible within 30 minutes. After each ascent, heart rate, handgrip strength and forearm girth was measured. Data were analyzed using repeated measures ANOVA and correlation with significance accepted at p < 0.05 level. Dominant and non-dominant handgrip strength decreased by 22% (p = 0.002) and non-dominant handgrip strength decreased by 23% (p = 0.002) compared to pre-climb. Dominant and non-dominant forearm girth increased by 4.4% (p = 0.001), the average heart rate while climbing was 71 ± 4.2% of age-predicted HRmax. The rest times in between ascents were 1:22:33:32. CONCLUSIONS: These results show that over a 30 minute bout of climbing, intermediate climbers' handgrip strength decreases and forearm girth increases. It is possible that with longer rest times, handgrip strength would not decrease as substantially. These results contribute to the existing literature and increase understanding of the physiological demands of indoor sport rock climbing.
Firefighting is a physically demanding profession that requires optimal muscular fitness levels. Until now, there have been no studies investigating longitudinal changes and characteristics of the muscular fitness of firefighters. PURPOSE: To investigate the changes in the resting and firefighter’s muscular fitness test over 6 years for each gender. METHODS: Muscular fitness data was received from the National Fire Academy and represented firefighters working in Seoul from 2011 to 2016. We analyzed the muscular fitness from a total of 30,933 people over a 6-year period. The data was made using ANOVA and multiple regression analysis.

RESULTS: Grip strength shows statistically significant differences between genders (Fmale = 256.808, Female = 10.856, both p < .001) every year. Records show that grip strength decreased as age increased (B = -3.36; records also show that grip strength improved in later years (B = -1.13). The results show that males’ grip strength was higher than that of females (B = 22.29). Back strength increased each year showing statistically significant improvement for each gender (Fmale = 1061.565, Female = 44.921, both p < .001). Records show that back strength decreased as age increased (B = -1.17); records also show improvements from year to year (B = 6.18). As the years went on, male firefighters showed a bigger improvement than female firefighters (B = 80.276). Sit-up records each year show statistically significant differences between genders (Fmale = 515.581, Female = 23.336, both p < .001). Sit-up results decreased as firefighters aged (B = -395); sit-ups increased each year (B = 1.525). Results among males were higher than among females (B = 10.93).

CONCLUSIONS: This study provided basic data on firefighter muscular fitness tests and practical information that can be used to train programs. The characteristics of firefighter’s tasks show that female firefighters need to perform their duties under the same conditions as male firefighters. However, results show that female firefighters are not testing as well in those three categories. Female firefighters should be required to carry out some tasks in emergency situations. Supported by the Field-oriented Support of Fire Fighting Technology Research and Development Program funded by NFA (MPSS: Fire-safety 2017)
CONCLUSION: Within the limitations of this study, a self-selected psyching up technique provided no significant advantage on maximal weight lifted in the deadlift exercise compared to a distraction technique in experienced male lifters. Further investigation is recommended using a larger sample size.

METHODS: Twenty-nine National Collegiate Athletic Association Division 1 women athletes (basketball (WBB): n=11; lacrosse (WLAX): n=18) completed a continuous GXT to volitional fatigue. Speed increased following each 1-minute stage with a 1% constant grade. VO2max indicated the highest VO2 achieved during a single test, while VO2peak indicated the subject’s functional limit was reached. The criteria to attain VO2max were: VO2 plateau of <0.15 L/min with an increase in the last two workloads; maximum heart rate (HRmax) within 10 bpm of age-predicted heart rate max; respiratory exchange ratio (RER)>1.10; rating of perceived exertion (RPE, 1-10 scale); 8); blood lactate (LAC) collected 5 min post-test >2 mmol/L. The attainment ≥ 3 of ≥ criteria was required for VO2max. Independent t-tests were used for comparison of two mean values, and chi-sqa red test was used for comparison of criteria attainment. Alpha level was set at p<0.05.

RESULTS: Relative VO2max values did not differ between teams (WBB: 53.5 ± 8.1; WLAX: 53.8 ± 5.4 mL∙kg⁻¹∙min⁻¹). The percent of athletes that met each of the five criteria were: plateau (WBB: 5%, WLAX: 6%); HRmax (WBB: 25%, WLAX: 3%); RER (WBB: 0%, WLAX: 7%); RPE (WBB: 12%, WLAX: 8%); LAC (WBB: 100%, WLAX: 8%). More WLAX attained VO2max than VO2peak (5% vs. 0%), while WBB was evenly distributed between VO2max (8%) and VO2peak (8%). There was no statistical difference between WBB and WLAX in VO2max or the number of athletes from each team who met each individual criterion. Significant differences between teams were observed for LAC (WBB 13.3 ± 1.7 W/LAX 10.3 ± 2.3 mmol/L; p<0.001) and RER (WBB 0.6 vs. 0.5 W/LAX 1.04 vs. 0.9 p=0.002). These findings suggest physiological responses to a fixed VO2peak protocol may vary between sport teams of different metabolic demands. Consideration should be given to such variations when selecting test protocols and interpreting results.

INTRODUCTION: Astronauts complete maximal aerobic capacity (VO2max) testing as part of their annual fitness assessment (AFA) as well as several times once assigned to an International Space Station mission. Historically, the 2-Way T-Shape Non-Rebreathing valve with a mouthpiece and nose clip (mouthpiece) has been used in these tests. The testing procedure was updated to use the oro-nasal mask (mask) for the AFA starting in June 2017. Astronauts who used the mask during their AFA rope sted it be certified to be used for all mission associated tests. Considering the criticality of the data and the schedule constraints of astronauts, it is imperative that the requested hardware change provide data with equivalent reliability and repeatability as provided by the mouthpiece. PURPOSE: To assess the reliability of mask vs. mouthpiece by comparing submaximal and VO2peak data within subjects (approximately 1 year apart).

METHODS: Each of 16 active astronauts completed a VO2peak test with the mouthpiece (first) and the mask (second) for their AFA. The VO2peak test was conducted on a cycle ergometer with a metabolic cart. The nominal protocol started with a 3 minute warm-up at 6 Watts (W) and increased 2W every minute until volitional fatigue (Light: 15W; normal: 18W). The VO2peak were compared between tests and the expected day-to-day variation (±5%) was used as the threshold for determining agreement between tests. Submaximal values were plotted and evaluated visually for deviations between mask and mouthpiece.

RESULTS: VO2peak values were more than 3% different, despite similar test times, between mouthpiece and mask in 6 of 17 comparisons, 3 of which were higher with the mask (0.8 ± 0.3%) while 3 were lower (-10.8 ± 2.0%) with the mask. The submaximal data did not indicate a leak in either apparatus during these tests. An Astronaut Strength & Conditioning Rehabilitation specialist confirmed that the measured differences in VO2peak of these 16 astronauts was consistent with observed changes in exercise habits during the year that separated the two tests. CONCLUSION: Despite presented with this data, the testing effort the mask was accepted for use in all tests, accepting that, if a leak is detected without resolve, the test will be repeated (if schedule allows) and remaining tests will be completed with the mouthpiece.

PURPOSE “Affective mind-set” is a mental frame or lens that selectively organizes. Previous reports proved that activation of the left anterior brain region is linked with the optimistic affective mind-set. Aerobic exercise such as moderate-intensity interval training (MCT) and moderate continuous training (MCT) activates the frontal area of the left hemisphere, which gives euphoric feelings. However, whether interval training is appropriate for stimulating an optimistic affective mind-set is unknown. We hypothesized that interval, rather than continuous, training activates the left brain. This study aimed to evaluate which exercise can activate the left brain more by using three different kinds of bicycle exercise. METHODS: Participants were six healthy male volunteers. The three bicycle exercises used were MCT, HIT, and high-intensity interval training (HIT). Exercise intensity was considered in the assessment of the peak heart rate (PRH) induced by the cardiopulmonary exercise test. A occurs PRH was defined as moderate intensity; and 90% PRH, as high intensity. The MCT protocol included 3 min of warm-up (WU) and 8 min of moderate-intensity (90% PRH) continuous exercise, 3 min of cooldown (CD), and 10 min of rest. The HIT protocol was composed of 3-minute WU, 4-erm of moderate-intensity (90% PRH) exercise, active rest (90% PRH), 8 min CD, and 10-min rest. The HIT protocol was composed of

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a 3-min WU, 4 erm of high-intensity (60% PHR) exercise with active rest (50% PHR), 3-min CD, and 10-min rest. Body mass index (BMI) was calculated using the formula weight (kg) / height (m)^2.曉 was performed during each session. Data were compared using intra-class correlation (ICC). RESULTS: Arm fat percentage was significantly higher (p=0.001) in females compared to males. CONCLUSION: Arm fat percentage was significantly higher in females compared to males.

3381
June 1 9:30 AM - 11:00 AM
Board #69
Forearm Circumference as a Sarcopenic Indicator in Older Mexican Population. A Preliminary Study
Ermilio Canton-Martínez1, Juan R. Gallegos-Ramírez2, Iván Rentería1, Patricia C. García-Suárez1, José Moncada-Jiménez1, Alberto Jiménez-Maldonado1, 1Universidad Autónoma de Baja California, Campus Ensenada, Mexico. 2University of Costa Rica, San José, Costa Rica.

The 10.5% of the total Mexican population is 60 years and older, and it is expected that this percentage will increase. This age group is at risk for sarcopenia and related comorbidities. The purpose of this study was to assess forearm circumference as a sarcopenic indicator in older Mexican adults. METHODS: A sample of 40 older adult community-dwelling Mexican participants (20 females, 20 males; age range: 65-80 years) was recruited from a community center and a local gym. Forearm circumference was measured at the midpoint of the forearm. RESULTS: The forearm circumference in older adults was 29 ± 4 cm for females and 31 ± 4 cm for males. The forearm circumference of females was significantly lower (p < 0.05) than that of males. CONCLUSION: Forearm circumference can be used as a sarcopenic indicator in older Mexican adults. Further studies are needed to validate this finding in a larger sample.

3382
June 1 9:30 AM - 11:00 AM
Board #70
Aerobic Fitness And Body Composition Of Individuals With Anterior Cruciate Ligament Reconstruction
Ashley N. Trippett, Christopher M. Kuenze. Michigan State University, East Lansing, MI.

Anterior cruciate ligament reconstruction (ACLR) requires on 6-12 months of rehabilitation, often resulting in long periods of sedentary behavior. Following rehabilitation, only 80% of patients fully return to pre-injury level of sport participation, placing them at elevated risk of developing a physically inactive lifestyle. It is unknown whether ACLR negatively impacts aerobic fitness and body composition in the months following surgery. PURPOSE: To compare body composition and aerobic fitness between women with ACLR and healthy controls. METHODS: Nine women with ACLR (<5 yrs post-ACLR, age=21.2±3.9 yrs) and seven healthy women (age=22.4±3.7 yrs) were recruited. RESULTS: A slight difference in absolute VO2peak was observed between groups (WU: 42.0±42.6 vs. HI: 38.8±38.3 mL/kg/min; p<0.05). However, test-retest reliability (intra-class correlation coefficients; ICC) was not significantly different compared to international norms. Forearm circumference and BMI relative to height might be considered appropriate assessment measures to explore sarcopenic condition in female Mexican older adults.

3383
June 1 9:30 AM - 11:00 AM
Board #71
Achievement of Healthy Fitness Zone by Academic Major in College Students from Puerto Rico
Lucía del R. Martínez-Colín1, Maniliz Segarra1, Mariym Villalobos2, Israel Almodovar-Rivera1, Maritza J. Ruiz-Nieves1, Farah A. Ramirez-Marrero1, FACSM1, 1University of Puerto Rico, Rio Piedras Campus, San Juan, PR. 2University of Puerto Rico, Medical Sciences Campus, San Juan, PR.

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Healthy fitness components such as body composition, cardiorespiratory endurance, and muscle strength are associated with disease risk and premature mortality. Factors influencing health related fitness in college-aged students are unclear, and academic major has not been yet considered. PURPOSE: To assess and compare the achievement of healthy fitness zone (HFZ) by academic major in college students from Puerto Rico. METHODS: College students (331 females, 28a males, 18-25 years of age) enrolled in elective courses at the Physical Education Department of the University of Puerto Rico (PR), completed the Fitnessgram® assessment protocol. A achievement of HFZ was determined for each component: strength-endurance fitness (SEF) with push-up, curl-up, and trunk lift; flexibility fitness (FF) with back-saver sit and reach, and shoulder stretch; body composition fitness (BCF) with BMI, and %fat; and cardiorespiratory fitness (CFR) with the 20-m PACER test. Students were also classified according to their academic major: teacher education (TE), physical education (PE), natural sciences (NS), business administration (BA), and others (OP) including social sciences, humanities, communication, and general studies. Froce nics and percentages of students achieving the HFZ in each component were determined, and Chi-squares used to detect differences by academic major and sex. RESULTS: HFZ for the SEF component was achieved by 66% of participants, FLF by 58%, and CRF by 62%. More males than females were in the HFZ for FLF (p=0.03), body composition fitness (p<0.001), and CRF (p=0.001); while more females than males were in the HFZ for BCF (6% vs. 3%; p<0.001). More PE majors were in the HFZ in SEF (2% vs. 85% vs. 97% for TE, NS, BA, and OP majors, respectively; p<0.01) and CRF (48% vs. 74, 34 and 19% for TE, NS, BA and OP majors, respectively; p<0.01) and CRF (48% vs. 74, 34 and 19% for TE, NS, BA and OP majors, respectively; p<0.01) and CRF (48% vs. 74, 34 and 19% for TE, NS, BA and OP majors, respectively; p<0.01) and CRF (48% vs. 74, 34 and 19% for TE, NS, BA and OP majors, respectively; p<0.01) and CRF (48% vs. 74, 34 and 19% for TE, NS, BA and OP majors, respectively; p<0.01) and CRF (48% vs. 74, 34 and 19% for TE, NS, BA and OP majors, respectively; p<0.01) and CRF (48% vs. 74, 34 and 19% for TE, NS, BA and OP majors, respectively; p<0.01) and CRF (48% vs. 74, 34 and 19% for TE, NS, BA and OP majors, respectively; p<0.01) and CRF (48% vs. 74, 34 and 19% for TE, NS, BA and OP majors, respectively; p<0.01) and CRF (48% vs. 74, 34 and 19% for TE, NS, BA and OP majors, respectively; p<0.01) and CRF (48% vs. 74, 34 and 19% for TE, NS, BA and OP majors, respectively; p<0.01) and CRF (48% vs. 74, 34 and 19% for TE, NS, BA and OP majors, respectively; p<0.01).
majors, respectively, P<0.001). No differences were observed by academic major for FLF and BCF. CONCLUSION: Although a relatively high proportion of students achieved HFZ criterion in SEF, BCF and FLF, standards proportionate to achieving CRF, particularly females, is of concern. Results also suggest that academic major should be considered when developing strategies to promote the achievement of HFZ in critical health components such as CRF and SEF among college students in PR. Supported by FIP/DEGU/UPRRP.

The physical demands of firefighting are evident, and a high level of physical fitness is required to perform the job safely. Despite the clear need for adequate physical fitness, the majority of firefighters (FF) remain unfit for duty. Regular exercise is an effective strategy to prevent/attenuate multiple health risks, as well as improve health and job performance. PURPOSE: To investigate the relationship between physical fitness (i.e., cardiovascular endurance and muscular endurance) and performance on the Academy FF Challenge (AFC). METHODS: During the first week (1) and last week (7) of the AFC, FF recruits repeated each exercise (e.g., sit-ups and push-ups and Young Men's Christian Association (YMCA) bench press), while FF ability was assessed via cardiovascular endurance (estimated VO_{2mm} via 1.5 mile run time) and muscular endurance (6- second sit-ups and push-ups and Young Men’s Christian Association (YMCA) bench press). CONCLUSIONS: Firefighting is a challenging occupation that requires these individuals to be in peak physical condition. Targeting FFs early in their careers and highlighting the importance of fitness is extremely vital to developing healthy, safe, and efficient FFs. By better understanding the relationship between physical fitness and firefighting ability, exercise specialists, researchers, and physicians may be able to better prescribe exercise in this population.

Phipps, E. W., Phillips, J. J. 1, Phillips, E. M. 1, Lang, J. J. 1, Orpana, H. O. 1, Pizarrorivera, F. A. 1, Ramírez, O. A. 1, Matto, L. A. 1, Desjardins, C. A. 1. 1Public Health Agency of Canada, Ottawa, ON, Canada. 2Illinois Fire Service Institute, Champaign, Urbana, IL. 3University of Illinois in Champaign, Urbana, IL. 4Illinois Fire Service Institute, Champaign, IL. (Sponsor: Steven J. Petruzello, FACSM) (No relevant relationships reported)
Acute Effect of Ischemic Preconditioning on Special Judo Fitness Test
Jeferson Vianna1, Aline Aparecida de Souza Ribeiro2, Jefferson Da Silva Novaes3, Daniel Godoy Martinez2, Luiz Guilherme Da Silva Telles1, Mateus Camaroti Laterza3, Leandro Raider3, Patricia Panza1, Victor Machado Resti1, Universidade Federal de Juiz de Fora, Juiz de Fora, Brazil. 1Center of Higher Education of Valença / Dom Álvaro Arcorede Educational Foundation, Brazil, Valença, Brazil. 2Rio de Janeiro Federal University, Brazil, Rio de Janeiro, Brazil. 3University of Trás-os-Montes and Alto Douro, Portugal, Portugal.

Ischemic preconditioning improves the physical fitness of athletes of different sports modalities. However, until now, there is no evidence of the effect of ischemic preconditioning (IPC) on the performance of judo athletes.

PURPOSE: Verify the acute effect of IPC on the Special Judo Fitness Test (SJFT) performed by judo athletes. METHODS: The study involved 13 udo athletes (age=21.35 ± 3.46 years, practice experience=8.94 ± 3.88 years, height = 1.73 ± 0.9m, body mass=69.3 ± 10.9kg). In the first session, they answered the questionnaires, underwent the anthropometric evaluation and the familiarization of the SJFT. The SJFT was used to evaluate the athletes’ physical fitness. In the second and third sessions, two experimental protocols were performed in a randomized and counterbalanced manner: a) IPC (3 cycles 5 min in ischemia at 220 mmHg / 5 min in reperfusion at 0 mmHg) + SJFT, and b) SHAM (3 cycles 5 min in ischemia at 20 mmHg / 5 min in reperfusion at 0 mmHg) + SJFT. A 30-minute interval between the experimental protocols and the SJFT and 24 h between the 2nd and 3rd sessions was observed. Statistical tests of variance homogeneity and Student’s t test were performed to verify possible differences between the IPC and SHAM groups in the following measures: number of throws in the SJFT per series, total number of throw in the SJFT and SJFT index. The magnitude of the difference between IPC and SHAM conditions was assessed using the effect size (d=Cohen’s). RESULTS: The IPC performed a larger number of throws in the SJFT per series (p=0.004, d=0.50, moderate effect) compared to SHAM. When we analyzed the total number of throws we found a significant difference between the IPC and SHAM groups (p=0.001, d=0.37, small effect). The SJFT index showed a significant difference between IPC and SHAM (p=0.001, d=0.50, moderate effect).

CONCLUSION: IPC improves the physical fitness of judo athletes.

Does Dynamic Stretching Warm-up Influence Hockey Players’ Anaerobic Performance During A Wingate Anaerobic Test?
Rodrigo Villar1, Alexander Schleper2, Robert Anzalone2.
1University of Manitoba, Winnipeg, MB, Canada. 2Franklin Pierce University, Rindge, NH.

PURPOSE: The aim of this study is to determine whether dynamic stretching warm-up prior to the Standard National Hockey League Wingate Anaerobic Test (DSW+SNHL) would improve anaerobic performance compared with the Standard National Hockey League Wingate Anaerobic Test (SNHL) of hockey players. METHODS: Twenty volunteer ice hockey players (ten males and ten females) visited the laboratory twice and compared between conditions (DSW+SNHL and SNHL). AC showed marginal trends (p=0.055 and p=0.062, respectively) between DSW+SNHL (RPP=11.5±1.4; AFI =51.0±9.4%) and SNHL (RPP=11.5±1.4; AFI =50.0±9.4%). AC showed statistically significant differences between DSW+SNHL (618±117.5 W) and SNHL (338±110.0 W) (p=0.0009). CONCLUSION: The dynamic stretching warm-up did not improve peak power output, but relative peak power and anaerobic fatigue index may benefit from dynamic stretching warm-up. However, anaerobic capacity performance improved when dynamic stretching warm-up was performed prior to the standard National Hockey League Wingate Anaerobic Test. Research supported by New Hampshire-INBRE through an Institutional Development Award (IDeA), P20GM103506, from the National Institute of General Medical Sciences of the NIH.

Recent examinations have turned to the development and validation of a 10-min self-paced graded exercise testing protocol. The 10-min duration was chosen because it represents the mean value of the recommended 8-12min ideal protocol duration; however, literature exists suggesting that an 8-12min duration may be more appropriate to elicit maximal exercise responses. Furthermore, a gender effect may exist to explain the finding. PURPOSE: We sought to examine maximal exercise responses during an 8 min self-paced (S PV), 10-min self-paced (10SPV) and standardized graded exercise (GXT) treadmill protocols. METHODS: Sixteen recreationally active males (n=8) and females (n=8) completed the three separate tests in a randomized order: a) SPV consisting of eight 1-min stages of increasing speed clamped by the Borg RPE6 –20 scale, b) 10SPV consisting of five 2-min stages of increasing speed clamped by the Borg RPE6 –20 scale, c) traditional Bruce protocol as the GXT. S PV and 10SPV maintained a 3% grade. A two-way (gender x protocol) ANOVA with repeated measures was employed to examine differences in maximal responses between protocols. Paired samples t-tests were used to examine the difference in maximal velocity between S PV and 10SPV. RESULTS: No gender effects were revealed. Maximal values for SPV, 10SPV and GXT were similar (p > 0.05) for oxygen consumption (VO2): d) 3.8 10.5 3.4 L/kg•min-1, heart rate (HR): e) 19 ± 11, f) 9 ± 13 beats/min), respiratory exchange ratio (RER): g) 1.12 ± 0.06, ventilation (VE): h) 113.0±30.3, 112.3±33.0 L•min-1), respectively. Maximal velocity for SPV and 10SPV were also similar (i) 3.1 ± 4.2 ± 2.7 km•hr-1, p > 0.05. CONCLUSION: Given no differences between protocols, SPV may serve as a valid and time efficient option to elicit maximal responses during self-paced exercise in recreationally trained college-aged men and women.

Does Dynamic Stretching Warm-up Influence Hockey Players’ Anaerobic Performance During A Wingate Anaerobic Test?
Rodrigo Villar1, Alexander Schleper2, Robert Anzalone2.
1University of Manitoba, Winnipeg, MB, Canada. 2Franklin Pierce University, Rindge, NH.

PURPOSE: To analyze the aerobic performance in male students in a region with a typical epidemiological shift (city of Ilhabela).

METHODS: The study is part of the Mixed-Longitudinal Study on Growth and Development from Ilhabela, organized by CELAFISCS since 1985. A total of 160 boys aged from 12 to 19 years, old, divided in 2 groups: (n=41) and (n=41). VO2max was predicted through a cycle-ergometer submaximal test, that provided VO2max in absolute and relative values. An ANOVA one way, with a post-hoc Scheffe, was taken to analyze the values. A p<0.05 was taken as a significant one.

RESULTS: VO2max in l/min and ml/kg/min values were, respectively, in (n=41) and (n=41), p<0.05. VO2max in l/min and ml/kg/min were, respectively, in (n=41) and (n=41). It represented a VO2max decline of 5% in l/min and 4% in ml/kg/min when (n=41) and (n=41). As a reference of age related deterioration, an increase of 10 bpm was observed in rest heart rate. In the same period it was observed an increase of 11 kg in body weight, and an increase of BMI from 12.1 to 18.1.

CONCLUSIONS: It was observed a marked decline in the aerobic power in absolute and relative values. Between (n=41) and (n=41) we observed a deterioration in physical activity level in that community.
Pickleball is the fastest growing racquet sport in the United States and is particularly popular among older adults. Because the typical frequency, intensity, and duration of play is undefined, the extent to which Pickleball participation can contribute to meeting physical activity guidelines is unknown. **PURPOSE:** To estimate the typical frequency, intensity, and duration of physical activity during recreational pickleball play. **METHODS:** A convenience sample of 24 pla yer (9 ±1 yr) s wore an Actigraph GT3X+ on their waist and rated their perceived exertion (RPE) for 2 to 5 a ses of recreational doubles play. Data were collected in 5 sec epochs and the Sasaki (2011) cutpoints were used to calculate the percent of game play spent in light, moderate and vigorous intensity activity. Players also reported their typical pickleball participation (frequency, intensity, and subjective exertion level) during the past 3 months via an online survey. **RESULTS:** Players reported playing pickleball 3.20 m inutes per session for 2.6-50.7 yrs per week (53.8 ±34.3 m in/week). On average, 8.5 ±4% of game play was at moderate or higher intensities (≥10.3% at moderate) based on Actigraph estimates. This was in general agreement with self-reported intensity levels (11.8 ±3.1 RPE scale). Assuming only 5% of reported weekly pickleball participation is spent in actual game play, it is estimated that players typically engage in an average of 15.5 ±10.1 m in/week (range: 5.8 ±26.0 m in/week) moderate and vigorous intensity activity during play. **CONCLUSIONS:** For most recreational pickleball players, over half of the duration of doubles play is spent at a moderate or higher intensity. This suggests that participation in recreational pickleball may be a viable strategy for increasing health enhancing physical activity in adults. However, the physical activity characteristics of pickleball play should be examined using alternative measures of intensity and in larger, more diverse, samples of players.

**Abstract:**

**PURPOSE.** To determine the accuracy of user indicated activity HR chest strap monitors for estimating EE. **METHODS.** Fourteen males (n=14) ages 20-39 yrs completed two circuit weight training protocols with integrated high-intensity interval training. Both trials were equated for total volume-load and lasted exactly 4.25m in. Following the exercise portion, each participant completed a 20-min excess post-exercise oxygen consumption measurement. Prior to each exercise protocol the HR monitor watch was set using individual subject anthropometric data and age. Heart rate was continuously monitored during the trials by watch device and portable metabolic analyzer. Comparisons of EE (kcal) were performed between estimations by HR monitor and via indirect calorimetry. Device comparisons for EE were made using paired t-tests, Pearson correlation and Bland-Altman analysis (SPSS @v22; p <.05). **RESULTS.** Estimated EE was significantly higher with the user indicated activity HR monitor chest strap compared to indirect calorimetry (r=0.75, p <.01) HG. For females, BMD exhibited a significant moderate-strong positive relationship between HR monitor and indirect calorimetry (r=0.6, p <.002). Average HR during the protocol was 152±18 bpm and percent-maximum HR was 64±9%. **CONCLUSION.** Despite accounting for activity type in the EE estimation software, HR derived estimations of EE appear to be far higher than those estimated by indirect calorimetry during high-intensity activity. Specifically, this is true for vigorous intensity exercise as indicated by 4xHRmax.

**Abstract:**

**PURPOSE.** The Wingate test (WAnT) is an exercise test designed to measure anaerobic capacity and peak power output. WAnT procedures are conducted through observation of the number of revolutions on a stationary bike. The number of counted revolutions is then used to calculate power output at five-second increments for 30 seconds. It is suspected that student counts can introduce error and lack precision particularly in partial revolutions. The purpose of this study was to examine the deviation between student’s calculations and computerized measurement. **METHODS.** Undergraduate exercise physiology students (N=2) were selected to conduct the WAnT procedure. Student observations were collected using the Monark ergometer so that computerized power ratings could be collected simultaneously to student counts. Student results were then directly compared to scores from the Monark software. **RESULTS.** A paired samples t-test revealed that student estimates of peak power were significantly lower (M = 676.72 W, SD = 260.09) than computerized testing results (M = 714.78 W, SD = 286.04), with a statistically significant mean underestimate of 38.05 W, 95% CI [4.96, 71.14], t(2) = 2.36, p =.026 and d = .4. Additionally student fatigue index calculations (M = 23.9%, SD = 18.5%) underestimated power drop compared to the computerized results (M= 53.3%, SD = 14.8%), with a statistically significant mean underestimate of 0.9%, 95% CI [5.38%, 13.42%], t(2) = 4.80, p <.01, d = .907. **CONCLUSIONS.** The WAnT procedure can be an effective tool for measuring anaerobic capacity for both sports performance and research purposes, however, this study found that there were significantly different values between computer derived testing results and human counting. Therefore when a high level of precision is required, it is recommended that WAnTs are conducted using the computerized software to maximize accuracy, especially when being administered by students. In the classroom, exercise physiology instructors should emphasize practice of WAnT administration to ensure more accurate measurements.
had no effect (p > 0.05) . Females carried less body weight in the plank position (66± 3% vs. 71± 5% , p<0.01). No differences in Fz were identified in the handedness condition, while no differences found in the UQYBT scores, which may be related to compensation mechanism in the non-dominant arm.

The bilateral deficit (BLD) refers to the phenomenon where the sum of force from each leg is individually greater than the force produced of both legs simultaneously. Muscular strength is often measured in one limb and this tends to be stronger in the dominant leg, and the average or sum of strength in both legs is used for analysis. In many individuals, especially older populations, there can be a difference in muscular strength between each leg, which is termed the asymmetrical difference. There is a paucity of information regarding the asymmetrical difference on fall risk. PURPOSE: The purpose was to evaluate single leg strength and asymmetrical deficits relative to balance performance and fall risk in an active elderly population. METHODS: 7 male and 3 female (Age: 2.3± 0.7 yrs , Height: 171± 11 cm, Body Mass: 72± 15.8 kg) volunteered to participate. Subjects were healthy, asymptomatic, ≥ 65 years and participated in exercise an average of twice per week (including resistance and cardiovascular exercise). Leg strength was assessed with a unilateral (UL) 12-RM single-leg (left & right) and a bilateral leg protocol (BL) on a variable resistance leg press machine and balance was assessed with both the Bilateral Comparison Test (BCT) and the Fall-Risk Screening Test (FRST) on the Biodex Balance System.

Familiarization trials preceded testing by a minimum of 2 hr s. with balance tests performed first and followed by strength tests. RESULTS: Mean sample displayed an asymmetrical difference (1.32± 1.8 kg), Pearson correlation statistical analysis revealed no significant relationship with overall balance performance (r = -0.15, p < 0.05) and no significant difference between right UL (1.24±0.36 overall sway, r = -0.174, p < 0.05) and left UL (1.34±0.60 overall sway, r = -0.805, p < 0.005). Conclusion: This study suggests for middle-aged individuals, there is no asymmetrical deficit does not appear to increase the chance of falls in older adults in this cohort. A larger sample size and a comparison to a sedentary population may provide additional insight.

**Vo2Max Test In Middle-aged Adults**

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The Upper-Quarter Y-Balance test (UQYBT) is frequently used to assess shoulder function and stability, and core stability. UQYBT consists three reaching tests in push-up position, Superior-Lateral Reach (SR), Inferior-Lateral Reach (IR), and Medial Reach (MR). Several studies identified differences between genders, sports, and pathologies. However, mechanical strategies during the UQYBT were not explored before the reaching tests. PURPOSE: To identify vertical ground reaction force (Fz) and center of pressure (CPa) patterns globally between the three reaching tests and moderated by gender, and handedness. METHODS: Twenty college students participated, eight females (25 ± 5 yrs; 6 ± 1 kg; 14 ± 3 m) and 12 males (23±4yrs; 8 ± 1 kg; 19 ± 2 m). After 10 min warm up on an arm ergometer, participants performed three trials of UQYBT on a force plate. The highest scores for each test for each arm were collected and further analyzed. The average of the three reach scores, composite score (COMP), were calculated for each arm. All scores were normalized to the right arm’s length. Fz was normalized to body weight in push-up position and CPa was calculated for each test.ANOVA tests were used. RESULTS: Differences in force were observed between ♂♂MRz, ♂♂RFz, ♂♂SFz (♂♂: 22%, ♂♂: 16%, ♀♀: 23%, p<0.05) and in area between IRCpa, MRCpa, SRCpa (126 ± 18 m², 123±119 m², 124±124 m², p<0.05). Females carried less body weight in the plank position (♂♂: 3% vs. ♂♂: 5% vs. p<0.01) and had a higher score in the UQYBT ♂♂ (89±15% vs. 78.9±1%, p<0.01). No differences were observed in %SR (75±15% vs. 70±12%, p<0.05), %MR (97±8% vs. 9% ♂♂ vs. 9% ♀♀ vs. p>0.05), and %COMP (♀♀: 11% vs. ♂♂: 8% vs. p>0.05). The non-dominant arm portrayed higher forces in ♂♂SFz (89±19% vs. 70±21%, p<0.01), %RFz (86±14% vs. 75±17%, p<0.05), %SFz (88±19 vs. 81±24%, p<0.05). However, no differences were observed in ♂♂SFz (%8±1%, p<0.05), %MR (♀♀ vs. 9% ♂♂ vs. p>0.05), and %COMP (♀♀: 10% vs. 83±9%, p>0.05). CONCLUSION: Globally, no differences in Fz and CPa patterns were identified in UQYBT. Similar results were found between genders. In contrast, differences in Fz were identified in the handedness condition, while no differences found in the UQYBT scores, which may be related to compensation mechanism in the non-dominant arm.
exercise test. As a result of increasing RPE levels, there was a concomitant increase in relative PSS. These results also corroborate previous studies showing RPE/F1 as an important threshold for determining optimal cognitive function during exercise.

**Non-motorized treadmills (NMT) are designed to replicate overground exercise and are used in fitness testing, simulation of team sport exercise, and sprint training. Limited research describes differences in physiological responses between running on a curved NMT and a standard treadmill (TM).** At the same speed, PURPOSE: Examine physiological differences between running on a NMT and a TM at the same speed and identify at which MT grade the physiological response to running on a TM is different from a NMT at the same speed. METHODS: Ten active females ran at three speeds (2.6, 3.13, and 3.80 m/s) on a curved NMT and a standard TM. Five participants also ran at 3.13 m/s and 6%, 9%, and 12% grades on the MT. VO2, blood lactate, heart rate, and rating of perceived exertion were compared between treadmills at each speed and grade using ANOVAs and paired samples t-tests. RESULTS: NMT VO2 was significantly greater at 2.6 m/s (40.89 ± 21.3 vs. 39.5 ± 19.1 ml/kg/min; p < 0.01) and 3.13 m/s (47.64 ± 2.73 vs. 42.29 ± 2.14 ml/kg/min; p = 0.004), but not significantly different from MT at 3.58 m/s (50.30 ± 2.95 vs. 53.0 ± 2.73 ml/kg/min; p = 0.08). NMT blood lactate concentration was significantly greater at 3.13 m/s (8.83 ± 2.5 vs. 6.2 ± 2.3 mmol/L; p < 0.01) and 3.58 m/s (11.63 ± 2.25 vs. 8.02 ± 2.4 mmol/L; p < 0.01). At 3.13 m/s and a MT grade of 8%, VO2 (t = -1.8; p = 0.22) and blood lactate (t = 0.95; p = 0.36) were not significantly different from NMT at 3.13 m/s. CONCLUSIONS: The physiological response to running on a NMT was significantly greater than a MT at submaximal speeds. A greater non-oxidative contribution to running at 3.13 m/s on the NMT is likely due to runner position on the curved belt. Running on a MT at an 8% grade produces similar VO2 and blood lactate responses to running on a NMT at the same speed. Practitioners prescribing NMT exercise should consider exercise intensity and effect of the NMT incline.
Through precise training for the athlete we can improve their specific physical condition for each sport discipline, in the same way the tests we perform to see the metabolic changes according to the corresponding pathways to the sport activity must try to be as specific as possible and simulate sports techniques. **PURPOSE:** To analyze with specific judo fitness test, the sports performance according to the training stage in athletes. **METHODS:** Descriptive study, n = 181 1 males, T emales of the Judo Senior Team, age 20±4: 3±9 yrs, with a range of 13 ± 2 yrs. The same test was performed three times, every 4m onths. The test is performed to assess the training sports in judo. The first and second tests, 11 athletes were evaluated, and in the 3rd test, 16 athletes participated. The fitness index tests are specific, analyze the performance with Judo technique (‘Ippon- sevi-nage’), the Index consists of the measurement of the maximum heart rate of effort (MHRE) plus the heart rate at the minute of recovery at the end of the test, in beats per minute, divided by the number of technique s, made from the 1st 15 s econds (s), 10 s recovery, 30±10 s recovery and 3rd 30 s work, and the heart rate at the minute of recovery. It started at 0900 hrs, with an ambient temperature 20°C, monitoring the heart rate, during rest, warm-up, maximum effort and at one minute of recovery using Polar®V800 heart rate monitors. Additional instruments used were writing board, sheets of bond paper, pencil, whistle and a chronometer. The information was tabulated in Microsoft Excel 2016. **RESULTS:** in the 1st test, 11 athletes, men (♀), the results were, 43% good, 1, 1% very good, 2, 18% excellent; women (♀, 1, 9% bad and 3, 2% regular, in the 2nd test, 11 men (♂, 1, 9% bad, 1, 9% regular, 3, 25% good and 3, 25% excellent; women (♀), 1, 9% regular and 2, 18% good and in the 3rd (♂, 10, 7% bad, 12, 5%, regular, 63% good and 2, 12% excellent; women (♀, 1, 9% bad, 6%, 12% regular and 3, 18% good. **CONCLUSION:** With the special fitness Judo Index test we can track the sports preparation of judo athletes and evaluate their performance specifically with Judo technique (‘Ippon-sevi-nage’).

**2019 Longwood University Student Research Experience**

**3405** June 9:30 AM - 11:00 AM 
Physiological Demands of Hard Shoe and Soft Shoe Irish Dancing: A Pilot Study

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**Purpose:** Irish Step Dance is a form of dance characterized by maintaining an upright posture and primarily moving the lower extremities with two different shoe styles. Soft shoe (SS) dance requires light and delicate movements, while hard shoe (HS) dance requires forceful and powerful movements. Irish dance competition pieces can last 30-60 s econds and performance pieces can last 10 minutes. The purpose of this study was to characterize the cardiorespiratory demands of female recreational Irish dancers. **Methods:** Seven female dancers (5 SS; 2 HS; BMI: 20.3± 3.7 kg/m^2^) performed all dance routines and cardiorespiratory responses were measured using a respiratory gas analyser (trueone®) and a heart rate monitor (Polar®V800). The analysis was performed using R Manual (https://www.sportsmeasures.com/r.html) to calculate METs, VO2max and HRpeak. **Results:** The SS dance routine had a lower VO2max (17.7± 3.5 mL/kg/min) and HRpeak (188± 11 bpm) than the HS dance routine (25.0± 2.5 mL/kg/min) and HRpeak (202± 12 bpm). **Conclusion:** Women have a lower VO2max and HRpeak than men. SS dance is less demanding than HS dance.

**3406** June 9:30 AM - 11:00 AM 
Elite Orienteering Athletes In Standardized Time-trial And Distance-trial Tests Own Better Physiological And Psychological Indicators On Treadmill

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(NO relevant relationships reported)

**Purpose:** The goal of this preliminary study is to explore physiological and psychological characteristics of elite orienteering players. **Methods:** Ten elite orienteering athletes (OA) (age: 23±1 ± 1.7 years; BMI: 20.2± 1.2 s/wk; 3 men and 7 females; VO2max: 38.1± 1.4 L/kg/min) and ten elite running athlete (RA) (age: 21.0± 1.5 yrs; BMI: 20.8± 1.1); training: 12± 2 hrs s/wk; 5 men and 5 females; VO2max: 41.7± 1.4 mL/kg/min) were recruited to attend a time-trial and a distance-trial treadmill tests in counterbalanced order. Athlete performance of participants were at least national level. Both tests were interspersed by 4 segments of mental games (named Peak in Apple Store) representing the capacity of problem solving, memory, concentration, and thinking agility in seque nce. While playing mental games, participants kept on running with their effort. Performance indicators and ECG/EEG signals /game scores were analyzed using independent t test and mixed design of repeated measures respectively. Statistical significance was set at p < .05.

**Results:** Better performance of time/distance trials (10m in vs. 1100 min; 3338 m vs. 3211 m) in OA and most all indicators of OA were better than those of RA in main effect. Results indicated that attention index (55.6 vs. 44.3), game score (10929 vs. 8817) and %HR (77.3 % vs. 67.6 %) of OA were significantly higher than those of RA during mental games in time-trial test (p < .05) in main effect. **Conclusion:** We conclude that elite orienteering athletes own stronger power for mental management while keeping on higher intensity of running. Introducing mental challenges on running may enhance training effect of orienteering.

**G-36** Free Communication/Poster - Methodology

**Saturday, June 1, 2019, 7:30 AM - 11:00 AM**
Room: CC-Hall WA2

**3407** June 8:00 AM - 9:30 AM
Accuracy Of The Equations For VO2max In Aerobically Trained Women.


(NO relevant relationships reported)

**Purpose:** Evaluate the accuracy of the VO2max equations for aerobically trained Colombian women. **Methods:** Estimated values of VO2max of the equations were compared with those of VO2max measured in a maximum cycloergometer test (MCT). When examining the constant error (CE), standard error of estimation (SEE), total error (TE), the comparison of means (Student’s t-test), the Bonferroni correction was used to adjust the level of significance, Pearson correlation coefficient (r) and Lin’s concordance correlation coefficient (CCC). A total of nine female cyclists and three female triathletes were volunteers for this study. **Results:** The athletes were aged 23.7± 3.8 yrs, with weight 56± 7kg a height 1.64± 1.3 m. They reached a maximum workload power of 28.5± 20 W and a VO2max of 41.9± 1.2 mL/kg/min). **Conclusion:** The accuracy of the equations was high, but there were statistically significant differences in absolute and relative values. Only equations 1 and 5 show CE values significantly different from zero, both for absolute and relative values. There were significant positive correlations between the CE and VO2max through the MCT values for equations 2, 3 and 6 in the relative values, and only for equation 5 in the absolute values. CCC rated all the equations with poor concordance.
A peak functional capacity test that is incremental in nature, varying in intensity, and specificity to the dancer.

