Both leptin (Lep) and estradiol (E2) influence bone formation. However, the combinatorial effects of Lep and E2 on bone microarchitecture require further elucidation. Purpose: To determine the effects of a KD and aerobic exercise training on cancellous bone microarchitecture in male rats. Methods: 3-month-old male Sprague-Dawley rats (n=28) were assigned to the following groups: 1) Vehicle-Lep (Veh-Lep) (n=7), 2) E2-Lep (n=9), 3) Veh-green florescence protein control (Veh-GFP) (n=5), or 4) E2-GFP (n=7). Lep or GFP (control) were delivered into the third ventricle of the brain at a dose of 1mL of rAA V1 (2.3 x 10^13 vg/mL). E2 (25 μg/kg diluted in 0.5 ml/kg sesame oil) or Veh (sesame oil, 0.5 ml/kg) were injected ex vivo micro-CT. The outcomes reported were: 1) cancellous bone volume/total volume (cBV/TV, %), 2) trabecular thickness (Tb.Th, mm), 3) trabecular number (Tb.N, 1/mm), 4) trabecular separation (Th.Sp, mm), and 5) trabecular pattern factor (Th.Pf). Separate One-Way ANOVAs were performed and Tukey’s post hoc tests were used when appropriate. Results: Both E2 treated groups exhibited directionally lower cBV/TV when compared with Veh-GFP (controls), while Veh-Lep also exhibited higher Th.Pf than E2-GFP (p<0.01), indicating a less connected trabecular network. Correspondingly, Veh-Lep displayed 36% lower cBV/TV and higher Th.Pf values compared to E2-Lep (p<0.05). No significant differences were observed between the E2-GFP and E2-Lep groups for any cancellous outcome. Conclusion: Our data indicate that neither the combination nor individual administration of E2 and Lep produced higher cancellous bone outcomes than Veh-GFP controls. However, E2 treated groups exhibited higher cBV/TV than Lep treated groups. Further investigation is necessary to determine whether E2 stimulated bone accrual and/or whether Lep suppressed bone gain in our male rodent model.

The osteogenic index (OI) has been used to estimate the potential effectiveness of an exercise protocol on bone adaptations. It is speculated that splitting a training program into multiple daily sessions while incorporating rest periods in between loading sessions is more advantageous than all loading occurring during a single bout of exercise.

Purpose: To test the hypothesis that two (2EX) vs one (1EX) session per day of ballistic resistance exercise produces greater adaptations in markers of bone turnover when equated for total exercise volume but differing in OI.

METHODS: Seventeen healthy individuals (6M/11W; 21.7 ± 3.7 y (mean ±SD), body mass (kg): 67.3 ± 11.2; height (cm): 165.2 ± 11.6; body fat (%): 31.3 ± 9.0) volunteered for the study. Participants performed ballistic non-linear periodized resistance training three days per week in either the 1EX (3M/8W) or 2EX (3M/3W) group. An acute exercise test (AET; 10 sets of 10 plyo-jumps; Plyopress 625 III) was done at pre (PreTr) and post-intervention (PostTr). Serum markers of bone turnover were analyzed immediately prior to (PreEx) and following (0 and 60 minutes PostEx) the AET using immunoassays. These included markers of bone formation (BAP, Osteocalcin, PINP) and resorption (TRAP, CTXs), and a hormonal marker (Vitamin D). PreTr vs PostTr changes in biomarker AET-induced responses were compared across groups using integrated area under the curve (AUC) analyses from the 90 minutes surrounding the AET (PreEx to 60 minutes PostEx) and 2-3 RMANOVA using GraphPad Prism software.

RESULTS: There were no significant group × time interactions for any bone biomarker (p≥0.05). However, there were significant main training effects for BAP and PINP, such that AUC concentrations increased by 9.9% and 14.3% respectively, following training (Mean ± SD; BAP PreTr: 2002 ± 1653 vs. PostTr: 2201 ± 1783, U/L; p<0.05). However, there were significant main training effects for BAP and PINP, such that AUC concentrations increased by 9.9% and 14.3% respectively, following training (Mean ± SD; BAP PreTr: 2002 ± 1653 vs. PostTr: 2201 ± 1783, U/L; p<0.05). However, there were significant main training effects for BAP and PINP, such that AUC concentrations increased by 9.9% and 14.3% respectively, following training (Mean ± SD; BAP PreTr: 2002 ± 1653 vs. PostTr: 2201 ± 1783, U/L; p<0.05).

CONCLUSION: Exercise-induced markers of bone formation increased following 12 weeks of ballistic periodized resistance training, with no differences between exercise programs differing in OI. Markers of bone resorption did not change following training. This indicates that the ballistic exercise training program stimulated favorable changes in bone turnover, regardless of training frequency.
exercise on cortical and trabecular bone morphology in mice. METHODS: Forty C57BL/6 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 12 weeks of vigorous intensity (blood lactate >4 mM post-exercise) 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-ethan纺as 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, (47.7±0.6um vs. 45.1±0.5um, p<0.05). Trabecular BMD was 3.0% higher in CEX compared to CSED (776.7±5.2mgHA/cm² vs. 754.0±5.2mgHA/cm², p<0.05), whereas trabecular BMD was statistically similar between KEX and KSED (757.5±6.2mgHA/cm² vs. 759.5±5.5mgHA/cm², 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 deterrents 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.

2713 Board #5 May 31 1:00 PM - 3:00 PM The Association between Quantified Training Load and Bone Adaptation
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PURPOSE: Habitual mechanical loading during pubertal stages has consistently been associated with current and future anabolic effects on bone characteristics. However, the specific aspects of mechanical loading that bring about anabolic effects are yet to be established. The present study investigated the relationship between soccer specific loading patterns and subsequent bone adaptation in youth soccer players. METHODS: 17 elite adolescent soccer players (mean ± SD = age: 16.3±0.5 years; height: 1.79±0.07m; body mass: 74.9±6.7 kg) gave informed consent to take part in a study approved by the National Research Ethics Service. Peripheral quantitative computed tomography scans of the tibia of the dominant leg were taken at the beginning of pre-season training and 12-weeks later. Tibial mass (g), trabecular area (mm²), cortical area (mm²) and density (mg/cm²), peristomial circumference (mm) and strength strain index (SSI) (mm³) at the 4, 14, 38 and 66% sites were measured. During the 12 week training period, workload was quantified using a global positioning system (GPS). The following metrics were analysed: session duration (min), total distance covered (m), and high-speed running distance (17.0 km/hr). Changes in bone characteristics were assessed using paired sample t-tests, and associations between GPS metrics and bone adaptation were assessed using Pearson’s correlation coefficient. RESULTS: Tibial mass increased by 2.9, 1.2 and 0.7% at the 4, 14 and 38% sites (P < 0.05). SSI (38%; 2337.1±340.9 compared to 2383.1±317.3, P = .05) and cortical area (38%; 380.9±23.2 mm² compared to 383.1±30.8 mm², P = .02) increased following 12-weeks of soccer specific training. Average session duration was positively correlated with increased trabecular area (4%; P=0.2, r=0.61) and peristomial circumference (38%; P=0.03, r=0.55). Average high-speed running was positively correlated with SSI (4%; P=0.05, r=0.51) and cortical density (38%; P=0.05, r=0.52).

CONCLUSIONS: Soccer specific training increases tibial bone characteristics at the 4, 14 and 38% sites. Moreover, session duration and high-speed running were associated with increased tibial strength, size and density following 12-weeks of specific training. These factors should be considered when recommending exercise for bone health.

2715 Board #7 May 31 1:00 PM - 3:00 PM The Effect of Running Vs Cycling on Bone Markers Response
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BACKGROUND: The Physical Activity Guidelines for American Adults recommend the equivalent of 150 minutes of moderate intensity aerobic activity each week without specifying the exercise modality. Running (weight bearing) and cycling (non-weight bearing) are common aerobic activities. However, they differ in their mechanical impact on the bone. Bone turnover (formation & resorption) can be reflected by circulating bone markers, bone specific hormones and cytokines (osteonitives) released from the dynamic remodeling of bone. PURPOSE: To compare the bone marker response to running versus cycling at the same moderate-intensity target Heart Rate (HR). METHODS: 13 healthy male adults (23.7 ± 1.0 yr.) completed 4 laboratory visits. Participants performed two progressive exercise tests to exhaustion on cycling ergometer (CE) and treadmill (TM) to determine peak VO2 and peak HR. On subsequent separate days, in a randomized order, participants performed a 30-min constant exercise challenge at 70% HR reserve (HRR) on CE and TM. Blood was drawn before (Pre), immediately post (IP) and 1h into recovery (Rec) and analyzed for lactate, osteocalcin, sclerostin and parathyroid hormone (PTH). Two-way ANOVA was used to evaluate within-person differences with time (Pre/IP/Rec) and exercise modality.

RESULTS: 70% HRR was successfully clamped during CE and TM (CE 155.7 ± 0.4; TM 159.3 ± 0.7 bpm). Exercise on CE elicited higher IP lactate (6.2 ± 1.1 Vs. 2.9 ± 1.1 mmol/l, p<0.01) and 13.7% lower O2 uptake. At IP sclerostin increased significantly (p=0.0007) only in TM (49% Vs. 16% p=0.004). PTH had similar transient increase at IP in both modalities (p<0.001). No significant changes were observed in osteocalcin in both modalities. CONCLUSIONS: 30 min of running and cycling at 70% HRR lead to a metabolic bone response immediately after the exercise in both modalities. While PTH, an essential factor for calcium metabolism and bone formation, increased significantly.
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
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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 than non-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, LC [basketball, baseball, soccer]: 21, NC [cheer, tennis, golf]: 6) and 33 female (FC: 6, LC [basketball, softball, soccer]: 16, NC [cheer, tennis, volleyball, swimming, rifle, track]): 17) Division I athletes was collected across each modality. RESULTS: There were significant differences in time to termination (TTT) (CONTROL = 77.3 ± 12.6 min; GEAR = 50.3 ± 12.6 min) and similarly at IP in both modalities, sclerostin (inhibitor of bone formation) increased during breath-holding (F(1,1909) = 0.20, p = 0.90) or hyperventilation (F(1,1909) = 0.31, p = 0.54) but not during prolonged supine (F(1,1909) = 0.64, p = 0.42) or forced head impact exposure altered brain activity 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.