METHODS: The Seifert Assessment of Functional Capacity (SAFD) was developed using previous valid and reliable functional capacity protocols, published research in dance specific fitness tests, and consult with content experts. Final test parameters included 3 min. stages of increasing intensity utilizing both speed and difficulty of movements, continued until exhaustion.

Following pilot testing, a survey of content experts supported the validity of the SAFD. Final test parameters included 3 min. stages of increasing intensity, and movement specificity to the dancer.

METHODS: The Seifert Assessment of Functional Capacity for Dancers (SAFD) was developed using previous valid and reliable functional capacity protocols, published research in dance specific fitness tests, and consult with content experts. Final test parameters included 3 min. stages of increasing intensity utilizing both speed and difficulty of movements, continued until exhaustion.

CONCLUSION: To examine the learning effect when fatigue testing without familiarization. METHODS: 22 masters-aged (53±5 years), competitive female cyclists completed 3 separate 50-repetition knee flexion/extension tests on a Biodex isokinetic dynamometer, separated by one-week with no familiarization. RESULTS: No significant differences [Wilks’Λ<0.05] existed between trials, indicating no learning effect was associated with the tests for any variable: a) peak torque (T1 50.7±10.4 N·m; T2 53.0±11.5 N·m; T3 56.6±11.0 N·m), b) relative peak torque (T1 36.2±6.7 N·m/kg; T2 37.9±7.5 N·m/kg; T3 39.2±7.3 N·m/kg), c) torque generated at 30º (T1 212.5±132.0; T2 197.5±172.4; T3 192.4±161.3), d) total work completed (T1 2548.4±524.4 J; T2 2544.8±516.0 J; T3 2615.3±579.3 J), e) peak power (T1 2985.1±321.5 W; T2 2934.0±281.9 W; T3 3131.4±320.8 W), f) VO2peak (T1 3131.4±320.8 W; T2 3125.3±315.1 W; T3 3125.9±315.1 W), and g) RPE (T1 4.2±0.6; T2 4.3±0.6; T3 4.3±0.6). CONCLUSION: No learning effect was seen with the isokinetic knee extension/flexion fatigue protocol in masters-aged, female cyclists. Therefore, these findings would suggest that previous experience in isokinetic muscular fatigue testing does not alter subsequent NT performance.

3410 Board #98 June 1 8:00 AM - 9:30 AM
A Novel Assessment of Baseball Throwing Mechanics
Mason Jiang1, William P. Lydon1, Mark J. Vanes1, Alexcis C. King2, Courtney D. Jensen1, Amanda M. Seifer1, Vincent J. Paolone2, Elizabeth M. Mullin3, Michelle Gray1, Nicole E. Moyen1, Jennifer L. Vincenz2, Kylie K. Harmon1, Lee E. Brown, FACSM1.

To remain competitive, collegiate athletes constantly seek novel methods of performance enhancement. As technological advancements permit more sophisticated assessments, it is important to appraise their utility. PURPOSE: To establish a mechanical profile of baseball throwing and to test which kinematic domains associate with on-field performance. METHODS: 12 collegiate baseball players (11 fielders, 7 pitchers) were tested using Proteus (Boston Biomotion, USA), which analyzes isotonic force production concurrently in all 3 planes. Players performed 5 consecutive throw motions against 3lb of magnetic resistance. Proteus software calculated power, velocity, explosiveness (rate of force development), endurance (maintenance of force characteristics), consistency (repeatability of movement), and range of motion (ROM). Across the total sample, these values were used to generate throwing profiles; among the subsample of pitchers, the values were used in linear regressions to predict in-season performance. RESULTS: Across all players, power was 118.8±40.0, explosiveness was 29.6±18.7, velocity was 6.0±1.2, and ROM was 118.9±23.7. CONCLUSIONS: To establish a mechanical profile of baseball throwing and to test which kinematic domains associate with on-field performance.

3409 Board #97 June 1 8:00 AM - 9:30 AM
Examining the Learning Effect On An Isokinetic Fatigue Test Protocol
Tyler J. Neltner1, Giovanna C. Ramos2, Emily E. Grammer3, Cameron D. Addie4, Marisa K. Straughn4, Jordan M. Glenn5, Michelle Gray4, Nicole E. Moyen6, Jennifer L. Vincenz4, Kylie K. Harmon1, Lee E. Brown, FACSM7. 1University of West Florida, Pensacola, FL. 2University of Central Florida, Orlando, FL.

When performing repeated repetitions of a task, the body becomes familiar with the task and can become more efficient. This is known as the learning effect and can alter performance. PURPOSE: To examine the learning effect when fatigue testing without familiarization. METHODS: 22 masters-aged (53±5 years), competitive female cyclists completed 3 separate 50-repetition knee flexion/extension tests on a Biodex isokinetic dynamometer, separated by one-week with no familiarization. RESULTS: No significant differences [Wilks’Λ<0.05] existed between trials, indicating no learning effect was associated with the tests for any variable: a) peak torque (T1 50.7±10.4 N·m; T2 53.0±11.5 N·m; T3 56.6±11.0 N·m), b) relative peak torque (T1 36.2±6.7 N·m/kg; T2 37.9±7.5 N·m/kg; T3 39.2±7.3 N·m/kg), c) torque generated at 30º (T1 212.5±132.0; T2 197.5±172.4; T3 192.4±161.3), d) total work completed (T1 2548.4±524.4 J; T2 2544.8±516.0 J; T3 2615.3±579.3 J), e) peak power (T1 2985.1±321.5 W; T2 2934.0±281.9 W; T3 3131.4±320.8 W), f) VO2peak (T1 3131.4±320.8 W; T2 3125.3±315.1 W; T3 3125.9±315.1 W), and g) RPE (T1 4.2±0.6; T2 4.3±0.6; T3 4.3±0.6). CONCLUSION: No learning effect was seen with the isokinetic knee extension/flexion fatigue protocol in masters-aged, female cyclists. Therefore, these findings would suggest that previous experience in isokinetic muscular fatigue testing does not alter subsequent NT performance.
Acute Effects of Neuromuscular Electrical Stimulation on Vertical Jump

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METH O DS: A group of 24 participants were randomly divided into an experimental and a control group. All participants were pretrained in the countermovement jump (CMJ) to determine maximum jumping height. Participants in the treatment group were treated with NMES to the quadriceps group. Participants in the control group received sham treatment in identical testing conditions. All participants then engaged in a post treatment CMJ test. The difference between pretest and posttest jump scores was computed to determine the effects of treatment.

RESULTS: A paired samples t-test showed a statistically significant increase in experimental CMJ scores from pre-test (M = 283.08, SD = 61.14) to posttest (M = 304.69, SD = 59.32), t(11) = 1.99, p < .05. (Figure 1). A statistically significant decrease in control CMJ scores occurred from pre-test (M = 30.2, SD = 4) to posttest (M = 28.8, SD = 4), t(11) = 1.99, p < .05. The mean increase in experimental CMJ scores was 1.45 with a 95% confidence interval ranging from 26.61 to 33.67. The mean decrease in control CMJ scores was 1.54 with a 95% confidence interval ranging from 26.10 to 32.15. Cohen’s d (24) indicated a small effect size.

CONCLUSION: The acute application of NMES to the quadriceps group lead to significant improvements in vertical performance.

PURPOSE: To examine the positional differences in linear momentum during a vertical jump in Division II college football players.

METHODS: 56 male Division II college football players were assessed for height, body mass, and vertical jump. All participants were categorized according to playing position into defensive back (DB), defensive line (DL), running/ full back (RB), wide receiver (WR), and tight end (TE) groups. All other positions were excluded due to insufficient sample. Height and body mass were assessed using a stadiometer and digital scale, respectively. A vertical countermovement jump test was performed to determine jump height, which was then used to calculate vertical jump velocity. Vertical jump momentum (VJM) was calculated as the product of body mass and vertical jump velocity. Positional comparisons in VJM were made using one-way ANOVA with LSD post hoc comparisons. Alpha level was set at p < .05.

RESULTS: A significant main effect of position was observed for VJM (F = 22.64, p = 0.02). Post hoc tests revealed that OL (439.6 ± 44.7 Ns) had significantly higher VJM than DB (p < 0.001), RB (p = 0.001), 717.24 ± 7 Ns), LB (p < 0.005; 373.41 ± 9.9 Ns), and TE (p < 0.005; 336.28 ± 25.0 Ns), while trending to be greater than DL (p = 0.089; 406.95 ± 6.6 Ns) and WR (p = 0.001), and trending to be greater than RB (p = 0.068). LB (p = 0.009), TE (p = 0.013), and RB (p = 0.004) had significantly greater VJM than DB, but only RB trended to be greater than WR (p = 0.08).

CONCLUSIONS: While positional differences in VJM exist in collegiate American football positions that regularly engage during game play (OL vs. DL, WR vs. DB, and LB vs. RB vs. TE), there have been no statistically significant differences. Therefore, these positions are most likely evenly matched when colliding on the field.

Validity And Reliability Of The Ymca Submaximal Cycle Test Using An Electrically-braked Ergometer

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PURPOSE: Electrically-braked ergometers allow a consistent power output regardless of variances in pedaling cadence. The present study sought to test the effect of using an electrically braked ergometer on the validity and reliability of the YMCA submaximal cycle test.

METHODS: 22 male and 13 female subjects (19 ± 31 y) completed one maximal treadmill test and four submaximal cycle tests (using the YMCA protocol) to measure and estimate VO2max, respectively. The submaximal trials consisted of two tests performed using a friction-braked ergometer (Monark) and two tests using an electrically-braked ergometer (Viasprint). All measured and estimated VO2max values were compared using repeated measures ANOVA and post-hoc tests using paired t-tests. Paired t-tests were also used to determine potential differences between repeated submaximal trials using the same ergometer. Pearson correlation coefficients were used to determine validity and reliability coefficients.

RESULTS: The treadmill VO2max protocol yielded markedly higher (P < 0.05) values (43.6 ± 7.2 mL/kg/min) than the YMCA submaximal protocol using the friction-braked (40.8 ± 7.2 mL/kg/min) and electrically-braked ergometer (38.4 ± 7.2 mL/kg/min). Furthermore, estimated VO2max using the friction-braked ergometer was higher (P < 0.05) than that observed using the electrically-braked ergometer. There were similar reliability coefficients for the friction-braked (R = 0.63) and electrically-braked (R = 0.5) ergometers. Lastly, a moderately strong (R = 0.54) relationship was observed between measured VO2max and prediction error (V02Max_estimated V02Max).

CONCLUSIONS: Both Monark and Viasprint ergometers underestimated V02max in a sample of fit, young individuals. The magnitude of underestimation was greater in individuals with higher VO2max values. Using an electrically-braked ergometer did not improve either validity or reliability of VO2max estimates from the YMCA protocol.
A New Functional Screening Tool For Lower Limb Injury Risk: A Retrospective Cohort Study

Liping Jiang1, Shimeng Shi1, Xiaojian Shi2, Zonghan Yang2, Gordon Waddington3, Jeremy Witchalls4, Roger Adams4, Doa El-Ansary5, Jia Han1, Tongji University, Shanghai, China. (Sponsor: Peter Wake Forest University, Winston-Salem, NC. (No relevant relationships reported)

PURPOSE: The aim of the current study was to develop a new screening instrument for lower limb functional assessment. METHODS: Fifty-three athletes (33M, 20F; mean age: 19 ± 2.8 yr; yrs old) were recruited for this study. athletic injury history and sport performance level (international, national, regional, recreational) were recorded. A lower lim function screening tool was developed (the LoLFST), based on 5 lower limb movements in different modes, planes, directions and at varying intensities. Both legs were assessed in a random order and each athlete was given a technique and a symptom score. Results: Spearman’s correlation was employed to examine the relationship between the measures and the incidence of injury. Receiver operating characteristic (ROC) analysis was employed to assess the instrument’s capacity to classify injury status.

RESULTS: (1) The test-retest reliability was 0.74. (2) Twenty-five of the athletes had a history of low back or lower limb injuries in the past 12 months. (3) Both the technique and symptom scores from the LoLFST were significantly correlated with the injuries (p<0.01; 0.27, 0.39, 0.96). (4) The correlation between legs was 0.82 (left leg r=0.83). When technique and symptom scores alone were included to differentiate between athletes with and without injury, the area under the ROC curve (AUC) scores were 0.79 (p<0.01; 0.84, 0.88), respectively. CONCLUSION: The findings support the use of a functional screening test tool that includes both technique and reported symptoms, that can be used in combination with sporting performance level to enhance capacity for identifying injuries. Future longitudinal studies are warranted to explore the validity of the LoLFST in determining low back and lower limb injury risk.

In the field of sports medicine, functional tests, such as the single leg hop for distance (SLHD) and single leg vertical jump (SLVJ) are often used to determine an athlete’s return to competition. Many sports medicine facilities, including Wake Forest University (WFU), have invested in pneumatic resistance machines, such as the Kesser Air® leg press, that precisely measure single leg power in Watts. However, little is known regarding the agreement of the data obtained from the functional tests and the Kesser Air®.

PURPOSE: To compare the results of the Keiser leg press to those of the SLHD and SLVJ in WFU athletes. METHODS: Data were obtained from 79 (40 males and 39 females) healthy student-athletes at WFU. After a warmup, each subject performed the SLHD and SLVJ (cm) and the Keiser leg press (W/kg) in random order with a 5' rest period between each test. The relationship between tests was examined with Pearson Correlation Coefficients. RESULTS: The means for the Keiser, SLHD, and SLVJ tests (listed right and left, respectively) were 15.4 ± 3.7 W/kg and 14.9 ± 3.6 W/kg, 170.6 ± 27.8 cm and 172.9 ± 28.0 cm, 36.2 ± 7.4 cm and 36.2 ± 7.8 cm, respectively. The correlations of leg power were statistically significant at an alpha level of 0.01. The SLVJ and Keiser scores (right leg r=0.81, left leg r=0.80) had a slightly higher correlation than the SLHD and Keiser scores (right leg r=0.76, left leg r=0.70).

CONCLUSIONS: As suggested by the observed relationships, both the SLHD and SLVJ tests data correlate significantly with leg peak power results obtained from the Keiser Air® in healthy, collegiate athletes. Thus, this study suggests low-tech/low-cost functional tests like the SLHD and SLVJ appear to be appropriate for evaluating leg power and return to competition in this population.
of rest, each subject completed 2 GXT protocols to the point of volitional exhaustion on a TM and SE. Max or peak values for VO$_2$, HR, VE, and RER were compared between TM and SE using a Paired-Samples t-Test with an alpha level at $p \leq 0.05$. Peak RPE was compared using a Wilcoxon Signed Rank Test. RESULTS: TM was significantly greater than SE in regard to mean VO$_2$max ($3.1 \pm 6$ vs 3.0 $\pm 0.1$ kg/min, $p < 0.001$), HR (191 $\pm 11$ vs 186 $\pm 10$ bpm, $p < 0.001$), and RPE (19.6 $\pm 2.2$ vs 18 $\pm 1.6$, $p = 0.039$). TM was not significantly greater than SE regarding RER (1.2 $\pm 0.4$ vs 1.2 $\pm 0.9$, $p = 0.6$) or VE (14 $\pm 1.5$ vs 14 $\pm 2.0$, $p = 0.44$). CONCLUSIONS: The TM appears to yield higher max values for VO$_2$, HR, RER, and RPE values compared to SE in college-age males. Although TM elicited higher values than SE, VO$_2$peak was only $15\%$ lower than values measured from TM. This percent difference is comparable to other currently accepted alternative forms of aerobic capacity testing such as leg and arm cycle ergometers. Future studies should assess how gender, protocol variations, SE technique, or various athlete populations may impact VO$_2$ values during a peak SE GXT.

**Short-Term Back Squat Protocol Effect on 5km Run Performance**

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(No relevant relationships reported)

**Purpose:** Previous research indicates conflicting data on concurrent training. For instance, high intensity strength training, an uncommon training method for runners, has the potential to be beneficial as studies show it allows for enhanced fatigue resistance during high intensity endurance performance. Conversely, some evidence suggests high intensity strength training is harmful for endurance running performance and may alter fuel substrate utilization. Therefore, this study sought to determine the effects of a short-term, high repetition back squat training protocol on 5km run performance as well as on carbohydrate and fat oxidation rates.

**Methods:** Fifteen runners [4 men, 11 women; 150+ minutes of endurance exercise per week; age = 22 $\pm$ 3y; 20.4 $\pm$ 5.2 body mass index] completed two weeks of a high repetition back squat training protocol consisting of three sets of 15-24 repetitions at 60% of one-repetition max (1RM), three times per week. Pre- and post-tests included a 5 km timed run on a outdoor track, respiratory exchange ratio (RER) through indirect calorimetry during two different intensities of steady-state treadmill exercise (60% and 70% heart rate max (HRmax)), and 1RM for back squats. Results: Back squat 1RM significantly increased by 15% with training (0.2 $\pm$ 9.5 vs $30.0 kg$, $p < 0.001$). However, no statistically significant differences were found in 5km times adjusted for heat-stress of outdoor conditions (Pre: 23.6 $\pm$ 5.0 min; Post: 21.5 $\pm$ 4.0 min; $p = 0.29$). Subsequently, it was determined that the subjects had a significant confounding effect on post-training outcomes. RER at 6% HRmax (Pre: 0.8 $\pm$ 0.04 vs Post: 0.9 $\pm 0.05$ $P = 0.6$) and %HRmax (Pre: 0.8 $\pm$ 0.04 vs Post: 0.8 $\pm$ 0.04 $P = 0.2$) was unchanged. Conclusions: Performing a high repetition back squat protocol for two weeks does not appear to impact running time or alter the body’s fuel utilization during exercise but is an effective way to improve lower body strength. Future studies are necessary in a temperature-regulated testing environment to determine whether high repetition strength training alters %HRmax running performance and fuel utilization.

**Proximity To Failure And Repetitions Per Set Effect RPE Accuracy In The Squat, Bench Press, And Deadlift**


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(No relevant relationships reported)

The repetitions in reserve (RIR)-based rating of perceived exertion (RPE) scale has gained significant popularity. Previous research has shown that intra-set RIR predictions become more accurate closer to failure. However, research has yet to examine this concept in the deadlift. PURPOSE: This investigation examined proximity to failure and total repetitions per set on intra-set RPE accuracy. METHODS: Ten males (age: 28 $\pm$ 4yr s; body mass: 81.8 $\pm$ 4 kg; training age: 10 $\pm$ 7yr s) performed 4 sets to failure at 90% of one-repetition maximum (1RM) on the squat, bench press, and deadlift in successive weeks; in a counterbalanced order. During all sets, subjects indicated when they believed to be at a 4 or 5 PE (i.e. 4 or 5 RIR). The RIR difference (RIRDiff) was calculated by subtracting the predicted number of repetitions in reserve (RIR) from the actual RIR. The RIRDiff was calculated by subtracting the predicted number of repetitions in reserve (RIR) from the actual RIR.
Each subject completed two standard DXA scans on the same day, before and after the S&C session. Following the consumption of a free-living meal prior to the first scan, subjects were encouraged to drink water ad libitum. RESULTS: The results of this study were analyzed via correlated t-test (p < 0.05 considered significant) and significant values are listed in Table 1 below. CONCLUSION: The acute physiological effects of a S&C session alter body composition measures obtained by DXA scan. Thus, athletic staff should consider the timing of DXA scans in relation to S&C sessions.

Recently, the importance of maintaining the alignment of the human muscles and managing the left and right symmetry has been widely recognized in fields that study pain medicine, physical therapy, and exercise rehabilitation. As a result, core stability exercise has been spotlighting. PURPOSE: To investigate the effects of a short-term core stability exercise on functional movement and balance in subjects with mild lower-limb discomfort. METHODS: Twenty people with mild lower-limb discomfort were randomly assigned to a non-training control (CG, n=10) and core stability exercise training group (EG, n=10). While CG maintained their daily routine, EG completed twenty 30-min training sessions consisting of 10 modified mat pilates program exercises aimed at increasing core stability. Functional movement, dynamic balance, and discomfort level were assessed before and after twenty sessions of core stability training using functional movement test, balance test and visual analog scale (VAS), respectively. Two-way (group by time) repeated measures ANOVA’s were performed for all dependent variables, and the significance for all statistical tests was set at p<0.05. RESULTS: EG demonstrated a significant increase in functional movement indicated by increased hurdle step (CG; -4.6% vs. EG; +5.0% group × time effect) and shoulder mobility (CG; -13.0% vs. EG; 13.0% group × time effect). The dynamic balance score was significantly improved only in EG for both limbs (right: EG = 7.7%, p = 0.007; left: EG = 8.10%, p = 0.011, time effect). A significant reduction of VAS score in ankle was exhibited in EG (EG: -74.76%, p = 0.024, time effect). CONCLUSION: This study highlights that twenty sessions of short-term core stability exercise can positively affect the lower limb’s functional movement and balance ability in people with mild lower-limb discomfort.
CONCLUSIONS

The correlation between the treadmill test and questionnaire was moderate (r = 0.75), and 95% limits of agreement were performed to assess validity. The prediction equation used to estimate VO2max uses age, body mass index (BMI), resting heart rate (RHR), physical activity index (PA-I) and is specific to gender. Women: 70.77 - (0.244*age) - (0.749*BMI) - (0.107*RHR) + (0.213*PAI) and for men: 23.13 - (0.215*age) - (0.700*BMI) - (0.099*RHR) + (0.198*PAI). The prediction equation to determine CRF level is performed on. There is limited data in regards to suspension training and whether it increases CRF. Our findings suggest using the SLS to assess lower limb strength and control given its higher reliability in novice and experts. The SLS rating was based on knee movement, while LSD was based on trunk, arm, pelvis, knee, and foot. The higher reliability on SLS than LSD may be due to evaluating only one component rather than several simultaneously.

The intensity of exercise may vary relative to the stability of the surface the exercise is performed on. There is limited data in regards to suspension training and whether it can modify the intensity of a resistance training session. Motor unit activation can be inferred through surface electromyography, therefore the recorded activity can translate to the relative intensity of a specific exercise. Purpose: The purpose of this study is to determine the magnitude of motor unit activation while performing a split squat on a stable surface (SSS) and on the unstable surface (US) (suspension cables). Methods: 18 subjects (age 19–35), height 160–201 cm, weight 50–110 kg volunteered to participate in a randomized cross over study. EMG electrodes were placed on four primary muscles (bicep femoris [BF], gluteus maximus [GM], rectus abdominis [RA], rectus femoris [RF]) involved in the split squat. Each participant was familiarized with the correct biomechanical movement of the split squat. All trials required the rear foot elevated 40.6 cm above the floor. Both SS and US trials were conducted with no external load present and required the subject to perform: 3 correct repetitions at a 3–1–3 cadence. Results: EMG peak millivolts for the RF was 1.4 ± 0.2 mV; BF was 1.6 ± 0.3 mV; GM was 1.2 ± 0.3 mV; RF was 0.8 ± 0.2 mV. For the RA was 0.9 ± 0.15 mV. There were 13 outliers compared to the SS trial. Conclusion: Although suspension training may create a new challenge while exercising, increased motor unit activation on the unstable surface may be limited to select muscles. Unstable surface training does not appear to increase the overall muscle activation for this given activity.

The single limb squat (1L) and lateral step down (LSD) are common lower extremity tests used to assess gross lower extremity strength and motor control. Purpose: To compare intra-rater reliability of lower extremity tests between novice and expert clinicians between sessions. Methods: Six licensed physical therapists (3 “novice” and 3 “expert”) rated 20 frontal plane video recordings of healthy adults who participated in a previous study performing the SLS and LSD. The sample size required to find a kappa of at least 0.50 with a 95% confidence interval of ±0.40 was estimated to be 18. Novice physical therapists were operationally defined as those within 3 years of initial licensure. Expert physical therapists were licensed for at least 10 years and held a board certification in either orthopedics or sports. Prior to data collection, clinicians practiced rating the SLS and LSD on a separate set of recordings. Kappa statistics were calculated based on previous reported formula and interpreted using a standard index. If bias or prevalence indices were above 0.51 be prevalence-adjusted bias-adjusted kappa (PABAK) was calculated. Results: For the SLS, intra-rater reliability of all raters, except one, had moderate reliability or better. For the LSD, most raters had substantial reliability except for one rater. The reliability was higher in novices and one expert, who had fair and moderate reliability, respectively. Conclusions: Our findings suggest using the SLS to assess lower limb strength and control given its higher reliability in novice and experts. The SLS rating was based on knee movement, while LSD was based on trunk, arm, pelvis, knee, and foot. The higher reliability on SLS than LSD may be due to evaluating only one component rather than several simultaneously.

Purposes: 1) To determine the relationship between Functional Movement Screen (FMS) and Mobility, Activation, Posture, and Symmetry (MAPS) scores in a group of middle-aged adults. 2) To identify the number of “declined attempts” among the FMS Deep Squat test scores and MAPS scores. Methods: Five licensed physical therapists (3 novices and 2 experts) rated 20 frontal plane video recordings of healthy adults who participated in a previous study performing the FMS Deep Squat (DS) test. The sample size required to find a relationship between FMS and MAPS scores was calculated based on previous reported formula and interpreted using a standard index. If bias or prevalence indices were above 0.51 we prevalence-adjusted bias-adjusted kappa (PABAK) was calculated. Results: For the FMS, intra-rater reliability of all raters, except one, had moderate reliability or better. For the MAPS, most raters had substantial reliability except for one rater. The reliability was higher in novices and one expert, who had fair and moderate reliability, respectively. Conclusions: Our findings suggest using the FMS to assess lower limb strength and control given its higher reliability in novice and experts. The FMS rating was based on knee movement, while MAPS was based on trunk, arm, pelvis, knee, and foot. The higher reliability on FMS than MAPS may be due to evaluating only one component rather than several simultaneously.
to at least one of the FMS tests, whereas all participants completed the MAPS assessment. A higher score on the FMS Deep Squat test was related to a higher score on MAPS; however, given the 21% common variance, FMS and MAPS are not interchangeable. From a practical perspective, one cannot replace the other when assessing movement in older adults.

3431 Board #119  June 1 8:00 AM - 9:30 AM Impact of Short Cranks on 3-Min All-Out Cycling Test and Critical Power Metrics
Boe M. Buruss1, Jessie Armendariz2, Brian M. Mosicki2.
1Gonzaga University, Spokane, WA. 2Humboldt State University, Arcata, CA.  (Sponsor: Dr. Vincent Paolone, FACSM)
Email: buruss@gonzaga.edu
(No relevant relationships reported)

The 3-minute all-out cycling test (3MT) is a valid, practical, and time effective method for determining Critical Power (CP) and intensities used in training and competition for cyclists. Changing the crank length (CL) on a bicycle may affect an individual’s ability to produce and/or maintain power output while cycling. A change in CP due to CL differences would lead to a change in the ability of the cyclist to maintain power output.

PURPOSE: To determine the impact of short cranks on the metrics of the 3MT.

METHODS: A total of 9 recreationally trained male cyclists (27.6 ± 7.5 yrs.) participated in the study. Subjects completed an incremental cycle test to determine VO2max (27.8 ± 6.4 kg/m; 36 ± 3 W) and gas exchange threshold (28.9 ± 7.2 W) to calculate the 3MT. Session two consisted of a familiarization trial of the 3MT. For sessions three and four, subjects completed the 3MT using CLs of 14 short crank, SC) and 18 m (normal crank, NC). CL was determined in a randomized counterbalanced format. T-tests were utilized to determine differences between outcome variables of the 3MT. RESULTS: Peak power and peak cadence were significantly higher in the SC trial compared to the NC trial (SC 531 ± 116 vs NC 4 ± 113 W, p = 0.00; SC 160 vs NC 136 RPM, p = 0.00). The mean cadence over the last 30 sec of the 3MT did not differ between CLs (SC 93.4 ± 13.4 vs NC 90.0 ± 13.0 RPM, p = 0.9), but the average pedal speed over the same 30 sec was significantly slower in the SC trial compared to the NC trial (SC 1.41 ± 0.21 vs NC 1.61 ± 0.23 m/s, p = 0.00). CP (SC 28.4 vs NC 28.2 W, p = 0.9) and work above end power (WEP) (SC 12.2 ± 4 vs NC 11.1 W, p = 0.4) were not significantly different between CL trials. CONCLUSION: CP was not different in the current study and demonstrated that changing CL by as much 10mm may not be a major factor in maintaining submaximal power output when position on the bike is maintained between CLs. However, individual differences among the subjects reveal changing CL could affect CP by up to 20 watts; some individuals performed better with 15 mm while others performed better with 18 m. Cyclists should begin testing CLs to determine if a CL outside of the typically prescribed norms of within 2 mm of 172.5mm could possibly benefit their performance and comfort while cycling.

3432 Board #120  June 1 8:00 AM - 9:30 AM Correlation Of Functional Movement Screen (FMS) And Mobility, Activation, Posture, Symmetry (MAPS) Among College Students
Annie G. Shirk, Michelle J.H. Heijnen, Ann T. Shields, Minda Harvey, Cody Leviner, Sarah Noland, Jeremy Grissett, Brad Hollingsworth, Cameron Fitch, Brianna Auer, Emma Baer, Cassandra Berger, Victoria Grande, Laurel K. Koontz, Cassidy J. Smith, Morgan Sanderson, Brittni Moskus, Rebecca Edwards, Jeffrey Welch, Kenneth Pate, Sierra McCoy, Sarah Cox, Michaela Tran, Claire Campbell, Wayland Tseh. University of North Carolina Wilmington, Wilmington, NC. (Sponsor: Dr. Robert Boyce, FACSM)
(No relevant relationships reported)

INTRODUCTION: Despite the growing popularity of functional assessment and corrective exercise prescription, there is limited research evaluating the correlation between two functional movement assessments: the Functional Movement Screen (FMS) and the Movement, Activation, Posture, and Symmetry (MAPS). FMS is a commonly-used tool that takes approximately 20-30 min to complete for a trained technician to subjectively score participants on 7 movements. MAPS is a novel assessment tool that takes about 45-60 seconds for a computer-based system to objectively score participants completing 1 movement. PURPOSE: To evaluate the relationship between FMS and MAPS assessment among an apparently healthy, young adult population. METHODS: Two hundred and nineteen participants (10 F; emales; 90; Na; males; Age = 19.1 ± 1.8 yr; Height = 166 ± 10.1 cm; Body Mass Index = 15.3) completed FMS and MAPS within a single testing session. Pearson’s correlation coefficients were used to determine the relationship between FMS and MAPS, as well as FMS and the four individual MAPS components. RESULTS: A weak correlation was observed between FMS and MAPS (r = 0.25, p = 0.001). Furthermore, all individual MAPS components demonstrated a negligible to weak relationship with FMS (r = 0.09).

CONCLUSION: These findings suggest that FMS and MAPS are relatively independent of one another. From an applied perspective, one cannot replace the other in terms of evaluation. Future research will have to examine the value of MAPS as a tool to monitor improvements during exercise interventions.
and ii) without the pin (EXP). The pin eliminated the spring effect of the elastomer, thus making a traditional rigid crank. There was a minute rest between each stage, except when changing from EXP to CON (3 minutes) to change the pin and allow subject to drink. The VCE was used as the external load generator and power was also measured at the pedals (PowerTap P1, WI; PT) to determine if any difference in power between external load and power necessary to turn the cranks against the load was present. MANOVA statistical tests compared %pVT between PT and VCE and VO2 in both EXP and CON (p<0.05).

**Results**

Across all conditions, there was a large effect for EXP power being 1.3% lower than CON (p=0.008; t=0.28). Although not significant, there were small effects for cadence at 8%, PVT, where EXP was lower than CON, but to a greater extent at 9%, which decreased 10% than CON (p=0.019). There was no significant difference between VO2 at each workload when expressed as a percentage of VT between EXP and CON. There were no significant differences by trial for any variables tested.

**Conclusion**

Lower power, but similar VO2 during EXP compared to CON supports the notion that the IMPACT crank improves effective power during cycling. Although small in magnitude, the effect was large and could be of interest to competitive cyclists or triathletes.

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**Table 1. Physiological characteristics of amateur padel players.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>36.5 ± 9.5</td>
<td></td>
</tr>
<tr>
<td>Lean (kg)</td>
<td>63.5 ± 7.5</td>
<td></td>
</tr>
<tr>
<td>SMM (kg)</td>
<td>33.0 ± 3.4</td>
<td></td>
</tr>
<tr>
<td>HRmax (beats/min)</td>
<td>19 ± 9</td>
<td></td>
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<tr>
<td>VO2max (l/min)</td>
<td>3.82 ± 0.61</td>
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<tr>
<td>VO2anaerobic (ml/kg/min)</td>
<td>21.7 ± 6.0</td>
<td></td>
</tr>
<tr>
<td>AT (ml/kg/min)</td>
<td>33.2 ± 6.2</td>
<td></td>
</tr>
<tr>
<td>%AT (%)</td>
<td>6 ± 11.0</td>
<td></td>
</tr>
<tr>
<td>HRat (beats/min)</td>
<td>134 ± 21.8</td>
<td></td>
</tr>
</tbody>
</table>

**SD:** standard deviation; **AT:** anaerobic threshold; **%AT** and **HRat** indicate oxygen uptake; % of VO2max and HR at anaerobic threshold, respectively.

**Discussion**

SMM and number of stages were the main predictors of absolute VO2max (R2=0.2; P=0.001); the equation was VO2max (l/min) = -0.001SMM kg + 1.1kSMM (kg) - Stage (number). The pc between measured and estimated VO2max was moderately high (pc=0.807).

**Conclusions:** We have provided references for body composition and maximal aerobic capacity variables in amateur padel players and a new eqn to estimate aerobic capacity from a specific test for the sport of padel. Larger and more heterogeneous datasets are necessary to validate these results.

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**Dual Stress Warm-Up Protocol Does Not Significantly Improve Anaerobic Performance**

Matthew P. Sacco1, Margaret M. Glick1, Eric C. Bredahl1, Michael T. Lane2, Jacob A. Siedlik1. Creighton University, Omaha, NE. Eastern Kentucky University, Richmond, KY.

**Purpose:** To determine whether a dual stress warm-up protocol improves performance on the 30 s Wingate Anaerobic Test (WAnT).

**Methods:** Thirty college-aged subjects (Mean ± SD; age = 21 ± 3.7 years; height = 176 ± 6 cm; weight = 83 ± 11.8 kg) volunteered to participate and completed a familiarization WAnT on a Monark cycle ergometer using a resistance of 50 bodyweight prior to testing. On two separate visits, separated by at least 3 d but no more than 1 wk, subjects randomly completed a WAnT preceded by either a 5 min warm-up at a resistance of 1.5 BW or a conditioning protocol of equal length (CTRL) or the same warm-up while also completing the Paced Auditory Serial Test, which is a mental arithmetic challenge (EX PT). Zephyr Bioharnesses were used to record heart rate (HR) during the testing sessions. Difference in HR between EXP and CON at each workload when expressed as a percentage of VT between EXP and CON.

**Results:** There were no significant differences in performance or HR response during the warm-up between the CTRL and EX PT.

**Conclusion:** These findings suggest that the addition of a mental task during a warm-up on a cycle ergometer has no effect on sympathetic activity or performance during a 30 s WAnT. The lack of significant findings may be due to the small sample size. Future work should focus on more challenging psychological stressors in conjunction with warm-up protocols to determine whether dual stress challenges can be utilized to optimize performance.
Swim-related fatalities have raised safety concerns in the sport of triathlon. As a majority of deaths occur during the swim, there are strict guidelines related to water temperatures and the use of wetsuits in triathlon events governed by USA Triathlon (USAT). Due to the varying water temperatures, athletes can select from a wide variety of wetsuit models. Two main categories of wetsuit models are sleeveless and full sleeve. The use of a wetsuit in warm water may increase body heat storage and may result in an increase in core temperature. However, there are no data investigating the influence of triathlon wetsuit design on core temperature when swimming in warm water.

PURPOSE: The purpose of this study was to examine the influence of wetsuit design on core temperature responses during swimming in warm water (28 °C).

METHODS: Three experienced triathletes (mean ± standard deviation; SD, age 30 ± 5 years) self-reported being active or non-active according to ACSM physical fitness guidelines. Sixteen subjects (6 male, 10 female, 22.1 ± 4.1 years) were required to rest until core temperature was within 0.5 °C of baseline before beginning the test session. Core temperature data were transferred to the monitor after each swim. Average Tc during the first and last minute of each swim was compared for analysis. A (2) (time) × 3 (wetsuit condition) repeated measures ANOVA was used (α = 0.05). RESULTS: There were no main effects for the interaction of time and wetsuit condition (p>0.05) and there was no main effect for time (p>0.05) nor wetsuit condition (p>0.05). Mean values for Tc were similar for all wetsuit conditions. The majority of deaths occur during the swim, there are strict guidelines related to water temperatures and the use of wetsuits in triathlon events governed by USA Triathlon (USAT). Due to the varying water temperatures, athletes can select from a wide variety of wetsuit models. Two main categories of wetsuit models are sleeveless and full sleeve. The use of a wetsuit in warm water may increase body heat storage and may result in an increase in core temperature. However, there are no data investigating the influence of triathlon wetsuit design on core temperature when swimming in warm water.

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CONCLUSIONS: The results indicate that wetsuit design does not significantly influence thermoregulatory responses.
Validity of a New Portable Metabolic Gas Exchange System

Holly L. McClung1, Leila A. Walker1, David P. Looney1, William J. Tharion1, Alexander P. Welles1, Heather M. Hansen2, Adam W. Potter3, Maxwell N. Rome4, Christopher R. Chalmers5, Reed W. Hoyt1, US Army Research Institute of Environmental Medicine, Natick, MA. 1Oak Ridge Institute for Science and Education, Oak Ridge, TN. (Sponsor: Scott Montain, FACSM) Email: holly.l.mclung.civ@mail.mil

(No relevant relationships reported)

Valid and reliable methods to measure oxygen consumption (VO₂) and carbon dioxide production (VCO₂) are required in the assessment of exercise capacity and energy expenditure. However, research is often restricted by financial and portability issues with existing open circuit spirometry, metabolic cart or portable devices. Purpose: Evaluate a new, light-weight and scalable metabolic system (COBRA) against a criterion metabolic cart system (Parvomedics TrueOne 2400 ™, PARVO). Methods: Fourteen volunteers (13 male, 1 female; 24 ± 5 yr; height, 175 ± 9 cm; body mass, 79 ± 14 kg) completed two trials over one test day. The COBRA and PARVO were used to monitor the physiological strain experienced during aerobic exercise. Unlike its predecessor COBRA, and PARVO were used to monitor the physiological strain experienced during aerobic exercise. Unlike its predecessor CO₂ production (V̇CO₂) on a treadmill in a laboratory (20 ± 0.5 °C; 45 ± 22 % ̇f ourt steady-state work rates: sitting rest, walk (23-36% VO₂peak), jog (49-67% VO₂peak), and run (6-12% V̇O₂peak) on a treadmill in a laboratory (20 ± 0.5 °C; 45 ± 22 % RH). Simultaneous gas samples were averaged over 3-min steady-state periods for each work intensity. Coefficient of determination and Concordance Correlation Coefficients (CCC) were used to evaluate the agreement between the systems when measuring VO₂, V̇CO₂, and minute ventilation (VE). Systematic bias was examined to assess the accuracy of the COBRA. Results: The COBRA and PARVO produced highly correlated measures of VO₂ (R² = 0.90), V̇CO₂ (R² = 0.9) and VE (R² = 0.9). The COBRA had very low bias compared to the PARVO for VO₂ (0.01 ± 0.13 L/min), V̇CO₂ (0.06 ± 0.13 L/min), and VE (2.12 ± 2.75 L/min). COBRA was in high agreement (CCC = 0.9) with the PARVO across each measure of VO₂, V̇CO₂, and VE. Conclusion: The COBRA device is an accurate mobile metabolic system for measuring respiratory variables across a range of work intensities.

Disclaimer: The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.

G-37 Free Communication/Poster - Predictive

Board #132 June 1 8:00 AM - 9:30 AM

A Comparison of Waist-to-Height Circumference Ratios to Standardized Measures of Overweight and Obesity

David Q. Thomas, FACSM, Marin McElroy, Ayunna Moore, Jennifer Spring, Illinois State University, Normal, IL.

(No relevant relationships reported)

Several methods have been used to screen people for overweight and obesity. Recently, waist-to-height circumference ratios have been gaining in popularity due to their ease of measure and focus on central adiposity. However, research on this method is lacking. Purpose: To determine the relationship between waist-to-height circumference ratios (WTHR) and more traditional methods (body mass index, waist-to-hip ratio, sum of skinfolds, and percent fat) of screening for overweight and obesity. Methods: Thirty-one volunteers (17 females and 14 males) ages 18-24 (20.8 ± 0.8 yr) participated in the study. After completing informed consent, each participant had height, mass, waist and hip circumferences, skinfolds (tricip, biceps, mid-axillary, abdominal, supra-iliac, anterior thigh, medial calf, and pectoral men only)) and percent fat (via air-displacement plethysmography - ADP) measured. Results: Height (1.7 ± 0.10 m), mass (76 ± 14.0 kg), waist circumference (~6 ± 3 cm), and hip circumference (~9 ± 3 cm) were determined following standard procedures. Body mass index (BMI) was calculated by dividing mass in kg by height in meters squared (2.12 ± 2.75). Skinfolds (SF) were summed (111.20 ± 21.17 mm). Waist-to-hip ratio (WTHR) was determined by dividing waist circumference by hip circumference (WTHR). Percent fat (21.06 ± 9.33) was measured by ADP. Pearson product-moment correlations for WTHR and BMI (r = 0.83), WTHR (r = 0.83), SF (r = 0.5), and percent fat (r = 0.5) were calculated. Conclusions: Waist-to-height circumference ratios had a strong positive relationship with BMI and moderate positive relationships with WTHR, SF, and percent body fat. It appears that WTHR may be an acceptable alternative to screening for overweight and obesity. Since WTHR only involves the measure of waist and height, waist circumference, this method has a high degree of feasibility. Its focus on central adiposity is an additional benefit. Further research is necessary to determine if these relationships hold true for other populations varying in age and body composition.