2717 Board #1 May 31 1:00 PM - 3:00 PM
Head Impact Exposure Alters Neural Synchrony and Complexity in Collegiate Athletes
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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 football, are at risk for repeated head impacts capable of damaging white matter and impairing brain circuit function. One way of measuring functional connectivity is through resting-state electroencephalography (EEG). PURPOSE: To test the hypothesis that repeated head impact exposure reduces fast-rhythm (’gammaina’) synchrony and an associated increase in slow-rhythm complexity. METHODS: Interscollegiate water polo players (9 Men; 10 Women) were tested before and after the season. During the testing, each player sat with eyes closed for five minutes wearing a 32 dry-electrode EEG cap (sampling rate = 500 Hz). From the pre-processed EEG data, we computed debiased weighted phase lag index (dWPLI) as a measure of gamma (50-50 Hz) synchrony and multicopy entropy (MSE) as a measure of neural complexity. Athletes were monitored during competitions for head impacts using cap-worn inertial sensors to quantify peak linear acceleration (PLA), rotational acceleration (PRA), and rotational velocity (PRV). Cumulative exposure (twPCA) was computed per athlete by summing principal component ‘magnitude’ scores (representing PLA, PRA, and PRV) weighted by time (1 days) relative to post-season assessment. Mediation analysis was performed using 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)]=7.99, p<.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> .06). 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.

2718 Board #2 May 31 1:00 PM - 3:00 PM
Prefrontal Cortical Neural Function and Decision-making Performance Following a Long Duration Incremental Exercise Protocol in the Heat while Wearing Personal Protective Equipment
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(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 making performance. RESULTS: Baseline resting MCAv did not significantly differ (t37 = -0.47, p = 0.64) between those with (MCAv = 50.8 ± 7.7 cm/s) and those without MCAv (MCAv = 49.6 ± 8.1 cm/s) concussion history. The MCAv response did not differ between those with and without concussion history during breath-holding (F(1,37) = 0.20, p = 0.69) or hyperventilation (F(1,37) = 0.31, p = 0.58). Among SOF personnel with concussion history, those with 3+ had significantly diminished CVR response relative to those with 1-2 concussions during the breath- holding (F(1,37) = 4.84, p = 0.03) and the hyperventilation (F(1,37) = 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.
± 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 a significant pre- and post-exercise values during a Go/No-go test in GEAR (p = 0.027). There was also a significant difference when evaluating incorrect responses between pre- and post-exercise values in GEAR (F(1, 14) = 6.069, 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 individuals 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 Pupillary Light Reflex: Implications for Special Operations Forces Personnel
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(No relevant relationships reported)

Pupillary 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 pupil 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 responsiveness, which may indicate prolonged ANS dysfunction. Our previous genome-imaging 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
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(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 Ommaya 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 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.
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-reported 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 PTSD 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), immediately following (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 Post40 [P = 0.36]. Fatigue was reduced from Pre to Post40 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 Post20 to Pre [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.

**Methods:** To determine the safety and efficacy of a resistance exercise training (RET) program in Gulf War Veterans (GV) with chronic widespread musculoskeletal pain (CMP). **Purpose:** To evaluate the effect of a routine 12-hour shift work on blood pressure (BP) among career FF. **Methods:** We evaluated 30 male FF, aged 40±3.2 yrs, BMI = 26.3±13.1 kg/m². BP was measured in a basal condition on an off-duty day (Eval1) and before (Eval2) and after (Eval3) a 12-h shift work, in resting supine (SUP) and orthostatic (ORT) postures. A 3-way repeated measures ANOVA (BP, body position, time) with Bonferroni post-hoc was performed. A BP increase ≥4 mmHg was considered meaningful. To understand BP responsiveness we use independent T-tests between subgroups (overweight, obese, cardiorespiratory fitness (CRF) ≥12METs and age). On-duty task effect on BP was performed with a sub analysis on those who increased diastolic BP. **Results:**ANOVA showed a significant effect of time, BP and position with significant mean BP increase of 3.5 mmHg from Eva 2 to 3. FF >40 yrs had a larger mean systolic BP increase than younger (12 vs 1 mmHg; p<0.01-Table 1). No differences were observed for those who had CRF≥12 METs, were overweight or obese. 5 FF (17%) had their systolic and diastolic BP meaningfully increased in SUP and ORT conditions: 12.2, 14.8, 10.2, 14.4 respectively. 4 of them (80%) participated in firefighting or emergency medical service (EMS). 16 FF showed a meaningful increase of 10.1 mmHg in diastolic BP during ORT condition, 14(88%) of them participated in EMS or firefighting. FF who performed fire fighting or a EMS had a 3.9 (5%) CI 0.7-21.7) higher odds of having their diastolic BP meaningfully increased. **Conclusion:** There was an important relationship between FF on duty emergency tasks and cardiovascular strain. Older FF seemed more susceptible to present a negative cardiovascular response after 12-h shift work. The increase on BP was meaningful in most cases, especially diastolic BP, which could be associate to non-fatal cardiovascular events in susceptible firefighters.

**Methods:** Gulf Veterans suffering medically unexplained CMP lasting at least 3 months (N=50) were randomized to either 16 weeks of twice weekly RET or wait-list control (WLC). Training was supervised by exercise specialists and consisted of 10 exercises targeting major muscle groups. The program started at a very low intensity (25-35% of estimated 1-repetition maximum (1-RM)) and progressed in small (≤5%) increments. Thus, training was both individualized and standardized. Testing of 1-RM was completed at baseline and reevaluated at 16 weeks. The McGill Pain Questionnaire (MPQ) and Profile of Mood States (POMS) were completed at weeks 1, 6, 12 and 16. Exercisers not completing >50% of training were excluded from statistical analyses (n=4). Average 1-RM values were compared using dependent t-tests, and MPQ and POMS data were evaluated using repeated-measures ANOVAs.

**Results:** The final sample consisted of 22 GV in the RET group, with >90% adherence, and 20 WLC Veterans. No drop outs were due to negative complications with exercise. Following RET, participants on average lifted 67 kg/kg of body weight and significant (p<0.05) 1-RM increases were observed in all 8 lifts. Estimated 1-RM increased by at least 20% for 7 of 8 lifts. Mood scores significantly improved in both groups over the course of the trial with no significant difference between groups. No time or group effects (p>0.05) were observed in MPQ scores.

**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 GV Veterans with widespread pain.

**Supported by Dept. of Veterans Affairs grant: IO1-CX000383.**

**F-08 Thematic Poster - Physiological Responses in Firefighters**

Firefighters’ job-related activities may expose firefighters (FF) to an elevated cardiac strain. **Purpose:** To evaluate the effect of a routine 12-hour shift work on blood pressure (BP) among career FF. **Methods:** We evaluated 30 male FF, aged 40±3.2 yrs, BMI = 26.3±13.1 kg/m². BP was measured in a basal condition on an off-duty day (Eval1) and before (Eval2) and after (Eval3) a 12-h shift work, in resting supine (SUP) and orthostatic (ORT) postures. A 3-way repeated measures ANOVA (BP, body position, time) with Bonferroni post-hoc was performed. A BP increase ≥4 mmHg was considered meaningful. To understand BP responsiveness we use independent T-tests between subgroups (overweight, obese, cardiorespiratory fitness (CRF) ≥12METs and age). On-duty task effect on BP was performed with a sub analysis on those who increased diastolic BP. **Results:**ANOVA showed a significant effect of time, BP and position with significant mean BP increase of 3.5 mmHg from Eva 2 to 3. FF >40 yrs had a larger mean systolic BP increase than younger (12 vs 1 mmHg; p<0.01-Table 1). No differences were observed for those who had CRF≥12 METs, were overweight or obese. 5 FF (17%) had their systolic and diastolic BP meaningfully increased in SUP and ORT conditions: 12.2, 14.8, 10.2, 14.4 respectively. 4 of them (80%) participated in firefighting or emergency medical service (EMS). 16 FF showed a meaningful increase of 10.1 mmHg in diastolic BP during ORT condition, 14(88%) of them participated in EMS or firefighting. FF who performed fire fighting or a EMS had a 3.9 (5%) CI 0.7-21.7) higher odds of having their diastolic BP meaningfully increased. **Conclusion:** There was an important relationship between FF on duty emergency tasks and cardiovascular strain. Older FF seemed more susceptible to present a negative cardiovascular response after 12-h shift work. The increase on BP was meaningful in most cases, especially diastolic BP, which could be associate to non-fatal cardiovascular events in susceptible firefighters.

**Supported by Dept. of Veterans Affairs grant: IO1-CX000383.**
2728  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. Isaacs. 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 combusting 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 yrs, 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, 0.065 in PM, and < 0.01 (P = 0.908) for PPE. A major concern for working in structural firefighter PPE is the heat strain that is caused by the heat protection it provides. This is a multi-faceted challenge that is caused that this type of drill is less physically taxing because there is no “live-fire”. However, little is known about the physiologic strain associated with SCBA confidence courses. It is often assumed that this type of drill is less physically taxing because there is no “live-fire”. More LBM and less BF can be advantageous to increasing their LBM to increase their overall performance during training or in real-life high stress situations.