Board #131 June 1 8:00 AM - 9:30 AM

Relationship of OMNI Scale of Perceived Exertion to Heart Rate and RER During Incremental Exercise

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(No relevant relationships reported)

The OMNI rating of perceived exertion (RPE) scale is a subjective indicator of physiological strain experienced during aerobic exercise. Unlike its predecessor the Borg RPE scale, relatively few studies have examined the relationship between OMNI Scale reported and the measured heart rate (HR) and respiratory exchange ratio (RER) during exercise. Purpose: To analyze the strength of the relationship between RPE scores from the OMNI scale and HR and RER during incremental exercise. Methods: Twelve active military personnel (11 male, 1 female; 24 ± 5 yr; height; 1.78 ± 0.12 m; body mass; 76.7 ± 8.6 kg) completed two trials over one test day. Each trial consisted of three exercise intensities (walk, jog, run) based on percentages of their maximal oxygen uptake (%VO₂peak) performed at baseline separated by a 20-30 minute rest between trials. Measures of RER were collected using a metabolic cart (ParvoMedics TrueOne® 2400 ™), HR with a commercial chest belt monitoring system (Polar T311 Heart Rate Sensor), and RPE with the OMNI-walk/run scale (Adult OMNI Scale of Perceived Exertion 2005). Results: The calculated Pearson’s correlation of coefficients for RPE was moderately correlated with HR (r=0.83) but weakly correlated with RER (r=0.7). The average RPE for walk (RPE = 2-3), jog (RPE, 4 ±1), and run (RPE, 8 ± 1) increased with each higher work rate. Conclusion: The OMNI RPE Scale is not closely related to heart rate responses elicited by exercise, but is less correlated to changes in RER and therefore less indicative of the transition to greater reliance on glycolytic energy pathways. Disclaimer: The views expressed in this paper are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the US Government. This research was supported in part by appointments to the Postgraduate Research Participation Program at the US Army Research Institute of Environmental Medicine administered by the Oak Ridge Institute for Science and Education through an interagency agreement between the US Department of Energy and USAMRMC.
The U.S. Navy is transitioning from a culture of fitness testing to a more pervasive culture of functional fitness. The objective is to shift away from the current Physical Fitness Assessment, which evaluates general physical fitness levels and disease risk, toward more operationally relevant metrics of performance fitness and mission readiness. **PURPOSE:** To assess and down-select from 11 fitness tasks to 3-5 modalities for potential inclusion in an alternative Physical Readiness Test (PRT).

**METHODS:** Forty-one active duty sailors (30 males; 11 females) completed traditional strength tests and 11 performance fitness modalities. A set of 30 athletes self-reported trauma exposure (TE, physical injury history, and bodily pain). FM characteristics of male tactical athletes, which can commonly be experienced during the career of a military tactical athlete, which can also advance MSKI prevention and treatment. Including TE into physical assessments may not only optimize performance in the psychologically relevant constructs in association with FM, but also advance MSKI prevention and treatment.

**RESULTS:** Seated medicine ball throw (SMBT) — the only modality that measured upper body strength and power — had a strong correlation with the 1 repetition maximum (1RM) bench press (r = 0.9). Standing long jump (SLJ) evaluated lower body strength and power and had a moderate correlation with 1RM seated leg press (r = 0.8) and 1.5 mile run (r = 0.9). The repeated 300-yd shuttle run (300SR) assessed agility and aerobic capacity and was highly correlated (r = 0.8) with participants’ 1.5 mile run times on their most recent PRT. Forearm plank (FP) did not show significant correlations to traditional strength tests or previous fitness test scores (PRT), with the exception of a moderate correlation to PRT push-up scores (r = 0.5).

**CONCLUSION:** SMBT, SLJ, 300SR, and FP were the modalities recommended for inclusion in an alternative PRT. These new modalities evaluate more operationally relevant measures of performance fitness, thereby providing advanced knowledge of a sailor’s physical capabilities and/or limitations. Future considerations should include a follow-on, large scale validation study to develop the appropriate norms and performance standards across gender/age brackets.

Accumulating data have demonstrated a link between psychological distress and musculoskeletal injury (MSKI) prevalence. High levels of physical stress are commonly experienced during the career of a military tactical athlete, which can result in injury and subsequently affect functional movement (FM) outcomes. It is also plausible that trauma exposure (TE), a psychologically salient factor, may influence FM characteristics. It is vital to understand psychological predictors of FM in tactical athletes to optimize performance and to help attenuate MSKI incidents. **PURPOSE:** The primary objective was to determine the associations of combat exposure (CE) and TE with FM characteristics in tactical athletes. Secondary objectives were to explore the confounding influences of age and physical injury history as well as the mediating role of bodily pain. **METHODS:** Eighty-two male, active duty U.S. Navy Explosive Ordnance Disposal personnel (mean age ± SD = 34 ± 6 years) self-reported CE, TE, physical injury history, and bodily pain. FM characteristics (i.e., Functional Movement Screen [FMS], V-Balance Test) were assessed by trained researchers, from which a composite functional status (CFS) measure was derived. Hypotheses were tested using correlational and multiple regression (causal steps) models. **RESULTS:** In unadjusted tests, CE was inversely associated with FMS (r = −0.32, p = 0.009) and CFS (r = −0.30, p = 0.009). In adjusted models, these relationships were robust to the confounding influences of age and physical injury history. In causal steps models, TE and bodily pain were substantive, independent predictors of FMS (R² = 0.20, p = 0.02) and CFS (R² = 0.18, p = 0.02), implying additive, rather than mediated, effects. CE did not predict FM characteristics. **CONCLUSIONS:** To our knowledge, this is unprecedented evidence of the influence of TE on FM characteristics of male tactical athletes that is independent of age, physical injury, and bodily pain. The shared variance of TE and FM characteristics implies that the addition of TE, and other psychologically relevant constructs in association with FM, may advance FM theories. Including TE into physical assessments may not only optimize performance in the tactical environment, but also advance MSKI prevention and treatment.

Maximal relative oxygen consumption (VO₂peak) assessed via a treadmill test to volitional exhaustion, is the foremost measure of aerobic capacity in healthy, recreationally active adults. Habitual exercise may improve the ability to perceive exercise difficulty and predict impending exhaustion. **PURPOSE:** The primary aim of this investigation was to determine if a correlation existed between VO₂peak and time to test termination after participants indicated they were 30 s from volitional exhaustion. A secondary aim was to ascertain if participants more accurately predicted impending exhaustion during a repeated trial.

**METHODS:** Participants completed a familiarization trial to minimize learning effects and determine treadmill speed for maximal testing. During the familiarization trial, participants self-selected a zero-grade jogging speed associated with a value of 12-13 on Borg’s 6-20 RPE scale when steady-state. This speed was used during two maximal tests separated by 36 ± 2 h. During maximal testing, grade was increased 2% every two minutes until volitional exhaustion. VO₂peak was measured as a 18 breath moving average via a metabolic cart. Participants were instructed before and during testing to tap on the treadmill when they perceived themselves to be 30 s from volitional exhaustion.

**RESULTS:** Thirteen (Females: 8 Males: 5) recreationally active individuals (20.7 ± 1.4 yr, 72.4 ± 12.3 kg) completed the protocol. Mean VO₂peak during session 1 (10.00 ± 2.04 ml kg⁻¹ min⁻¹) was 2.5 ± 0.7 ml kg⁻¹ min⁻1 and 0.01 kg (p < 0.01). No significant correlation was detected between VO₂peak and time to test termination after the tap was 38 ± 0.7. Mean VO₂peak during session 2 (10.08 ± 2.31 ml kg⁻¹ min⁻1) was 7.1 ± 0.7 ml kg⁻¹ min⁻1 and 0.01 kg (p < 0.01). No significant correlation was detected between VO₂peak and time to test termination after the tap was 40.0 ± 18.5 s. No significant correlation was detected between VO₂peak and time to test termination after the tap was 38 ± 0.7 or session 2 (r = 0.315, p = 0.29). A dependent t-test (t(12) = −0.8, p = 0.439) did not reveal significant differences in time to test termination across the tap between session 1 and session 2.

**CONCLUSIONS:** Aerobic capacity did not affect the ability of healthy, recreationally active adults to predict impending volitional exhaustion during maximal treadmill running. Time to test termination after the tap did not significantly change during a repeated trial.
The isometric midhith pull (IMTP) has been shown to be able to predict change of direction (COD) ability. This is of interest for sports that require COD movements, as it could potentially be used to identify standout athletes in their respective sports. However, no literature to our knowledge has assessed split stance isometric midhith pull (SSIMTP) as a predictor of COD ability compared to the IMTP. PURPOSE: The purpose of this study was to determine whether SSIMTP is a better predictor of COD ability than the IMTP. METHODS: Seventeen (12 M and 5 F) university aged adults participated in the following study. Mean height, weight, and age were 1.78 ± 0.12 m, 12.3 ± 2.4 kg, and age 22.3 ± 3 years, respectively. Participants completed two sessions randomized in order that were two to five days apart; four trials of the SSIMTP (two trials per lead leg) and the other session involved two trials of the IMTP. Each day also consisted of four trials of the 505-agility test. Two trials involved pivoting off of the left foot and two trials pivoting off of the right foot, which was randomized in order. RESULTS: All results are Pearson Correlation Coefficients presented with their respective p-value. The combined peak force (PF) of the IMTP and the best 505 agility time for the left and right foot had r values of -0.648 (p < 0.09) and -0.644 (p<0.08), respectively. The r values during the SSIMTP condition were -0.22 (p = 0.02) and -0.01 (p = 0.07) when the left leg was the lead leg and COD to the left and when the right leg is the lead leg and COD to the right, respectively. Conclusion: The main finding of this study is that the combined PF produced during the IMTP and the PF produced by the lead leg during the SSIMTP both can uniformly predict COD. For the SSIMTP condition, a significant strong inverse correlation exists between COD ability and left leg and left leg when it is forward and a moderate inverse correlation between right COD ability and the right leg when it is forward. For the IMTP condition, there is a strong inverse correlation between the combined PF and COD ability to the left and moderate inverse correlation between the combined PF and COD to the right. Previous literature has found correlations between IMTP and COD ability anywhere between r = 0.9 and r = 0.09.

Board #138
June 1 9:30 AM - 11:00 AM
Bilateral And Split Stance Isometric Midhith Pulls Can Equally Predict Change Of Direction Ability
Email: brandon.richards@unb.ca
(No relevant relationships reported)

Board #139
June 1 9:30 AM - 11:00 AM
Use Of A Clinic-Based ACL Prediction Algorithm In Division III Female Soccer And Basketball Players
Charles Ruot, Rachel Holick, Lindsay Edwards. Hardin-Simmons University, Abilene, TX. (Sponsor: Dr. Dennis O'Connell, FACSM)
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(No relevant relationships reported)

Board #140
June 1 9:30 AM - 11:00 AM
Can a Field Based Neuromuscular Test Determine Readiness to Train in Female Team Sport Athletes?
Joel Prowling, Nick Hodgson, Rebecca Larson, Christopher Black, FACSM, Jason Campbell. University of Oklahoma, Norman, OK. (Sponsor: Christopher Black, FACSM)
Email: joel.prowling@ou.edu
(No relevant relationships reported)

Board #141
June 1 9:30 AM - 11:00 AM
Predict Failure: Muscle Oxygen Dynamics In Elite Climbers During Finger Hang Tests
Email: andri.feldmann@ispw.unib.ch
Ownerships/interests: stock, owned stocks.

Introduction: Failure in elite sport climbing is associated with an inability to maintain isometric muscle contraction. The ability to supply and utilise oxygen is the primary bioenergetic contributor to muscle contraction and can be examined locally using near-infrared spectroscopy (NIRS). Examining changes in NIRS derived muscle oxygenation (SmO2) have shown to be related to changes in performance output during gripping exercises. Purpose: The aim of this study is to measure SmO2 dynamics in a climbing specific test until task failure in varying conditions. Our prediction is that SmO2 should be a good marker to predict task failure. Methods: Eight elite level climbers performed a finger-hang test with four different intensities maintaining grip until voluntary exhaustion. During each trial SmO2 and time to failure (TTF) were measured. TTF was then compared to the minimally attainable value of SmO2 (SmO2min) and time to SmO2 min (TMin). Results. Two-one-sided tests (TOST) resulted in SmO2 min equi valence for the high intensity conditions (M = 21.9%, SD = 5.9%, M = 22.8%, SD = 6.9%, M = 24.8%, SD = 7.9%, M = 25.3%, SD = 7.9%, M = 25.8%, SD = 7.9%, M = 26.5%, SD = 7.9%, M = 27.2%, SD = 7.9%, M = 27.9%, SD = 7.9%, M = 28.6%, SD = 7.9%, M = 29.3%, SD = 7.9%, M = 30.1%, SD = 7.9%, M = 30.8%, SD = 7.9%, M = 31.6%, SD = 7.9%, M = 32.3%, SD = 7.9%, M = 33.1%, SD = 7.9%). No significant differences (p<0.05) were found for peak or average velocity during the MSs across any trial. Lower body soreness was significantly greater (p<0.05) during the 24-48h follow up visits as assessed via a 0-10 visual analogue scale. The sprint protocol induced a high internal physiological load, evidenced by significantly elevated post-exercise blood lactate levels (pre: 1.6 ± 0.5 mmol/L, post 1.6 ± 0.5 mmol/L). Conclusion: Concentric RFD determined using a CMJ was the best metric for detecting performance impairments, as it consistently declined 24 h after completing a repeated sprint protocol. The other CMJ metrics, as well as MS performance did not decrease across all trials. A CMJ test that assesses concentric RFD may be a useful tool for coaches to determine readiness to train in female athletes. Future research should seek to replicate this protocol using higher sprinting volumes, to determine whether concentric RFD declines in a predictable dose-response manner. Limitations of this study were the small sample size and the lack of control for external damaging activity (i.e. rugby training).

Board #142
June 1 9:30 AM - 11:00 AM
Bilateral And Split Stance Isometric Midhith Pulls Can Equally Predict Change Of Direction Ability
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(No relevant relationships reported)
Numerous prediction equations have been developed to estimate one-repetition maximum (1RM) bench press in various subject populations. While many of these equations have been validated on various groups, rarely have groups of various levels of training been combined to evaluate the accuracy of separate and combined equations. PURPOSE: To produce and evaluate 1RM bench press prediction equations developed on untrained, trained, and athletic men. METHODS: Untrained college men (UT, n = 16), resistance-trained college men (RT, n = 10), and college athletes (ATH, n = 19) were measured for 1-RM bench press and repetitions-to-fatigue (RTF) on separate days. RT men had trained 3 days/wk for 12 wks using a linear periodization program, and ATH had trained for several years using either linear periodization or autoregulatory progressive resistance training. Linear regression equations were generated on validation samples of each group (UT = 119 TR = 120, ATH = 131) using a weight (Rep/Wp) that produced between 2 and 10 RTF. RESULTS: All 3 groups differed significantly in 1RM (UT = 74.1 ± 15.5 kg, RT = 88.8 ± 21.7 kg, ATH = 136.2 ± 21.9 kg) but not in %1RM used for RTF (UT = 8.9 ± 3%, RT = 8.0 ± 3%, ATH = 83.4% ± 6%). Despite this, the percent difference in %1RM, ATH (6.7 ± 2.4) produced significantly more RTF than UT and RT men (6.1 ± 2.2 and 6.0 ± 2.1, respectively). Multiple correlations and standard errors of estimate (SEE) for group equations were similar for UT (R = 0.95, SEE = 5.1 kg), RT (R = 0.96, SEE = 5.3 kg), and ATH (R = 0.95, SEE = 6 kg). Global equations combining all 3 groups had comparable results [1RM (kg) = 1.16 Rep(Wp) + 2.07 RTF - 9.4, R = 0.98, SEE = 6.2 kg]. Cross-validation of each equation on 25% randomly selected subsamples accurately predicted %1RM of each group within ±10.0% of actual 1RM. The global equation predicted better in RT (βRT) and ATH (βATH) than in UT (βUT) [1RM (kg) = 1.16 Rep(Wp) + 2.07 RTF - 9.4, R = 0.98, SEE = 6.2 kg]. CONCLUSIONS: A newly developed global prediction equation appears to have acceptable accuracy for estimating 1RM bench press in men with varying resistance training backgrounds.

Water polo requires leg muscle biosequencing that is different from weight bearing sports. The kinematics and forcefulness for each player could be optimized for different positions and help predict player success. Comparing vertical jump with Sparta Science force plate technology outputs on in-season performance of women’s water polo players. METHODS: 1D vision 1 women’s water polo players were evaluated during two consecutive seasons: 2018 2019and 2017 2018 statistics tabulated for each season were Games played, shots, goals, shooting percentage, assists, steals, exclusions (EX), and exclusions drawn (DEX). All players were tested for vertical jump once a week during conditioning prior to resistance training using Sparta force plate and proprietary outputs, which calculated “Load” (rate of eccentric force), “Expload” (power generation during concentric force output), and “Drive” (neural recruitment during eccentric phase of motion). Linear regression tested Sparta data in-season performance outcomes. RESULTS: Athletes weighed 0.2 ± 9kg, had a vertical jump of 30.7 ± 6c in m and Sparta Load of 0.2, Expload of 3.4± 1kg, and Drive of 30 = 10.0. On average, throughout each season, the athletes played 26 ± 6 games, took 7 ± 4.5 shots, scored 31.3 ± 8% of shots taken, had 24 ± 12.5 steals, and 16 ± 3.4 assists. Vertical jump predicted a higher shooting percentage (β=0.010; p=0.001), more steals (β=0.820; p=0.043), fewer assists (β=-1.324; p=0.005), and fewer EX (β=-1.466; p<0.001). Load predicted a lower shooting percentage (β=-0.003; p=0.001) and more EX (β=0.284; p=0.001) and DEX (β=0.219; p=0.002). Explode predicted a higher shooting percentage (β=0.003; p=0.009), more steals (β=0.642; p<0.001), and lower EX (β=-0.001; p=0.007). Drive predicted a higher shooting percentage (β=0.002; p=0.001), fewer assists (β=-0.221; p=0.007), lower EX (β=-0.099; p=0.017), and higher DEX (β=0.107; p=0.017). CONCLUSION: These findings indicate that both vertical jump and force plate biosequencing data may be useful predictors of water polo performance and could be employed to identify athletic capacities that need improvement.

Use of Traditional and Modified Functional Movement Screening to Predict Balance with Military Load

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Purpose: To determine if Functional Movement Screen (FMS) or modified Functional Movement Screen (mFMS) items scores predict dynamic balance scores of potential military recruits who wore a 24 kg military load. METHODS: Thirty physically-active males and females who displayed anthropometric and physical fitness characteristics typical of military recruits entering basic training completed FMS and mFMS. Torso-loads balanced was assessed as loaded cohesive reach distance (LCR) and loaded overall stability indices (LOSI) measured using the Y Balance test and Biodex Balance System, respectively. RESULTS: FMS composite scores exhibited the strongest relationship with LOSI and correlations with LCR were positive. Correlations between items of the test and LCR were positive. Correlations between items of the test and LOSI were significant. CONCLUSIONS: Functional Movement Screen scores predicted dynamic balance of potential military recruits who wore a 24 kg military load. This study implies that the Functional Movement Screen may be a useful tool in predicting balance performance in a military load environment.

A Fitness Field Test to Predict VO2max in Female Collegiate Field Hockey Players

Jennifer Morton, Ian Klein. Ohio University, Athens, OH. (No relevant relationships reported)

Field hockey is a competitive sport requiring aerobic fitness. The gold standard method for determining aerobic fitness is a maximal oxygen consumption (VO2max) test performed in a laboratory on a motorized treadmill (LAB) by a trained professional. The 30-15-intermittent fitness test (FIELD) is a maximal effort running test performed in a laboratory on a motorized treadmill (LAB) by a trained professional. The 30-15-intermittent fitness test (FIELD) is a maximal effort running test in a laboratory on a motorized treadmill (LAB) by a trained professional. The 30-15-intermittent fitness test (FIELD) is a maximal effort running test designed to predict VO2max on the field relative to a traditional treadmill graded exercise test (GXT). METHOIDS: Nine (N=9) experienced female collegiate field hockey players (mean age=19.78±1.56 y, field hockey experience=8.20±2.2 y) were classified as healthy via a health assessment consisting of height, weight, and body fat (BF%). Each participant completed a LAB GXT test in a temperature-controlled laboratory using a metabolic cart and motorized treadmill, followed by the FIELD test a month later on a standardized turf field as a group under the same conditions. The FIELD test consists of a series of 30 second shuttle runs with 15 s between each run. The mean score for each participant was calculated as the mean of the scores for each run. The mean score was used to predict VO2max using a linear regression equation. The in-line lunge item score from the FMS may be the best predictor of torso-loaded balance and the test may be more appropriate than items from a torso-loaded FMS battery in predicting torso-loaded balance in military recruits. Use of the FMS by clinicians may aid in mitigating musculoskeletal injuries in service members, thus minimizing losses that contribute to decreased military readiness.

All 3 groups differed significantly in %1RM, ATH (6.7 ± 2.4) produced significantly more RTF than UT and RT men (6.1 ± 2.2 and 6.0 ± 2.1, respectively). Multiple correlations and standard errors of estimate (SEE) for group equations were similar for UT (R = 0.95, SEE = 5.1 kg), RT (R = 0.96, SEE = 5.3 kg), and ATH (R = 0.95, SEE = 6 kg). Global equations combining all 3 groups had comparable results [1RM (kg) = 1.16 Rep(Wp) + 2.07 RTF - 9.4, R = 0.98, SEE = 6.2 kg]. Cross-validation of each equation on 25% randomly selected subsamples accurately predicted %1RM of each group within ±10.0% of actual 1RM. The global equation predicted better in RT (βRT) and ATH (βATH) than in UT (βUT) [1RM (kg) = 1.16 Rep(Wp) + 2.07 RTF - 9.4, R = 0.98, SEE = 6.2 kg]. CONCLUSIONS: A newly developed global prediction equation appears to have acceptable accuracy for estimating 1RM bench press in men with varying resistance training backgrounds.
Purpose: The vertical jump provides critical kinetic information regarding athletic performance, and can be quantified by the force-time (F-T) curve with defined phases of movement. Alterations in the efficiency of mechanisms used for force production could potentially lead to abnormal force dissipation and resultant injury. The purpose of this study was to identify which force plate variables from a vertical jump task could identify collegiate athletes who sustained a lower extremity injury. Methods: Vertical jump testing using a force plate with dedicated software (SpartaTrac system) was performed by all healthy varsity collegiate athletes at several intervals throughout the athletic year over 3 academic years. The testing procedure consisted of each subject performing a series of 6 consecutive vertical jumps. Jumps were documented by the team athletic trainers and verified with the health care organization’s electronic medical documentation system. Injuries were defined as occurring no more than 60 days after a jump and defined as lower extremity by OSICS 10 code. 234 lower extremity injuries were identified. Subjects were matched by age, sex and sport. Vertical jump variables used were load, explode and drive, operationally defined as the average eccentric rate of force development, average concentric force, and concentric impulse, respectively. Logistic regression was used to determine if the battery of variables could predict whether or not an athlete would sustain a lower extremity injury. Additionally, these variables were able to identify athletes who sustained a lower extremity injury. Finally, these variables were able to identify athletes who sustained an ACL injury. Subjects who sustained an ACL injury were identified, matched, and analyzed correspondingly. Results: Load, explode, and drive, when entered into the regression equation, showed the ability to predict lower extremity injury, $\chi^2 = 14.6, df=4, P < 0.01$; with explode independently showing significant prediction at $P < 0.02$. Load, explode, and drive also showed the ability to predict ACL injury, $\chi^2 = 13.9, df=3, P < 0.01$, with explode independently showing significant prediction at $P < 0.02$. Conclusion: The force plate variables collected from vertical jumps were able to identify athletes who sustained a lower extremity injury. Additionally, these variables were able to identify athletes who sustained an ACL injury.

Protocols for the prediction of maximal oxygen uptake ($\text{VO}_{2\text{max}}$) on a cycle ergometer have been criticized for either being too long or aggressive for individuals of variable fitness and/or disease status. Current protocols typically increase workload by adding resistance to the flywheel at a fixed RPM. Increases in RPM rather than resistance later in the test may provide increased physiological yield, affording a more valid prediction of $\text{VO}_{2\text{max}}$. Purpose: The purpose of this study was to design and validate a novel $\text{VO}_{2\text{max}}$ protocol systematically adding increments based on the subject’s predicted heart rate reserve (HRR) in order to individualize the test protocol while adhering to well-documented $\text{VO}_{2\text{max}}$ testing principles. Methods: Subjects included 12 females (20-23yo) who performed a $\text{VO}_{2\text{max}}$ test using the new cycle ergometer protocol. Prior to testing, seat height on a Monark cycle ergometer was standardized with a 5-10 degree knee bend in the pedal-down position with the sole of the foot parallel to the floor. $\text{VO}_{2}$, blood pressure, rating of perceived exertion (RPE), and heart rate using ECG were measured at rest and throughout the cycle ergometer exercise test, as well as the assessment of signs and symptoms. Workload increases were based on pre-determined Incremental Target Heart Rates (ITHR) using HRR. Subjects commenced at a workload of 18 kg/min (0.5kg; 9 RPM) and increased every 2 minutes by adding 0.5kg or 1.0 kg resistance based on achievement of ITHR for each stage. When an ITHR representing $\geq 60\%$ HRR was achieved, workloads were increased by 10 RPM for each subsequent stage. Exercise tests were terminated when the subject could not maintain RPM or reached volitional exhaustion. This novel cycle ergometer protocol was demonstrated to be a valid predictor of $\text{VO}_{2\text{max}}$ for the population tested. Further testing on other diverse populations is warranted.

PREFERENCE OF LOWER EXTREMITY INJURIES FROM VERTICAL JUMP KINETIC DATA IN COLLEGIATE ATHLETES

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Results: Bivariate correlations revealed that TRANSFER was associated with age ($r = 0.27$, $P < 0.01$), comorbidities ($r = 0.33$, $P < 0.01$), and BMI ($r = 0.28$, $P < 0.01$). Using linear regression analyses, TRANSFER was a significant predictor of LEFP Z-score (standardized $r = -0.73$, $P < 0.01$) independently accounting for 30% of the variance after adjustment for covariates. Discussion: Our results suggest that the ability to lower oneself to the ground and return to a standing position is a significant indicator of LEFP in middle-age and older adults. Further study is warranted to determine the clinical relevance of this simplified evaluation of LEFP and its ability to predict falls, physical disability, and mortality.
PURPOSE: Investigate whether baseline physical activity behaviors predict aerobic fitness adaptations following an individualized structured exercise intervention in an older adult population.

METHODS: Twenty-four cognitively healthy adults (age=64.8±4.6 yrs) from the Augustana University, Sioux Falls, SD. A test of maximum aerobic capacity, to estimate aerobic fitness, was used to determine whether the test was appropriate for the individuals. The gold standard for determining aerobic fitness is VO_{2max} testing, a time-consuming test which requires expensive equipment. The Yo-Yo Intermittent shuttle test is a field test performed to provide a more specific estimate of aerobic fitness, but its ability to accurately predict VO_{2max} in women was investigated.

RESULTS: For the entire sample, baseline physical activity was significantly and positively associated with baseline fitness (r = .452; p < .018). Demonstrating the effectiveness of our test, we observed a significant test-retest reliability for VO_{2max} (r = .58; p < .001). Pearson correlations were calculated for all individual samples and found to be significant at the p < .01 level.

CONCLUSIONS: Six-months of aerobic exercise training significantly improved fitness levels in our older adult population. As expected, baseline physical activity and fitness were positively associated. However, baseline physical activity did not predict aerobic fitness gains to a structured exercise training program. Future exercise trials with larger sample sizes are needed to determine whether it is necessary to recruit inactive participants.

The gold standard for determining aerobic fitness is VO_{2max} testing, a time-consuming test which requires expensive equipment. The Yo-Yo Intermittent shuttle test is a field test performed to provide a more specific estimate of aerobic fitness, but its ability to accurately predict VO_{2max} in women was investigated.

PURPOSE: To determine the ability of Oddvar Holton (OH) diagram to accurately predict repetitions achieved at 6% and 8% loads in female lifters. METHODS: Participants were 18 college-aged women (18-23 yrs) consented and 29 completed assessments. Fitness assessments included a maximal exercise test and 7 days of physical activity monitoring via accelerometry. Aerobic fitness was defined as the highest oxygen consumption (VO_{2max}, ml/kg/min) value recorded during the exercise test and physical activity was defined as total minutes spent in moderate-vigorous physical activity. A repeated measure ANOVA design, adjusted for age, gender, APOE status, and BMI was used to examine changes in fitness. Bivariate Pearson correlations were used to investigate 1) the relationship between baseline physical activity and baseline fitness across the entire group (n=24) and 2) baseline physical activity and changes in fitness (%VO_{2max}) within participants randomized to the exercise intervention (n=12).

RESULTS: For most exercises, the repetitions achieved deviated substantially from the expected repetitions (14 of 16 exercises deviated by >5 repetitions). These findings were most extreme at lower loads: 60% load error scores (11.9 ± 2.7 reps) were significantly greater (p < 0.01) than 80% load error scores (3.9 ± 1.4 reps). Conclusion: Considerable variability exists among females in the repetitions achieved versus the repetitions predicted by OH. In all exercises, greater deviations from expected values occurred at lower loads.

To determine the appropriate load for resistance training (RT), exercise professionals (EPs) commonly have clients complete one repetition maximum (1RM) testing. Then, submaximal loads can be easily estimated for RT sessions and expected repetitions can be determined utilizing published prediction tables. PURPOSE: To determine the ability of Oddvar Holton (OH) diagram to accurately predict repetitions achieved at 6% and 8% loads in female lifters. METHODS: Participants were 18 college-aged women (18-23 yrs) consented and 29 completed assessments. Fitness assessments included a maximal exercise test and 7 days of physical activity monitoring via accelerometry. Aerobic fitness was defined as the highest oxygen consumption (VO_{2max}, ml/kg/min) value recorded during the exercise test and physical activity was defined as total minutes spent in moderate-vigorous physical activity. A repeated measure ANOVA design, adjusted for age, gender, APOE status, and BMI was used to examine changes in fitness. Bivariate Pearson correlations were used to investigate 1) the relationship between baseline physical activity and baseline fitness across the entire group (n=24) and 2) baseline physical activity and changes in fitness (%VO_{2max}) within participants randomized to the exercise intervention (n=12).

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The US Army Load Carriage Decision Aid (LCDA) is a planning tool composed of biomedical models that predict Warrior physiological responses during dismounted operations. The LCDA’s metabolic model requires new equations to accurately predict the added metabolic cost of carrying varying types and amounts of military equipment.

**Purpose:** Develop an equation for the LCDA metabolic model that better predicts the metabolic costs of carrying backpack loads.

**Methods:** Thirteen studies in which volunteers walked while carrying heavy pack loads were obtained for analysis. Treadmill speeds ranged between 1.1 - 1.8 m·s⁻¹ with maximum pack loads exceeding 5% body mass. We used k-fold cross-validation to test how well the new model generalized to new data. Equations were validated using predicted and measured metabolic rates was tested using the one-sided t-test (TOST). We compared the new backpacking equation’s accuracy against the LCDA graded walking equation using the Concordance Correlation Coefficient (CCC).

**Results:** Predictions from the LCDA metabolic model were statistically equivalent to metabolic rates measurements during each step of the k-fold cross-validation (p < 0.05). Predictions from the new backpacking equation had a higher correlation to measured metabolic rates (0.46 ± 0.36 W·kg⁻¹ with a lower standard error of 0.05) versus the existing LCDA graded walking equation (0.11 ± 0.22 W·kg⁻¹).

**Conclusions:** The LCDA metabolic model accurately predicts the metabolic costs of backpacking. Military mission planners, backpackers, and trail walkers can rely on improved guidance from the LCDA metabolic model for training, nutritional intake, and heat injury prevention.

**Indirect calorimetry** is used to measure oxygen consumption for estimating resting metabolic rate (RMR). Laboratory devices are available for the measurement of RMR, such as the BodyGem® indirect calorimeter and the Vacumed VO₂ metabolic cart, and can be used to provide an estimate of RMR.

**Purpose:** To compare the RMR of college-aged women while sedentary on the BodyGem® and the Vacumed VO₂ metabolic cart, and establish prediction equations.

**Methods:** Participants were college-aged women (n = 15), aged 15-50, volunteering by scheduled time and day. All participants completed a thirty-minute supine resting session in a quiet environment. Five minutes of resting data were then collected using the Vacumed while in the supine position. Immediately thereafter, five minutes of resting data was collected using the BodyGem® indirect calorimeter while in the seated position. The RMR values for the Vacumed VO₂ metabolic cart was calculated using the proprietary software utilized by the Vacumed metabolic system, while the MSJ estimate of RMR was hand-calculated. RESULTS: The correlation coefficient (r²) for the BodyGem® and Vacumed VO₂ metabolic cart was 0.49 ± 0.41 versus 0.73 ± 0.29 for the Vacumed VO₂ metabolic cart and MSJ estimate of RMR, respectively.

**Conclusions:** The BodyGem® indirect calorimetry accurately predicts the metabolic cost of sedentary resting metabolic rate. Military mission planners, backpackers, and trail walkers can rely on improved guidance from the BodyGem® for training, nutritional intake, and heat injury prevention.
sprint speed in active individuals. Coaches and active individuals may consider the FSQ and BSQ as interchangeable squat modalities providing squat modality variability within RT protocols.

The Freebounder™ Fitness and Rehab Machine consists of a spring-loaded platform attached to a metal frame and has characteristics similar to those of a mini-trampoline. The Freebounder™ purportedly reduced the impact forces on the lower body during an aerobic workout. PURPOSE: This study was designed to compare the ground reaction forces (GRF) and loading rate (LR) when subjects exercised on the Freebounder™ compared to walking and running on a treadmill and double leg-bouncing on a mini-trampoline. METHODS: Eighteen volunteers (M and F) between 19-28 yrs of age completed 4 conditions, in random order: walking at 3.0 mph on a motorized treadmill, running at 6.0 mph on a motorized treadmill, double-leg bouncing on a mini-trampoline at 1 jump/min, and double-leg bouncing on the Freebounder™ at 6 bounces/min. During all testing plantar forces were collected using Loadcal in-shoe sensors. Data were recorded during the last 10 seconds of each trial, with 5 representative strides being analyzed for GRF and LR. RESULTS: The GRF (Freebounder™ = 6 ± 17.2, w/ walking = 8 ± 15.3) in-trampoline = 145 ± 0.17, quadriceps (Freebounder™ = 8 ± 15.3, running = 16 ± 15.3, and LR (Freebounder™ = 8 ± 15.3, walking = 15 ± 10.8, m in-trampoline = 8 ± 15, running = 15 ± 15.3) when exercising on the Freebounder™ were significantly lower (<0.05) compared to walking and running on a treadmill and double-leg bouncing on a mini-trampoline. CONCLUSION: These findings suggest that the Freebounder™ is an excellent low-impact option for individuals looking for an alternative aerobic exercise modality compared to more traditional modes of exercise.

PURPOSE: As we age, various functional functions of our body such as muscular strength and balance ability gradually decline. The decline of muscular strength associated with aging is a major cause of decreased balance ability and gait instability. The purpose of this study was to examine the effects of whole-body vibration training (WBVT) on muscular strength and balance ability of elderly men. METHODS: 30 elderly men aged between 60-79 yrs, who met the inclusion criteria, were recruited and randomly assigned into training and control groups. Training group carried out 12-wk WBVT at the same amplitude (3mm) and frequency (28 30Hz) on the Power-Plate vibration platform, while control group had no any training. Muscular strength of back and knee, static and dynamic balance ability were measured respectively by portable digital muscle strength tester (microFET3, American) and dynamic balance assessment training system (Biodex, Norwood, American) before and after the experiment. RESULTS: The core and lower extremity muscular strength of the subjects in training group were significantly enhanced after 12-wk WBVT, with the average increase of dorsal extensor muscular strength by 15% and extensor knee muscular strength by 20% , with the eyes open, the overall (1.9: 0.8s 1.0 0.27) , left-and-right (1.710.42 vs. 1.570.05) static balance index decreased significantly and the overall (0.21 vs. 3.42 vs. 0.29, fore-and-aft (0.30 vs. 2.53), right-left (0± 0.26 vs. 0.26 0.29) static balance index with the eyes closed also decreased significantly; the dynamic balance scores in the front (36.63±12.41 vs. 25.39±18.91) enhanced significantly. Meanwhile, there was no obvious change in muscular strength and balance ability in the control group at the end of experiment. CONCLUSIONS: It was concluded that the core and lower extremity muscular strength as well as static and dynamic balance of elderly men could be improved with a 12-wk WBVT.

PurPOSE: To determine if bench press training with leg-drive elicits similar strength characteristics to a standard bench press in strength and body fat measures after 8-weeks of bench press only training. METHODS: 23 healthy, college-age men were randomized into two groups: standard bench press (STP) (n = 12, age 22 ± 2.3 yrs, height 172.2 ± 6 cm, mass 77 ± 10.4 kg), and leg-drive (LD) (n = 11, age 22.5 ± 1.9yrs, height 172.8 ± 5.9 cm, mass 80 ± 10.4 kg). Pre and post analyses of bench press 1-repetition maximum (1RM), and changes in body fat percentage were conducted. Average bench-press volume was determined on a weekly basis. The training consisted of two sessions per week for five weeks of either standard bench press or bench press using leg-drive. For each session, participants completed four sets of bench press to volitional fatigue at 80% of their 1RM. During week three of training, a new 1RM was conducted to determine whether to move the participant up in weight. A 2 x 2 repeated measures ANOVA (RMANOVA) was conducted for 1 RM and body fat, and a 2 x 3 RMANOVA was conducted for average weekly lifting volume. RESULTS: Significant condition main effects were found with both groups experiencing an approximate 5% increase in 1RM strength (p-values < 0.001), and an approximate 0.5% reduction in body fat percentage (p = 0.040). A condition main effect was found for average lifting volume (p = 0.041) and post-hoc analysis revealed that week three was significantly higher than all other weeks. No significant group main effects were observed for any of the variables (all p-values > 0.05).
Objective: To compare the effects of vibration training (V) and control training (C) on balance, core stability and muscle strength in young martial arts athletes. Methods: Fourteen athletes were recruited and randomly assigned to two groups: vibration group (V, n = 7) and control group (C, n = 7). Before and after the 12 weeks training, the SMART Balance Master system was used to measure scores in the limits of stability (LS): reaction time (RT), movement velocity (MLV), end point excursion (EPE), maximum excursion (MAX), and directional control (DCL). The core stability was evaluated by the performance of grade 6 bdominal bridge. Core muscle strength was indirectly evaluated by integrating electromyography (iEMG). Student t-tests were used for data analysis. Results: 1. MLV(3.17 deg/sec, p < 0.01), EPE(10.86%, p < 0.01), MAX(7.00%, p < 0.05), DCL(2.86%, p < 0.05) in group V were significantly higher after the Vibration Intervention. 2. EPE(8.86%, p < 0.01), MAX(4.43%, p < 0.01) in group C were higher after the control training. The percentage range was higher in group V (8.29% than C4.50%). No significant differences were found in LS between the groups at 12 weeks of follow up. The full score of grade 6 bdominal bridge was obtained in the vibration group, and the overall Range was higher in group C than group V (p < 0.01). The scoring of core stability also revealed no differences between the groups. In group V left rectus abdominis iEMG value (nearly 100% mV s·P<0.01), left rectus femoris (0.71 mV s·P<0.05), left tibialis anterior (0.39 mV s·P<0.05)were higher after 12 weeks training. In group C left rectus femoris (0.42 mV s·P<0.01), left tibialis anterior (0.12 mV s·P<0.05) were higher after 12 weeks training. After 12 weeks training, the iEMG value of left tibialis anterior (0.63 mV s·P<0.01), right rectus abdominis (0.34 mV s·P<0.05) in group V were higher than C. Over time, these differences demonstrated the ability to improve core muscle strength in vibration group and decrease in control group. Conclusion: Vibration training improved balance, core stability and muscle strength in young martial arts athletes.

**Discussion**

Vibration training improved balance, core stability and muscle strength in young martial arts athletes.

**Conclusion:** Vibration training improved balance, core stability and muscle strength in young martial arts athletes.

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**Conflict of Interest**

No relevant relationships reported.
For collegiate football players, an outstanding performance at the NFL scouting combine or an athlete’s college pro-day may increase the likelihood of being drafted or signed to an NFL team. In recent years, it has become common for players to decline playing in bowl games to allow for additional preparation for combine and pro-day performance. PURPOSE: To determine if the duration of combine preparation training influences NFL Combine or Pro Day performance. METHODS: 23 college football players participated. A main effect was found for exercise condition on muscle activation for each of the eight exercises. At the end of the eight-week strength training, all parameters in the suspension strength group improved significantly. However, the main effect was found for exercise condition on muscle activation for each of the eight exercises.
increase the MA. Funding for this project was provided by Secretaría d’Universitats i Recerca del Departament d’Empresa i Coneixement de la Generalitat de Catalunya i als Fons Socials Europeus.

3482 Board #170 June 18 8:00 AM - 9:30 AM Developing Muscular Power vs. Muscular Endurance: Results from Two Different Push-ups Training Programs

Austin McClintock, Istvan Kovacs, Wenhao Liu, FACSM, Slippery Rock University, Slippery Rock, PA. (Sponsor: Wenhao Liu, FACSM)

(No relevant relationships reported)

PURPOSE: While development of muscular power (MP) vs. muscular strength (MS) requires the use of different repetitions, weights, and movement velocity, push-ups involve overcoming constant resistance (body) weight and might be able to develop both MP and ME, especially among beginning trainees. This study examined whether two different push-ups training programs, one focusing on MP and the other on ME, would influence the development of MP and ME of the upper body differently among novice trainees. METHODS: A six-week push-ups training with three sessions each week was administered to college students (mean age: 21.36 ± 1.18). Participants had limited experience in resistance training, and were randomly assigned to the MP group (MPG) or the ME group (MEG), with each group having 14 males and 9 females. In each training session, the MPG performed six sets of ballistic plyometric push-ups with low (4), or female, or 4 and 5 males) repetitions at maximum velocity, and the MEG did six sets of regular push-ups with high (10-20 for females, 15-20 males) repetitions. Two push-ups tests were administered before (pretest) and after (posttest) the six-week training: (a) four consecutive ballistic push-ups test for average flight height (T1), calculated from the flight time provided by a contact mat, and (b) regular push-ups for maximum repetitions (T2). The test results were compared within and between groups. RESULTS: Paired-samples t-tests indicated significant within-group improvements in both push-ups tests (p < 0.05) in both groups. The MPG improved in T1 from 1.6 ± 1.0 to 1.3 ± 0.9, and in T2 from 20.9 ± 13.1 to 29.1 ± 11.10 reps. As for between-group comparisons, MANCOVA showed no significant differences (p > 0.05) in adjusted means in either push-ups test after controlling for pretest differences: MP-T1 4.78 ± 1.74 vs. ME. T1 7.06 ± 2.86 in. (T1), and 29.1 ± 11.10 reps. (T2). CONCLUSION: While the two push-ups training programs each has a different focus (MP or ME), they have roughly the same results in developing both MP and ME. This may be related to the constant resistance (bodyweight) in push-ups, as well as the transfer effect between MP and ME in early stage of resistance training among novice trainees.

3483 Board #171 June 18 8:00 AM - 9:30 AM Actinin 3 Genotypes and Altitude Training

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(No relevant relationships reported)

Certain genotypes determine adaptation to certain exercise and can be used to monitor adaptability to training. PURPOSE: To gauge cardiovascular response by using oxygen saturation and heart rate change to determine adaptation to altitude training in athletes with RR, RR X and the XX genotypes. METHODS: Athletes who were previously genotyped for the actinin 3 genes were recruited for the study. Forty athletes consented to participate and were divided in two groups. One group participated primarily in running events of distance > 1000m (group M, n=8) and the other participated in running events ≤ 400m (Group S, n=35). Each group was subjected to running up a steep slope of 8°00M twice weekly for 12 weeks. Oxygen saturation was recorded using a pulse oximeter for each participant before the start of 12 weeks and every 2 weeks up to 12 weeks. Blood pressure and heart rate were recorded before the start of the 12 week trial and each 4e.e eks up to 12 weeks. RESULTS: Thirty five athletes had the 577RR or the weaker 577RX variant of the actinin 3 gene. Five had the 97 XX genotype. Those with the RR and R X genotypes had no significant difference in their Spo2 values over 12 weeks (p>0.1). Their heart rate and blood pressure did not significantly decrease over 12 weeks (p>0.5). Group M athletes had significant increase in Spo2 values , heart rate and pulse rate also significantly decreased over 12 weeks (p<0.001). CONCLUSION: Those with the XX genotype adapted better to altitude training than those with the RR and R X genotypes.
Elite military training is highly stressful on the body and challenges the individual operator to maintain allostatic load (i.e., the ability to adapt and recover from repetitive stressors). It is well understood that increased allostatic load, above that of allostatics, may lead to hormonal imbalances in the hypothalamic-pituitary-adrenal (HPA) and gonadal (HPG) axes. However, it is not well understood if elite military training elevates allostatic load enough to disrupt the HPA and HPG axes. PURPOSE: To determine the cortisol awakening response (CAR) as a marker of the HP A and HPG axes. METHODS: Healthy, elite, male operators (n = 37; age: 26.8 ± 4.8 yrs; height: 180 ± 8 cm; weight: 87.0 ± 6.6 kg) were selected in this study. Operators were stratified into 3 groups based on age (20-26, 27-29, and 30-41 yrs). Daily saliva samples were collected by each operator at the time of awakening (06:00), 30 min after awakening, and 60 min after awakening. RESULTS: Participants were significantly different among age groups in their CAR (p < 0.001). The CAR in the youngest age group (20-26 yrs) was significantly lower than the CAR in the older age groups (27-29, 30-41 yrs) (p < 0.001). Adjusted contrast analysis revealed the difference was only significant between the 20-26 yrs and 27-29 yrs age groups. CONCLUSIONS: Various ratios indicating the ability of players to handle their body weight during explosive movements may be useful in classifying playing position and evaluating training improvement.
Resistance exercise (RE) has been demonstrated as a superior modality for increasing muscle strength, muscle endurance, power, and motor performance. The sled used in this study is a novel device that provides a proportional increase in resistance with increased speed.

**PURPOSE:** To examine the impact of resistance on gait temporospatial parameters using a sled in healthy young adults while walking and running.

**METHODS:** Fifteen young adults (ages 21-35) were recruited to participate in this study. Mobility Lab sensors (accelerometers and gyrosopes) were placed on each subject at the chest, waist, and both wrists and ankles. Each participant performed three trials of one condition: self-paced walking (W), self-paced walking while pushing the sled (WP), and maximal speed walking while pushing the sled (RP).

**RESULTS:** A repeated measures MANOVA was conducted to compare gait temporospatial parameters across conditions. Results indicate significant differences (P < 0.005) between all conditions for stride length, cadence, double support time, swing %, and stance %. Stride length decreased across all three conditions: W (3.97 ± 0.20 m), WP (3.47 ± 0.20 m), and RP (3.97 ± 0.20 m). Cadence decreased while WP (105.7 ± 11.01) was the greatest during WP (105.7 ± 11.01) compared to W (105.7 ± 11.01). During resistance conditions (WP and RP) participants demonstrated greater gait cycle percentage in stance phase [(WP, stance phase: 56.0 ± 1.6, swing phase: 44.0 ± 1.6) and (RP, stance phase: 57.0 ± 2.7, swing phase: 43.0 ± 2.7)] when compared to W (stance phase: 57.0 ± 2.7, swing phase: 43.0 ± 2.7).

**CONCLUSIONS:** Longer stance phase with a proportional increase in resistance could be utilized as a combined resistance and gait training tool as supposed to only gait training. This resistance as an intervention might be a viable option to improve the push-off of patients with limitations such as neurological disorders. Future studies should focus on neuromuscular activation of the lower extremity, specifically the muscles involved in the gait cycle stance phase when walking or running with resistance.

**Board #180 June 1 8:00 AM - 9:30 AM Effects Of Lower-leg Kinesio Taping On Ankle Strength, Foot Pressure And Balance**

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(No relevant relationships reported)

The use of kinesio tape among health care professionals has grown recently in efforts to efficiently prevent and treat joint injuries. However, limited evidence exists regarding the efficacy of this technique in enhancing joint stability and neuromuscular control.

**PURPOSE:** To compare the effect of lower-leg kinesio taping and traditional taping method on ankle strength, foot pressure and static and dynamic balance.

**METHODS:** In a double-blinded, randomized, crossover trial, and twenty healthy adults were applied lower-leg kinesio taping and traditional taping method for 1-week. The two taping methods were separated by a 2-week. All subjects were evaluated for isokinetic strength (plantar flexion, dorsiflexion, inversion and eversion of 30/60°/sec and 0°/sec), foot pressure during gait and static and dynamic balance.

**RESULTS:** Results showed that backward, leftward and rightward of dynamic balance were significantly increased in lower-leg kinesio-taping compared to CON (p < 0.05). The two taping methods were separated by a 2-week. All subjects were evaluated for isokinetic strength (plantar flexion, dorsiflexion, inversion and eversion of 30/60°/sec and 0°/sec), foot pressure during gait and static and dynamic balance.

**CONCLUSIONS:** Both taping methods applications are recommended for increasing dynamic balance ability. Further research might investigate how this affects the participants with a history of injury.

**Board #181 June 1 8:00 AM - 9:30 AM Effects Of Whole-body Electrostimulation On Concurrent Training Related To Explosive Strength, Anaerobic Power And VO_max.**

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Training programs typically involve the concurrent use of strength and endurance training sessions. Moreover, whole-body electrostimulation has also been used by athletes in the context of training programs to develop strength and physical performance. We postulate that the addition of whole-body electrostimulation (WB-ES) to concurrent training may improve explosive strength, anaerobic power and aerobic performance.

**PURPOSE:** To identify which of two concurrent training protocols-consecutive (weightlifting + HIIT) or simultaneous (WB-ES + HIIT)-is more effective in enhancing explosive strength, anaerobic power and aerobic performance in recreationally trained subjects.

**METHODS:** Twenty-two recreationally trained subjects (Age 20.08 ± 2.08 yr, Weight 72.49 ± 5.20 kg, BMI 22.23 ± 2.47 kg/m2) were randomised into 3 groups: Concurrent Consecutive (CC), Concurrent Simultaneous (CS) or Control Group (CG), who carried out 3x5 RM for 2 weeks. The CC group performed a circuit strength training of 4x exercises (bench press, front pull down, back squat and femoral curl); k 8 reps 6 – 8 reps. 1RM, followed by HIIT (4x in 9 – 9 reps), maximal aerobic power (30 min of recovery) on a cycle ergometer. Conversely, the CS group demonstrated temporal overlaps (TO) for each muscle. 2D data were collected during the propulsive (PRO) phase of FC and eccentric (ECC) and concentric (CONC) phase of BP and PU.

**RESULTS** The individual results show little TO between FC and BP and FC and PU. Furthermore, FC and BP had significantly (P < 0.05) greater TO compared to FC and PU. The ratio of the ECC and CONC phase during the BP, MP and PU, show significant (P < 0.01) differences compared to the recovery (REC) and PRO phase of FC. Additionally, duration of time under tension during the CONC phase, of BP (P < 0.01) and BU (P < 0.001), was significantly higher than during the PRO phase of FC.

**CONCLUSION** The EMG data shows different individual responses and little specificity between FC and BP and FC and PU. The targeted prime movers show little TO between FC and RT. These findings may question the validity of this method for assessing specificity, as it does not account for their dynamic nature. The lack of specificity between RT and FC shows further differences as the ratio and duration of time under tension of the RT compared to FC show significant differences. Velocity based training may be a viable method to target specific movement velocities and increase specificity.
completed the same HIIT training combined with a strength program with WB-ES (WiensPro, USA). Participants were evaluated in three moments; PRE, POST, and after a detraining (DET) test. Testing included Wingate test for anaerobic power, CMJ for explosive strength and an incremental maximal test for VO2max. Analysis was performed using the two-way ANOVA with repeated measures. RESULTS: CS and CG increased mean power in Wingate test between all measurements (CC: $r = 0.75$; W vs 562±77 W vs 553±70 W; CS: 457±74 W vs 566±112 W vs 563±105 W; $P < 0.01$). CMJ increased in CG (29,75±3,87 cm vs 33,68±4,48 cm; $P < 0.05$). However, CS group only improve CMJ after DET with respect to PRE measurement ($2.3 ± 3.8$ cm vs $3.8 ± 3.8$ cm; $P < 0.05$). No differences were found in VO2max. CONCLUSIONS: Concurrent training is more effective at improving lower-limb explosive strength, however both concurrent training protocols are effective at improving anaerobic power even though concurrent simultaneous protocols take half the time to complete. Supported by CTS03G. R18

### Board #182 June 1 8:00 AM - 9:30 AM

**Improving Shoulder Internal Rotation Motion of In-Season Throwing Athletes: A Randomized Controlled Trial**

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(No relevant relationships reported)

**PURPOSE:** Throwing athletes commonly experience loss of shoulder internal rotation (IR). This adaptation, when combined with compromised resting posture, has the potential to increase risk of rotator cuff and biceps tendinopathy, labral tears, and elbow injuries. This study investigated the effectiveness of two methods prescribed to restore IR: the Sleeper Stretch (SS), which aims to stretch the capsule, and the Balloon Blow (BB) which aims to optimize breathing, posture, and scapular stability. Because the BB is less stressful to the shoulder joint, it may be a superior alternative. We hypothesized that when using the BB, IR would be increased either as effectively, or more so, than the SS.

**METHODS:** Healthy in-season baseball and softball players were randomly assigned an intervention (BB or SS) to the dominant arm twice per day for 3 consecutive days. After a 2-week period of no intervention, both groups crossed over and performed the alternate intervention. IR was passively measured in supine at baseline, immediately after a throwing session on day 1, after intervention on day 1, and prior to practice on days 2-5. The last day of the study, each subject was asked if he/she had a preference for either exercise. Statistical analysis for comparisons of differences in IR among intervention type (SS and BB) was performed using an analysis of covariance (ANCOVA) for the 6 instances as listed above. Statistical significance was set at $α < 0.05$.

**RESULTS:** 13 softball players (1.76 ± 0.8 yr.; BMI 20.7 ± 3.4 kg/m²) and 10baseball players (1.70 ± 0.7 yr.; BMI 26.2 ± 3.9 kg/m²) participated in the study. Both interventions increased IR over the course of the 5 days, but there was no significant difference ($P = 0.3$) between SS and BB. When performing SS, the mean IR was $11.38$ degrees immediately after the throwing session and incrementally improved to $3.06 ± 10.9°$ on day 5 when performing BB, the similar incremental increase was from $3.06 ± 10.9°$ to $12.5°$ on day 5. There was no statistically significant difference in preference between the SS (51.1%) and the BB (48.9%).

**CONCLUSIONS:** The BB and the SS were both observed to be effective at increasing IR ROM in healthy in-season baseball and softball players over 5 days, yet neither proved to be superior with regard to degree of improvement nor speed of attaining increased IR.

### Board #183 June 1 8:00 AM - 9:30 AM

**The Influence Of Previous Training Intensity On The Rating Of Perceived Exertion**

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(No relevant relationships reported)

A discrepancy between coach-intended session-intensity and the intensity as experienced by the athlete has been found in many sport settings. To avoid deconditioning as well as non-functional overreaching, it is important that athletes execute and perceive the training as prescribed by the coach. **PURPOSE:** The aim of this study was to evaluate the effects of a 12-week yoga intervention on flexibility and dynamic balance of female college students. **METHODS:** A one-group pretest-posttest design was employed. Seventy females (20.8 ± 1.9 yrs; 54.2 ± 9.6 kg; BMI 21.2 ± 3.18 kg/m²) attended yoga practice for a total of 12 weeks, consisting of one 60-min session per week. All participants have no previous experience on the Star Excursion Balance Test (SEBT) and yoga practice. Lumbar and hamstring flexibility and dynamic balance were assessed using the sit and reach and SEBT before and after 12-week intervention. Participants performed the anterior (ANT), posterior (PL), and posteromedial (PM) reach directions of both legs in the SEBT.

**RESULTS:** A statistically significant increase in post-intervention normalized reach distances from $60°$ to $90°$ was seen in all directions of both legs. Results of paired sample t-test also displayed a significant normalized reach distance difference before and after the intervention. Left leg (ANT: $t = 7.52$, $P < 0.01$; PL: $t = 7.25$, $P < 0.01$; PM: $t = 3.29$, $P < 0.05$); Right leg (ANT: $t = 7.25$, $P < 0.01$; PL: $t = 7.45$, $P < 0.01$; PM: $t = 3.29$, $P < 0.05$). The increase in flexibility was observed after the intervention ($39.3 ± 5.8cm$ versus $37.8 ± 6.5cm$; $t(69)=4.64$, $P < 0.01$).

**CONCLUSIONS:** The dynamic balance ability and flexibility of the female college students were significantly enhanced after 12-week yoga intervention.

### Board #184 June 1 8:00 AM - 9:30 AM

**The Effects of 12-week Yoga Practice on Flexibility and Dynamic Balance of Female College Students**

Siu Kuen NG. The Chinese University of Hong Kong, Hong Kong, China.

Email: sarobert1218@gmail.com

(No relevant relationships reported)

**PURPOSE:** In recent years the practice of yoga has gained popularity as a means to improve health, sports performance and psychological wellbeing. **PURPOSE:** The aim of this study was to evaluate the effects of a 12-week yoga intervention on flexibility and dynamic balance of female college students. **METHODS:** A one-group pretest-posttest design was employed. Seventy females (20.8 ± 1.9 yrs; 54.2 ± 9.6 kg; BMI 21.2 ± 3.18 kg/m²) attended yoga practice for a total of 12 weeks, consisting of one 60-min session per week. All participants have no previous experience on the Star Excursion Balance Test (SEBT) and yoga practice. Lumbar and hamstring flexibility and dynamic balance were assessed using the sit and reach and SEBT before and after 12-week intervention. Participants performed the anterior (ANT), posterior (PL), and posteromedial (PM) reach directions of both legs in the SEBT.

**RESULTS:** A statistically significant increase in post-intervention normalized reach distances from $60°$ to $90°$ was seen in all directions of both legs. Results of paired sample t-test also displayed a significant normalized reach distance difference before and after the intervention. Left leg (ANT: $t = 7.52$, $P < 0.01$; PL: $t = 7.25$, $P < 0.01$; PM: $t = 3.29$, $P < 0.05$); Right leg (ANT: $t = 7.25$, $P < 0.01$; PL: $t = 7.45$, $P < 0.01$; PM: $t = 3.29$, $P < 0.05$). The increase in flexibility was observed after the intervention ($39.3 ± 5.8cm$ versus $37.8 ± 6.5cm$; $t(69)=4.64$, $P < 0.01$).

**CONCLUSIONS:** The dynamic balance ability and flexibility of the female college students were significantly enhanced after 12-week yoga intervention.

**ABSTRACT**

Dance is an art form in which it is necessary to develop various physical abilities because for a ballet dancer to achieve high performance it is necessary to acquire technical, athletic and aesthetic capacities so that the movements flow in a controlled way and without apparent effort. To generate positive effects on the performance, it is necessary to complement the training program with a method that maintains the technical ballet characteristics and principles. One type of training is the Mat Pilates method.

**PURPOSE:** To verify the effect of a training periodization with the original Mat Pilates on the performance of muscle strength and flexibility in a ballerina. **METHODS:** A female ballet dancer (age: 19 yr; height: 1.60m; body mass: 60kg; BMI: 23.6 kg/m²), without lesions, was submitted to the Mat Pilates method during 8 weeks, with a duration of 1 hour per training session, performed 2 times a week with a 48-hour interval between the sessions. The pre- and post-intervention tests were: strength and resistance abdominal test, isometric test of the column extensor, sit and reach, My Jump, and hip flexion with extended knee.

**RESULTS:** The highest post-intervention response value was for the abdominal resistance test, possibly because the exercises of the Mat Pilates contemplate this muscleature. However, the jump test showed a negative post-intervention response (Table 1). Table 1. Results of the pre- and post-intervention tests.
CONCLUSIONS: The original Mat Pilates Method applied in the present study potentiated the increase in the flexibility, abdominal and lumbar resistance and strength levels, but did not influence the performance of the vertical jump. New studies are suggested with a greater number of participants, with Pilates exercises in machines, in both sexes, in different age groups and with subjects of other sports and artistic modalities.

3498 Board #186  June 1 8:00 AM - 9:30 AM  Relationship Between Cumulative Training Loads and Treatments of Division II Swimmers
Cristopher Lara, Candace Juhala, James Moutat, IV, Jose Alvarez, Bianca Lagamon, Angel Quintero, Adam Murphy, Cameron Cristopher Lara, Candace Juhala, James Moutat, IV, Jose Alvarez, Bianca Lagamon, Angel Quintero, Adam Murphy, Cameron
FACSM. CSU East Bay, Hayward, CA. (Sponsor: Vanessa Yingling, FACSM).
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(No relevant relationships reported)

Coaches are responsible for designing training sessions to optimize athlete progression while decreasing the incidence of treatments and fatigue by monitoring training loads. Training loads (TL) consist of the external load (work done by the athlete) and internal load (athlete’s perceived intensity of that work). Multiple methods are used to monitor both external and internal TL’s such as the utilization of heart rate, lactate concentration, rate of perceived exertion (RPE) and session duration (Gabbett et al, 2004). Among NCAA Division II athletics, monitoring team training loads necessitates a cost-effective method, like that of RPE and session duration. Purpose: To determine the relationship between cumulative training load, and number of visits to the Athletic Trainer for treatments, in a Division II women’s swimming team. Methods: For one season, twenty-four collegiate female swimmers (mean ± SD, 20.2 ± 1.23 years, height 1803 ± 68 m, mass 68.7 ± 8.9 kg) were surveyed after each practice and asked to report the date, the duration of training in minutes and the type of treatments. TL’s were averaged daily across the whole team, and a 72.5% increase in treatments occurred after a 3 week period where TL’s were consistently high (>4000 au). A 72.5% increase in treatments after consecutive high TL’s (>4000 au) is expected based on number of treatments occurred after a 3 week period of high TL’s. Conclusion: A latent period for the mat Pilates method was supported by Fundamental Research Funds for the Central Universities at SWU Grant 130932)

Abstracts were prepared by the authors and printed as submitted.
Results of a Six Week Training Protocol for Dancers to Achieve Pointe (Toe Shoe) Readiness

Marijanne Liederbach1, Kristen Stevens1, Emily Sandow1, Karl Orishimo2, Ian J. Kremenic2, NYU Langone Orthopedic Hospital, New York, NY. 1Lenox Hill Hospital, New York, NY. (Sponsor: Malachy P. McHugh, PhD, FACSM)

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(No relevant relationships reported)

PURPOSE: It is estimated that 2 million children study dance each year in USA public schools alone, and that more than 35% of all adolescent girls participate in some form of dance training. Their most common injury is ankle sprain, with recurrence as high as 80%. This study aimed to test the efficacy of a six-week, pre-pointe (toe shoe) progressive training program that, if effective, would subsequently be put into a 3-year prospective epidemiologic study examining the intervention’s effect on ankle sprain rate. METHODS: 16r e-pointe students, (average age 11 yrs), at a professional ballet school assented, (along with parent/guardian consent), to participate. Three motor control-based concepts were incorporated into a 8 m inute progressive exercise class taught twice per week for 6 weeks. The motor control principles underlying all of the exercises were: 1.) identification and maintenance of trunk-heel-neutral; 2.) appropriate weight shift; 3.) dissociation of the limbs from the trunk. Tests of lower extremity and trunk strength were assessed using hand-held dynamometry and Kendall methods. Four functional tasks, (single leg eyes-closed balance; toe/; airplane andault tests), were assessed along with one IMU-based jump task. Jump height and GRF were estimated using an inertial sensor (BTS G-Sensor 2, Brooklyn, NY). The sensor, worn in a pouch on a velcro belt wrapped around the dancer’s trunk at umbilicus level, contained a triaxial accelerometer, gyroscope and magnetometer and connected wirelessly via Bluetooth to a computer. Based on the accelerations measured by the sensor and the weight of the subject, several parameters were estimated.

RESULTS: Pairwise t-tests revealed changes from the pretest to posttest assessment day: hip abduction (p<0.009) and trunk strength (p<0.045), balance (p<0.001), postural control (p<0.001) and ankle strength (p<0.005) showed improvement.

CONCLUSIONS: Significant improvements in strength, balance, and alignment were demonstrated by this cohort. Jump performance did not show improvement, but was an unfamiliar task to the subjects at the beginning of the training; it will be monitored intermittently as training continues.

Effect Of 3d Multiple Object Tracking Training On Collegiate Ice Hockey And Lacrosse Game Performance

Erin Manning, Jesse Hall, John Rosene. University of New England, Biddeford, ME.

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(No relevant relationships reported)

3D multiple object tracking (3D MOT) aids in improving working memory and spatial awareness by stressing foveal and peripheral vision while demanding multi-faceted attentional focus. 3D MOT also improves cognitive processing which may improve the ability to rapidly extract data from the environment thereby enhancing decision making capabilities. These attributes have the potential to enhance sports performance.

PURPOSE: The purpose of this study was to determine if 3D MOT training increases in-game performance during a competitive season. METHODS: 9 male athletes from four NCAA DIll collegiate athletes (3 ice hockey n=3; 6 lacrosse n=6) participated. Athletes were assigned to either a 3D MOT intervention or control (C) group (n=4). Athletes completed 2× sessions of 3D MOT training, 2-4 times per week over 12 weeks during the respective competitive seasons. At the conclusion of the season, independent samples t-tests were used to compare performance measures (game statistics) between 3D MOT and C groups for ice hockey (men’s and women’s combined), men’s lacrosse, and women’s lacrosse. RESULTS: There were no significant differences in performance measures between 3D MOT and C groups for ice hockey (p>0.05). For men’s lacrosse, faceoff winning percentage was significantly different (p<0.001) with the C group having a greater faceoff winning percentage versus the 3D MOT group (30% vs. 0%). For all other performance measures there were no significant differences (p>0.05) between groups. For women’s lacrosse, there were significant differences for assists (p<0.05), points (p<0.03), shots (p<0.03), and free-position shots (p<0.01) with the 3D MOT group having lower values versus C. CONCLUSIONS: Athletic performance is multifactorial in uncontrolled environments such as competitive ice hockey and lacrosse, and may suggest that performance benefits of 3D MOT training may be overshadowed by the complexities of game play. This study, with its limitations, may be due to player skill differences versus a 3D MOT effect. Further research is warranted to determine the effectiveness of 3D MOT training and its impact on sport performance.

Poor pelvic posture demonstrated through anterior pelvic tilt have been known to produce musculoskeletal imbalances involving muscular weakness of the abdominal and pelvic regions. While stretching and massage techniques have been reported to be effective in alleviating anterior pelvic tilt, it remains unclear if similar improvements can be elicited by pelvic and core strength training. PURPOSE: To examine the effect of an 8-week pelvic and core strengthening program on anterior pelvic tilt (APT), hamstrings-to-quads (H:Q) strength ratio, and vertical jump performance in healthy individuals. METHODS: Nine healthy males (age=27 ±1±12.5 years; mass=83±13 kg; height=178±8 cm) performed resistance training (2×/week; 30-40 min) in a combination of abdominal and hip extensors strengthening exercises for 8 weeks. APT (°), vertical jump height (m), vertical jump power (W), and H:Q ratio at 80° and 60° were assessed prior to and following the 8 week pelvic and core strengthening program. Paired samples t-tests were used to evaluate pre- to post-training changes in APT, vertical jump height and power, and H:Q ratio. Effect sizes (ES) were calculated for all analyses and ES magnitudes of <0.50, 0.50-1.0, and >1.0, were interpreted as small, medium, and large effects, respectively.

RESULTS: APT was significantly decreased, and vertical jump height and the H:Q ratio at the angular velocity of 300°/s were significantly increased, following 8 weeks of pelvic and core strength training (all p<0.05, Table 1). CONCLUSION: Resistance training emphasizing pelvic and core strengthening was effective in reducing APT, improving vertical jump performance and H:Q ratio. Our findings have potential implications for clinicians prescribing resistance exercises to improve pelvic posture in patient populations with musculoskeletal imbalances, and for injury prevention and maintenance of postural equilibrium in healthy individuals.

Table 1. Pre- versus post-training responses (mean±SD) following pelvic and core strengthening training.

<table>
<thead>
<tr>
<th></th>
<th>Pre-training</th>
<th>Post-training</th>
<th>Δ</th>
<th>P</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>APT (°)</td>
<td>14.9± 3.2</td>
<td>8.6± 3.5</td>
<td>6</td>
<td>0.005</td>
<td>1.9</td>
</tr>
<tr>
<td>Vertical jump power (kW)</td>
<td>0.8± 0.09</td>
<td>1.0± 0.12</td>
<td>0.2</td>
<td>0.18</td>
<td>0.12</td>
</tr>
<tr>
<td>Vertical jump height (m)</td>
<td>0.457± 0.099</td>
<td>0.493± 0.090</td>
<td>0.06</td>
<td>0.49</td>
<td>0.06</td>
</tr>
<tr>
<td>H:Q ratio @ 60°/s</td>
<td>0.9± 0.07</td>
<td>0.6± 0.12</td>
<td>0.14</td>
<td>0.06</td>
<td>0.9</td>
</tr>
<tr>
<td>H:Q ratio @ 180°/s</td>
<td>0.6± 0.15</td>
<td>0.3± 0.12</td>
<td>0.15</td>
<td>0.06</td>
<td>0.9</td>
</tr>
<tr>
<td>H:Q ratio @ 300°/s</td>
<td>0.5± 0.13</td>
<td>0.6± 0.13</td>
<td>0.18</td>
<td>0.04</td>
<td>0.9</td>
</tr>
</tbody>
</table>

*Significantly different compared to pre-training (P<0.05).

Supported by CCSU Faculty-Student Research Grant 2016 17

Impact of 4-week Brain Endurance Training (BET) on Cognitive and Physical Performance in Professional Football Players

Walter Staiano1, Michele Merlini2, Chiara Gattoni2, Samuele Marcotta2, 1University of Valencia, Valencia, Spain. 2University of Kent, Chatham Maritime, United Kingdom. 3University of Bologna, Bologna, Italy.

(No relevant relationships reported)

PURPOSE: It has been hypothesized that acute negative effect of mental fatigue (MF) could potentially become a training stimulus for the brain (Brain endurance training [BET]) to adapt and improve its ability to better sustain or attenuate MF states during sport competitions. The aim of this study was to test the efficacy of BET to reduce fatigue during a battery of cognitive and physical tests in players from a professional football team. We hypothesised that combination of BET and standard physical training during a 4 week period would increase cognitive capacity and physical football performance by increasing resilience to fatigue, more than standard football training alone. METHODS: 24 professional football players were randomly assigned to 2 different training groups: BET and Control. Both groups completed 20 supervised physical training sessions. Immediately after each session BET group completed on average 80 m in 20 (min/session) of cognitive training. Control group, instead, was asked to listen to neutral music for the same amount of time. Endurance performance (30-15 intermittent Fitness Test), Sprint and Decision Making (RSA Random Test), Reactive Agility alongside with cognitive performance (STROOP Task) were measured at baseline (pre-test) and after 4 weeks of training (post-test). Data were...
analysed using mixed model ANOVAs. RESULTS: STROOP task showed reaction time in both groups decreased at post-test. However, BET decreased significantly more compared to control group (p < 0.02) despite no significant differences in accuracy. BET group completed better reaction times significantly faster than the control group (p < 0.05) and with lesser errors (p < 0.03). During the RSA Random Test no significant differences were found between the groups for linear acceleration phase (first 10 m). However, BET group completed significantly faster (p < 0.05) the decisional phase (second 10 m). Evidence of fatigue was covered during the 30-15 test showed there was no difference in the performance of the BET group. However, control group showed a significant decrease (p < 0.05) in performance. CONCLUSION: The results of this study provide evidence that the combination of BET and standard football training is more effective than standard training alone in boosting cognitive and physical performance in elite football players.

CONCLUSIONS: This study is the first to quantify comprehensive improvements in aerobic fitness, body composition, resting metabolic rate, resting blood pressure, and triglycerides after a brief 6 week HIIT regimen. The implications of franchised group exercise with wearable technology serves as a scientific approach to understand novel exercise prescriptions on health-fitness outcomes. Future research should investigate sociological aspects of program adherence, while biological applications should be examine the adaptive stimuli of HIIT training on health and fitness improvements.

**3507** Board #195 June 1 8:00 AM - 9:30 AM
**Comparison of Two Training Programs for Improvement of Muscular Strength Quantified via Pull-ups**

Ciara-Lyn Lee1, Eric C. Bredahl1, Michael T. Lane2, Jacob A. Siedlik1. 1Creighton University, Omaha, NE; 2Eastern Kentucky University, Richmond, KY. (Sponsor: Joe Eckerson, FACSM) (No relevant relationships reported)

The requirement to integrate women into combat-arms military occupational specialties represents an opportunity to refocus training protocols for optimized performance in specific components of military physical and combat fitness tests. The United States Marine Corps will incorporate new standards in 2018 that include requiring more pull-ups for female Marines. The pull-up requirement is often difficult for Marine recruits to achieve and the overabundance of training protocols potentially confuses recruits and minimizes potential gains in event specific muscular strength.

METHODS: To qga nify changes in completed pull-ups between two training programs to determine an optimal program for improved performance in college-aged females.

METHODS: Twenty-nine female subjects volunteered to participate and were randomized to either a control group or one of two training programs (Control [n = 3]; Free Weights [n = 14]; Machines [n = 12]). The two training programs consisted of pre-programmed workouts 3 d wk-1 focused on upper body and core exercises. There was at least 1 d of recovery between workouts. Subjects were monitored for the first 2 wk of training to ensure compliance and proper technique. Maximum number of pull-ups were assessed at baseline, 3 wk, and 6 wk. Data were analyzed using a 3x3 repeated measures ANOVA.

RESULTS: There were no significant differences in age, height, or weight between the groups. Mean ± SD: Age 19 ± 3 y; Height = 164 ± 6 cm; Weight = 60 ± 9 kg. Over the 6 wk period a total of 5 subjects withdrew from the study (Control [n = 3]; Free Weights [n = 11]; Machines [n = 10]). No significant interaction effect was observed between programs (p = .7), and there was no main effect for time (p = .1). CONCLUSION: Overall the training protocols improved pull-up performance with free weight participants and 3 of the machine-based participants improving from zero to one or more pull-ups. Results are limited due to the dropout rate of ~17% over the training period which is not unexpected given the duration of this study. Future research should focus on improved adherence, and subject monitoring, to optimize performance in the pull-up event.

**3508** Board #196 June 1 8:00 AM - 9:30 AM
**Effect Of Suspension Training On Functional Movement Screen (FMS) and Mobility, Activation, Posture,and Symmetry (MAPS)**

Megan Jackson1, Emily Hilliard1, Ann T. Shields1, Alex McDaniel1, Ryan Sweeney1, Rachel Willilly1, Courtney K. Milleson1, Andrew Ortiz1, Brad Hollsworth1, Sarah Nolant1, Raechel Santee1, Phillip Moric1, Lauren Ackerman1, Emma Schmidt1, Kelsey D. Bryan1, Frances M. Livingston2, Tiago Barreira1, Wayland Tsel1, 1University of North Carolina Wilmington, Wilmington, NC; 2Syracuse University, Syracuse, NY. (Sponsor: Dr. Robert Boyce, FACSM) (No relevant relationships reported)

**INTRODUCTION:** Although suspension training is used in various exercise routines, there has been insufficient research to determine the effect of suspension training on functional movement. PURPOSE: 1) to examine the effect of suspension training on functional movement, assessed via the FMS and MAPS and 2) to identify the correlation between the FMS and MAPS. METHODS: Twenty-one participants (19 females; 2 males; Age = 20 ± 1.11 yrs; Height = 170 ± 9 cm; Body Mass = 66 ± 14 kg) completed 28 exercise sessions over a 14 week course. Throughout each 60-minute exercise session, six body positions were utilized on the suspension training straps which included pull, push, rotational, squat, and lunge movements; participants also engaged in using medicine balls and resistance bands. Pre- and post-fitness assessments included the FMS, MAPS, body composition, muscular endurance, muscular strength, and flexibility. Dependent t-tests were used to determine if there were mean changes in functional movement status. Due to multiple comparisons, Bonferroni correction was used, therefore, alpha level was set at .007. RESULTS: There were significant positive changes in FMS (14.6 ± 2.7 to 15.9 ± 2.1, p < 0.001) and MAPS (52.9 ± 10.3 to 56.3 ± 9.7, p < 0.001) values, as well as mean gain of pull-ups (28 ± 1.3 to 39 ± 2.9; 13 ± 0.9 to 0.004) and hangdmop stamina (78.0 ± 21.7 kg to 85.6 ± 24.0 kg, p < 0.006). There were no significant changes in

Abstracts were prepared by the authors and printed as submitted.
Mean body mass, fat mass, lean mass, percent body fat, and sit-and-reach values. Pearson correlation was used to determine the relationship between FMS and MAPS both at pre- and post-testing. At both time points, pre- and post-testing, the correlations were significant ($r= -0.52$ and $-0.43$, respectively). CONCLUSIONS: Participation in suspension training produced significant improvements in overall functional movement, muscular strength, and endurance. Although there were significant positive changes in both FMS and MAPS from pre- to post-assessment, a weak correlation existed between the FMS and MAPS assessments.

Endurance is critical to a starting pitcher’s success. However, the repetition of pitching stress can decrease performance and increase risk of injury in later innings. Improving arm endurance likely enhances late-game performance. PURPOSE: To evaluate predictors of mechanical endurance in collegiate pitchers. METHODS: 10 Division-1 pitchers were tested using Proteus technology (Boston Biomotion, Inc.). They completed 6 sets of 5 pitches; each set changed in resistance, ranging from 5 to 10 lbs. Endurance was a calculation of the ability to preserve power in each set on a continuous scale of 0.00 (0% preservation) to 1.00 (100% preservation). Mean endurance was the mean value of all sets. Proteus also assessed biceps curls, triceps extensions, internal and external rotation, and horizontal adduction and abduction.

Pitchers were tested during the 2017 season and data were compared to in-game performance on other tests, and in-game statistics. RESULTS: Pitchers were 2.9 ± 2.1 inches in height, had a mean fastball velocity of 86.3 ± 9.8 mph, a mean earned run average (ERA) of 5.2. 8% nd a mean endurance of 5.1. 19%. Endurance was unrelated to class year ($p=0.08$) and was not related to anthropometric measurements, including height ($p=0.08$), weight ($p=0.18$), arm length ($p=0.35$), and leg length ($p=0.6$). Maximum squat strength ($p=0.07$), fastball velocity ($p=0.82$), and three-dimensional measurement of pitch range of motion ($p=0.30$) were also unrelated to pitch endurance. Biceps curl endurance ($p=0.035$) and triceps extension explosiveness ($p=0.09$) of the dominant arm correlated with pitching endurance. These relationships lost significance on non-dominant arm for curls ($p=0.241$) and extensions ($p=0.187$).

Given a larger sample, other associations may be found; of interest, there may be relationships between endurance and innings per appearance ($β= -0.353, R^2=0.19$) and ERA ($β= -0.559, R^2=0.19$) $p=0.232$ and ERA ($β= -0.539, R^2=0.19$) $p=0.305$. Post-hoc power analyses revealed samples of 30 and 38 respectively to reach significance ($power=0.80, p=0.05$). CONCLUSIONS: Fatigue results from repetitive overhead throwing, elevating risk of injuries. Use of Proteus may provide modes of exercise unrecognized by traditional baseball training.

Purpose
Video corroboration of on-ice impacts identified by wearable sensors (WS) is a time-consuming task. To automate this, we attempted a computer vision approach to recorded game video to corroborate impacts identified using WS among national ice hockey team members.

Methods
23 U.S. National U18 hockey team members consented to procedures approved by EMU IRSC. Impacts were previously validated from data collected at 100 Hz (Impact Processor, Zephyr MD) from 8 players with the top activity levels determined by WS in 4 games. Game video was manually synchronized, and timestamps were used to extract frames from the video that allowed for visually identifying and labeling impacts. A convolutional neural network (YOLO) was used to detect impacts in video and generate a training dataset from 100 iframes from 5 game videos that included 6 impacts. Video and timestamps were used for training instead of still frames. Denoising filters were used to account for time shift errors due to manual labeling and anomalous detections appearing and disappearing in up to half a second of video. Thus, we removed any impacts detected by video for less than 30 or $c$ continuous frames (0.5 or 1.0 second, respectively). An smaller version of the model (YOLO-tiny) was also tested on a Note 8 (Samsung) smart phone to determine applicability to real-time game setting.

Results
The trained YOLO network was applied to the 4th game video that had 32 validated sensor identified impacts. The model successfully detected all 32 impacts but generated 1000 false positives. With a 20 frame filter, the model detected 20 of the 32 impacts, but false positives were reduced to 211. With a 30 frame filter, the model detected all 32 impacts but false positives increased to 38. Interestingly, the mobile model and 30 frame filter detected all 32 impacts with 222 false positives, of which, 99 were classified as “Pass Bys” or players that occluded each other on the video but did not make physical contact.

Conclusion
These results demonstrate that computer vision techniques can be used to identify validated impacts with high success, but with many false positives. The high false positive rate presents a challenge, but since a large proportion of false positives were simple pass-bys, using a real-time sensor fusion approach with WS, the false positives may be reduced substantially.