**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.

<table>
<thead>
<tr>
<th>Table 1. Physiologic characteristics of academy training among cadets (N=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration (minutes)</strong></td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Peak HR (bpm)</td>
</tr>
<tr>
<td>APMHR</td>
</tr>
<tr>
<td>Peak ECT (°C)</td>
</tr>
</tbody>
</table>

* p < 0.05 vs SCBA and Live Fire Training

Supported by FEMA AFG Grant EMW-1015-FP-00731

2730  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. Pollock1, Jason Springer2, Tom Burgasser2, Tim Berczik1, Keith Burns1, Jackie Novak1. 1Walsh University, North Canton, OH. 2Cleveland Clinic - South Pointe Hospital, Cleveland, OH. 3Massillon Fire Department, Stark County, OH. 4Jackson Fire Department, Stark County, OH. Email: bpollock@walsh.edu. (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 VO₂ max wearing their SCBA (SCBA). One week later, participants exercised at 50% of their VO₂ max 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 ± 4.4%). 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 inspired oxygen is reduced, resulting in oxygen not being diffused as efficiently.

2731  Board #5  May 31 1:00 PM - 3:00 PM  Exertional Strain and Task Performance Consequences of a Reduction in Protection in Structural Fire Fighter PPE - A Pilot Study  
Emiel A. DenHartog. North Carolina State University, Textile Protection and Comfort Center, Raleigh, NC. (Sponsor: Dr Lacy Alexander, FACSIM). Email: cadenhar@ncsu.edu. (No relevant relationships reported)

**PURPOSE**: A major concern for working in structural firefighter PPE is the heat strain that is caused by the heat protection it provides. This is a multi-faceted challenge that requires studying heat protection, firefighter strain and task performance. To initialize this a pilot study on the consequences of reducing firefighter heat and flame protection on thermal strain, task performance and overall experiences of user safety was conducted at a firefighter training facility in The Netherlands.

**METHODS**: Ten experienced firefighters between the ages of 25 and 50 participated in a protocol approved by the local ethical committee. They performed a simulated task performance test in which they had to move a simulated victim from one floor to another using a simulated stairway. Heart rate and skin temperature were monitored. The original protocol was conducted at a firefighter training facility in The Netherlands.
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/hr) in R-gear versus 2.52 (1.20 °C/hr) in S-gear (p<0.04). Maximum body temperature was slightly higher in the R-gear, possibly due to the reduction in protection (35.1 °C) versus 34.3 °C (S), 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

**Board #6 May 31 1:00 PM - 3:00 PM**

**Firefighters Do Not Exhibit Postexercise Hypotension Following a Bout of Vigorous Exercise**

Paul M. Parducci, Beth A. Taylor, FACSM, Amanda L. Zaleski, Adam R. Blanchard, Yeojin Gwon, Ming-Hai Chen, Burak T. Cilhoroz, Paul D. Thompson, FACSM, Linda S. Pescatello, FACSM. 1University of Connecticut, Storrs, CT. 2Hartford Hospital, Hartford, CT. (Sponsor: Beth A. Taylor, PhD, FACSM)

*No relevant relationships reported*

Firefighters have a higher than normal prevalence of cardiovascular disease (CVD) and accompanying risk factors such as hypertension. These CVD risk factors may increase the risk of sudden cardiac death (SCD), which accounts for 45% of all on-duty firefighter deaths. Exercise confers protection against CVD risk, in part due to the immediate blood pressure (BP) reductions of 5-7 mmHg following exercise, termed postexercise hypotension (PEH). PEH in firefighters has not been studied.

**PURPOSE:** To examine PEH after sudden vigorous physical exertion simulated by a maximal cardiopulmonary stress test (GEST) among career firefighters. METHODS: Firefighters (n=19 men) performed non-exercise control (CONTROL) and GEST on separate days followed by attachment to an ambulatory blood pressure (ABP) monitor for 19hr. Ambulatory systolic BP (ASBP) and diastolic BP (ADBP) were recorded at hourly intervals over awake (11hr), sleep (8hr), and 19hr. Additionally, other CVD risk factors and SCD biomarkers were measured as possible correlates of PEH. RESULTS: Firefighters were middle-aged (39.5±8.9yrs) and overweight (29.2±4.0 kg/m²) men with high resting BP (123.1±7.9/87.8±10.4 mmHg). Compared to CONTROL, ASBP increased after the GEST over awake (18.2±3.9 mmHg, p<0.01), sleep (14.6±10.3 mmHg, p<0.01), and 19hr (16.5±11.7 mmHg, p<0.01). Compared to CONTROL, ADBP increased after the GEST over awake (4.4±3.1 mmHg, p<0.01), sleep (7.6±5.4 mmHg, p<0.01), and 19hr (5.9±4.1 mmHg, p<0.01). Resting SBP explained up to 25.6% of variance in the ASBP response over awake (r=0.51, p<0.03) and up to 30.0% over 19hr (r=0.55, p=0.02), while blood glucose levels explained up to 72.8% of variance over sleep (r=0.85, p<0.01). Resting DBP explained up to 52.9% of variance in the ADBP response over sleep (r=0.73, p<0.01), while resting DBP and medication use explained up to 76.1% of variance over awake (r=0.87, p<0.01) and up to 76.5% over 19hr (r=0.88, p<0.02). CONCLUSIONS: Sudden vigorous exertion evoked postexercise hypertension as opposed to PEH among firefighters with elevated resting BP, which was largely explained by the positive relationship between resting BP and the increase in ABP following exercise. These unexpected findings indicate that reducing hypertension is critically important to the CVD health of career firefighters.