Women entering training for physically demanding occupations typically perform strength oriented tasks less well than their male counterparts. However, they are not often strength-trained and appropriate training may reduce these differences. Force time assessment of the isometric mid-thigh pull (IMTP) has been used to monitor strength adaptations in athletes as they relate to dynamic task performance. The ratio between peak countermovement jump (CMJ) concentric force and IMTP peak force (Dynamic Strength Index [DSI]) has also been used to guide prescription of maximal or ballistic strength training. PURPOSE: To examine the efficacy of IMTP and DSI to monitor and prescribe strength training in untrained women. METHOD: Following familiarization, 26 iviian women volunteers (mean ± SD, age: 24 ± 3 years, height: 1.64 ± 0.05 m, body mass: 65.4 ± 11.8 kg) completed five tests in this order: bench press one-repetition maximum (1RM); CMJ; IMTP; seated medicine ball throw (MBT); dominant handgrip strength. Force plates sampling at 1000 Hz recorded IMTP and
CONCLUSION: Significant differences were observed. We observed significantly lower relative change in O$_2$Hb for ACLR compared to healthy controls in the rectus femoris muscles. Relative changes in O$_2$Hb were ensemble averaged and plotted for each contraction intensity with associated 90% confidence intervals. Statistically significant differences were defined as portions of the exercise trials where confidence intervals of the O$_2$Hb graph did not overlap. Effect sizes calculated (Hedges’ g). RESULTS: Absolute peak IMTP force (minus body weight) correlated moderately with handgrip strength ($r = 0.6, p < 0.001$) and relative IMTP peak force (per kg body mass) with CMJ height ($r = 0.5$). The IMR (Low vs High DSI) was $11.0 \pm 1.9$ N/0.5 kg, $g = 1.6$, absolute IMTP (138.50 vs 161N, $g = 2.9$), relative IMTP (20.70 vs 28.80, 11.0 $\pm 1.9$ N/kg, $g = 0.6$). RESULTS: ABM (3.3 vs 2.7 m, $g = 0.3$) and handgrip (53.80 vs 26.20 kg, $g = 3.1$) were greater in Low DSI participants ($p < 0.01$), with no difference in CMJ height ($0.23 \pm 0.03$ vs $0.19 \pm 0.05$ m, $g = 0.5$).

G-39 Free Communication/Poster - Anterior Cruciate Ligament

Saturday, June 1, 2019, 7:30 AM - 11:00 AM
Room: CC-Hall WA2

3513 Board #201 June 1 9:30 AM - 11:00 AM
Quadriceps Oxygen Consumption During Exercise in Patients with ACL-Reconstruction
Abbis Jaffri, Maggie Lynch, Susan Saliba, Joe Hart, FACSM. University of Virginia, Charlottesville, VA.
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(No relevant relationships reported)

PURPOSE: Patients with ACL reconstructed knees (ACLR) commonly experience persistent muscle weakness. Altered oxygen consumption (OC) during voluntary rehabilitation exercises of the quadriceps may be a contributing factor. The purpose was to compare quadriceps muscle OC during knee extension exercises in patients with ACLR versus healthy controls. METHODS: 10 patients with primary, unilateral ACLR (M: 3F, 22.9 y, 10±3 m, 7.7 kg) and 10 matched controls (M: 3F, 22.9 y, 10±3 m, 8 kg) participated. Each participant completed a single data collection session consisting of 5 second isometric contractions at 25$^\circ_{\text{C}}$ & $30^\circ_{\text{C}}$ of the volutional maximum followed by a 30$s^{-1}$ maximal isometric knee extension contraction. We continuously recorded measures of oxygenated hemoglobin (O$_2$Hb) on the reconstructed thigh (versus the non-dominant thigh of healthy controls) using three wearable, wireless near-infrared spectroscopy units placed superficial to the vastus medialis, lateralis, and rectus femoris muscles. Relative changes in OC were ensemble averaged and plotted for each contraction intensity with associated 90% confidence intervals. Statistically significant differences were defined as portions of the exercise trials where confidence intervals of the O$_2$Hb graph did not overlap. Effect sizes were calculated for statistically significant relationships.

RESULTS: We observed significantly lower relative change in O$_2$Hb for ACLR compared to healthy controls in the rectus femoris at 25$^\circ_{\text{C}}$ and 30$^\circ_{\text{C}}$. A retrospective analysis of prospectively collected data was performed in 20 patients (20±9 y) with ACLR and examined 2 years post-surgery. All patients underwent systematic training during this period. The study aimed to compare quadriceps muscle O$_2$Hb during knee extension exercises in patients with ACLR and healthy controls. RESULTS: Significant differences were observed in quadriceps muscle O$_2$Hb between patients with ACLR during the same exercises versus healthy controls. However, not all portions of the quadriceps are affected uniformly across contraction intensities.

3514 Board #202 June 1 9:30 AM - 11:00 AM
Comparison of Knee Functional Outcomes after Anterior Cruciate Ligament Reconstruction between Older and Younger Patients
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(No relevant relationships reported)

Anterior cruciate ligament (ACL) reconstruction is frequently performed to restore knee stability and function following ACL injury. Traditionally, ACL injury people older than 50 years are considered non-operative treatments because of not performing high-demanding activities and possible inferior surgical outcomes. According to increasing sports activities, there are more chance to injury and surgical reconstruction in patients older than 50 years. However, a few numerous research with knee function and stability outcomes had been reported following ACL reconstruction in age over 50 years old.

PURPOSE: The aim of this study was to evaluate muscle strength, ligament stability, and functional outcomes in comparing older (>50 years) and younger (<40 years) patients at 1 year after ACL surgery. METHODS: A retrospective analysis of prospectively collected data was performed in 20 older (52.3±2.1 yr) and younger (29.0±5.1yr) ACL reconstruction patients each. All patients were evaluated with isokinetic extensor and flexor muscle strength, laxity, and functional scores at 1 year after operation. The highest peak torque at each velocity was compared with the uninjured side by isokinetic device. The knee laxity was assessed by the KT-2000 arthrometer. The comparing injured and uninjured knee side-to-side difference was measured at anterior maximum manual tension. Knee functional score were evaluated using the validated International Knee Documentation Committee (IKDC) and Lysholm scores.

RESULTS: There was no statistically significant difference in extensor strength deficits between older and younger groups at 60$^\circ_{\text{C}}$ and 180$^\circ_{\text{C}}$ (p = 0.495, p = 0.419, respectively). In addition, there was no differences in knee flexor strength deficits between the groups (p = 0.417, p = 0.449, respectively). There was also no statistically significant difference in ligamentous laxity (p = 0.06) and Lysholm scores (p = 0.126). However, IKDC scores in the younger group showed significantly greater improvement than those in the older group (p = 0.009). CONCLUSION: Older patients with ACL reconstruction surgery would have similar results for knee strength and ligament laxity. This study showed that ACL reconstruction is more effectiveness and safety for restoration of knee strength and stability in older than 50 ye ars old.

Abstracts were prepared by the authors and printed as submitted.
Deficits in quadriceps function are common in patients who sustain an anterior cruciate ligament (ACL) injury and undergo subsequent ACL reconstruction (ACLR). Quadriceps atrophy is among the notable changes in muscle tissue after ACLR. The relationship between muscle morphology and self-reported function should be established so treatment options can be targeted to improve function after ACLR. PURPOSE: To evaluate rectus femoris (RF) cross-sectional area (CSA) and intramuscular fat percent (PF) in the injured and uninjured limb from 9 weeks post-ACLR to return to activity (RTA) and (2) identify associations between injured limb quadriceps CSA, PF, and self-reported function. METHODS: 28 individuals with primary unilateral ACLR (Age=16.6±2.7; Weight=71.8±17.7; 64% female; 18 bone-patellar tendon-bone; 24 patellar tendon, 9 intracondylar tendon) were recruited for this study. RF was imaged at 16 m proximal of superior border of the patella. Quadriceps CSA and PF of the injured and uninjured limb were used for analysis.

Self-reported function was evaluated using the International Knee Documentation Committee score (IKDC). Paired-samples t-tests were used to compare inter-limb differences in CSA and PF from changes from 9 weeks to RTA. Partial correlations adjusting for sex were used to analyze the relationship between RF morphology and IKDC scores.

RESULTS: Injured limbs had smaller RF CSA at each time point (±1.6 m2 vs ±1.9 m2; p<0.01 and 5.2±1.9cm2 vs 5.1±2.1 cm2, respectively) compared to the uninjured limb. Injured limb CSA increased at RTA (±1.6 m2 vs ±1.9 m2; p=0.01; while both time points (r=0.55, p<0.01, and r=0.39, p=0.02, respectively). CONCLUSIONS: Inter-limb differences in RF muscle CSA are not ameliorated at RTA. RF CSA and PF are associated with self-reported function in individuals with ACLR and should be treatment targets to improve patient function following injury.

CONCLUSION:

There was evidence of decreased SMM in some participants following ACLR. It is possible that continued study with more participants may find difference in muscle mass following injury. SMM and circumferences provide useful information concerning muscular atrophy and discrepancies between limbs. SMM obtained via BIA may be used as a cost-effective measure indicative of stability and limb strength for return to play protocol (1). Future research should include measurements made pre and post injury/surgery to understand muscle mass progression after injury.

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(No relevant relationships reported)

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3517 Board #205 June 1 9:30 AM - 11:00 AM Skeletal Muscle Mass and Circumference Disparities Between Injured and Un-Injured Limbs Post-ACLR Reconstruction

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(No relevant relationships reported)

Lower extremity injuries are common in sport. Anterior cruciate ligament (ACL) injuries often result in muscle atrophy in the thigh and calf muscles of the injured leg. Evaluating muscle atrophy via circumferences to document asymmetry has been recommended and is often used clinically (1). Previous studies have shown a small loss of skeletal muscle mass (SMM) may cause a greater loss in muscular strength (1), thus investigating muscle mass and girth may be beneficial in evaluating return to play post-ACLR injury.

PURPOSE: The purpose of this study was to examine SMM and circumference discrepancies between injured and uninjured limbs post-ACLR reconstruction.

METHODS: Participants (n = 7 F, 3 M; 21.9 ± 4.5 kg; 156 ± 8 cm; 3.8 ± 1 D; p = 0.8) were tested using bioelectrical impedance analysis (BIA). Fat mass, fat-free mass, body fat percentage, and SMM (kg) for extremities and torso were obtained. Circumference measurements were taken on the injured (I) and un-injured (NI) limbs at the mid-patella, and superiorly and inferiorly of the patellar poles at 10, 15a nd 20 centimeters, using a standard, non-elastic tape measure.

RESULTS: There was no significant difference between SMM (1.4 ± 0.3 kg; NI:14.48 ± 3.48 kg; I:14.54 ± 3.80 kg; p = 0.67) while the uninjured limb did not (p = 0.12). No differences in PF were found between limbs (p = 0.18, and p = 0.43, respectively) or time point (p = 0.67, and p = 0.9, respectively). After adjusting for sex, larger injured limb CSA was associated with higher IKDC scores at 9 weeks and trending toward significance at RTA (r = 0.32, p = 0.05a nd r = 0.2p= 0.09p respectively). Injured limb PF was negatively associated with IKDC score at both time points (r<0.55, p<0.01, and r<0.39, p<0.02, respectively). CONCLUSIONS: Lower extremity injuries are common in sport. Anterior cruciate ligament (ACL) injuries often result in muscle atrophy in the thigh and calf muscles of the injured leg. Evaluating muscle atrophy via circumferences to document asymmetry has been recommended and is often used clinically (1). Previous studies have shown a small loss of skeletal muscle mass (SMM) may cause a greater loss in muscular strength (1), thus investigating muscle mass and girth may be beneficial in evaluating return to play post-ACLR injury.

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3518 Board #206 June 1 9:30 AM - 11:00 AM Patient Reported Outcomes after Anterior Cruciate Ligament Reconstruction Predict Isometric Quadriceps Torque

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(No relevant relationships reported)

Individuals who have undergone anterior cruciate ligament reconstruction (ACLR) have reduced muscle function that has been shown to persist for many years post-surgery. The ability to predict future levels of neuromuscular function with the use of early-on inflammatory markers may assist clinicians to better target common muscle function deficits seen after ACLR. PURPOSE: The purpose of this study is to determine if levels of inflammation and patient reported outcomes one month post-surgery predict muscle function at six months post-surgery. METHODS: Nineteen patients who underwent ACLR (2.8 ± 3.3kg, 1.7 ± 0.1m, 128 ± 22 cm, 65 ± 11F) completed this study. One month post-surgery (1.1±0.3 months) individuals completed the Knee Osteoarthritis Outcomes Score (KOOS), and visual analog scale (VAS) for pain. Patients were also aspirated one month post-ACLR and commercially available ELISA kits were used to determine concentrations of interleukin-1β (IL-1β) in the synovial fluid. At six months (6.1±0.3months) patients completed maximal isometric contractions of the involved limb at 60 degrees of knee flexion. Rate of torque development (RTD) was calculated as the slope of the time-torque curve taken from onset of torque to peak torque . Multiple linear regressions were run to determine if levels of IL-1β, KOOS scores, and VAS scores, at one month post-surgery contributed to predicting peak torque or RTD six months post-ACLR. Models were compared and the highest adjusted R2 was identified as the best model. An alpha level of 0.05 was used. RESULTS: Levels of IL-1β, and patient reported outcomes one month post-surgery did not significantly contribute to the variance of RTD (β = 0.00, m/kg) but KOOS (β = 0.02), and VAS (β = 0.02) were included in the final model predicting 50.6% of the variance of peak isometric torque (151.3±91.1Nm; p<0.038). IL-1β (β = 4.75±1.3mg/mL) did not significantly contribute to predicting the variance of peak torque. CONCLUSION: Although levels
of inflammation one month after surgery may not explain muscle function six months after surgery, patient reported outcomes for pain and sport performance can, suggesting early clinical use to help drive targeted rehabilitation.

**3519 Board #207 June 1 9:30 AM - 11:00 AM Differences in T1ρ Relaxation Time in the Vastus Lateralis after an Anterior Cruciate Ligament Tear**

Madalyn G. Romines, Lauren N. Erickson, Kylie A. Davis, Peter A. Hardy, Anders H. Andersen, Cale J. Jacobs, Brian Noehren, FACSM. University of Kentucky, Lexington, KY. (No relevant relationships reported)

Anterior cruciate ligament (ACL) injury results in quadriceps atrophy and fibrotic changes in the extracellular matrix of the muscle that may not resolve. To date, some works have used a muscle biopsy; however, this is an invasive procedure and impractical on a wide scale. Magnetic resonance imaging (MRI) technique such as T1ρ, hold promise to measure fibrotic changes. This technique has been used to study cartilage degeneration and liver fibrosis, but has not been widely applied to muscle. Whether T1ρ relaxation time is different between the quadriceps of the injured and non-injured limbs, as well as its relationship to quadriceps strength, is not established.

**PURPOSE:** To investigate the variance in T1ρ relaxation times in the vastus lateralis (VL) between the injured and non-injured limb following an ACL tear and possible correspondence to quadriceps strength.

**METHODS:** 17 ACL deficient patients (8M, 9F, 21 ± 4.2 y, BMI 25.0 ± 3.3, days since injury 26 ± 17.26) underwent an MRI. T1ρ acquisition included a single 6 mm thick slice at the location of the largest cross-sectional area of the VL with 6 echoes collected within spin lock times of 0–4 s (spin lock amplitude 300Hz, matrix 256x256, 2 excitations with 4 shots per slice). Data was fitted to a mono exponential decay curve using custom MATLAB code. Quadriceps strength was assessed via maximal voluntary isometric contractions on a dynamometer. Paired t-tests and Pearson product moment correlation coefficients were used to analyze the data.

**RESULTS:** T1ρ times were significantly longer in the involved limb compared to the non-involved limb (involved: 0.026 ± 0.0032 s; non-involved: 0.026 ± 0.0031 s; 5.7% difference; p=0.04). Peak isometric torque was significantly less in the involved limb as compared to non-involved limb (involved: 1.9 ± 0.7 N/m kg; non-involved: 2.6 ± 0.52Nm/kg; 27.7% difference; p=0.001); however, was not significantly correlated with longer T1ρ time (r=0.07; p=0.70).

**CONCLUSION:** T1ρ was significantly longer soon after injury, indicating that this tool is sensitive to measure early changes in muscle organization. Contrary to our hypothesis, a relationship to quadriceps strength was not found. Potentially, T1ρ measures a different factor than peak strength and additional variables of muscle function should be evaluated.

NIH R01AR0738

**G-40** Free Communication/Poster - Blood Flow Restriction Saturday, June 1, 2019, 7:30 AM - 11:00 AM Room: CC-Hall WA2

**3520 Board #208 June 1 9:30 AM - 11:00 AM Acute Muscular Responses to Practical vs. Traditional Blood Flow Restriction Resistance Exercise**

Robert Thiebaud1, Takashi Abe2, Jeremy Loenneke2, Tyler Garcia1, Yohan Shirazi1, Javier Fiol1, Ross McArthur1.1Texas Wesleyan University, Fort Worth, TX. 2The University of Mississippi, University, MS. (No relevant relationships reported)

**PURPOSE:** To compare the impact of blood flow restriction (BFR) resistance exercise on changes in muscular force output (MVC), muscle thickness (MTH) and total exercise volume (TEV) when using elastic knee wraps (practical) or nylon cuffs (traditional) inflated to 40 and 80% of arterial occlusion pressure (AOP).

**METHODS:** Participants (male=27 females=22) were 22 (4) years and had a body mass index of 23±1 kg/m². A randomized cross-over study design used unilateral knee extension exercise (4 sets to failure) with six different conditions at three separate visits. Low-load (LL, 30% 1-RM) exercise was performed with four conditions: elastic knee wraps (Valeo ®) stretched two inches from resting length (K2) and to a value that was 85% of thigh circumference (K85), and nylon cuffs inflated to 40% (BFR40) and 80% (BFR80) of AOP. LL (30% of 1-RM) and high-load (HL, 90% of 1-RM) exercise with longer T1ρ time (r=0.07; p=0.70).

**RESULTS:** MVC decreased from pre to post-exercise for all conditions (AHL: -90 (81) N, ABL: -126 (57) N, ΔBFR40: -168 (89) N, ΔBFR80: -240 (134) N, AK2: -178 (91) N, ΔK85: -197 (57) N, p=0.05). The changes in MVC were significantly different in K85 vs. HL (p<0.001) and K85 vs. LL (p=0.013). HL and BFR80 MVC at 15 minutes post-exercise were not different from pre-values (AHL: -53 (68) N, p=0.95; ΔBFR80: -67 (77) N, p=0.138) but LL, BFR40, K2 and K85 were still significantly below pre-values (p=0.05). MTH changes were similar from pre to post-exercise (AHL: 0.22 (0.22) cm, ABL: 0.26 (0.1) cm, ΔBFR40: 0.26 (0.14) cm, ΔBFR80: 0.28 (0.19) cm, AK2: 0.26 (0.21) cm, ΔK85: 0.25 (0.13) cm, p=0.892). HL MVC was higher [889.6 (227.7) cm/kg] compared to all the other conditions (p=0.05) while the LL [686.1 (173.1) cm/kg] was higher than the BFR40 [576.8 (160.7) p=0.026], BFR80 [434.9 (142.3) cm/kg, p=0.001] and K85 [520.2 (132.9) cm/kg, p=0.023] conditions.

**CONCLUSIONS:** Exercise to fatigue with elastic knee wraps could be used to produce similar acute changes in MVC, MTH and TEV compared to known BFR pressures.
concluded, the present data suggest that NO is a key signaling molecule activated during conditions of partial blood-flow restriction in human skeletal muscle. NO synthesis leads to blunted MSC activation in response to muscle contractions.

**CONCLUSIONS**

- *P<0.001*, while remaining unchanged with NOS inhibition.
- Post3 (15.3 ± 4.2) and Post24 (18.8 ± 7.0) (P<0.05-0.01).

**RESULTS:**

- Resting leg blood-flow decreased 3% (0.57 ± 0.14 mL/min to 0.36 ± 0.12 mL/min) and oxygen extraction increased 98% (26.8 ± 9.2 to 53.1 ± 7.9 %) with NOS inhibition (P<0.001), while remaining unchanged in the Placebo condition. MSC counts increased (4 %) with Placebo infusion from baseline (9.7 ± 3.3 MSC per 100 myofiber) to Post1 (15.0 ± 4.1), Post3 (15.3 ± 4.2) and Post24 (18.8 ± 7.0) and Post48 (14.2 ± 5.3) (P<0.05-0.001), while remaining unchanged with NOS inhibition.

**CONCLUSIONS:** This study is the first to show that inhibition of endogenous NO synthesis leads to blunted MSC activation in response to muscle contractions performed during conditions of partial blood-flow restriction in human skeletal muscle. In conclusion, the present data suggest that NO is a key signaling molecule activating MSC in human skeletal muscle in vivo.

**Purpose:** The importance of training to failure, especially when using low-loads (i.e., 30% 1RM) is well established. However, it remains unknown if lifting 15% of a person’s one repetition maximum with BFR applied with a wide cuff induced greater muscle hypertrophy compared to lifting 15% of a person’s one repetition maximum with BFR applied with a narrow cuff. Whether these acute changes translate to differences in chronic adaptations is currently unknown.

**METHODS:** Eight male subjects (20.9 ± 2.7 (SD) years) performed five sets of low-load knee extensor exercise (20% 1RM) with concurrent BFR applied with a pressure cuff (100 mmHg) positioned at the proximal thigh. Concurrently, local arterial inflow of the NO synthase (NOS) inhibitor, NG-monomethyl-L-arginine (L-NMMA) or Placebo was applied in a within-subject cross-over design. Arterio-venous blood samples were obtained before and after exercise (30min) for assessment of leg blood-flow and oxygen extraction. Muscle biopsies were obtained at Baseline as well as 1, 3, and 24 h post exercise (Post1-Post4) for assessment of myogenic satellite cell (Pax7+) content using immuno-fluorescence techniques.

**RESULTS:** Resting leg blood-flow decreased 3% (0.57 ± 0.14 mL/min to 0.36 ± 0.12 mL/min) and oxygen extraction increased 98% (26.8 ± 9.2 to 53.1 ± 7.9 %) with NOS inhibition (P<0.001), while remaining unchanged in the Placebo condition. MSC counts increased (4 %) with Placebo infusion from baseline (9.7 ± 3.3 MSC per 100 myofiber) to Post1 (15.0 ± 4.1), Post3 (15.3 ± 4.2) and Post24 (18.8 ± 7.0) and Post48 (14.2 ± 5.3) (P<0.05-0.001), while remaining unchanged with NOS inhibition.

**CONCLUSIONS:** This study is the first to show that inhibition of endogenous NO synthesis leads to blunted MSC activation in response to muscle contractions performed during conditions of partial blood-flow restriction in human skeletal muscle. In conclusion, the present data suggest that NO is a key signaling molecule activating MSC in human skeletal muscle in vivo.
Blood flow restriction (BFR) therapy has been proposed to induce comparable adaptations to traditional resistance training, however the underlying mechanisms remain unknown. Despite the absence of direct support, a suggested mechanism of BFR is an increase in reactive oxygen species (ROS). PURPOSE: We aimed to determine if the rate of mitochondrial ROS emission was altered following an acute bout of occluded (BFR) or non-occluded resistance training (RT), and to mechanistically investigate the role of skeletal muscle O2 partial pressure (pO2) in this response.

METHODS: Ten males (25 ± 1 yrs) performed 3 sets of single leg squats to failure at 30% 1RM, with either BFR (60% occlusion), or without occlusion (RT), while skeletal muscle tissue oxygenation was estimated using near-infrared spectroscopy. Muscle biopsies were obtained at rest and 2-hours post-exercise to determine mitochondrial respiration and ROS emission in permeabilized muscle fibers. In a separate cohort, muscle biopsies were obtained from six males (25 ± 2 yrs) to examine the effects of pO2, on in vitro mitochondrial bioenergetics.

RESULTS: Resistance exercise, with or without BFR, did not alter maximal respiratory capacity or mitochondrial sensitivity to ADP. While maximal mitochondrial ROS emission was undetected following RT, decreases were observed when compared to rest (Δs = 0.12 nmol mg dry wt-1/s). Skeletal muscle oxygenation was lower in the BFR compared to RT leg, both during (4% vs. 6% saturation, p<0.01) and between (50.3% vs. 61.1% saturation, p<0.01) exercise sets. Further evidence of mitochondrial bioenergetics in vitro revealed that mild O2 restriction (50µM) dramatically attenuated maximal mitochondrial ROS emission (4-fold), and fraction electron leak to ROS (~3-fold) compared to room air (200µM). This effect was especially evident in the presence of non-saturating ADP, as submaximal ROS emission was almost completely suppressed during O2 restriction, without a reduction in mitochondrial inhibition.

CONCLUSIONS: These data indicate that a reduction in skeletal muscle pO2 attenuates the propensity of mitochondria to produce ROS, a mechanism which may contribute to the acute responses to BFR training. This research is supported by NSERC funding.

Blood flow restriction (BFR) therapy has been observed to improve post-operative recovery in the limbs when combined with low intensity resistance exercise (LIEx). Little data exists regarding use of BFR for proximal benefit of the upper limbs (shoulders). PURPOSE: (1) Determine if rotator cuff (RC) exercises combined with BFR (BFR-Rx) promote greater increases in strength, muscular endurance, and lean mass compared to exercise alone (NoBFR-Rx); (2) Determine if BFR applied to the arm during acute LIEx increases activation of RC muscles. METHODS: Eighteen healthy adults (♂ 11, ♀ 7; 32±7 yr, 15±3 kg; 1.73±0.07 m, 0.89±0.10 kgm) were recruited and randomized into two groups (BFR-Rx, NoBFR-Rx). Each performed 8 wk of LIEx (30% 1RM, with either BFR (60 - 70% occlusion), or without occlusion (RT), while Delsys®) recorded during acute ER and IR fatigue tests in all subjects. Type I error was set at α=0.05.

CONCLUSIONS: Combined BFR-Rx using RC exercises may yield greater increases in shoulder/arm lean mass, strength, and muscular endurance compared to exercise alone. These findings may be partially due to a greater activation of shoulder musculature while using BFR. Data collection is ongoing and will be completed prior to conference.

When completing blood flow restriction, use of a perceived tightness scale is recommended as a method for setting sub-occlusive pressures. However, whether or not participants can consistently rate a similar pressure using this scale is unknown. PURPOSE: To determine the reliability of a perceived pressure when asking participants to rate a 7 out of 10, considered a moderate pressure with no pain, during blood flow restriction. METHODS: Participants (12 men, 12 women) were tested over 3 visits, involving measurements for arterial occlusion and the relative pressure at which participants deemed a 7 out of 10, considered a moderate pressure with no pain, during blood flow restriction. RESULTS: Participants rated a 7 out of 10 at a higher relative pressure on day 1 compared to days 2 (BF10: 4.482, median δ (95% credible interval): -.694 (-1.307, -.130)) and 3 (BF10: 4.962, median δ (95% credible interval): -.509; median δ (95% credible interval): .016 (-.741, .752)).

CONCLUSIONS: The % CV for relative arterial occlusion pressure in the lower body also did not differ between sexes (men: 13.7% vs. women 10.3%; BF10: .509; median δ (95% credible interval): .016 (-.741, .752)). The % CV for relative arterial occlusion pressure in the upper body did not differ between sexes (men: 13.7% vs. women 10.3%; BF10: .509; median δ (95% credible interval): .016 (-.741, .752)). Participants rated a 7 out of 10 pressure above the arterial occlusion pressure for the upper body and below for the lower body. A repeated measures analysis with a between subject factor of sex was used to compare relative arterial occlusion pressures across days and sex with a default prior of 0.5 for the fixed effects and 1 for the random effects. An independent samples t-test was used to determine if there were sex differences in %CV. The t-test and the default prior of 0.5 were used in all cases. Results are presented as %CV ± 1 standard error of the mean (SEM), 95% CI. Data are presented as means ± SD in all figures.
**G-41 Free Communication/Poster - Nutrition and Metabolic Health**

**Saturday, June 1, 2019, 7:30 AM - 11:00 AM**

**Room: CC-Hall WA**

**Board #217**

**The effect of Metabolic Syndrome on Exercise Performance in American Football Players From a Mexican University**


Email: dulcemorales@gmail.com

(No relevant relationships reported)

**PURPOSE:** To demonstrate the effect that the presence of the metabolic syndrome (MetSyn) has on the physical performance on American Football Players of a college team in Mexico

**METHODS:** Seventy six players were included in the study, thirteen had MetSyn (21.1 1.5yr s) and sixty three were not diagnosed with MetSyn (21.8 1.5yr s). In order to establish a statistical significance between the physical performance and MetSyn, the data was analyzed in two different ways: With MetSyn (WMS) or absence of MetSyn (AMS) and by groups of similarity of Body Mass and type of execution in the field Group 1 Offensive and Linemen (OL and DL) and Tight ends (TE).

Group 2 Running Backs (RB), Linebackers (LB) and Quarterbacks (QB).

Group 3 Wide Receivers (WR), Kickers (K), Strong Safeties (SS) and Cornerbacks (CB).

The physical performance tests that were measured were: Maximum strength, explosive strength, Isometric hand strength, muscular resistance, power of upper and lower body, lumbar flexibility, agility, speed and cardiovascular resistance.

**RESULTS:** The physical performance tests between WMS revealed better performance in maximum upper body strength (BF10 9.79) seconds against 5.21( 4.75- 822) and cardiovascular resistance 13.32(10- 18) against 6.20( 5- 15) minutes.

**CONCLUSIONS:** The players with MetSyn negatively relating to their lower athletic performance, suggesting a possible favorable relationship to presence of MetSyn negatively relating the MetSyn with these motor skills.

**Board #218**

**Inhibition Of miR-16 In Vitro Decreases Glucose Uptake And Insulin Signaling**

Seongkyun Lim, David E. Lee, Megan E. Rosa-Caldwell, Jacob L. Brown, Tyrone A. Washington, Nicholas P. Greene, University of Arkansas, Fayetteville, AR. (Sponsor: Matthew S. Ganio, FACSM)

(No relevant relationships reported)

Type 2 Diabetes Mellitus (T2DM) is a fast-growing epidemic and skeletal muscle insulin resistance may be the onset point in the development of T2DM. Recent data have suggested that microRNAs (miR) may play an important role in T2DM glucose intolerance. Specifically, reduced miR-16 content in muscle has been noted in human and rodent models of T2DM. However, regulation of miR-16 and its relation to muscle insulin resistance is largely unexplored. **PURPOSE:** To investigate how miR-16 content affects insulin resistance and glucose regulation in myotubes during insulin resistant states. **METHODS:** This study was performed in three experiments. Experiment (Ex) 1: To test if miR-16 is necessary for muscle insulin sensitivity, C2C12 myoblasts were cultured to become myotubes. Cells were transfected with a plasmid to inhibit function of miR-16. Ex 2: To test if miR-16 is sufficient to improve insulin resistance, myotubes were treated with 1-oleoyl-2-acetyl-sn-glycero (OAG), to simulate lipid overload-induced insulin resistance, cells were transfected with plasmid to overexpress functional miR-16 and x 3: To test if Primary-miR-16 prior to miR-16 is differently expressed in insulin resistance state, Pri-miR16 level was measured by RT-PCR in both in vivo and in vitro models of insulin resistance. In experiment 1 and 2, glucose uptake and insulin signaling by uptake of 2-NBDG (a fluorescent analog of glucose), and immunoblot of phosphorylation of AKT and IRS1. Data were analyzed by ANOVA or t-test as appropriate, significance was denoted at p<0.05. **RESULTS:** Ex 1: Insulin-stimulated glucose uptake was ~25% lower in myotubes following miR16 inhibition (p<0.01). Insulin signaling was lower in myotubes with miR16 inhibition (31%; p=0.002). Ex 2: OAG-induced insulin resistant myotubes exhibited lower glucose uptake (p<0.01; 12%). However, overexpression of miR16 did not improve OAG-induced insulin resistance (p<0.05). Ex 3: Pri-miR16 level was not different between control and OAG. **CONCLUSION:** Reduction of miR-16 content seems to be necessary for glucose handling, however, miR-16-overload is not sufficient to rescue glucose regulation and synthesis of pri-miR16 was not a culprit for reduced miR16 expressing insulin resistance, therefore it may be due to either degradation or export of miR16 or ing the miRNA process.
had free access to a running wheel in their cages. Food intake was monitored every other day and body weights once per week. After 12 weeks animals were sacrificed. Total RNA was extracted from colon tissue fixed in RNAlater and converted into cDNA using the RNeasy Mini and First Strand kits. q-T-PCR was performed using a custom RT2-profiler PCR array (Qiagen). Ct values were normalized to GAPDH and a one-way ANOVA with LSD post-tests was used to analyze group means of ΔCt values for each sex. A difference of mean with a p value of ≤ 0.05 was considered statistically significant. mRNA expression was calculated with the ΔΔCt method.

RESULTS: For females, Aldh and Ire1β expression was increased in VHF X mice (0.9 ± 1.1-fold times) compared to VHF X (0.6 fold times; p = 0.001 and p = 0.008). Muc2 expression was significantly increased in CDX mice (2.3-fold times) compared to VHF X (0.7 fold times; p = 0.02). In males, no significant differences in the expression of any factor was observed. CONCLUSION: High-fat diets coupled with exercise increases the expression of endoplasmic reticulum membrane protein sensors involved in the unfolded protein response in females. Exercise increases muc2 expression in females.

3533 Board #221 June 19 9:30 AM - 11:00 AM
Hypocaloric High Fat and High Carbohydrate Diets on Visceral Adipose Tissue and Body Composition
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Introduction: Excess visceral adipose tissue (VAT) is strongly associated with increased cardiometabolic risks. High-fat (HF) diets are a popular method for improving body composition. Purpose: To determine the role of HF diets in body composition and VAT. Methods: In a randomized, cross-over design, 12 healthy, sedentary individuals were assigned either to a HF or HC diet trial with a 20% reduction in total caloric intake from their typical diet. Participants maintained their 1st assigned diet for 2 weeks followed by a 1-week washout period where they consumed their typical diet. After the 1-week washout period, participants began the opposite diet trial (either HF or HC) for 2 weeks. The HF diet consisted of 9% fat and 30% carbohydrate and protein, with a limit of 50 grams of carbohydrate. The HC diet consisted of 70% fat and 30% carbohydrate and protein, with a limit of 50 grams of carbohydrate. The HC diet had less frequent intake of protein via nutritional shakes. VAT in mass and volume were determined using dual-energy x-ray absorptiometry.

RESULTS: Total body mass decreased up to 1.3 kg from the pre-intervention (0.01 125% fold) following either the HF (ΔSe) or HC (ΔSe1.2) kg trial, yet it was not statistically significant. VAT in mass and volume decreased following either the HF or HC diet from the pre-intervention (2.2 123% fold)Δ 420(ΔM) m3. However, the magnitude of change in VATmass and VATvolume was greater in the HF diet (2.2 123% fold)Δ 420(m3) m3 than the HC diet (1.8 128% fold)Δ 310(m3) m3 although it was not statistically significant. Notably, percent body fat decreased only following the HF diet (pre-intervention: 29.0 129% fold)F 2 19.9% fold)HC. 28.1 11.8% fold) Conclusion: Although a short-term hypocaloric diet with either HF or HC did not yield a significant change in body composition, there was a strong trend showing that hypocaloric diets, whether HF or HC, can lower total body weight. HF diets though may be more effective than HC at decreasing body fat percentage and VAT. Our study only looked at changes after two-week dietary interventions in healthy sedentary individuals. Thus, future studies examining long term effects of HF diets in a various sub-populations, including obese people, may provide more accurate information regarding a role of HF diets in body composition and visceral adipose tissue.

3534 Board #222 June 19 9:30 AM - 11:00 AM
Exploring The Utility Of Muac In Classifying Adult Metabolic Syndrome Risk Using NHANES 2015-2016
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Metabolic syndrome (MetS) is a constellation of cardiometabolic risk factors (visceral adiposity, dyslipidemia, hyperglycemia, and hypertension) that, when presented in tandem, exponentially increases the risk of heart disease and insulin resistance. Finding a simple and validated screening method is critical to proactively intervene and prevent further cardiometabolic risk. Purpose: The objective of this study was to develop a simple and validated screening tool to identify individuals with the metabolic syndrome (MetS) in tandem, exponentially increasing the risk of heart disease and insulin resistance.

METHODS: The study sample was derived from National Health & Nutrition Examination Survey (NHANES) 2015-2016 for individuals aged 4+ (N = 9,971). MetS was defined using the NCEP ATP III 2005 MetS diagnosis criteria. A recursive partitioning methodology (RPM), using the Classification & Regression Tree (CART®), was used to develop the screening tool. The CART® methodology is an intuitive and powerful approach to develop predictive models that are easy to interpret.

RESULTS: Seventeen percent (17%) of the total sample presented with the MetS. The RPM resulted in sex specific MetS criteria with the MetS criteria being ≥32cm (p = 0.024 and ≥29 cm (p = 0.024) for males and females, respectively. Specifically, those presenting with the risk criteria were ≥31 or males, and ≥30 cm ≥29c m for females. Overall classification accuracy for both the training and validation models were 83% with no statistical difference between models (p = 0.8).

CONCLUSIONS: This screening tool promises in being an effective screening method for MetS in guiding further diagnostic tests to prevent associated cardiometabolic morbidity and mortality.

3535 Board #223 June 19 9:30 AM - 11:00 AM
Patterns of Interrupting Prolonged Sitting and Postprandial Triglycerides in East-Asian Young Men with Central Obesity
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No relevant relationships reported

PURPOSE: To examine the acute effect of different frequency of interrupting prolonged sitting on postprandial triglycerides (TG) in young men with central obesity compared with prolonged sitting.

METHODS: Twenty-one East-Asian men with central obesity (mean age: 23.24 ± 3.65 years; body mass index: 29.78 ± 3.17 kg·m⁻²; waist circumference: 94 ± 18 cm) completed three randomized 7 laboratory-based trials including 1) a prolonged sitting trial (SIT), 2) 3-min walking every 30 min (3-min) at 3.2 km·h⁻¹, and 3) 6-min walking every 60 min (6-min) at 3.2 km·h⁻¹ separated by 7 h. Standardized mixed meals (8% carbohydrate, 30% Fat, and 15% Protein) were provided at 0 and 3 h. Blood samples were collected at -1, 0, 0.5, 1, 2, 3, 3.5, 4, 5, 6 h, and converted into later total sample, selected at random.

RESULTS: Regarding the TAUC, the main effect of trial (F TAUC = 4.10, P = 0.022, η² = 0.174) was significant with 6-min trial (10.58 ± 3.62 mmol·L⁻¹ per h) being lower than SIT trial (11.83 ± 3.52 mmol·L⁻¹ per h). There were no differences on the 7-h TAUC for TG concentrations between 3-min (11.52 ± 3.47 mmol·L⁻¹ per h), 6-min (11.52 ± 3.47 mmol·L⁻¹ per h), and SIT trials as well as between 3-min and 6-min trials (both P > 0.05). Regarding the TG concentrations, the main effect of model (F model = 0.61, P = 0.018) was significant with 6-min trial being lower than SIT trial (P = 0.013). The main effect of time was also significant (F time = 4.10, P < 0.001, η² = 0.08) with the TG concentrations significantly increased from 1 h to 6 h (all P < 0.05) compared with the baseline (the average of TG concentrations between -1 and 0 h).

CONCLUSIONS: Interrupting prolonged sitting with 6 min trial elicited superior benefit on reducing postprandial TG than SIT trial in East-Asian young men with central obesity.

3536 Board #224 June 19 9:30 AM - 11:00 AM
The Relationship Between a High Sugar-Low Fiber Dietary Food Intake and Obesity in a Clinical Setting
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No relevant relationships reported

Diet high in simple sugars and processed foods, and low in whole, fibrous plant foods have been linked to insulin resistance and weight gain. To prevent obesity and cardiometabolic disease, it is recommended that Americans limit intake of sugary beverages, fruit juices, added sugars, and processed carbohydrates, in favor of more fibrous foods such as whole grains, fruits, vegetables, nuts, beans, whole grains, and seeds.

PURPOSE: To examine the relationship between frequency of foods consumed high in sugar and low in fiber (HSFL) with BMI. We hypothesized that a HSFL diet would be significantly higher among obese individuals (BMI ≥ 30) than non-obese (BMI < 30).

METHODS: A total of 2,033 adults (1,311 females and 1,182 males) from a HealthSnap wellness assessment utilized in physicians’ offices across the country were evaluated for anthropometric measurements and nutritional behaviors. HSFL consumption was evaluated from patients’ self-reported intake of soda, juices, energy drinks, and other high sugar foods versus selection of whole grains, whole plant foods, nuts, beans, and seeds. To identify the association between HSFL and obesity, a
### Acute Exercise Intervention Combined with Metformin’s Influences on Glucose Homeostasis in T2D Mice

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**Purpose:** The aim of our investigation was to determine the effects of different ways of acute exercise intervention combined with high dose of metformin on glucose homeostasis and its relative molecular mechanisms in type 2 diabetic mice.

**Methods:** 4-week high fat diet (HFD) and one-time Streptozocin (100mg/kg) intraperitoneal injection were used for building T2D mice. 24 mice were divided into normal control (NC), normal acute resistance training (NCR) and normal acute endurance training (NCE) group, all n=8 in each normal group. Finally 4 mice were developing T2D and divided into diabetic control (DC), diabetic acute resistance training (DCR), diabetic acute endurance training (DCE), high dose of metformin (200mg/kg) control (HMC), metformin combined with acute resistance training (HMR) and metformin combined with acute endurance continuous training (HEME) group, all n=8.

**Results:** The two ways also enhanced blood glucose and lipid metabolism in T2D mice. Compared to HMC group, hepatic GAP expression mRNA expression in HMR and HME group showed opposite trends, one was down and the other was up. Compared to HMC group, hepatic PEPCK mRNA expression in HMR group mice was notably raised and hepatic AMPKα, PGC-1α and CREB mRNA expression in HMR and HME group mice was notably increased and only hepatic AMPKα mRNA expression in HME group was significantly increased.

**Conclusions:** Acute resistance training (ART) and acute endurance training (AET) combined with metformin can effectively improve glucose homeostasis in T2D mice. And the two ways can improve blood glucose and lipid metabolism in T2D mice. ART combined with metformin was better to improve glucose homeostasis and inhibit hepatic gluconeogenesis relative mRNA expression in T2D mice probably via the signaling pathway of AMPKα-PGC-1α-CREB.

### Lactate Response During Graded Exercise Test In Individuals With Prediabetes After Aerobic Exercise Training

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**Purpose:** Prediabetes (PD) is a metabolic disorder that precedes type 2 diabetes. The lactate concentration at rest, the response of lactate during graded exercise test, and the effect of aerobic training (AT) on lactate adaptation in subjects with prediabetes is little known. The aim of this study was to measure the lactate response adaptation to AT in individuals with prediabetes.

**Methods:** Twenty-one subjects participated (age 39 ± 7 yrs; BMI 29 ± 5 kg/m²; after a glucose tolerance test, they were classified as normal glycemic (NG, n=11) and PD (n=10) group according to the criteria of the American Diabetes Association. All participants performed a graded exercise test in cycloergometer (MONARK 894E), capillary lactate was measured every 5 min in as well as the power output at a lactate concentration of 4 m mol/L. The maximal heart rate (HR max) and peak oxygen consumption (VO2peak) were also determined. Blood biomarkers, anthropometric measurements, and physical capacity were evaluated before and after AT.

**Results:** Participants in both groups showed no change in blood glucose and lipid profile. VO2peak increased similarly (p < 0.01) in both groups (NG: 33.5 ± 5.3 vs 37.9 ± 6.8 m l/kg/min; PD: 33.5 ± 5 vs 36.8 ± 3.8 m l/kg/min). The lactate at rest was similar in both groups before intervention and did not change significantly after AT (NG: 1.39 ± 0.5 vs 1.17; PD: 1.4 ± 1.18 m mol/L). However, after AT, it was observed that the workload needed to reach the lactate threshold (4 m mol/L) increased significantly in each group (NG: 8.9 ± 16 vs 120 ± 22 W; p < 0.05; PD: 87.6 ± 16 vs 101 ± 15 W, p < 0.01), without a difference between groups.

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**ACSM May 28 – June 1, 2019 Orlando, Florida**
CONCLUSIONS: Nine weeks of AT resulted in increased exercise capacity in both NG and PD, which indicates that patients with PD manage to respond and adapt to an exercise program and increase their aerobic capacity.

METHODS: Male C57BL/6 J mice (8 week old) were randomly divided into two groups: (1) control group (CON; n = 6) and (2) endurance exercise group (EX; n = 6). The experiment was administered for one year. The mRNA levels of FAT-CD36, other fatty acid transporters were determined by semi-quantitative reverse-transcription polymerase chain reaction (RT-PCR). The protein levels of FAT/CD36 and insulin signaling pathway related molecules were examined by western blot analysis. The localization of FAT/CD36 were detected by immunofluorescence. The differences in means were analyzed by t test. RESULTS: Compared with the aging CON group, the mRNA levels of FAT/CD36 (1.000 ± 0.156 vs. 0.543 ± 0.051, P < 0.05) and CPT-1B (1.033 ± 0.167 vs. 0.528 ± 0.055, P < 0.05) in the EX group were significantly decreased, while other fatty acid transporters were not significantly changed (FATP4: 1.000 ± 0.15 vs. 0.82 ± 0.036 > 0.05; and (FABPpm: 1.00 ± 0.08 vs. 0.78 ± 0.09 > 0.05). When compared to the aging CON group, the protein levels of FAT/CD36 were also significantly decreased in the EX group (0.415 ± 0.053 vs. 0.337 ± 0.021, P < 0.05), as well as the phosphorylation levels of AKT (0.177 ± 0.012 vs. 0.290 ± 0.034, P < 0.05) and ERK (0.099 ± 0.014 vs. 0.322 ± 0.088, P < 0.05) were significantly increased. The immunofluorescence pictures showed that FAT/CD36 were localized to the caveolae of plasma membrane, but not the mitochondrial membrane. CONCLUSIONS: Exercise intervention protects against aging-induced insulin resistance by regulating FAT/CD36 expression and translocation. Supported by the National Natural Science Foundation of China (No. 316096).

Purpose: Diabetes mellitus (DM) is an important risk factors of cardiovascular disease. Long-term hyperglycemia, hyperlipemia and insulin resistance may lead to diabetic cardiomyopathy (DCM). No rodent models fully captured the whole process of cardiac morphology and function changes during the course of DCM. Aerobic interval training (AIT) has been advised as a non-pharmacological strategy against DM patients. However, little is known whether impose AIT intervention at the onset of DM will reverse the process of DCM. In this study, we sought to evaluate the cardiac function during the development of DCM and explore whether AIT will reverse the process of DCM. Methods: 6 Wistar male rats were randomly divided into control group (CON), DCM group (DCM) and AIT intervention group (AIT). Rats in DCM group and AIT group used high fat diet and STZ to induce diabetes models. Rats in AIT group were subjected to 8× eeks AIT intervention. Fasting blood glucose (FBG), lipid profiles, insulin resistance (IR) and GLP1-R signaling were measured. Results: Compared with CON, the heart function of DCM gradually changes from impaired diastolic function to impaired systolic function, with heart developed hypertrophy at onset and gradually cardiac walls became thinner with large LV volume. The FBG, TG and LDL-c levels in AIT was 16%, 16% and 10% lower than that in DCM (P < 0.01). AIT increased HDL-c level up to 60% than DCM (P < 0.01). AIT significantly decreased IR for 37.3% (P < 0.01). Histological analysis and echocardiography results revealed that AIT prevent the thinners of cardiac wall and improve systolic and diastolic function. There was a 81% increase of α-MHC mRNA expression and a 67% decrease of β-MHC mRNA expression in AIT group than in DCM (P < 0.01), which represented that AIT prevent the heart transformation to embryo type. AIT protect DCM heart improving serum GLP-1 level (80%, P < 0.05) and GLP-1 expression (144%, P < 0.01) and GLP-1R expression (219%, P < 0.01). CONCLUSIONS: AIT intervention may reverse the process of DCM by activating of GLP-1/GLP-1R signaling.

RESULTS: There were no differences in IS, ATPmax and VO2max between groups at baseline (one-way ANOVA all P > 0.05). Three weeks of exercise increased VO2max only in IS-ATPmax and ATPmax compared to those without a family history of T2D (FH-) and 2) if exercise induced changes in IS, VO2max and ATPmax is impeded in those with a FH+. PURPOSE: The purpose of this study was to determine if normoglycemic, sedentary healthy individuals with FH+ have a lower IS, VO2max and ATPmax compared to those without a family history of T2D (FH-) and 2) if exercise induced changes in IS, VO2max and ATPmax is impeded in those with a FH+. METHODS: Fourteen normoglycemic sedentary males with FH+ age ~23 ± 2.6 years; BMI ~22 kg/ m2 or without (n = 8; age ~20 ± 2.6); 1.4 ± 0.3 + 0.3 kg/ m2) were trained on a stationary bicycle for 30.5 ± 2.5 min/session on alternate days of continuous and interval training for 13 days over 3 weeks. Each exercise session (~24 ± 2.6); 1.8 ± 0.3 kg; BMI ~23 ± 0.3 kg/ m2 were performed. The training protocol was supplemented with fasting blood glucose (FBG), hemoglobin A1c (HbA1c) percentage, and the homeostatic model assessment of insulin resistance (HOMA-IR). The purpose of this study was to evaluate the relationships between these clinical indicators and body composition, physical activity level, and glucose response to mixed nutrient challenge in older adults. METHODS: In 38 subjects (31 F) body composition (bioelectrical impedance); and echocardiography results revealed that AIT protect DCM heart through improving serum GLP-1 level (80%, P < 0.05) and GLP-1R signaling.

Purpose: Exercise intervention protects against aging-induced insulin resistance.

CONCLUSIONS: Exercise intervention protects against aging-induced insulin resistance.

RESULTS: Approximately 30.3 million adults in the United States have diabetes. Diabetic complications include stroke, myocardial infarction, nerve damage, and renal failure, among others. In addition to being the seventh leading cause of death in the country, the medical costs due to diabetes is over $328 billion annually. Clinical evaluation for type II diabetes can be assessed in a variety of ways: fasting blood glucose (FBG), hemoglobin A1c (HbA1c) percentage, and the homeostatic model assessment of insulin resistance (HOMA-IR). The purpose of this study was to evaluate the relationships between these clinical indicators and body composition, physical activity level, and glucose response to mixed nutrient challenge in older adults.
Previous study reported that hyperbaric treatment with 36% oxygen decreases glucose and insulin level in type 2 diabetes rats, and the improvement could be due to increased oxygen saturation and blood flow during hyperbaric treatment. However, the effects of simple hyperbaric treatment without high oxygen remain unknown. PURPOSE: To investigate the effects of hyperbaric treatment with normal air on hyperglycemia in type 2 diabetes, focusing on skeletal muscle hemodynamics.

METHODS: 24-week-old male Otsuka Long-Evans Tokushima fatty (OLETF) rats and Long-Evans Tokushima Otsu (LETO) rats were used as diabetes model and non-diabetes model, respectively. All rats were assigned to hyperbaric treatment or non-treatment groups. The rats in the hyperbaric treatment group were exposed to hyperbaric chamber at 1.3 ATA with normal air for 8 s/day for 16 weeks. The oxygen saturation and total-hemoglobin (Hb) changes in the calf muscle during hyperbaric treatment was measured by near-infrared spectroscopy. Oral glucose tolerance test was performed at 8-week-old. RESULTS: Oxygen saturation and total-Hb were significantly lower in the hyperbaric treatment group than the non-treatment group at the fasting insulin level and the levels at 120 min after glucose administration were significantly higher in OLETF rats than LETO rats at both fasting and after glucose administration (p < 0.05). Among OLETF rats, the glucose levels at 30, 60, 120 min after glucose administration were significantly lower in the hyperbaric treatment group than the non-treatment group (30 min: 32.7 ± 3.8 vs. 43.6 ± 0.8 mg/dL, p < 0.05). Additionally, the fasting insulin level and the levels at 120 min after glucose administration were significantly lower in the hyperbaric treatment group than the non-treatment group (Fasting: 3.6 ± 1.1 vs. 4.3 ± 2.7, 120 min: 4.4 ± 1.6 vs. 5.2 ± 3.9 ng/mL, p < 0.05). CONCLUSIONS: The present study demonstrated that hyperbaric treatment with normal air also prevents the progression of hyperglycemia in OLETF rats, and the treatment without high oxygen increases oxygen saturation and blood flow in the skeletal muscle.

Purpose: To verify the effect of HIT on cardiopulmonary performance and substrate oxidation in obese adolescents with and without insulin resistance. METHODS: Clinical trial with 2x2bse adolescents, allocated to two groups: with insulin resistance (IR, n=12, HOMA ≥ 3.16) and without IR (n=13), submitted to a 6-week intervention protocol with six HIT sessions weekly of 30 min, p=0.03 vs. IR, p=0.06 vs. non-IR, respectively. CONCLUSION: Six HIT sessions were sufficient to alter parameters of cardiorespiratory and CHOxox performance in obese adolescents resistant or not to insulin, suggesting its use in potential implications for the regulation of physical fitness and glycemia in these populations.
Postprandial hyperglycemia is a risk factor for future CVD events. Lifestyle interventions to blunt postprandial glucose are needed to reduce diabetic and CVD risk. Apple cider vinegar, a “functional food”, has been shown to attenuate the rise in glucose following a meal. Aerobic exercise may also reduce blood glucose (BG) levels when performed before or following a high-glycemic meal. Purpose: This study aimed to compare the effectiveness of post-meal vinegar ingestion and pre-meal walking in reducing postprandial hyperglycemia in elderly individuals. We also investigated whether this population will self-select walking speeds sufficient to reduce postprandial glucose spikes. Methods: Participants (n=12) reported for testing following a 3 hour fast. Baseline BG was measured upon arrival, after which participants completed one of three conditions in a randomized, crossover order: (1) Consumption of standard meal followed by 2 hours of sitting, (2) Consumption of standard meal with apple cider vinegar (1g/kg BW) or (3) Consumption of a standard meal followed by 15 minutes of self-paced walking. BG was measured by finger stick at 30, 60, 90, and 120 minutes following meal consumption. The meal was designed to be a glycemic-index (GI) and included a bagel, butter, and orange juice. Total energy content of the meal was 470kcal (79g CHO [28gsugar], 12g FAT, 1g PRO). Results: The control trial confirmed BG rose significantly following the meal at 30 (167.8±6.1 mg/dl vs. 91.8±24.8 mg/dl; p<0.005) and 60 minutes (172.8±11.8 mg/dl vs. 91.8±2.4 mg/dl; p<0.005) but there was no difference in BG area under the curve (AUC) at any time point following vinegar or walking interventions vs. control. However, following vinegar and walking, the absolute increase in BG at 30 minutes following the meal was significantly reduced vs. control (ΔBG0-30 min: 42.5±4.0 mg/dl vs. 46.4±9.2 mg/dl vs. 36.3±7.5 mg/dl; p<0.05). Speed was found to be correlated with BG AUC, such that an increase in walking speed was associated with a greater reduction in 2-hour glucose AUC (R² > 0.9). Conclusions: Lifestyle interventions such as vinegar supplementation may effectively lower postprandial glucose spikes. For elderly individuals this represents alternative therapeutic strategies to aid in glucose management and improve metabolic health.

**Sarcopenia** associated with arterial stiffness and poor nutrition intake. However, it is unclear whether the effects of nutritional status on arterial stiffness in the subjects with pre-sarcopenia. Purpose: The purpose of this study was to investigate whether the effects of nutritional status on arterial stiffness in the subjects with pre-sarcopenia. Methods: The participants included 60 Japanese men (47 ± 15 years) and 70 women (48 ± 15 years). Sarcopenia was defined as a reduction of muscle mass (≤ 2 standard deviations below the mean of young adults) and a decline in muscle strength (≤ 2 standard deviations below the mean of young adults). Anthropometric assessments included body weight, height, and body composition. Blood pressure was measured using a mercury sphygmomanometer. Arterial stiffness was assessed using the pulse wave velocity (PWV) and pulse pressure (PP). Results: The prevalence of sarcopenia was 26.3% in men and 10.5% in women. PWV was significantly higher in men with sarcopenia compared to those without sarcopenia (7.3 ± 1.6 m/s vs. 6.0 ± 1.3 m/s, p<0.05). PP was also significantly higher in men with sarcopenia compared to those without sarcopenia (48.9 ± 6.4 mmHg vs. 37.5 ± 7.2 mmHg, p<0.05). Conclusions: The results of this study suggest that sarcopenia is associated with increased arterial stiffness in men. However, further studies are needed to determine the underlying mechanisms of these associations.
The most potent lifestyle intervention for treatment of Type II Diabetes (T2D) is consistent exercise. However, for many patients with the condition, other comorbidities such as osteoarthritis and hypertension, and high body mass index prevent them from being able to exercise intensively and consistently enough to experience optimal metabolic benefits. Recent research has supported the use of compression exercise in physically limited populations and demonstrated physiologic responses at lower intensities (10–20% one repetition maximum vs. 0%) for hypertrophic response in conventional resistance exercise). The combination of compression technology with core cooling further lowers the exertional requirements and has been used in cardiopulmonary rehabilitation populations to provide a safe and reliable exercise intervention. Compression exercise has also been shown to significantly increase muscle hypertrophy, with a greater growth in type II fibers (higher expressers of GLUT4). Therefore, this technology could directly address basal metabolism through increasing muscle protein turnover. Changes were observed in glucose storage in skeletal muscle mass, and improving glycemic control. This capacity to attenuate the insulin response combined with the accessibility of the platform suggests a clinical implication for diabetes management.

**PURPOSE:** To establish safe use of compressed exercise intensity in Type II Diabetics and to examine the effect of 6 months of training on biomarker markers, especially Glycoghemoglobin levels and weight.

**METHODS:** Thirty Type II Diabetics agreed to 3 training sessions a week for 6 months. Biomarker markers via blood draw were analyzed at 0, 3, and 6 months.

**RESULTS:** Midpoint data from 16 participants at 0 and 3 months were analyzed with a two-tailed T-test, revealing significant differences in Glycogemoglobin and weight. There was an 8% average decrease in Glycogemoglobin levels (Δ 2.2 vs. 7.8 mg/dL, p = 0.002) and an average weight loss of 3.0 lbs (211 lbs vs. 208 lbs, p = 0.032).

**CONCLUSION:** The preliminary results of this study suggest exercise with compression and cooling contributes to a reduction in biomarker markers of diabetes. This intervention has promise in contributing to effective management of T2D with a low physical burden.

**Women with Polycystic Ovary Syndrome (PCOS) present substantial weight gain that may increase the risk of developing cardiovascular diseases. Hormonal, metabolic and cardiac autonomic changes also occur and increase the risk of these diseases. However, despite advances, the effects of aerobic exercises on the different aspects of this syndrome are still unknown, especially when the body fat percentage is considered.**

**PURPOSE:** To investigate the effects of aerobic exercise on hormonal and metabolic aspects and cardiac autonomic modulation in women with PCOS with different percentages of body fat. **METHODS:** We administered a 6 mm skin punch biopsy of dedifferentiated Schwann cells (p75NTR+/Sox2+ cells) as well as testing the efficacy of Schwann cell transplantation to rescue HDF-induced neuropathy and wound healing deficits. **CONCLUSION:** Collectively, these experiments will give insight into the mechanisms underpinning two major complications associated with type-II diabetes that could be further explored to develop novel therapeutics.
**Purpose:** Previous research indicates that midbrain-striatal dopaminergic disruption is associated with obesity and involves in feeding behavior and voluntary physical activity. Since the action of exercise on midbrain-striatal dopamine, it may be an effective strategy to improve physical inactivity and overeating induced by food reward dysfunction in obesity. We therefore explored the mechanisms.

**Methods:** Male C57BL/6 mice were randomly divided into control group (C, n=12), exercise group (E, n=12), fed a normal diet (13% fat), and an additional group (H, n=12), fed a high fat diet (5 % fat). Obese mice in H were further divided into obesity group (O, n=12) and obesity + exercise group (OE, n=12). The CE and OE mice underwent treadmill exercise (13 min/min, about 5 ± 0.5 VO2max, 8 d/wk for 8 wks). The food preference test and open-field test were used to assess food reward, and voluntary physical activity. Tyrosine hydroxylase (TH) neurons were detected by immunohistochemistry, and the expression of TH protein in midbrain-striatum were measured by western blot.

**Results:** Body weight of OE was 15% lower than that of O (P < 0.01). Sucrose preference, physical activity level and time were decreased by 2.8 ± 0.3%, 32% and 32%, in O compared to C (P < 0.05, P < 0.01, P < 0.01), but were 18.2%, 37.28% and 26.5% higher, respectively, in OE compared to O (P < 0.05). TH+ cells in substantia nigra pars compacta (SNc) and ventral tegmental area (VTA) decreased by 13% and 18% respectively, in O compared to C (P < 0.05), but increased by 12.62% and 15.53% in OE compared to O (P < 0.05). TH fibers in dorsal striatum nucleus accumens were 16.8% lower in O compared to C (P < 0.05), but was 12.54% and 14.13% higher in OE vs. O (P < 0.05). In addition, the expression of TH protein in midbrain and striatum decreased by 18.46% (P < 0.05) and 16.35% (P < 0.05) in O compared with C, but increased by 12.23% and 11.6% in OE compared to O (P < 0.05).

**Conclusions:** The aerobic exercise inhibits body weight gain, improves food reward and voluntary physical activity in obese mice. The exercise-induced midbrain-striatal dopaminergic plasticity may be one of the important mechanisms for this adaptation.

**Board #245 June 19, 2020 - 11:00 AM**  
**Effect Of Physical Training In Leptin-deficient Ob/ob Mice: Oxidative Stress Evaluation In Prefrontal Cortex**

Matheus Santos de Sousa Fernandes, Sr., 1 Lucas Lucena, 2 Diorgnis José 3 Ferreira, 2 Anderson Pedrozera, 2 Severina Andrade-Silva, 2 Gianuber Braz, 2 José Stefano Tadeu, PhD, 2 Fabiana Sant'ana Evangelista, PhD, 2 Claudia Pinotto Marchi, 3 Souza de Oliveira, PhD, 2 MD, 1 Claudia J. Lagranha, 1 University of São Paulo, São Paulo, Brazil.  
**Federal University of São Paulo, São Paulo, Brazil.  
**Federal University of Pernambuco, Vitória de Santo Antão, Brazil.  
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(No relevant relationships reported)

**Purpose:** The overweight/obesity affects brain function from cellular to structural levels, and due to the mitochondria importance, several studies have focused upon its parameters in the prefrontal cortex of leptin-deficient ob/ob mice.

**Results:** Body weight of O E was 15.2% lower than that of O (P < 0.01). Sucrose preference, physical activity level and time were decreased by 2.8 ± 0.3%, 32% and 32%, in O compared to C (P < 0.05, P < 0.01, P < 0.01), but were 18.2%, 37.28% and 26.5% higher, respectively, in O E compared to O (P < 0.05). TH+ cells in substantia nigra pars compacta (SNc) and ventral tegmental area (VTA) decreased by 13% and 18% respectively, in O compared to C (P < 0.05), but increased by 12.62% and 15.53% in O E compared to O (P < 0.05). In addition, the expression of TH protein in midbrain and striatum decreased by 18.46% (P < 0.05) and 16.35% (P < 0.05) in O compared with C, but increased by 12.23% and 11.6% in O E compared to O (P < 0.05).

**Conclusions:** The aerobic exercise inhibits body weight gain, improves food reward and voluntary physical activity in obese mice. The exercise-induced midbrain-striatal dopaminergic plasticity may be one of the important mechanisms for this adaptation.

**Board #247 June 19, 2020 - 11:00 AM**  
**Comparing Modified Treadmill Protocols for Cancer Survivors: A Pilot Study**

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(No relevant relationships reported)

**Purpose:** Cancer-related fatigue (CRF) is defined as a distressing, persistent, subjective sense of physical, emotional, and/or cognitive tiredness or exhaustion related to cancer or cancer treatment that is not proportional to recent activity and interferes with usual functioning. It has previously been suggested that CRF is associated with cardiorespiratory deconditioning. However, there is a lack of data to support this hypothesis. **Purpose:** To investigate: (i) peak oxygen uptake (VO2peak) in fatigue- vs. non-fatigued cancer survivors; and (ii) the relationship between VO2peak and CRF severity. **Methods:** Participants (n=18) were recruited via a cancer-registry mail-out and from local cancer centres. Participants were allocated into two groups using the Functional Assessment of Chronic Illness Therapy-Fatigue (FACT-F) scale and a previously established cut-off score of ≤34 vs >34 for fatigued and non-fatigued, respectively. Participants categorized as fatigued (n=9 [25 female]) and non-fatigued (n=9 [21 female]), age 57±11 years; FACT-F score 44±5 vs 27±6

**Conclusion:** The aerobic exercise inhibits body weight gain, improves food reward and voluntary physical activity in obese mice. The exercise-induced midbrain-striatal dopaminergic plasticity may be one of the important mechanisms for this adaptation.

**Board #248 June 19, 2020 - 11:00 AM**  
**Severity of Fatigue is Associated with Cardiorespiratory Fitness in Cancer Survivors**

Rosie Twomey1, Mary E. Medsky2, John Temesi3, S. Nicole Gullos-Reed2, Guillaume Y. Millett.  
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**Oregon Health & Science University, Portland, OR.  
**Northumbria University, Newcastle upon Tyne, United Kingdom.  
**Univers Lyon, UMM-St Etienne, Saint-Etienne, France.  
**Email: Rosemary.Twomey@ucalgary.ca  
(No relevant relationships reported)
Exercise throughout cancer treatment can positively affect clinical and patient-reported outcomes. However, adverse side effects (e.g. fatigue) may reduce exercise adherence during chemotherapy. To potentially further improve patient prognosis, developing strategies to maximize exercise participation across the cancer treatment trajectory is warranted. Purpose: To compare adherence and attendance to a supervised multimodal exercise intervention completed during chemotherapy for breast cancer to the same intervention completed after chemotherapy. Methods: Women with stage I-III breast cancer were randomized to: 1) immediate exercise during chemotherapy (IE); or 2) delayed exercise after chemotherapy (DE). The exercise intervention matched the length of each participant’s chemotherapy regimen (8-12 wks) and included 3x/wk supervised aerobic (65-75% HR, 30-35m in), resistance (1-2 sets, 10-12 reps, 65-85% estimated 1-RM), and balance training. Mean attendance and adherence to aerobic (i.e. intensity/duration) and resistance (i.e. sets/reps) exercise were calculated. Exercise trainers recorded reasons for missed sessions. Results: 26women enrolled and attended ≥1 session (IE: n=12, DE: n=14). Attendance did not differ between groups (IE=79±24%, DE=81±27%, p=0.82). No group differences were found for adherence to aerobic duration (IE=82%, DE=88%, p=0.28 or intensity (IE=30%, DE=28%, p=0.15). Among IE participants, top reasons for missed sessions were treatment-related symptoms (38%) (i.e. fatigue) and non-treatment-related illness (17%) (i.e. cold/flu). Missed sessions for the DE group were most often due to non-treatment-related injury (8%) and travel (23%). Conclusion: Adherence to an identical supervised exercise intervention did not vary based on whether it was completed during or after chemotherapy. Barriers to attendance differed by group, thus strategies to maximize exercise participation during chemotherapy should be unique to the time of intervention delivery. Although feasibility data may vary by time relative to treatment, further analysis is required to determine if the timepoint of exercise delivery has differing effects on physical and psychological benefits.

Exercise as Supportive Care Has Selective Benefits for Chemotherapy Tolerance and Side Effects

Amy A. Kirkham1, Kelecy A. Bland2, Karen A. Gelmon3, Donald C. McKenzie4, Kristin L. Campbell, FACSMS.

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Email: amy.kirkham@ualberta.ca

Purpose: To determine whether chemotherapy tolerance and side effects differ among women with breast cancer who do and do not participate in an exercise program. Methods: Women with early stage breast cancer who were offered supervised exercise programming as supportive care during adjuvant chemotherapy (n=37) were compared to a randomly selected, retrospective, usual care group (n=8). Exercise programming included supervised moderate-intensity aerobic and whole-body resistance training 3x/week plus home-based aerobic training 2x/week. Clinical data were extracted from medical records in a standardized manner for both groups. Weight gain was defined as ≥0.5 kg increase in body weight from chemotherapy records. Complete blood counts were extracted to determine prevalence of anemia and neutropenia. Results: The groups were matched on age, body mass index, medical history, diagnosis, and treatment characteristics. The relative dose intensity and risk of a dose reduction of any chemotherapy type did not differ between groups. Neutropenia was the most common reason for a dose reduction and the prevalence did not differ between groups. Dose reductions due to neutropenia or fatigue were significantly less common, while dose reductions due to mucositis were more common in the exercise group (all p<0.04). The severity, frequency, and risk of experiencing neutropenia and anemia did not differ between groups. Most (95%) patients experienced anemia, while one-third experienced neutropenia for at least 1 treatment cycle. There were some agent-specific effects of exercise including 1) a relative risk reduction of a doxorubicin dose reduction (relative risk, RR=0.8, 95% CI=0.7, 0.9), but not for docetaxel or paclitaxel; and 2) risk reduction of weight gain with receipt of docetaxel and cyclophosphamide (RR=0.61, 95% CI=0.37, 1.00, p=0.05) but not with receipt of doxorubicin and cyclophosphamide. Conclusions: Women who participated in a supportive care exercise program did not experience greater overall tolerance for chemotherapy treatment. However, exercise may have some selective effects on tolerance for doxorubicin chemotherapy, weight gain with docetaxel chemotherapy, and dose reductions due to neutropenia and fatigue.
Cardiotoxicity is the leading non-cancer related cause of morbidity and mortality in cancer survivors. Cardiac rehabilitation (CR) improves function and reduces morbidity and mortality in patients with heart failure, but little is known about its ability to ameliorate or attenuate the known cardiotoxic effects of chemotherapy agents.

**PURPOSE:** Determine if participation in CR improves fitness and quality of life (QOL) in patients undergoing treatment with either Doxorubicin or Trastuzumab who exhibit markers of subclinical cardiotoxicity.

**METHODS:** 20 female patients with breast cancer and evidence of subclinical cardiotoxicity (i.e. >10% decrease in global longitudinal strain (GLS) or a cardiac troponin > 20 ng·L⁻¹) were randomized to 10 weeks of CR or usual care (UC). Exercise training was performed at a cardiac rehabilitation facility and included 2-3 days per week of interval training on a treadmill or cycle at 0-90% of heart rate reserve for 40 minutes.

RESULTS: Cardiorespiratory fitness, as measured by peak oxygen uptake (VO₂peak), was significantly improved with CR and decreased in the UC group (between group change, 0.009; Table). No changes were observed between or within groups with respect to QOL or high sensitivity troponin. GLS improved overtime in both groups, but no differences were observed between groups.

**CONCLUSIONS:** This pilot study suggests the use of CR may be a viable option to attenuate the reduction in fitness that occurs in patients undergoing cardiotoxic chemotherapy. While trends were observed for improvements in both predictors of cardiotoxicity (GLS and troponin) with CR, these changes were not significant when compared to UC. The long-term effects of exercise on these predictors and left ventricular function warrants further investigation.

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Baseline</th>
<th>Exercise post test</th>
<th>Control baseline</th>
<th>Control post test</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak VO₂ (mL·kg⁻¹·min⁻¹)</td>
<td>15.7 ± 6.8</td>
<td>19.2 ± 5.9*</td>
<td>16.7 ± 1.5</td>
<td>15.1 ± 1.4</td>
<td>0.009</td>
</tr>
<tr>
<td>High sensitivity troponin (ng·L⁻¹)</td>
<td>2.0 ± 0.8</td>
<td>3.8 ± 1.0*</td>
<td>1.5 ± 0.8</td>
<td>2.3 ± 0.8</td>
<td>0.211</td>
</tr>
<tr>
<td>FACT-G score</td>
<td>3.6 ± 11.6</td>
<td>3.8 ± 11.8</td>
<td>2.4 ± 11.7</td>
<td>3.0 ± 13.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Relative global longitudinal strain (%)</td>
<td>-1.6 ± 13.7</td>
<td>3.3 ± 9.0*</td>
<td>20.7 ± 8.0</td>
<td>12.3 ± 10.7*</td>
<td>0.09</td>
</tr>
<tr>
<td>Myoglobin (ng·mL⁻¹)</td>
<td>10.5 ± 7.7</td>
<td>21.5 ± 5.7*</td>
<td>21.9 ± 11.4</td>
<td>31.2 ± 14.1*</td>
<td>0.134</td>
</tr>
</tbody>
</table>

**RESULTS:** Mean survivors age was 22.27 ± 6.30. The survivors included had 46% SR and 54% HR factors. The mean VO₂peak was significantly lower than the one predicted, 86 ± 16%. The heart rate measured at the end of the walk represents a mean of 86% of the maximal predicted. The mean intensity measured at the end of the walk was 6.8 ± 1.7 the VO₂peak. There is no significant difference between low and high cardiorespiratory fitness level of relative exercise intensity during the 6MWT (p=0.699). We observe a trending difference in relative exercise intensity during the 6MWT depending on risk factors (SR: 8.3% ± 1.4 vs HR: 8.8% ± 0.6; p=0.05).

**CONCLUSIONS:** Although the physical cardiorespiratory fitness of survivors is lower, our results demonstrate that with a self-paced exercise (i.e. 6MWT) participants reached similar level as those of a healthy population. Their physical fitness level does not impact the relative intensity levels measured during the 6MWT. Criteria link to the disease (ALL risk prognostic: SR and HR) needs to be considered while prescribing PA to this population. Survivors have greater chances of overcoming their disease than in past history, but specific and increased knowledge about physical activity is needed to prevent late-effects related to the treatments.

Androgen deprivation therapy (ADT) results in adverse effects on body composition (BC) and places prostate cancer (PCa) patients at increased risk for sarcopenic obesity. Accurate BC assessment across the treatment continuum is an important aspect of integrating successful supportive care strategies. Dual-energy x-ray absorptiometry (DEXA) and air displacement plethysmography (ADP) are valid methods and have exhibited excellent reliability in various populations. Evaluation of the relationship between methods when used to detect BC changes in PCa patients across an active treatment timeline would inform future trials of their respective clinical relevance.

**PURPOSE:** The purpose of the single-blind, randomized controlled Individualized Diet and Exercise Adherence-Pilot (IDEA-P) trial is to evaluate the preliminary efficacy of an exercise and dietary intervention, implementing a group-mediated cognitive behavioral approach, relative to standard of care treatment among PCa patients undergoing ADT. In the current study, we evaluated the reliability and absolute agreement of estimates of percent body fat (%BF), fat mass (FM) and fat-free mass (FFM) between DEXA and ADP in PCa patients to establish efficacy for detecting change in BC during treatment.

**METHODS:** Change in BC estimates (baseline to 3-month) from a total of 30 PCa patients (Mage = 66) on ADT were analyzed by DEXA and ADP. Degree of interrater reliability between methods was evaluated using mean-rating (k = 2), absolute-agreement, 2-way mixed-effects model intra-class correlation coefficients (ICC) and 95% confidence intervals. Potential bias between DEXA and ADP was examined using Bland-Altman plots and analysis. **RESULTS:** A high degree of reliability and agreement was found for measurements of %BF and FFM change between methods with average ICC = 0.89, 0.90 (95% CI = 0.80, 0.95; p<0.001) and 0.90 (95% CI = 0.80, 0.95; p<0.001), respectively. Bland-Altman plots of change in %BF, FM and FFM revealed no evidence for proportional bias between DEXA and ADP. **CONCLUSIONS:** Findings from this study suggest DEXA and ADP measure change in BC with similar sensitivity across time. These results support the clinical application of DEXA and ADP as valid and reliable methods of BC quantification for PCa patients undergoing ADT. Supported by NIH/NCI R03 CA188101.

**RESULTS:** Mean survivors age was 22.2 ± 6.0. The survivors included had 46% SR and 54% HR factors. The mean VO₂peak was significantly lower than the one predicted, 86 ± 16%. The heart rate measured at the end of the walk represents a mean of 86% of the maximal predicted. The mean intensity measured at the end of the walk was 6.8 ± 1.7 the VO₂peak. There is no significant difference between low and high cardiorespiratory fitness level of relative exercise intensity during the 6MWT (p=0.699). We observe a trending difference in relative exercise intensity during the 6MWT depending on risk factors (SR: 8.3% ± 1.4 vs HR: 8.8% ± 0.6; p=0.05).

**CONCLUSIONS:** Although the physical cardiorespiratory fitness of survivors is lower, our results demonstrate that with a self-paced exercise (i.e. 6MWT) participants reached similar level as those of a healthy population. Their physical fitness level does not impact the relative intensity levels measured during the 6MWT. Criteria link to the disease (ALL risk prognostic: SR and HR) needs to be considered while prescribing PA to this population. Survivors have greater chances of overcoming their disease than in past history, but specific and increased knowledge about physical activity is needed to prevent late-effects related to the treatments.

**PURPOSE:** Advance in cancer treatment induced drastic improvements in survival rate of Acute Lymphoblastic Leukemia (ALL) for pediatric patients. These medical advancements came at the cost of cardiac dysfunction. Regular physical activity (PA) has been known to have a preventive effect on these health issues. Previous studies have shown that survivors are less active than their peers and below the recommended PA guidelines. The aim of this study is to evaluate the intensity measured from the Six Minute Walk Test (6MWT) comparatively to maximal exercise test and verified if it is compatible with standard recommendations.

**METHODS:** We tested 17 ALL survivors. We used a 6MWT and a cardiopulmonary exercise test (VO₂max). Classification of risk level factors was based on treatment dosage, age at diagnosis, sex, prognostic risk group, time from the end of the treatment (Standard Risk (SR) and High Risk (HR)). Participants were divided in two groups according to their median cardiorespiratory fitness level (<84.3% vs ≥84.3)

**RESULTS:** Myoglobin (ng·mL⁻¹) | 10.5 ± 7.7 | 21.5 ± 5.7* | 21.9 ± 11.4 | 31.2 ± 14.1* | 0.134 |

**CONCLUSIONS:** Although the physical cardiorespiratory fitness of survivors is lower, our results demonstrate that with a self-paced exercise (i.e. 6MWT) participants reached similar level as those of a healthy population. Their physical fitness level does not impact the relative intensity levels measured during the 6MWT. Criteria link to the disease (ALL risk prognostic: SR and HR) needs to be considered while prescribing PA to this population. Survivors have greater chances of overcoming their disease than in past history, but specific and increased knowledge about physical activity is needed to prevent late-effects related to the treatments.
quality of life. Exercise has been shown to be feasible, safe and effective in other cancer populations to mitigate treatment-related side-effects, improve quality of life and minimise dose limitation. Exercise may therefore have clinical utility within pancreatic cancer.

**Purpose:** To establish the safety and feasibility of a supervised exercise program for patients with histologically confirmed adenocarcinoma of the pancreas.

**Methods:** This non-blinded, single cohort feasibility study provided patients with a 3-month supervised exercise program consisting of resistance and aerobic exercise two days per week. Upper and lower-body muscle strength, physical function (M WT, 00m Walk Test), and body composition (DEXA) were obtained at baseline, 12 and 24w eeks.

**Results:** Thirty nine patients (M=23, F=16) were referred with approximately 8% of referrals leading to enrolments (n=22; M=11, F=11). Patients who declined to participate reported feeling too unwell (4%), unable to travel easily (23%), not interested (1%), lost to follow-up (17%), and in one case, the patient deceased during the screening period (2%). Twenty two patients aged 69± 1.2yr olds were assigned baseline testing and commenced exercise, however, a 8% withdrawal rate was observed during the intervention consisting of 9 females (7%) and 3 males (27%). Increased appendicular lean mass at baseline was significantly associated with patient completion, using gender and age as covariates (F = 0.06). For those who exercised, improvements (p=0.05) were observed at 12 weeks and maintained at 24 weeks for M WT, 00m Walk Test, 1RM Seated Row and 1RM Leg Press. Diastolic BP was also significantly reduced following training (p=0.012).

**Conclusion:** Exercise programs are safe for pancreatic cancer patients. Appendicular skeletal muscle (ASM) appears critical to facilitate program completion. Focusing on increasing ASM could be a priority for this patient population. RCT’s are required to confirm these results.

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**B256 Influence of Acute Aerobic Exercise on 24-hour Ambulatory Central Blood Pressure**

**Malvina Shoukri, Thomas Burke, Brandon Kistler, Bradley Fleenor, Matthew Harber, FACSMM, Ball State University, Muncie, IN. (Sponsor: Matthew P. Harber, FACSMM)**

**No relevant relationships reported**

Ambulatory central blood pressure (cABP) assessed for 24 hours is a relatively new measurement that may be predictor of cardiovascular disease (CVD). Acute bouts of exercise lower peripheral blood pressure; however, it is currently unknown if an acute bout of vigorous exercise reduces 24 hour cABP. **PURPOSE:** To examine the response of cABP over 24-hour s after an acute bout of aerobic exercise. **Methods:** Healthy asymptomatic adults (N=10; 6m s; age: 29.2 1.3yr s; body mass index 23.8 0.6 kg/m^2; VO_{2max} 3.7 0.4 ml/kg/min) completed two trials in a randomized order. Trials consisted of a progressive maximal treadmill exercise test to assess VO_{2max} or a non-exercise control. During each trial, participants were ambulatory BP (ABP) monitor to record brachial and central BP variables over 24-hour s. Hemodynamic variables between trials were analyzed as mean ± 2SD a s and by t of day; Daytime (0800- 2200 hours), and Nighttime (2200- 0800 hour s). Dependent t-test were used to compare 24 hour averages between control and exercise. A 2-way ANOVA with repeated measures was performed to examine time of day differences between trials. **Results:** Over the course of 24-hour s, average brachial systolic BP (cSBP) (135.3± 2.8 vs. 122.0± 2.5 mmHg) central systolic BP (cSBP) (108± 2.2 vs. 111.2± 2.4 mmHg), and mean arterial pressure (MAP) (cSBP: 71± 1.5m Hg; cDBP: 16± 1.9m Hg) were lower (p<0.05) after exercise compared to control. A main effect for time (p=0.05) indicated that cSBP, cDBP, brachial pulse pressure, MAP, cSBP, and cDBP, were lower during nighttime compared to day time, independent of exercise. **Conclusion:** A single, vigorous bout of aerobic exercise lowers ambulatory central hemodynamics for at least 24 hours. These novel findings provide insight into the regulatory effects of exercise on blood pressure.