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**Board #7 May 31 1:00 PM - 3:00 PM**

**The Effect of Rapid and Slow Heat Acquisition on Heart Rate Variability**

Brandon Cotton, Cory Coelhoorn, Lynneth Stuart-Hill. University of Victoria, Victoria, BC, Canada

*No relevant relationships reported*

Autonomic tone (AT), measured by heart rate variability (HRV), has shown to be linked to the risk of cardiovascular and other diseases. Firefighters are chronically exposed to environments and tasks that put them under acute bouts of thermal and cardiovascular stress, acutely affecting AT. HRV has been shown to respond to both heat stress and heavy exercise though it is not known if rapid heat acquisition caused by the microclimate of personal protective equipment (PPE) affects autonomic tone by lowering the LF frequency domain.

**CONCLUSION:** Results from the current study suggest that regardless of the rate of thermal acquisition, HRV response is similar, however the shift of HRV into the VLF domain during the PPE condition may have masked the magnitude of sympathetic response by lowering the LF frequency domain.

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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

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 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 previously.
Resistance 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瑞士轮. Maternal skinfolds and anthropometric measures were collected at 16 and 36 weeks of gestation. Student t 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): weight (CG=86.9kg vs REG=85.8kg), %body fat (CG=96.7kg vs REG=94.1kg), percent of body fat (%BF) (CG=36.2% vs REG=36.3%), %Fat36 (CG=37.1% vs REG=39.2%), gestational weight gain (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 WHR36 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 #159RT24470029

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**Oxygen Uptake Kinetics During the Different Phases of the Menstrual and Or 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 (VO₂) kinetics changes across the phases of the menstrual and oral contraceptive cycles. **Methods**: Forty highly active women who were either non-oral contraceptive users (n=7, 28.6±0.6 yrs) or monophasic oral contraceptive users (n=7, 22.1±3 yrs) participated in the study. The time-constant of the VO₂, kinetics response (tVO₂) was determined by ensemble-averaging the VO₂ response during the 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 (folicular 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 oral 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 VO₂ across cycle phases between non-oral contraceptive and oral contraceptive users. Statistical significance was set at p<0.05. **Results**: tVO₂ was affected by cycle phases, regardless of contraception use, whereby tVO₂ was greater in the menstruation phases of the non-oral contraceptive and oral contraceptive cycles (24±1 s) compared to the non-menstruating phases (19±5 s) (p<0.05). **Conclusion**: The speed of the VO₂ kinetics response is affected by the phases of the menstrual and oral contraceptive cycles, such that a greater tVO₂ is observed during the menstruation phase. Anmol T. Mattu was supported by the NSERC Alexander Graham Bell Canada Graduate Scholarship.

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**The Impact Of Pms And Pmd On Physical Performance In Female Track And Field Athletes**

(No relevant relationships reported)

Previous studies showed that menstrual cycle is associated with physical performance and subjective condition in female athletes. It is also known that premenstrual syndrome (PMS) and premenstrual dysphoric disorder (PMDD) affect subjective condition in female athletes. However, the relationships among PMS, PMDD and physical performance in female athletes are not clarified yet. **Purpose**: To investigate the impact of PMS and PMDD on physical performance in female track and field athletes. **Methods**: Sixteen female track and field athletes with regular menstrual cycles participated in this study. Participants were measured body composition and physical performance test in follicular phase (no PMS and PMDD phase) and luteal phase (PMS and PMDD phase). As a physical performance test, Counter Movement Jump (CMJ), Rebound Jump; RJ, and Wingate test were performed. PMS and PMDD were evaluated by questionnaire survey of premenstrual syndrome (ACOG practice bulletin, 2000) and premenstrual dysphoric disorder (DSM-5, APA, 2013). **Results**: In all subjects, there were no significant differences in body composition and physical performance between follicular phase and luteal phase. However, subjects who had breast tenderness of PMS decreased more greatly than non-symptom subjects in jump height of CMJ (p=0.038) and RJ index (p=0.015). Also, subjects who had anxiety of PMS decreased more greatly than non-symptom subjects in jump height of CMJ (p=0.05). Moreover, subjects who had overeating of PMDD increased more greatly than non-symptom subjects in HR max during Wingate test (p=0.042). **Conclusions**: In this study, we showed that some symptoms of PMS and PMDD were associated with suppressed physical performance in female track and field athletes. Thus, PMS and PMDD may lead to decrease the physical performance in female track and field athletes.