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**G-43 Free Communication/Poster - Clinical Exercise Physiology - Other**

**G3568 Leucocyte Telomere Length, Inflammation and Oxidative Stress in Master Athletes: The Interplay**

**Herbert G. Simó, Samuel S. Aguiar, Lysleine A. Deus, Cao V. Souza, Rodrigo VP Neves, Lucas P. Barbosa, Patrick A. Santos, Érica C C e Rosá, Rosângela V. Andrade, Thiago S. Rosa. Catholic University Of Brasilia, Brasilia, Brazil.**

**Email: hgsimoes@gmail.com**

**No relevant relationships reported**

Leucocyte telomere length, chronic inflammation and oxidative stress play a self-feeding loop that may be cause and consequence of several age-related diseases. However, the interplay of markers of biological aging, oxidative stress and inflammation were not investigated in master athletes who follow an anti-aging lifestyle. **PURPOSE:** To analyze the leucocyte telomere length (LTL), inflammatory markers and redox profile of master athletes and compare to young and age-matched untrained controls. **METHODS:** Subjects (n=45) were 23 middle-aged master athletes (MA, 23± 3.4yr s), 11 young controls (YC, 21.8± 1.3yr s) and 11 middle-aged untrained controls (MU, 31.0± 3.3yr s). Relative LTL was determined with CR analyses (T/S). Markers of inflammatory, oxidative and anti-oxidant status were assessed in plasma using commercial kits. A one-way ANOVA and Pearson’s moment correlation enabled for comparisons and correlations. **RESULTS:** The LTL (T/S) of YC (1.26±0.46) did not differ significantly from MU (0.48±0.52) (p>0.05) but did not differ from MA (0.9± 0.9). MA and YC demonstrated a higher CAT, SOD activity, CAT/ TBArs and SOD/TBArs ratios than MU, and the % body fat of MA was also lower than MU (p<0.05). The levels of inflammatory cytokines TNF, soluble TNF receptor (sTNF), IL6 nd sIL6 were lower in the YC in comparison to MU and MA. Moreover, MA presented lower levels of sTNF, IL6 nd sIL6 n higher IL2 and IL10/IL6 r. MA and YC presented a higher % of CAT, SOD activity, CAT/ TBArs and SOD/TBArs ratios than MU, and the % body fat of MA was also lower than MU (p<0.05). The levels of inflammatory cytokines TNF, soluble TNF receptor (sTNF), IL6 nd sIL6 were lower in the YC in comparison to MU and MA. Moreover, MA presented lower levels of sTNF, IL6 nd sIL6 n higher IL2 and IL10/IL6 r. MA and YC presented a higher % of CAT, SOD activity, CAT/ TBArs and SOD/TBArs ratios than MU, and the % body fat of MA was also lower than MU (p<0.05). The levels of inflammatory cytokines TNF, soluble TNF receptor (sTNF), IL6 and sIL6 were lower in the YC in comparison to MU and MA. Moreover, MA presented lower levels of sTNF, IL6 and sIL6. This was also confirmed with pro-inflammatory cytokines (TNF: r=0.28; sTNF: r=0.09; IL6 r=0.20; sIL6 r=0.430) (p<0.05). Further, CAT and SOD were negatively associated with inflammatory parameters (sTNF, IL6 and sIL6). While the LTL was negatively associated with inflammatory markers and positively associated with anti-inflammatory variables (p<0.05). **CONCLUSIONS:** Middle-aged master athletes presented lower markers of oxidative stress and inflammation, with improved antioxidant defense and longer LTL. Once inflammatory and oxidative stress were negatively associated to adiposity and LTL, the biological aging of MA is attenuated possibly due to a low adiposity, a better redox balance and reduced inflammatory markers.
An interruption in the training routine may have deleterious effects on cardiorespiratory fitness (CRF) and body composition. Particularly the decline that can occur in the phase-angle (PhA), derived from the tangent value of the ratio of reactance (DXA) and Fat was assessed with BIA. CRF was evaluated with a breath-by-breath gas analyser system (Quark RMR, Cosmed) with a modified Bruce protocol. During the 15 day detraining period, participants were instructed to refrain from structured and supervised exercise sessions. One way repeated measures ANOVA were performed and all analyses were adjusted for sex.

RESULTS: The interruption of structured and supervised exercise sessions for 18 days resulted in declines in PhA (5.5%; p-value=0.037). No differences were found for weight (p=0.8), body mass index (p=0.8). %FM (p=0.9), %FFM (p=0.5). %GFM (p=0.6), %LM (p=0.6), %BF (p=0.7), %LBF (p=0.6), and CRF (p=0.4).

CONCLUSIONS: A short-term detraining period of 2-weeks resulted in detrimental changes in PhA, suggesting a decline in the integrity of body cells, but no changes in the remaining body composition outcomes or CRF. These results highlight the importance of maintaining structured exercise sessions in older adults in order to preserve body cell integrity.

People living with HIV (PLWH) often present with lower heart rate variability (HRV) than healthy counterparts. This is problematic because lower HRV has been associated with cardiovascular morbidity and mortality. Aerobic exercise has been shown to improve HRV in the general population and in those with chronic diseases but its effectiveness in PLWH is unknown. PURPOSE: To evaluate the effects of 8 week aerobic exercise in PLWH on anti-retroviral therapy. Twenty-three participants completed the study. Resting HRV was measured for 3 minutes through an electrocardiogram. Measures included high frequency power (HF), low frequency power (LF), very low frequency power (VLF), standard deviation of normal-to-normal (NN) intervals (SDNN), and the ratio of the mean NN red differences of successive intervals (RMSSD). Estimated VO2peak was assessed through a 6-minute walk test (6-MWT) on a treadmill. Body fat percentage (BF%) was measured through air displacement plethysmography. The training group performed aerobic exercise 3 times per week (2 lab-based sessions and 1 home-based session per week) at 65% - 75% of heart rate max. Exercise duration was 30 minutes per session during the 1st week increasing to 3 n minutes for weeks 2 to 8.

RESULTS: Participants were 48 ± 10 years old with a CD4 T-cell count of 6 ± 2 cells/μL. There were no significant differences between groups in any of the HRV indexes. However, SDNN (a marker of overall autonomic function) increased significantly in the exercise group (Pre: 32.9 ± 3 m s vs Post: 32.0 ± 3 m s, p = 0.038). There was a moderate correlation between SDNN and VO2peak (r = 0.5, p = 0.01). There were no significant differences in VO2peak or BF% between groups. CONCLUSIONS: While differences in HRV were not observed between groups, our data suggests that overall autonomic function can improve with aerobic exercise and these changes are associated with higher levels of VO2peak. These results advocate the importance of improvements in HRV as greater levels of HRV are associated to lower risk of CVD and mortality.
**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**3576 Board #264 June 1 9:30 AM - 11:00 AM**

**The Effectiveness Of Simulation-based Learning In Preparing Exercise Physiology Students For Emerging Clinical Practice Domains**

Nathan E. Reeves, Griffith University, Griffith University, Australia.

Email: n.reeves@griffith.edu.au

(No relevant relationships reported)

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**3577 Board #265 June 1 9:30 AM - 11:00 AM**

**Relationship Between Changes in Gait Speed & Resistance Training**

William Perez, Brian Phipps, Jeffrey Beans, Leslie Katzell, Odessa Addison. Veterans Affairs Medical Center, Baltimore, MD.

(No relevant relationships reported)

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**3575 Board #263 June 1 9:30 AM - 11:00 AM**

**Comparison of Work-induced Fatigue Responses Between One Versus Three 12-hour Shifts in Nurses**

Brennan J. Thompson. Utah State University, Logan, UT.

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(No relevant relationships reported)

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**3574 Board #262 June 1 9:30 AM - 11:00 AM**

**Hippocampal Growth Factor and Myokine Cathespin B Response to Aerobic and Resistance Training in 3xTg-AD Mice**

Gabriel Pena. Florida Atlantic University, Boca Raton, FL.

(Sponsor: Michael Whitehurst, FACSM)

(No relevant relationships reported)

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Fatigue-related impairments in the nursing workforce contribute to a multitude of health, safety, and economic consequences at the individual, organizational and societal levels. Long and compressed work schedules are commonly worked in the healthcare industry, but more research is needed to understand the cumulative effects of multiple work shifts on performance outcomes in nurses.

**PURPOSE:** To examine the effects of 12-hour nursing work shift compared to three successive (one every 24 hours) 12-hour shifts on fatigue, performance-based, and vertical gait speed responses in nurses and aides.

**METHODS:** Twenty-six full-time hospital working nurses and aides (age = 38 ± 13.3 years) reported to the lab for testing before, immediately after a single 12 hour shift, and after working three 12-hour shifts in a 27- hour period. Outcome measures included vigilance-based reaction time and muscle function assessments (lower and upper body maximal strength, rate of torque development, and vertical gait speed performance).

**RESULTS:** All performance variables except hand grip strength showed a significant (P < 0.05) decline following the three work shifts. The psychomotor vigilance reaction time variable significantly declined from the end of shift one to the end of the three shifts (8% more impaired following shift 3 versus shift 1), inducing an accretion of fatigue with increasing number of shifts worked. Muscle function variables responded early in the shift cycle, showing a significant decline following shift one (P < 0.05 for all but hand grip) and remained reduced but did not further decline by the end of the third shift (performance reductions ranged from 61% from baseline to post shift three).

**CONCLUSION:** This study used objective measures to substantiate that fatigue impairments occur from working a single 12-hour shift and in several instances, increases further with increased number of successive work shifts. Nurse personnel and administrators should view work schedules involving multiple successive shifts with caution. Fatigue management strategies may reduce consequence from fatigue-related mishaps, and this study reports several variables that may be sensitive for identifying and tracking fatigue in a full time working nurse population.
Reductions in %body fat and markers of obesity-related disorders have been reported following obesity treatments; however, this short-term success is regressed after the termination of treatments. **PURPOSE:** The purpose of this study was to evaluate whether telephone follow-up intervention is effective in preventing long-term regression of %body fat and inflammation after primary intervention in obese children. **METHODS:** 86 obese children (aged 10-14 yr) completed this study (19 PTI: primary intervention and telephone follow-up intervention, 18: primary intervention only, and 19: no intervention). Anthropometric data and blood samples were obtained before (PRE), after each week of primary intervention (POST), and 10-month follow-up (1YEAR) to measure levels of %body fat, tumor necrosis factor-alpha (TNF-α), C-reactive protein (CRP), and adiponectin. **RESULTS:** 8 weeks of primary intervention in PTI and PI significantly reduced %body fat (PITI: 29.1±1.1% vs. 25.8±1.3%; Mean±SE; P=0.003; PL29.1: 9.0±0.6% vs. 9.1±0.6%; P=0.004; TFN-α (PITI: 4.1±3.8 mg/L vs. 3.1±3.3 mg/L; P=0.016), and CRP (PITI: 9.5±3.5 mg/L vs. 6.2±3.1 mg/L; P=0.035; P2.8±0.4 mg/L vs. 2.2±0.3 mg/L; P=0.031) and elevated levels of adiponectin (PITI: 6.6±6.9 µg/mL vs. 8.5±5.3 µg/mL; P=0.019; P3.6±4.6 vs. 8.8±1.8; P=0.024), while CON showed an increase in %body fat (29.3±1.0% vs. 30.7±1.1%; P=0.028) with no differences in inflammatory cytokines. Results of 10-month follow-up measurement (1YEAR) were reverted back to PRE for the PTI (1YEAR value and P value for PRE vs. 1YEAR: %body fat: 28.2% vs. 1.2% P; TFN-α: 4.1±4.1; P=0.06; CRP: 2.6±6.5; P=0.75; adiponectin: 6.8±7.9; P=0.47) whereas those in PTI at 1YEAR remained statistically significant to PRE (1YEAR value and P value for PRE vs. 1YEAR: %body fat: 27.1±1.3% vs. 16.0%; TFN-α: 3.6±8.2% P=0.035; CRP: 2.8±8.3; P=0.99; adiponectin: 80±2.4; P=0.03). **CONCLUSIONS:** Results of this study confirm that levels of inflammation are correlated to changes in %body fat, indicating that fat loss is effective in preventing and managing obesity-associated disorders. It is suggested that a telephone intervention is an effective follow-up tool for stabilizing reductions in %body fat, and levels of inflammation obtained from an intensive primary intervention in obese children.

**G-43b** Free Communication/Poster - Late-Breaking Abstracts

Saturday, June 1, 2019, 7:30 AM - 11:00 AM

Room: CC-Hall W2A

**3578** Board #268

June 1 9:30 AM - 11:00 AM

**Telephone Intervention Is An Effective Follow-up To Stabilize %body Fat and Markers Of Inflammation After Primary Intervention**

Kyung-Shin Park1, Brett S. Nickerson1, Seongkwan Cho1, Boung Jin Kang1, 2Texas A&M International University, Laredo, TX. 3Elizabethtown College State University, Elizabethtown, NC.

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(No relevant relationships reported)

Studies revealed that participation in Physical Education (PE) classes could increase the chance to be more physically active and influence aerobic fitness among youth (Chen, 2014 Fairclough & Stratton, 2004). Meanwhile, it is noted that weekly amount of PE classes in Shanghai and Hong Kong is largely different (Shanghai: 5 times per week; Hong Kong: 80-120 minutes per week). Due to the difference in PE class volume, we hypothesized that attitude toward PE class, physical activity (PA) level and aerobic fitness of adolescents may be different between these two cities. **PURPOSE:** to compare the attitude toward PE class, PA and fitness between adolescents in Hong Kong and Shanghai. **METHODS:** A total of 2,086 adolescents (12-15yr olds) randomly recruited from middle-schools of Hong Kong and Shanghai completed questionnaire surveys on attitudes toward PE class and levels of aerobic fitness (15m PACER). **RESULTS:** Chi-squared test showed Hong Kong adolescents ‘like’ PE (54.8%) more than that of Shanghai counterparts (39.5%; p<0.001), whereas Hong Kong adolescents “dislike” PE (58% ) much less than the Shanghai adolescents (21.5%); (p<0.001). After adjusting for age and gender, ANCOVA revealed that MPA of Hong Kong adolescents was considerably higher (38.1±10.3) than that of Shanghai counterparts (30.2±8.4); (p<0.001). There was no difference (p>0.05) in aerobic fitness between adolescents from the two cities. **CONCLUSIONS:** The present study demonstrated that Shanghai adolescents, though receiving much higher volume of PE classes than Hong Kong adolescents, do not have better attitudes toward PE class nor higher MPA level than the Hong Kong counterparts. Other factors other than the PE volume, such as PE curriculum and contents, teaching styles or leaderships, may be more important to affect attitude toward PE, PA and fitness levels.

**3579** Board #267

June 1 9:30 AM - 11:00 AM

**Sports Injury Management Program in Pima Community College Offers Study Abroad Opportunities for International Students**

Akira Kondo1, Chaki Ishikoa1, Nobuko Hongu, FACSM2. 1Pima Community College, Tucson, AZ. 2University of Arizona, Tucson, AZ. (Sponsor: Nobuko Hongu, FACSM)

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(No relevant relationships reported)

**PURPOSE:** Sports injury management program is a growing academic discipline. Pima Community College, Tucson, Arizona offers study abroad sports science program. The program attracts the students who are interested in physical training, personal training, exercise sciences, and sports coaching as a career.

**METHODS:** Pima Community College Sports Injury Management (SIM) program offers an athletic training student internship. Students interns are expected to fulfill reqs. including taking classes at the college and professional development activities in the US. Qualified student applicants were evaluated on the quality of their athletic training experiences, academic performance, and professional attitudes. To be enrolled in the program, the students went through an application process such as writing a letter of interest, resume, and references, then had a face-to-face interview experiencing a formal job-hunting process with SIM staff. **RESULTS:** All selected applicant international students were from Japan (39 yrs. olds and older). They were assigned to work with SIM staff who provide athletic training services to their 16 intercollegiate athletic teams. The interns took classes on SIM (i.e., learning principles and techniques of preventing, recognizing, treating and rehabilitating sports related injuries, recognition of common sports injury, gaining skills of taping/wrapping technique and an event management and risk management). They also independently continued their academic development in health, physical education, recreations, coaching, dance, or fitness. Some students completed their prerequisite classes to transfer to four-year college/university and/or to apply for an entry level of master’s degree program for athletic training. **CONCLUSION:** Pima Community College SIM interns were not only preparing to become an athletic trainer (e.g., completion of an accredited athletic trainer education program, hands-on experiences, etc.), but they also gained cultural awareness and valuable life-changing experiences by receiving opportunities such as volunteer work in a local community.

**3580** Board #268

June 1 9:30 AM - 11:00 AM

**A Comparison of Attitude Toward Physical Education Class, Physical Activity Level, and Aerobic Fitness between Hong Kong and Shanghai Adolescents**

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(No relationships reported)
The maximum force recorded from each muscle group during a session was used for analysis. A paired sample t-test was conducted to compare pre and post road march strength measurements.

RESULTS: No significant change in lumbar extension strength was identified between the pre and post conditions. Significant decreases in strength performance were observed in the hip flexion (8.3%; p<0.003), knee extension (7.8%; p=0.032), and lumbar flexion (9.9%; p<0.009) measurements between the pre and post conditions.

CONCLUSION: The decrease in hip flexion strength could be due to the hip adduction and flexion demands of the road march. Knee extensor strength improvements may result from the single leg, dynamic, and repetitive nature of the road march, and the associated eccentric and concentric contractions.


Please note: This abstract is an example and does not reflect the content of the actual abstracts presented at the conference. The abstracts are expected to discuss the impact of military exercises on strength.
fatigue. METHODS: Thirty players from the Danish U20 national team participated and completed one experimental game. The game was modified so each period consisted of 8 shifts of 1 minute duration performed by 2 players and 2 minutes of recovery resulting in a total playing time of 24n in for each participant. During the game each player was monitored continuously using heart rate monitors and a local positioning system assessing the activity pattern. Muscle biopsies were taken before and after the game (n=7) as well as instantly following shifts during the game (n=9). Blood sampling was performed between the game and at the end of each period. In addition, players performed a repeated sprint test consisting of three maximal 30 m sprints interspersed by 2s recovery before the game and following each result.

RESULTS: Players covered on average 01 5 19n reaching peak speeds of 29 2 km/h including 109 14 intense accelerating or decelerating actions and 201±23 m high-intensity- and sprint skating resulting in an average and peak heart rate of 186 9±18 8eats pr min, respectively. Muscle lactate rose from 3 3 before the game to 38 20 and 20±12 mmol/kg d.w during the first and third period, while blood lactate increased from 0.81±0.3 at baseline to 4.7±3 and 4.9±3 mM following the first and third period (p=0.05). Muscle glycogen decreased from 400±22 to 188±43 mmol/kg d.w. over the course of the game (p=0.035). Compared to pre-game values mean sprint time declined following the first (p=0.05) and third (p=0.01), but not after the second period.

CONCLUSIONS: Ice hockey is a high-intensity team sport with a large anaerobic contribution resulting in significant glycogen utilization and fatigue development especially at the end of the game. The latter finding may at least partly be explained by lowered muscle glycogen levels.

Many potential benefits of altering bicycle crank length (CL) have been proposed from reducing injury to increasing aerodynamics and conseque natly, performance. Submaximal cycling bouts are often used to simulate various riding efforts to determine how CL can impact race performance in various cycling disciplines. These studies either used a set wattage for all participants or an intensity relative to VO2max or Ventilatory Threshold (VT) based on a Cardiopulmonary Exercise Test (CPET) performed on one CL. However, it is unknown whether CL impacts VO2max and/ or VT, or Ventilatory Threshold (VT) across the three crank lengths. To determine the influence of crank length on VO2max and VT across the three crank lengths. To after a familiarization session, 10 subjects performed three separate trials using different crank lengths (162.5, 12.5 and 18.5 m) in randomized, counter-balanced order. The trials consisted of a maximal CPET to determine VO2max and VT, a supra-maximal effort to verify VO2max, and two 10-min submaximal efforts at a low intensity (70% of VT) and a high intensity (% of VT). Individual repeated measures analysis of variance (ANOVA/s) were used to compare differences in VO2max and VT across the three crank lengths. To achieve a power of 80% with a difference of 3 mL/kg/min and a standard deviation of 1.51 ne subjects were required. RESULTS: VO2max and VT were not significantly different across the three crank lengths (162.5, 172.5 and 182.5 mm) 455±9 (w), 444±1 (w)/min, p=0.6 and 1083±0.3a (w) 3.89±0.3/min, p=0.6 e respectively. CONCLUSION: Mean differences in the VO2max and VT values between crank lengths were not statistically significant; however, several individual differences were of clinical relevance (5 10 subjects for VO2max and 6/10 for VT differed by -3 mL/kg/ min or more between at least two CLS). Factors including explosive power capacity, preferred cadence, leg length, body composition, and submaximal cycling economy were explored and warrant further evaluation.

Prolonged strenuous endurance exercise is associated with altered cardiac physiology that often manifests as both transient cardiac dysfunction and detectable cardiac troponin (cTn) in peripheral circulation. The extent of a possible relationship between cTn release and cardiac function is unclear. As many studies do not report significant correlations. The influence of exercise intensity, mode and duration on EICF and cTn release is also unknown due to large methodological variation.

Purpose: We performed a systematic review, meta-analysis and meta-regression of studies that sought to determine the relationship between cTn and left ventricular (LV) function. The second objective was to determine how study-level and exercise factors influenced the variation in the body of literature.

Methods: A systematic search of Pubmed Central, Science Direct, SPORTDISCUS, and MEDLINE databases for original research articles published between 1998 and 2018 involving >30mins of continuous exercise, measured LV cTn event rates, LV ejection fraction and E/A ratio. Random-effects meta-analyses and meta-regressions with four a priori determined covariates (age, exercise heart rate [HR], duration, mass) were performed.

RESULTS: Pooled cTn event rates were evident in 5% of participants CI = 33.6 – 58.2%), however, the overall effect was non-significant (P>0.05). There were significant (P<0.05) reductions in E/A ratio: –0.38 (SMD = –12.95, CI [–1.4, –1.0]), and LVEF: 2.02% (SMD = –0.38, 95%CI [–0.7, –0.1]) pre to post-exercise. Exercise HR predicted cTn release and E/A ratio. Participant age was negatively associated with cTn release. There was a significant negative association between E/A ratio and cTn event rate (P<0.05).

Conclusions: High levels of statistical heterogeneity and methodological variability exist in the majority of EICF studies. Exercise intensity and age are the most powerful determinants of cTn release. E/A ratio is influenced by exercise HR and cTn release, implying exercise bouts at high intensities are enough to elicit cTn release and reduce E/A ratio. Future EICF studies should standardize the echocardiographic technique such as myocardial speckle tracking, maintaining participant hydration, serial follow-up measures to assess symptom progression or recovery.

P0554 Board #277 Jun. 1 9:30 AM - 11:00 AM
Independent and Combined Effects of Arterial Angulations and Shear Stress on Vascular Function

Aaron R. Caldwell, Lisa T. Jansen, Megan E. Rosa-Caldwell, Ronna C. Turner, Erin K. Howie, Kaitlin M. Gallagher, Matthew S. Ganio, FACSM. University of Arkansas, Fayetteville, AR. Email: ac639@email.uark.edu

Excessive sedentary time is a significant health risk, independent of daily physical activity or exercise. In particular, long periods of prolonged sitting is associated with an increased risk of cardiovascular disease. Prolonged sitting reduces flow-mediated arterial dilation. Endothelial dysfunction may be mediated by arterial angulations and shear stress. Aims: To determine the effects of arterial angulations and shear stress on the flow-mediated dilation (FMD) response to acetylcholine (ACH) in a human forearm muscular artery.

Methods: 8 healthy male volunteers participated in the study. FMD responses were measured in response to a standard vascular response to the intervention (ach). The effects of 500μg of acetylcholine were measured before and after the intervention. The effects of arterial angulations were measured by measuring the FMD response in the presence of a 180° arterial angulation (ang). The effects of shear stress were measured by modifying the FMD response in the presence of a 180° arterial angulation (ang) and a 180° arterial angulation (ang).

Results: The FMD response to ACH was significantly reduced in the presence of arterial angulations (ang) and arterial angulations (ang). The FMD response to ACH was significantly reduced in the presence of arterial angulations (ang). The FMD response to ACH was significantly reduced in the presence of arterial angulations (ang).

Conclusions: Arterial angulations and shear stress reduce the FMD response to acetylcholine in human forearm muscular arteries. These findings suggest that arterial angulations and shear stress may play a role in the development of endothelial dysfunction.
to examine the effects of blood flow restriction training on endothelial function in women 6 months-3 years after delivery. The findings suggest that exercise during blood flow (i.e., shear stress) on maintaining endothelial function, BFR exercise may have a greater impact on endothelial function, which is closely linked to coronary artery endothelial function and thus heart function.

CONCLUSIONS:

Mid-pregnancy exercise levels were significantly associated with arterial stiffness in women 6 months-3 years after a singleton delivery. Participants maintained this position for 2 h. Participants then returned to a supine position and post measures of PWV were obtained. RESULTS: Overall, sitting led to a 1.2% decline in PWV. Standing appeared to confer the greatest benefit independent of heating (\(p = 0.02\)). By the end of standing, participants FMD was 2.88% (pm = 0.37) greater than after 2-h of sitting. However, there was no significant effect of local heating (0.75% ± 1.90, p = 0.594) and no interaction between heating and body position (0.17% ± 2.0, p ≠ 0.05). CONCLUSION: Standing was superior to sitting with regards to FMD while local heating had a non-significant effect. However, future studies need to examine modifiers such as biological sex.

3592 Board #280

Jun. 1 9:30 AM - 11:00 AM

The Effects of Simultaneous Upper and Lower Body Cycling on Cardiorespiratory Responses.

Jessica Royen, Brandi N. Guillette, Kierstin Marshall, Kimberly Billiot, Robert R. Kraemer, FACSM. Southeastern Louisiana University, Hammond, LA.

(no relationships reported)

Some forms of physical activity require greater amounts of upper body activity combined with lower body activity. Arm exercise has been shown to elicit larger increases in blood pressure and heart rate when compared to lower body exercise. Arm ergometry, in workloads up to 125 W, has been shown to illicit greater increases in VO2 due to extra stabilization of the torso and mechanical efficiency. The effects of a combined lower and upper body ergometry simultaneously, with identical workloads, on the cardiorespiratory system has not yet been studied. Previous studies have evaluated cardiorespiratory responses to elliptical ergometry, which utilizes both upper and lower body extremities. However, an elliptical does not allow for precise regulation and measurement of work performed by both upper and lower body extremities. PURPOSE: The aim of this study was to examine the effects graded upper body arm ergometry, lower body arm ergometry, and combined upper and lower body ergometry on oxygen consumption, heart rate, minute ventilation, respiratory exchange ratio, and blood pressure. METHODS: Eight males, ages 18 ± 2, participated in three trials over seven days. Subjects were divided into two groups. Session one included one trial of graded leg ergometry and one trial of graded arm ergometry. The two groups completed each of these trials in a counterbalanced fashion with 20min rest between sessions. Two session included a trial of graded leg ergometry combined with graded arm ergometry, performed simultaneously, at identical workloads. Each trial began with a warmup at 4kp and maintained a 60rpm cadence. Workload for each trial increased by 0.6kg every 2 min peaking at 9W. RESULTS: Combined body ergometry produced significantly (p < 0.001) greater peak oxygen consumption (36.14 ± 4.95 ml/kg/min) compared lower body ergometry (18.7 ± 3.84 ml/kg/min) and upper body ergometry (21.58 ± 7.08 ml/kg/min). Combined elicited a significantly higher peak blood pressure (p < 0.005) and heart rate (p < 0.005), respectively (180mmHg ± 10) (168 ± 10 BPM), than lower body (15 ± 13 mmHg) (126 ± 12 BPM), but not upper body. CONCLUSIONS: These data could be helpful in considering cardiorespiratory stress in healthy and clinical populations from manual tasks involving both upper and lower body extremities.

3593 Board #281

Jun. 1 9:30 AM - 11:00 AM

Bone Density and Cross-Sectional Area are Inversely Related in the Young Adult Distal Tibia

Nathaniel I. Smith1, Paul M. Bartlett1, Katelyn I. Guerriere2, Kathryn M. Taylor1, Mary L. Bouxsein2, Stephen A. Foulis1, Julie M. Hughes2,3, U.S. Army Research Institute of Environmental Medicine, Natick, MA; Massachusetts General Hospital, Beth Israel Deaconess Medical Center; Harvard University, Boston, MA.

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(no relationships reported)

Bone is posited to develop and adapt to loads by satisfying the competing demands for achieving sufficient stiffness and minimizing mass. This compromise has been demonstrated at the midshaft of the tibia by an inverse relationship between cross-sectional area and thickness of the cortical shell. The requirements for remodeling to cortical shell properties cause bone mass to be more metabolically expensive. Whether there is a similar tradeoff between bone size and the amount of bone tissue at the distal tibia remains to be determined. PURPOSE: Determine whether cross-sectional area of bone is inversely related to bone density at the distal tibia.

METHODS: Six hundred seventy-three (91% ; 19% ) Army trainees (20.4 ± 3.4yrs; 1.71 ± 0.06 m; 2.5 ± 13.3kg) underwent whole resolution peripheral quantitative computed tomography (HR-pQCT, XtremeCT, Scanco Medical AG; scans of their non-dominant distal tibias at 8% bone height from the distal growth plate, at the start of their initial military training. Generalized linear models adjusted for sex were used to test the significance and directionality of relationships between total cross-sectional area (CSA) normalized to body mass and total volumetric bone mineral density (vBMD). RESULTS: Normalized CSA was significantly and inversely related to vBMD (p < 0.001) with a one-unit increase in normalized CSA (mm/kg) resulting in a 3% g HA/cm^2 reduction in vBMD. Specifically, the lowest to the highest tita. rone of normalized CSA had 13% higher vBMD, per unit body mass. CONCLUSION: These findings support the hypothesis that bone in the distal tibia...
metaphysis develops in a manner which balances the need to be adequately stiff against that of minimizing the mass of a metabolically costly tissue through maintaining lower bone density relative to larger bone size.

3594  Board #282  Jun. 1  9:30 AM - 11:00 AM Dynamic Changes Of Doppler Signal During Tendon Scraping Andrea Dockery, Michael Baria. Ohio State University Wexner Medical Center, Columbus, OH.  
Email: andrea.dockery@osu.edu  
(No relationships reported)  
Midsubstance Achilles tendinosis and patellar tendinosis are degenerative lesions that impede athletic performance and activities of daily living. Tendon scraping (TS) is a minimally invasive procedure to accelerate pain relief by disrupting neovascularity and neoinnervation hypothesized as responsible for pain. The original description uses color Doppler (CD) to identify the region with increased blood flow but does not comment on how CD changes during TS. Others propose that TS is complete when Doppler flow is absent. Our observation is that CD is absent after a small volume injection of local anesthesia, before scraping is begun.  
PURPOSE: This case series reports changes in CD during TS to better inform technical understanding of this procedure.  
METHODS: Six patients (male=6; female=2) with acute or chronic Achilles and 1 case of patellar tendinosis presented to the Sports Medicine Clinic. Ultrasound identified diseased tendon, and all patients had increased CD prior to the procedure. A 28 gauge 1.5 inch needle was advanced from lateral to medial to the tendon-fat pad interface. Doppler was left on during anesthetic administration. Once local anesthesia was administered, a stab incision was made with an 11 blade scalpel. A 14 gauge 2-inch needle was then advanced under ultrasound guidance in identical fashion. The bevel was turned to make contact with the superficial surface. The fat pad was separated by pulling it away from the tendon in an anterior-posterior direction and then semi-circular, cranial-caudal sweeps were made to complete fat pad separation until the needle moved with unrestricted motion.  
RESULTS: In all six patients, CD was absent after injecting 1-3 mL of lidocaine. Though only 1 needle pass was made, CD was completely absent throughout the length of the tendon. No complications occurred.  
CONCLUSION: The most important finding of this work is that CD is absent after a small injection of local anesthetic, demonstrating that CD cannot be used to determine TS completion. CD is still a useful pre-procedure guide to identify the tendon region needing treatment, but it cannot be used as a marker of effective scraping / devascularization. A superior marker of procedure completion is freedom of needle motion demonstrating tendon separation from adjacent fat pad.

3595  Board #283  Jun. 1  9:30 AM - 11:00 AM Mesenchymal Stem Cells Injection As A Therapy In A Rat Model Of Collagenase-induced Tendinopathy Beatrice Deschenes-St-Pierre1, Mathieu Boudier-Reveret2, Shant Der Sarkissian3, Henry Aceros3, Carl-Elie Majdalani3, Melanie Borie3, Nicolas Noisieux3, Martin Lamontagne3, Elie Majdalani2, Laval University, Quebec, QC, Canada.  
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(No relationships reported)  
Tendinopathy represents 30 to 50% of sports-related injuries. Yet, a significant proportion of patients do not respond to the first-line conservative management with progressive loading and strengthening exercises program. Recently, Mesenchymal Stem Cells (MSC) have emerged as a potential regenerative treatment in tendinopathy.  
PURPOSE: The aim of the present study is to determine whether the injection of MSC and/or Celastrol-conditioned MSC promote histopathological healing in a rodent Achilles tendinopathy model.  
METHODS: Eighteen Sprague-Dawley rats (36 Achilles tendons) were injected with collagenase type IA (25 international units) in each Achilles tendons under echographic guidance. After one week, rats were randomly and equally assigned to receive a repeat injection, also under echographic guidance, with either: 1) 60 µL of Phosphate-Buffered Saline (PBS; vehicle); 2) 2.4 AM MSC derived from rat bone marrow aspirate or; 3) 2.4 AM MSC conditioned with celastrol, a HSP90 inhibitor and antioxidant. The outcome measurements were histopathological changes assessed after Hematoxylin Eosin Saffron, Bleu Alcian and Factor VIII staining of Achilles tendons. Each item of the semi-quantitative modified Bonar score (tenocytes morphology, cellularity, vascularity, abundance of mucin in fundamental substance and collagen organization) was assessed by an blinded experienced pathologist at 4x, 10x and 40x (2 rats/4 tendons per group) and at 12 weeks (2 rats/4 tendons per group).  
RESULTS: There were no statistically significant differences between groups, both at 4 weeks and 12 weeks (a > 0.05). However, at 12 weeks, there was a trend towards more improvement and better Modified Bonar Scores in the tendons treated with vehicle (0.48 ± 0.46) and conditioned-MSC (1.3 ± 0.8) compared to tendons injected with MSC (2.26 ± 1.9)  
Conclusion: No difference was found in Modified Bonar Scores in tendon specimens injected with PBS-saline compared to MSC and celastrol-conditioned MSC at 4w. The number of rats per group that was observed until 12 weeks for pathologic analysis was insufficient to draw any conclusion. Nevertheless, these results underline that we need to host rats for a longer period for pathologic analysis. We are currently expanding this experiment with a larger number of rats to be assessed at 12 weeks.
of 1.3 years. The extent to which PAM users share their data should be considered when using this technology as a behavior change tool. Encouraging users to share data publicly may lead to longer device engagement.

**S786 Vol. 51 No. 5 Supplement**

**3598 Board #286**

**Jun. 1 9:30 AM - 11:00 AM**

**Does Post-diagnosis Physical Activity Prolong the Duration of Active Surveillance in Men With Prostate Cancer?**

Effthymios Papadopoulos¹, Shabbir M.H. Alibhai², George A. Tomilison¹, Andrew G. Matthew², Michael Nesbitt², Antonio Finelli³, John Trachtenberg⁴, Daniel Santa Mina¹. ¹University of Toronto, Toronto, ON, Canada. ²University Health Network, Toronto, ON, Canada. ³University of Minnesota, Minneapolis, MN.

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(No relationships reported)

**PURPOSE:** In this retrospective cohort study, we examined the effect of post-diagnosis physical activity on active surveillance (AS) termination in men with low-risk prostate cancer.

**METHODS:** 80 participants were included in the analysis. Post-diagnosis physical activity was measured using the Godin Leisure-Time Exercise Questionnaire and expressed in metabolic equivalent (MET)-minutes per week (MET-min/wk). Four physical activity categories were created to classify participants throughout the study: inactive (<210 MET-min/wk), insufficiently active (210-500 MET-min/wk), active (500-1000 MET-min/wk), or highly active (>1000 MET-min/wk). Using Cox regression models, we evaluated the relationship between post-diagnosis physical activity and risk of terminating AS, adjusting for age, prostate-specific antigen (PSA) and number of positive cores most proximal to AS initiation.

**RESULTS:** Of the 80 participants, 18% were active while using the TD and 82% were censored. The earliest and latest events of AS termination, indicated by active treatment initiation occurred at 9 and 16 months, respectively. In this cohort, post-diagnosis physical activity was not significantly associated with time to AS termination. PSA (HR, 1.11; 95% CI, 1.03 to 1.20) and the number of positive cores (HR, 1.34; 95% CI, 1.12 to 1.6) most proximal to AS initiation were associated with a significantly increased risk of initiating active treatment.

**CONCLUSIONS:** The findings of this study suggest that termination of AS and initiation of active treatment is not influenced by post-diagnosis, self-reported physical activity status.

**3599 Board #287**

**Jun. 1 9:30 AM - 11:00 AM**

**Assessing Safety, Ease of Use, and Productivity While Using Treadmill Desks: A Pilot and Feasibility Study**

Lucy N. Berman, Sarah A. Rydell, Nathan R. Mitchell, Mark A. Pereira. University of Minnesota, Minneapolis, MN.

(No relationships reported)

**BACKGROUND:** Sedentary behavior is associated with a variety of health complications. Long bouts of sitting is becoming a recognized risk of workplace environments.

**OBJECTIVE:** The purpose of this study was to evaluate the safety, ease of use, and productivity associated with using treadmill desks (TD) during the workday.

**METHODS:** Sedentary office workers (n=14; 86% female, 40±12 yrs) took part in a within-person, 4 week randomized crossover study comparing group usage of a TD to a usual desk condition. During the TD condition, participants were asked to use the treadmill for a minimum of 30 minutes each weekday. In-person study visits were conducted at baseline and during the final week of each condition, and electronic surveys were administered via an email link. Treadmill use and physical activity bouts were tracked with logs and the activPAL accelerometer worn on the thigh.

**RESULTS:** During the TD period, participants spent an average of 33±25 mins at an Active Station (Hopkins, Minn.) TD each day; the range of the walking bouts, when the TD was used, was 15±120 minutes. All participants reported feeling safe while using the TD. 12 people reported it was ‘easy’ to use, with one person reporting it was ‘somewhat easy’. Productivity results were mixed; 4 reported they were somewhat or much more productive, 4 reported they were somewhat more productive, 4 reported neutral, and 5 reported they were somewhat less productive. All participants endorsed a desire to continue using the treadmill desks.

**CONCLUSIONS:** Results suggest that, over the short term, treadmill desks are safe and easy to use and appear to have mixed effects on productivity. Further research should include full-scale long-term efficacy trials of treadmill desks that include measures of productivity, adherence, and cardiometabolic health outcomes.

**3600 Board #288**

**Jun. 1 9:30 AM - 11:00 AM**

**Dearborn SHINES For Healthy Kids: Understanding Physical Activity Among Arab American Students in Physical Education and the Impact of SPARK**

Erin E. Centeio¹, Jeanne Barcelona², Hayley McKown³, Christine Pedder⁴, Mariane Fahlman, FACSM⁵. ¹University of Hawaii at Manoa, Honolulu, HI. ²Wayne State University, Detroit, MI. ³Email: ecenteio@hawaii.edu

(No relationships reported)

**Background/Purpose:** Arab Americans account for almost 3.7 million people in the United States (Arab American Institute, 2014). However, limited health data is available on youth populations. Additionally, very few interventions have been designed to increase the physical activity levels of Arab American youth. Therefore, the purpose of this study is twofold: evaluate Arab American children’s physical activity (PA) levels during physical education (PE) class and understand how the implementation of SPARK can influence the PA of Arab American youth in the PE context.

**Methods:** System for Observing Fitness Instruction Time (SOFIT) was used to assess activity levels, lesson context, and teacher involvement during PE class. A total of 6 PE classes in one urban, primarily Arab American, district, were observed in grades 3-8 involving 188 E teachers. Data collection took place over two time points, with one professional development of the SPARK PE curriculum occurring in-between.

**Results:** MANCOVA’s were run to better understand the effect grade level has on physical activity minutes, lesson context, and teacher involvement while controlling for teacher, total lesson minutes, and type of activity. In general results showed that students were not meeting suggested PA guidelines during PE class M̅_7thgrade=18.7 min, M̅_8thgrade=13.4 min, M̅_9thgrade=13.8 min, M̅_10th grade=15.3 min. Overall, there were no significant differences in the dependent variable of PA (p>.05). MVPA did not increase between T1 and T2 (p>.05), but there were significant changes across timepoints in lesson context (p<.01) and teacher involvement (p<.01).

**Conclusion:** The results show that youth were not meeting recommended amounts of daily PA during PE class at either timepoint. A one-time SPARK professional development did not significantly change student behavior as measured by MVPA, but did show improvements in teacher knowledge as measured by lesson context and teacher involvement. Implications for using SOFIT data gathered to inform the ongoing SPARK and Dearborn SHINES intervention and importance of prolonged professional development to transition from increases in knowledge to behavior change will be discussed.

**3601 Board #289**

**Jun. 1 9:30 AM - 11:00 AM**

**Do Activity Monitors Correctly Classify Driving Time as Sedentary?**

Rachel Barnett, Matthew Nelson, Cami Christopher, Mami Takeda, Julian Martinez, Sarah K. Keadle. California Polytechnic State University, San Luis Obispo, CA.

(No relationships reported)

**PURPOSE:** Driving is a common sedentary activity for many individuals. Previous studies suggest that accelerometers may misclassify driving as a more active behavior due to vehicle vibrations not related to human movement. Therefore, the purpose of this study is to examine how accurately accelerometer processing methods classify driving-specific sedentary time.

**METHODS:** Participants (n=26; age=30±7 yrs, 16 female, 20 male) wore an ActiGraph wGT3X-BT (AG) on the right hip, an AG on the non-dominant wrist, and a wrist-based accelerometer (WBA) on the left wrist. The AG and WBA were classified using a random forest (RF) and linear model (lm), and the AP used a proprietary algorithm. 3x (S3x), Freedson, Sasaki, and Crouter methods. The AG-wrist was classified using a proprietary algorithm.

**RESULTS:** Driving is a common sedentary activity for many individuals. Previous Methods: Participants (n=26; age=30±7 yrs, 16 female, 20 male) wore an ActiGraph wGT3X-BT (AG) on the right hip, an AG on the non-dominant wrist, and a wrist-based accelerometer (WBA) on the left wrist. The AG and WBA were classified using a random forest (RF) and linear model (lm), and the AP used a proprietary algorithm. 3x (S3x), Freedson, Sasaki, and Crouter methods. The AG-wrist was classified using a proprietary algorithm.

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is highly accurate. Since the average American spends 6h in/day in the car, there is a need to develop new methods that correctly classify driving time for hip- and wrist-worn devices.

**3602 Board #290 Jun. 1 9:30 AM - 11:00 AM Comparing Estimates Of Sedentary, Light And Moderate-vigorous Physical Activity Between Activity Monitors**
Camí Christopher, Rachel Barnett, Mami Takeda, Julian Martinez, Matt Nelson, Sarah Keable. *California Polytechnic State University, San Luis Obispo, San Luis Obispo, CA.* Email: cchris17@calpoly.edu

Accelerometers are widely used in research, but studies use different monitors, attachment sites, and/or data processing methods, making it difficult to compare results across studies.

**PURPOSE:** Therefore, the purpose of our study is to compare data collected at the hip, wrist, and thigh to determine if estimates of sedentary time (ST), light physical activity (LPA) and moderate-vigorous physical activity (MVPA) are comparable over a 7-day wearing period.

**METHODS:** Participants wore an ActiGraph (AG) on the hip and non-dominant wrist, and activPAL on the thigh 24houns/day for 7 days. Intensity was categorized using the following methods: AG-Hip 3x, Freedon, Sasaki, Matthews, and Crouter; AG-wrist random forest (RF), linear model (LM) and GGIR; and activPAL software. Across the different methods, we compared mean estimates and pearson correlations for ST, LPA and MVPA.

**RESULTS:** Average ST ranged from 6 m in/day (Hip-Crouter) to 60 m in/day (Hip-Freedson), the lowest correlation was between Hip-3x and Wrist-GGIR (R = 0.14) and the highest was between Hip-Freedson-Hip and Wrist-Sasaki (R = 0.9). A LPA ranged from 201 min/day (Hip-Matthews) to 338 m in/day (Hip-Sasaki), the lowest correlation was between Hip-3x and Wrist-LM (R = 0.6) and the highest was between Hip-Freedson and Hip-Matthews (R = 0.8). Average time in MVP was ranged from 5 m in/day (Hip-Freedson) to 10 m in/day (Wrist-LM), the lowest correlation was between Wrist-LM and Wrist-GGIR (R = 0.30) and the highest was between Hip-3x and Hip-Matthews (R = 0.9).

**CONCLUSIONS:** Estimates of ST, LPA and MVPA are heterogeneous across different processing methods and attachment sites, particularly when comparing hip and wrist attachment sites. There is a need to identify which procedures will result in equivalent methods to facilitate data pooling and ensure coherent public health translation of prospective cohorts that are using accelerometers.

**3603 Board #291 Jun. 1 9:30 AM - 11:00 AM High-active Mice Have Elevated Clearance Rate Of Bcaas Compared To Low-active Mice**
Jorge Z. Granados, Gabriella A. M. Ten Have, Aylaid C. Lentsinger, John J. Thaden, J. Timothy Lightfoot, FACSM, Nicolas E. P. Deutz. *Texas A&M University, College Station, TX.* Email: Jorgegranados@tamu.edu

Physical activity (PA) is associated with a diminished prevalence of hypokinetic related diseases and its worldwide economic burden on health care cost. For several decades, branched-chain amino acids (BCAAs; leucine [LEU], isoleucine [ILE], and valine [VAL]) have been studied for muscle wasting disorders. However, little is known about the metabolic interactions between BCAAs and regulation of PA levels.

**PURPOSE:** To assess BCAA metabolism by measuring plasma clearance rates in mice previously classified as either low-active (LA; CHFHe) or high-active (HA; C57BL/J).

**METHODS:** 12-week-old male LA (n = 23) mice (body weight: 28±1 g body mass; 21±1 g fat mass; 2.5±0.5% ) and HA (n = 20) mice (27±1.2% lean mass; 12±1.3% fat mass; 2.5±0.7% ) were used. Under anesthesia, a pulse of stable tracers (L-LEU[13C5]; L-ILE [1-13C], and L-VAL [13C5]) was administered via the right jugular vein catheter. Subsequently, blood samples were taken (Time: 1, 3, 5, 7, 10, 15, 20, 25, 30, and 40 mins). Plasma enrichments and concentrations of LEU, ILE, and VAL were determined by LC-MS/MS. Whole-body production (WBP) was calculated from fitted area under the curve (AUC) as pulse/AUC, and clearance of stable tracers was calculated as

**RESULTS:** HA mice had significantly lower plasma concentrations for LEU (125±4.8 vs 144±6.4 µmol/L, p = 0.02), ILE (485±19.7 vs 577±2.3 µmol/L, p = 0.01) and VAL (156±4.9 vs 187±7.1 µmol/L, p = 0.01) and significantly higher WBP values for ILE (11.6±0.8 vs 8.3±1.1 mg/g mmol/m, p = 0.02) and VAL (111±5.4 vs 92.8±2.8 mg/g mmol/m, p = 0.01) compared to LA mice. No significant WBP differences were observed for LEU (75.5±3.3 vs 72.7±3.2 mg/g mmol/m, p = 0.56). HA mice demonstrated higher percent clearance for LEU (0% ), ILE (9%), and VAL (2% ) compared to LA mice.

**CONCLUSIONS:** The observed changes in plasma concentration, WBP, and clearance of BCAAs suggest modified metabolic pathways of LEU, VAL, and ILE in HA mice, compared to LA mice. FUNDING SOURCES: Texas A&M Vice President of Research Office, FACSM Student Research Development Award, College of Education & Human Development Student Research Grant, and funds from the Osmar Smith Endowment.

**3604 Board #292 Jun. 1 9:30 AM - 11:00 AM Ghrelin and PYY Are Differentially Altered Following An Acute Bout of Aerobic vs Resistance Exercise**
Tanya M. Halliday1, Mollie H. White2, Davis M. Bitton3, Allison K. Hild2, Jonathan R. Miller2, Edward L. Melanson, FACSM, Marc-Andre Cornier4. *1University of Utah, Salt Lake City, UT; 2University of Colorado Anschutz Medical Campus, Aurora, CO.* Email: tanya.halliday@uth.edu

**PURPOSE:** The purpose of our ongoing trial is to determine if aerobic exercise (AEx) and resistance exercise (REx) differentially influence acute energy intake and appetite regulation.

**METHODS:** Physically inactive adults with overweight/obesity (n = 1935; 1.7 yrs, BMI 28.1 ± 1.1 kg/m2) completed 2 conditions; 1) AEx (treadmill walking at 6% of age-predicted maximum heart rate for 45 mins) and 2) REx (1-set to failure of 12 resistance exercises). Each condition was initiated in the post-prandial state (35 minutes post breakfast). Appetite (visual analog scale [VAS] for hunger and satiety) and hormones (ghrelin and PYY) were measured every 30 minutes for 4 hours following consumption of standardized breakfast meal. Post-exercise food cravings (following 90 min VAS and blood draw via Food Cravings Inventory [FCI] questionnaire) and ad libitum energy intake at the lunch meal were also measured.

**RESULTS:** There was no difference in post-exercise ad libitum energy intake between conditions (AEx: 92±15 kcal vs. REx: 109±16 kcal). There were also no differences in post exercise food cravings, nor area under the curve (AUC) for hunger, satiety, ghrelin, and PYY. However immediately following exercise (9 mins post breakfast), ghrelin (AEx: 15.9±9 pg/mL vs. REx: 11.3±9 pg/mL, p=0.05) and PYY (AEx: 16.12±5 pg/mL vs. REx: 124.1 ±11 pg/mL, p=0.05) were both higher in the AEx condition. Across conditions, higher scores on the FCI (p=0.49, p=0.01), increased hunger AUC (p=0.02, p=0.001), and decreased satiety AUC (p=0.43, p=0.013) were associated with increased ad libitum energy intake.

**CONCLUSIONS:** The data suggest that an acute bout of aerobic exercise appears to transiently increase both ghrelin and PYY, which are orexigenic and anorectic gut peptides, respectively, compared to resistance exercise. However, ad libitum energy intake was not different between conditions. Future work is needed to confirm these findings and uncover mechanisms by which exercise influences appetite indexes and energy intake.

**3605 Board #293 Jun. 1 9:30 AM - 11:00 AM Can A Polyphenol Supplement Improve Sports Vision And Reaction Time? A Pilot Investigational Study**
Neil E. Wolkodoff1, Gerald M. Haase2, Bethany Braunstein3. *1Colorado Center for Health & Sport Science, Denver, CO; 2University of Colorado, Aurora, CO; 3Boulder Community Hospital, Boulder, CO.* Email: neil@cochss.com

**PURPOSE:** Polyphenol supplements have emerged as potential influencers in lipid and metabolic regulation related to cardiovascular disease risk. Limited research has assessed their value in neurological function and sports reaction measures. A highly concentrated extract of citrus bergamot polyphenols was tested because of extensive publications demonstrating benefits in oxidative stress and dyslipidemias, and therefore might improve visual components.

**METHODS:** Nineteen (19) volunteers, aged 20-36 years old, were studied. Fourteen (14) subjects consumed BergaMet Sport, a high concentration polyphenol compound, and five (5) controls consumed placebo. Subjects were randomly assigned to either the placebo or intervention groups. Weight, body composition, visually directed balance, vision-related reaction time and a seven-test sports vision battery were measured at time 0 and at 30 and 60 days.

**RESULTS:** The mean age for the control group was 28±6 yrs or 32±6 yrs for the and for the intervention group, 30±8 yrs or 30±8 yrs. 24% were female and 76% were male. The subjects who received the intervention improved to statistically significant levels in all sports vision and balance measures compared to the placebo group. The key measures of time to balance task (sec, increased change Placebo (PL) vs 13.8 sec, decreased/improvement Intervention (INT), reaction time test (3.88 sec improvement PL vs 2.89 sec improvement INT) and the sports vision rating composite of seven measures (4 percentile to normative (80) percentile improvement in percentile ranking for PL vs. 6.33 point improvement for INT), were all significant (p<0.05), using paired student’s t-tests.

Abstracts were prepared by the authors and printed as submitted.
CONCLUSIONS: In this pilot study, consumption of a high concentration polyphenol produced significant improvements in neurological function specifically related to visual components, balance and reaction time in this older age group in a relatively short time period. Further investigation in other age groups attempting to regain and maintain function in domains related to vision and reaction time is warranted in response to polyphenol compounds.

3606 Board #294 Jun. 1 9:30 AM - 11:00 AM
Metabolic Flexibility is Impaired in Response to Acute Exercise in the Young Offspring of Mothers with Type 2 Diabetes
Cullen Vincellette, Timothy Allerton, Brian Irving, FACSIM, Guillaume Spielmann, Neil Johanssen. Louisiana State University, Baton Rouge, LA. Email: cvinc19@lsu.edu

(No relationships reported)

Metabolic Flexibility is Impaired in Response to Acute Exercise in the Young Offspring of Mothers with Type 2 Diabetes.

Cullen Vincellette1, Timothy Allerton2, Brian Irving1, Guillaume Spielmann1, and Neil Johanssen1
1Louisiana State University, Baton Rouge, LA. 2Pennington Biomedical Research Center, Baton Rouge, LA.

Healthy adults with a family history (first degree relative) of T2D demonstrate impairments in metabolic flexibility (MF), which is considered to be a factor in the development of T2D. Insulin sensitivity has been shown to improve in the first 48 hours in response to exercise. Whether, a single bout of high intensity interval exercise (HIIE) improves MF in men and women with a family history of T2D remains to be resolved.

PURPOSE: The purpose of this study was to assess MF in a group of young, seemingly healthy adults with a positive family history of maternal T2D (FH+) and those without a positive family history of T2D (FH–) in response to a single bout of HIIE and 1 hour (H) after exercise.

METHODS: Seventeen participants (n=12 FH+; 28±7 yrs.; 50±9 kg; 172±11 cm) consumed a liquid mixed meal with 3-hour post-prandial resting metabolic assessments (RMR) taken at baseline (BL, no prior exercise), and at 1H and 4H after a bout of HIIE (10 x 60 s @80% watt max). RESULTS: AER AUC for FH+ vs. FH– groups differed at BL, but not significantly (p=0.08); however, at the 1H visit the AER AUC for the FH+ group (4.3±1.6) was lower when compared to FH– group (6.5±1.9; p=0.02). The suppression of Fat O2 (reduction at 60 minutes post-meal) was attenuated during the 1H visit in the FH+ participants (0.01±0.01 g/min), but not in FH– participants (0.007±0.01 g/min; p=0.03). AER AUC was increased at 4H in FH+ participants. DISCUSSION: Our results suggest that young adults with a maternal family history of T2D demonstrate impaired MF in response to a mixed meal tolerance test 1H post-HIIE. However, MF was improved to the level of FH+ participants at 4H.

3607 Board #295 Jun. 1 9:30 AM - 11:00 AM
Relationship Of Leptin,Body Composition And Resting Metabolic Rate In Chinese Overweight And Obese Adults
Jingjing Xue1, Shuo Li2, Xiujuan Hao3, Yue Fu4, Rou Wen5, Ping Hong1. 1China Institute of Sport Science, Beijing, China. 2Shanghai University of Sport, Shanghai, China. 3Beijing Sport University, Beijing, China. 4Beijing Dance Academy, Beijing, China. 5Winter sports management center of the general administration of sport of China, Beijing, China. Email: xue_jingjing@126.com

(No relationships reported)

PURPOSE: Resting metabolic rate (RMR) and substrate utilization are important factors in maintaining energy balance and leptin is postulated to be involved in the regulation of body weight. However, in overweight and obese individuals, excess fat mass has a significant impact on metabolic function both directly through altered metabolic rate and substrate oxidation, and indirectly, through chronic changes in hormonal concentrations. This study determined the relationship of body composition and leptin with RMR and substrate utilization (carbohydrate, fat and protein oxidation rates) in Chinese overweight and obese adults.

METHODS: The subjects were 33 women (age = 40±10 yrs.; BMI = 27.1±4.9; %fat = 38%±8%) and 34 men (age = 30.0±9.7 yrs.; BMI = 24.1±3.2 kg/m2; percent body fat (%fat) = 38.7±4.0% ). The prescribed exercise in the Ex group contributed to a lower body weight, but not lower % abdominal fat, which is the greatest risk factor for T2D. Supported by NIH Grant P20GM103443 and NSF Grant IIA-13383.

RESULTS: In men and women, RMR significantly correlated with Skeletal Muscle Mass (Men: R=0.55, p=0.001; Women: R=0.9, p=0.004), but both not significantly correlated with leptin(both p>0.05). In stepwise multiple regression analysis, SM was the main predictor of RMR, explaining 35% and 28% of the variance of RMR in men and women respectively. In women, but not men, leptin significantly correlated with RER (R=0.8, p=0.029) and carbohydrate, fat, and protein oxidation rates respectively (R=0.5, p=0.010; all p<0.001). Furthermore, in stepwise multiple regression analysis, leptin explained 33% of the variance of RMR in women.

CONCLUSIONS: Skeletal Muscle Mass is a significant predictor of RMR in Chinese overweight and obese adults, evaluation of body composition may be an effective and efficient way to evaluate metabolic status. Serum leptin concentrations in female subjects showed a negative association with respiratory quotient and carbohydrate oxidation rate and positive association with fat and protein oxidation rates. We suggest that sex-specific evaluations are also necessary. Acknowledgements: This work was supported by National Science and technology program of China (Grants No.2013FY1100).

3608 Board #296 Jun. 1 9:30 AM - 11:00 AM
Exercise, Estradiol, And Specific Estrogen Receptor Activation For The Prevention Of Type 2 Diabetes
Brittany Gorres-Martens1, Janelle Shiffler1, Teresa Binkley2. 1Augustana University, Sioux Falls, SD. 2South Dakota State University, Brookings.

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(No relationships reported)

Postmenopausal women have an increased risk for type 2 diabetes (T2D), and hormone replacement therapy (HRT) decreases this risk. However, HRT increases the risk of breast cancer and stroke, and thus, the US Preventive Services Task Force does not recommend HRT to prevent or manage T2D. Moreover, exercise is an effective means to prevent and treat T2D.

PURPOSE: To compare exercise treatment with drug-induced estrogen receptor (ER) activation in ovariectomized (OVX) rats fed a high-fat diet (HFD).

METHODS: OVX female rats were fed a HFD for 10 weeks. One group of rats ran on a treadmill for 2.5h in utes/day at 8 m/s for 3ia yeweek (Ex), while the other groups were treated with estradiol (E2, 1.4 µg/day), the specific ERα activator PPT (18 µg/day), or the specific ERβ activator DPN (18 µg/day) (Ex/Group). Throughout the study, weekly food intake was determined by weighing the amount of food given and the amount of food remaining at the end of the week, and voluntary cage activity was measured using Opto-Me 4: age monitors. At the end of the study duel energy X-ray absorptiometry (DXA) determined the body composition. Normally distributed data were analyzed using one-way ANOVA and an LSD post-hoc test. Non-normally distributed data were analyzed using Kruskal-Wallis testing.

RESULTS: At the end of the study, the Ex and E2 groups gained 125±8 g and 124±9 g of body weight, which was significantly less than the PPT and DPN groups (165±12 g and 10±2 g respectively, p<0.05). Although the Ex and E2 groups gained the same amount of total body weight, the Ex group had a significantly lower abdominal fat % compared to the E2 group (30.1% vs. 37.2%; p<0.001), and the abdominal fat % of the E2 group was the same as the PPT and DPN groups (39±3% and 38±2%, respectively). Although the food intake (kcal/day) did not differ between the groups, the voluntary cage activity of the E2 group ($) 27 counts/hr) was significantly greater (p<0.05) than the Ex, PPT, and DPN groups ($ 27 counts/hr, respectively).

CONCLUSION: The prescribed exercise in the Ex group contributed to a lower body weight and lower % abdominal fat, and the voluntary cage activity in the estradiol group contributed to a lower body weight, but not lower % abdominal fat, which is the greatest risk factor for T2D. Supported by NIH Grant P20GM103443 and NSF Grant IIA-13383.

3609 Board #297 Jun. 1 9:30 AM - 11:00 AM
The Effect Of Gestational Physical Activity On The Psychological Health Of Their Offspring
Jung eun Byun1, Da-Ae Kim1, Yong-Chul Jang2, Sung-Hun Park1, Tayler S. Thurston3, Eun-Young Kim4, Hyun-Chul Cho5, Joon-Yong Cho5, Jung-Hoon Koo5. 1Korea Incubator Laboratory of group exercise, Seoul, Korea, Republic of. 2University of West Florida, Pensacola, FL. 3University of Utah, Salt Lake City, UT. 4Preventive Medicine, , Chungbuk, Korea, Republic of. 5Yongin University, Gyeonggi, Korea, Republic of. 6Korea National Sport University, Seoul, Korea, Republic of.

(No relationships reported)

PURPOSE: Gestational physical activity (GPA) has been associated with improved fetal outcomes. The purpose of this study was to examine whether exercise during pregnancy contributes positively to the psychological health of their offspring.

METHODS: A survey was administered to 198 children (ages 11-13) to identify psychological health factors such as mental stress, depression, and self-esteem using a modified Daily Hassles Questionnaire, Children’s Depression Inventory, and Rosenberg's self-esteem, respectively. Mothers of the participants were retrospectively categorized into three groups based on GPA: non-exercisers (CON), low-intensity aerobic exercise (AD), and body-weight strength training (BWT). Non-normally distributed data were analyzed using Kruskal-Wallis testing. RESULTS: After excluding questionnaires due to incomplete data sets, surveys were analyzed. Our results indicated significantly lower levels of depression with concomitant increased self-esteem among children of exercising mothers compared...
to CON (AE: p<0.05 and p<0.01; BWT: p<0.05 and p<0.01, respectively). However, there was no effect of exercise on offspring mental stress levels, or between AE and BWT for any psychophysiological health factors. Mental stress was significantly correlated with depression (r=0.6, p<0.01) and self-esteem (r=-0.31, p<0.01). In addition, depression was negatively correlated with self-esteem (r=-0.8, p<0.01).

CONCLUSIONS: GPA had a positive influence on the psychological health of their offspring. Interestingly, there were no differences between types of physical activity, which should be recognized to benefit the mental health of their children regardless of modality. Therefore, implementation of GPA should be accepted as part of the healthy gestational regimen along with prenatal vitamins and a healthy balanced diet.

3610 Board #298 Jun. 1 9:30 AM - 11:00 AM Investigation of the Association of Depression and Cardiovascular Disease Risk in Retired Professional Football Players

Eric Kessler, Jocelyn N. Simons, Genevieve E. Smith, Mark M. Cassidy, Gregory W. Stewart, FACSMM. Tulane University School of Medicine, New Orleans, LA.

(No relationships reported)

Former professional football players have considerable cardiovascular disease risk. Studies have shown that psychosocial factors and depression are also strongly associated with CVD morbidity and mortality. PURPOSE: To better understand the association of cardiovascular disease and psychosocial factors such as depression in a population of retired NFL players. METHODS: Blood pressure, anthropometry, and laboratory blood analyses were collected from former NFL athletes (n = 6 between October 2016 and February 2018) ing cardiovascular screenings held throughout the U.S. Questionnaires were used to collect demographic information, exercise freq ncy and Patient Health Questionnaire 2 (PHQ-2) scores. Means were analyzed via one-way ANOVA and associations between variables assessed using GLM. Chi-square analysis or t-test was used to assess differences between categorical variables, as appropriate. RESULTS: Variables of race (p=0.007), log of systolic blood pressure (SBP) (r = 0.528, p = 0.0404), log of waist circumference (r = -0.369, p = 0.0218), log of hip circumference (r = 0.27, p = 0.0196) and waist to hip ratio (r = 0.243, p = 0.0171) were significantly associated with positive screen for depression on the PHQ-2. Variables (r = 0.0002), log of SBP (r = 0.381, p = 0.0009), diastolic blood pressure (DBP) (r = 0.168, p = 0.0035), log of hip circumference (r = -0.463, p = 0.0171) were significantly associated with positive screen for depression on the PHQ-2. There were significant differences in prevalence between racial groups for positive screen for depression on the PHQ-2 (p<0.0006). CONCLUSIONS: Factors reflecting body composition were found to be significantly associated with a positive screen for depression and depressive symptoms. Measures for abdominal obesity may be a better indicator for the association of body composition and depression in retired athletes. Accounting for racial differences in clinical practice may also help improve overall health outcomes.

3611 Board #299 Jun. 1 9:30 AM - 11:00 AM Influence of Physical Stress on Interpretation of Ambiguous Social Cues

Julie A. Cantelon1, E. Caroline Davis1, Nate Ward1, Erika Hussey2, Robin B. Kanarek1, Holly A. Taylor1. Tufts University, Medford, MA. 1U.S. Army Combat Capabilities Development Command Soldier Center, Natick, MA.

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(No relationships reported)

Individuals with high stress jobs (e.g. law enforcement or military personnel) are often tasked with quickly interpreting ambiguous information in order to guide appropriate action. For example, certain social cues, such as (surprised) facial expressions, are ambiguous as they do not clearly signal whether an individual feels positive or negative, and could be interpreted as either safe or threatening. Previous work has shown that ambiguous social cues is important, as even slight shifts might alter if information is perceived as safe vs. threatening. This could have significant behavioral consequences for individuals operating in high-stakes environments. Results suggest that despite differences in participant's emotional state between moderate and high levels of physical stress, interpretation of ambiguous social cues remains unaffected. Supported by the U.S. Army Combat Capabilities Development Command Soldier Center (CCDC, Natick, Massachusetts, USA) under award number W9 1Y13C0012.

3612 Board #300 Jun. 1 9:30 AM - 11:00 AM The Gut Microbiome Modulates Diet’s Effect on the Regulation of Physical Activity

Ayland C. Letsinger, Rani Menon, Jorge Z. Granados, Brianne M. Breidenbach, Edward C. Nagel, Tatiana N. Castro, Sarah A. Little, Arul Jayaraman, J. Timothy Lightfoot, FACSMM. Texas A&M University, College Station, TX.

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PURPOSE: We have observed chronic overfeeding via a high fat/high sugar diet decreases wheel running and substantially alters the microbiome in C57BL/6J mice. In this study, we wish to test the hypothesis that gut microbiota modulates the effect of nutrient intake on physical activity. METHODS: 0 C B L/6 male mice (5 to 6 weeks of age) were individually housed, adjusted to a standard “chow” diet (CHOW) for a week, and then divided randomly into four groups: Group 1 (control group) received an ad libitum CHOW diet and water while Groups 2.3, and 4 received an ad libitum high fat diet and a 20% fructose drinking water solution (HFHS) for a total of 12 weeks. Each group was given a running wheel for physical activity monitoring after three days on the new diet. After 12 weeks, Groups 2 and 3 were changed to a CHOW diet. Fresh fecal pellets from Group 1 (control group) were collected, homogenized in an anaerobic solution, and then 100 ul was orally gavaged into Groups 2 and 4 one time a week for five weeks. Wheel running and body composition data were analyzed via repeated ANOVAs. The major bacterial phyla were quantified using qPCR.

RESULTS: By week 12, Groups 2, 3, and 4 (HFHS diet) ran significantly less distance, duration, and speed than Group 1 on a CHOW diet (p<0.05). The HFHS animals ate significantly greater calories and had more body fat (p<0.05) over the 12 weeks. With the diet alteration at week 13, Groups 1-3 (now all on CHOW) ran at a significantly higher speed than Group 4 (HFHS). Group 2 (CHOW plus transplant) had a significantly greater increase in wheel running compared to Group 3 (CHOW diet and a vehicle transplant). Bacteroidetes and Firmicutes were similar between Groups 1-3 within two weeks after the diet change regardless of the fecal transplant. CONCLUSIONS: A HFHS diet increases body fat and decreases wheel running activity compared to a CHOW diet in C57BL/6J male mice. Recovery of wheel running and lowering body fat was accomplished within 2 weeks by switching from a HFHS diet to a CHOW diet. However, switching diets plus receiving a fecal transplant provided no clear results that stood alone. A fecal transplant without changing diet type did not recover activity levels.

3613 Board #301 Jun. 1 9:30 AM - 11:00 AM The Association Between Player Age and Initial Helmet Contact Amongst American Football Players.

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Recent research has demonstrated an association between repetitive head trauma and the incidence of chronic traumatic encephalopathy (CTE), particularly among professional American football players. It is believed that younger players are more susceptible to head injury yet the incidence in these younger age groups appears to be lower. We have shown that video review of game film is a reliable tool in quantifying the frequency and characteristics of head impacts in football games. PURPOSE: To study the association between player age and dangerous tackling technique s in all age groups of tackle football using video review of game film.

METHODS: 8 video reviewers were trained in a universal definition of a “hit” and the number of hits classified as “hit” was counted. Each reviewer classified each “hit” between a ball carrier and defender based on the level of helmet involvement from the two players. Initial Helmet Contact (IHC) hits were defined as hits between a
Repetitive subconcussive impacts to the head are commonplace in soccer. The ability to detect the extent of neurological injury due to these impacts over the course of a season is paramount. PURPOSE: The purpose of the current study was to examine alterations in blood biomarkers of head injury over the course of a soccer season. METHODS: Sixteen National Collegiate Athletic Association (NCAA) male soccer athletes (20.1±1.3 years, 1.8±0.1 m, 11.3±1.0 kg; 60% B%BF) participated in weekly blood sampling throughout an 18-week season. Coaches provided player statistics following the season. Headers (HEAD) were defined as any impact of the players’ heads with the ball. Serum samples were stored at -80°C until analysis for the model without the effect in question. Visual inspection of residual plots did not reveal any obvious heteroscedasticity or deviation from normality. RESULTS: NFL was significantly elevated in weeks 5 (7.3±2.8 pg/mL; p<0.001), 14 (7.0±3.1 pg/mL; p<0.05), and 3 days after completing repeated air and oxygen resting dives. METHODS: 15 and 12 healthy male divers completed 8 consecutive 6 hr dives with 18 hr surface intervals while breathing air and 100% oxygen, respectively, at 1.35 ATA (Air/Oxygen: 30±5/35±3 m/s; VO2max: 3±0.7±1 kg/min; mean±SD). Treadmill endurance time at 6% of VO2max and associated physiological variables were tested a few days prior to the first dive (BL), 2 hours post-dive day 0 (PD) and 3 days post-dive (PD3) on day 8. Breath-by-breath (Innocor) minute ventilation (VE), end-tidal CO2 (FETCO2), oxygen consumption (VO2) and respiratory quotient (RQ) were collected during the first minute, mid-run, and last minute of the run. RESULTS: PD cardiovascular endurance significantly decreased for Air and Oxygen phases (Air: -34%; Oxygen: -36%; p<0.05), yet only the Oxygen phase remained reduced PD3 (Air: -11.9%; p<0.05; Oxygen: -31%; p<0.05). VE increased significantly during the run, but was not different between Air and Oxygen phases or across testing days. Although FETCO2 decreased across run times and testing days for Air and Oxygen phases, the Oxygen group remained lower than the Air throughout (p<0.05). PD VO2 showed decline in both groups (Air/Oxygen: PD: -7%; p<0.05; VO2 for Air recovered by PD3, whereas Oxygen remained reduced (Air: -15%; Oxygen: -13%; p<0.05). PD R increased overall for both groups, yet Air returned to baseline while Oxygen remained elevated by PD3 (Air: PD: +4%; p<0.05; Oxygen: PD +7%; PD3: +4%; p<0.05). CONCLUSIONS: Treadmill endurance is reduced after long-duration diving and persists longer when exposed to hypoxic diving conditions. Reduced VO2 and elevated R has been reported in the literature to correlate with increased lactate production and a greater reliance on anaerobic energy systems making them likely causes of this decrease in aerobic performance.
have beneficial down-stream physiological effects. However, the responses to the combination of these environments are unclear. **Purpose:** To determine the impact of combined acute exposure to heat and altitude on ISPO and IFH-1a.

**Methods:** Using a randomized, cross-over study design, 10 men (mean ± SD; age: 25 ± 37; weight: 73; height: 180 ± 14; sea level (SL VO2peak): 42 ± 5 ml kg⁻¹ min⁻¹) were exposed to four environmental conditions separated by at least one week: (1) SL thermoneutral (SLTN; 28 °C, 20–30% rh); (2) SL hot (SLH; 28 °C, 20–30% rh); (3) altitude thermoneutral (ATN; 3000m, 20 °C, 30–50% rh); and (4) altitude hot (AH; 3000m, 35 °C, 30–50% rh). Blood samples were collected at SL (baseline, BL) prior to –1.5 hour environmental equilibration period and again immediately Pre- and Post- 30 minute of steady state (SS) exercise (cycling, 50% of SL VO2peak). ISPO70 and IFH-1a were measured from peripheral blood mononuclear cells. The percent change (%Δ) from BL to Pre-Post SS was calculated with 2 × 4 (%Δ BL to Pre- and Post-SS × environment) RM ANOVA. **Results:** ISPO70 there was an effect of exercise [Pre-SS: -1.4 ± 7.6 vs PostSS: 17.5 ± 9.6, p < 0.05], but no effect of environment (p > 0.05) or an exercise × environment interaction (p > 0.05). IFH-1a: there was no effect for exercise (p > 0.05), environment (p > 0.05), or an exercise × environment interaction (p > 0.05).

**Conclusion:** Our results indicate that ISPO70 increased in response to SS exercise while IFH-1a was unaltered in these testing conditions. The combination of heat and altitude did not result in an even greater protein expression when compared to exercise alone. However, it is plausible that a more severe environmental stress and/or higher exercise intensity (> 80% SL VO2peak) would result in elevated cellular response compared to a single environment. Funded by USAMRC; authors view not official US Army or DD0 policy.

**Vaccination Responses In Mice**

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Vaccination is one of the most successful public health interventions for preventing infectious diseases, although the immunosuppressive effects of chronic stress can reduce a vaccine’s efficacy. Exercise improves vaccine responses, but the role in attenuating stress-induced effects is unknown. **Purpose:** We investigated the effects of forced/acute (eccentric exercise, ECC) and voluntary/long-term (wheel running, WVR) exercise on antibody and cell-mediated immune responses to vaccination in chronically stressed mice.

**Methods:** Mice were randomized into Control (CON), (S) Stress-ECC, S-VWR, and S-SED (Sedentary) groups. Chronic restraint stress occurred 6-h/day, 8 days/week for three weeks. S-VWR mice were allowed access to a wheel for the entire experiment. One week post-stress, S-ECC mice ran on a treadmill for 1-h min, -20% grade, for 45 min and were then injected with 100μg of ovalbumin (OVA) and 20μg of adjuvant (intra muscularly), along with all other groups. Anti-OVA IgM and IgG was measured via ELISA. Three weeks post-stress, mice were injected with OVA into the ear to determine delayed-type hypersensitivity (DTH) response as a measure of cell-mediated immunity. **Results:** As expected, chronic restraint stress significantly reduced body weight and caused adrenal hypertrophy. Over the course of the experiment, S-ECC, and S-VWR groups had significantly elevated anti-OVA IgG compared to S-SED which had significantly lower levels compared to CON (p < 0.05). No differences were observed with anti-OVA IgM nor DTH responses.

**Conclusion:** Acute ECC and WVR alleviated chronic stress-induced reductions in anti-OVA IgG vaccination responses while neither type of exercise had an impact on anti-OVA IgM or cell-mediated immune responses. Future experiments need to address the mechanism of the exercise beneficial effects on IgG.

**Body Composition Assessment in Athletes with Spinal Cord Injury**

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**PURPOSE:** To determine which anthropometric equation used to estimate body composition in athletes with chronic spinal cord injury (SCI) has better concordance with Dual X-ray absorptiometry. **METHODS:** Seventeen male athletes with chronic SCI AIS A or B, participated in this study. Body composition was estimated using two anthropometric equations (Kerr Ross and Durnin Womersley). The evaluation was performed with the athlete in the supine/prone position and seating in their wheelchair. The same day a DEXA scan was performed. Shapiro Wilk test was used and results were analyzed with student T test, Pearson correlation test and Bland & Altman method. **RESULTS:** The athletes were 30.88 ± 5.02 ar old (SD: 7.3) . They trained 1 day SD: 7 hour a week and averaged 3.5 ± 2.4 ars of experience in sports. They had 29.1 ± 2.8 Fat Mass (FM) (SD: 2.5) and 6.5 ± 2.0 kilograms of Free Fat Mass (FFM) measured with DEXA scan. There was no difference between FM and FFM results determined by DEXA scan and those estimated by Kerr Ross Method (p>0.001). There was a significant difference between DEXA scan results and estimations by Durnin Womersley equation (p<0.001). No difference was found when comparing anthropometric results with the athlete in the supine/prone position and seating in their wheelchair. The correlation between FM and FFM measured with DEXA scan and the estimated By anthropometric equation was superior for Kerr Ross method (r=0.75 and r = 0.86 respectively). The average difference between DEXA scan results and Kerr Ross method estimation for FM and FFM was 0.6 ± 0.39 kilograms (SD= 0.56 and 0.39 respectively).

**CONCLUSIONS:** When comparing anthropometric evaluation to estimate body composition in athletes with SCI, Kerr Ross method is superior to Durnin Womersley equation. But this method does not have acceptable agreement with DEXA scan for clinical purposes. Anthropometric evaluations are easily performable in the field and affordable, but more research is needed to determine the best method to estimate body composition in athletes with SCI.
Low physical activity (PA) levels are implicated in the aetiology of many non-communicable diseases. However research often fails to specifically focus on the impact of physical inactivity on the health of older adults, despite the fact that PA declines and worsens with age.

**PURPOSE:** An umbrella review of the epidemiological evidence for the effects of physical inactivity on physical and mental health in older adults (≥60yrs) for the 2019 Copenhagen Consensus Statement on PA and Ageing.

**METHODS:** Systematic database search for meta-analyses (MA) of longitudinal observational studies. Titles and abstracts were reviewed independently by two researchers. Duplicates were removed and data from included MAs extracted, including relative risk (RR) for health outcomes, characteristics and risk of bias (AMSTAR Scale) of included reviews.

**RESULTS:** 4,434 citations were identified. 17 full text MA were included. Key findings of high quality reviews (≥8/11 on AMSTAR scale): All-cause mortality: 3% RR reduction with highest vs lowest level of PA (≥70yrs, RR=0.96, 95% CI 0.95–0.97) (Barnes et al., 2017). Healthy aging was significantly associated with PA (n=174,114, 365yrs, ES=−1.14 95% CI 1.07–1.22) (Daneshparvar et al., 2017). Cognitive decline: Moderate vs lowest level of PA RR reduction ranged from 2% (OR=0.98) to 4% (OR=0.85). (CI 0.60–0.90) (Guare et al., 2017) to 35% (RR=0.65, 95% CI 0.57–0.75) (Sofi et al., 2011). Dementia: Highest vs lowest level of PA=1% RR reduction (n=38 RR=0.95, CI 0.90–0.99) (Blondell et al., 2014). Alzheimer’s disease: Highest vs lowest level of PA=35% RR reduction (n=23,350 RR=0.69, 95% CI 0.66–0.72) (Sofi et al., 2011). Incident depression: Highest vs lowest level of PA=1% RR reduction (n=38 RR=0.95, CI 0.90–0.99) (Sofi et al., 2011). Lower activity amplitude was associated with reduced cortical thickness in the entorhinal cortex. For those with follow-up data, greater activity during the active 5-hours of the day was associated with memory decline longitudinally (p<0.05).

**Conclusion:** Disruptions to the rest-activity cycle relate to both memory and language decline cross-sectionally and memory decline longitudinally as well as to degeneration of key temporal brain regions. Alterations in this cycle may represent a preclinical or prognostic marker for dementia and may warrant intervention.

**Funding:** Supported by NIH grant R01 AG128447 and INCT in part by CCTSA 1UL1RR024989 and the FAPESP 15/00566-0.
repetitions (10x3, n=14) and three sets of ten maximal repetitions (3x10, n=17). The biceps curl, squat and elbow extension exercise were performed twice a week. The maximum strength (one repetition maximum test-1RM) was tested before and after the study for these exercises. Muscle thickness (MT) was also measured (pre x post) for biceps brachii (BB), triceps brachii (TB) and vastus lateralis (VL). RESULTS: As showed in Table 1, a significant main effect (p=0.001) on time in 1RM biceps curl, 1RM squat and 1RM elbow extension was observed for both groups. There was no significant difference in time x group interaction for 1RM biceps curl, 1RM squat and 1RM elbow extension (all p>0.05). A significant main effect (p=0.001) in time was observed in MT for BB, TB and VL. There was no significant difference in time x group interaction for BB, TB and VL (all p>0.05). CONCLUSION: The present study suggests that, regardless of the number of sets and maximum repetition zone, the improvement of maximum strength in squatting, elbow flexion and extension, as well as biceps, triceps and vastus lateralis muscle thickness occurs similarly when volume of repetitions is equalized.

**KEY WORDS:** Resistance training; Muscular adaptations; Volume of training

Table 1. Muscle strength and muscle thickness measures after 8 weeks of training.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Before</th>
<th>After</th>
<th>∆%</th>
<th>Cohen</th>
<th>ANOVA 3x2</th>
<th>ES</th>
<th>p value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1RM biceps curl (kg)</td>
<td>3x10</td>
<td>29±10</td>
<td>38±11</td>
<td>30.3</td>
<td>0.86</td>
<td>0.001</td>
<td>0.414</td>
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<td></td>
<td>10x3</td>
<td>29±15</td>
<td>38±17</td>
<td>33.2</td>
<td>0.60</td>
<td>0.001</td>
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<td>1RM squat (kg)</td>
<td>3x10</td>
<td>156±4</td>
<td>206±43</td>
<td>32.4</td>
<td>1.20</td>
<td>0.001</td>
<td>0.973</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10x3</td>
<td>152±73</td>
<td>206±85</td>
<td>35.3</td>
<td>0.68</td>
<td>0.001</td>
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<tr>
<td>1RM elbow extension (kg)</td>
<td>3x10</td>
<td>56±18</td>
<td>69±19</td>
<td>22.8</td>
<td>0.69</td>
<td>0.001</td>
<td>0.375</td>
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<tr>
<td></td>
<td>10x3</td>
<td>54±20</td>
<td>66±23</td>
<td>20.8</td>
<td>0.52</td>
<td>0.001</td>
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<tr>
<td>BB (mm)</td>
<td>3x10</td>
<td>34.6±6.9</td>
<td>39.3±6.8</td>
<td>13.7</td>
<td>0.69</td>
<td>0.001</td>
<td>0.226</td>
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<tr>
<td></td>
<td>10x3</td>
<td>34.9±6.5</td>
<td>39.4±6.7</td>
<td>13.0</td>
<td>0.69</td>
<td>0.001</td>
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<tr>
<td>TB (mm)</td>
<td>3x10</td>
<td>35.4±3.9</td>
<td>39.8±4.4</td>
<td>12.2</td>
<td>1.03</td>
<td>0.001</td>
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<tr>
<td></td>
<td>10x3</td>
<td>35.0±5.5</td>
<td>40.1±4.7</td>
<td>14.4</td>
<td>0.98</td>
<td>0.001</td>
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<tr>
<td>VL (mm)</td>
<td>3x10</td>
<td>40.7±5.5</td>
<td>45.2±6.3</td>
<td>11.2</td>
<td>0.77</td>
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<tr>
<td></td>
<td>10x3</td>
<td>40.9±4.7</td>
<td>45.7±4.9</td>
<td>11.8</td>
<td>1.01</td>
<td>0.001</td>
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</tbody>
</table>

Values expressed in mean±SD of 3x10 group and 10x3 group One maximal repetition test (1RM). Muscle thickness (mm) of the biceps brachii and brachialis (BB), triceps brachii (TB) and vastus lateralis (VL). Effect size (ES). ‘*significant (p<0.05) differences to before.'
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