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**Physical Activity Influences the Relationship between BMI and Adiposity Differently in College Males and Females**

Ginny M. Frederick, Bhibha M. Das, Michael V. Fedewa, Rachelle M. Reed, Rachel E. Salyer, Michael D. Schmidt, Ellen M. Evans, FACSM. University of Georgia, Athens, GA.  
(No relevant relationships reported)

**Purpose**: Body mass index (BMI) is often used as a surrogate measure of adiposity (%Fat). It is well-established that physical activity (PA) influences body composition. In addition to the well-established sex differences in body composition, college-age males 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 compared to 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 ± 5.7 %Fat, p < 0.001) and accumulated more PA (11,625 ± 2930 vs. 10,866 ± 3467 steps/day, p = 0.03) compared to females. Because of the known sex difference in %Fat, separate linear regression models were analyzed to explore 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, p < 0.05). The addition of the BMI x PA interaction term improved the model in females (AR² = 1.3%, p = 0.005) but not males (AR² = 0.0 %, 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**: 1,741/2000
**RESULTS:** Only RPE, %PO, and BL did not differ between sexes on all 3 exercise intensities (Table). HR, %HR, and PO did not differ between sexes on at least 2 exercise intensities. VO2 and %VO2max did not differ between sexes on at least 1 exercise intensity.

### Table: Exercise intensity variables

<table>
<thead>
<tr>
<th>Load (0-2 mmol/l)</th>
<th>Variable</th>
<th>Females (n=15)</th>
<th>Males (n=15)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR (bpm)</td>
<td>115.9 ± 14.4</td>
<td>96.8 ± 14.2</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>%HR (%)</td>
<td>68.7 ± 7.5</td>
<td>59.4 ± 8.8</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>RPE</td>
<td>7.7 ± 2.0</td>
<td>7.5 ± 1.6</td>
<td>0.796</td>
<td></td>
</tr>
<tr>
<td>PO (Watts)</td>
<td>61.3 ± 20.3</td>
<td>67.3 ± 15.3</td>
<td>0.440</td>
<td></td>
</tr>
<tr>
<td>%PO (%)</td>
<td>44.1 ± 11.2</td>
<td>36.4 ± 9.7</td>
<td>0.051</td>
<td></td>
</tr>
<tr>
<td>VO2 (ml/kg/min)</td>
<td>15.1 ± 3.7</td>
<td>15.7 ± 3.6</td>
<td>0.731</td>
<td></td>
</tr>
<tr>
<td>%VO2max (%)</td>
<td>54.0 ± 9.8</td>
<td>45.8 ± 8.4</td>
<td>0.010</td>
<td></td>
</tr>
<tr>
<td>BL (mmol/l)</td>
<td>1.5 ± 0.4</td>
<td>1.3 ± 0.4</td>
<td>0.439</td>
<td></td>
</tr>
<tr>
<td>HR (bpm)</td>
<td>143.4 ± 15.8</td>
<td>127.9 ± 19.9</td>
<td>0.053</td>
<td></td>
</tr>
<tr>
<td>%HR (%)</td>
<td>84.9 ± 6.2</td>
<td>75.4 ± 6.7</td>
<td>0.000</td>
<td></td>
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<tr>
<td>RPE</td>
<td>10.5 ± 2.4</td>
<td>10.8 ± 2.4</td>
<td>0.711</td>
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</tr>
<tr>
<td>PO (Watts)</td>
<td>93.3 ± 22.0</td>
<td>116.7 ± 19.5</td>
<td>0.017</td>
<td></td>
</tr>
<tr>
<td>%PO (%)</td>
<td>67.6 ± 10.3</td>
<td>52.1 ± 8.3</td>
<td>0.086</td>
<td></td>
</tr>
<tr>
<td>VO2 (ml/kg/min)</td>
<td>20.1 ± 4.2</td>
<td>24.7 ± 5.1</td>
<td>0.034</td>
<td></td>
</tr>
<tr>
<td>%VO2max (%)</td>
<td>71.9 ± 10.0</td>
<td>71.3 ± 6.7</td>
<td>0.760</td>
<td></td>
</tr>
<tr>
<td>BL (mmol/l)</td>
<td>2.6 ± 0.6</td>
<td>2.8 ± 0.7</td>
<td>0.367</td>
<td></td>
</tr>
<tr>
<td>HR (bpm)</td>
<td>164.0 ± 15.6</td>
<td>149.0 ± 17.0</td>
<td>0.016</td>
<td></td>
</tr>
<tr>
<td>%HR (%)</td>
<td>97.0 ± 3.7</td>
<td>91.1 ± 7.3</td>
<td>0.017</td>
<td></td>
</tr>
<tr>
<td>RPE</td>
<td>19.7 ± 2.4</td>
<td>14.1 ± 2.4</td>
<td>0.504</td>
<td></td>
</tr>
<tr>
<td>PO (Watts)</td>
<td>123.7 ± 23.0</td>
<td>136.0 ± 29.2</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>%PO (%)</td>
<td>89.9 ± 8.6</td>
<td>77.8 ± 8.2</td>
<td>0.414</td>
<td></td>
</tr>
<tr>
<td>VO2 (ml/kg/min)</td>
<td>26.3 ± 5.5</td>
<td>31.0 ± 5.6</td>
<td>0.074</td>
<td></td>
</tr>
<tr>
<td>%VO2max (%)</td>
<td>93.3 ± 7.4</td>
<td>39.6 ± 5.5</td>
<td>0.212</td>
<td></td>
</tr>
<tr>
<td>BL (mmol/l)</td>
<td>4.7 ± 0.7</td>
<td>4.8 ± 2.1</td>
<td>0.657</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.

### Table: Exercise intensity variables

<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>MA</td>
<td>Male</td>
<td>28.276, 5.485</td>
<td>0.065</td>
<td>-0.765</td>
<td>0.766</td>
</tr>
<tr>
<td>OH</td>
<td>Female</td>
<td>41.362, 6.193</td>
<td>0.548</td>
<td>-0.256</td>
<td>0.585</td>
</tr>
<tr>
<td>NHIW</td>
<td></td>
<td>27.280, 5.942</td>
<td>0.187</td>
<td>0.113</td>
<td>0.146</td>
</tr>
<tr>
<td>NHB</td>
<td></td>
<td>39.991, 6.849</td>
<td>0.064</td>
<td>-0.042</td>
<td>0.113</td>
</tr>
<tr>
<td>OR</td>
<td></td>
<td>27.726, 5.485</td>
<td>0.057</td>
<td>0.139</td>
<td>0.057</td>
</tr>
</tbody>
</table>

For all, p = 0.000

**CONCLUSION:** Formulating prediction equations in different gender and race groups does not improve the prediction of %BF. Further analyses such as cross-validation based on split training and testing datasets are needed.

**REFERENCES:**

1. National Health and Nutrition Examination Survey (NHANES): Twentieth Century 2003-2004 data with sample weighting 488058396 in five race groups including Mexican American (MA), Other Hispanic (OH), Non-Hispanic White (NHIW), Non-Hispanic Black (NHB), and Other Race (OR). %BF was measured by dual-energy X-ray absorptiometry (DXA). Prediction equation of %BF was derived 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 the following table:

**Factors that could contribute to infant motor development during the first 4 months of life:**

- Activity level 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 was calculated for one week. Within 48 hours of birth, surveys were given to participants to complete prospectively with information on time their infant spends in different positions (supine, prone, supported sitting 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.

**RESULTS:** Infant motor development percentile (r=.68, p=.003). CONCLUSIONS: There was no relationship between maternal physical activity during pregnancy and infant motor development at four months of age. Exercise during pregnancy may elicit improvements in the brain/neurodevelopment of offspring; however, it is unknown whether or not physical activity during pregnancy is connected to 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 was calculated for one week. Within 48 hours of birth, surveys were given to participants to complete prospectively with information on time their infant spends in different positions (supine, prone, supported sitting 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=0.2, p=0.94), time spent participating in light activity (r=0.3, p=0.88), or time spent participating in moderate activity during late pregnancy (r=0.4, p=0.85). In addition, there was no 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=0.003). 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 the development percentiles. The long-term implications of these data are substantial as the development percentiles.
PURPOSE: To examine sport-specific associations of sport specialization and exceeding sport volume recommendations with overuse injuries in adolescent basketball, soccer, and volleyball athletes. 

METHODS: 716 youth athletes (70.8% female, age 14.21±5.9 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 injuries 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 [1.3-3.5], 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.
Gender Differences In Match Contact Injuries In U.S. Rugby-7s

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 & Prevention Group’s Injury Registry. Significant differences were examined using chi-square and ANOVA tests. RESULTS: A total of 1223 contact match injuries were recorded. Of these, 474 were documented in women (28.2%) and 749 in men (46.9%). The most commonly sustained injuries were head (NFI), neck, and face injuries (HNFI). The most common causes of injury were contact with another player and contact with the ground. A high incidence of head injuries, including concussions, has been documented in 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 relationship 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 concussions (40.3%), respectively. The final model revealed gender, age, position during contact, contact surface, and play legality were significantly associated with HNFI. Controlling for play legality and position during contact, under 18 (U18) boys injured during contact with an opposing player had the highest probability of HNFI (51%) and a higher probability than U18 girls (p=0.004). However, women 18-24 (p=0.019) and over 30 (p=0.042), injured during contact with the ground, had a higher probability of HNFI than men. CONCLUSIONS: 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.

Evaluation of the Rate of Orthopedic Injuries of Concussed And Non-concussed Players In the NFL

Concussions may increase the risk of musculoskeletal injury during the 90 day period after return to play. Previous work has evaluated this effect in collegiate players with consistent results. PURPOSE: To examine possible increased risk of orthopedic injury among National Football League players 12 weeks (90 days) after return to play from an incident concussion compared to an incident orthopedic injury. METHODS: Weekly NFL injury data from 2012 through 2017 was collected from public websites and weeks 3-10 of the regular season were analyzed. Players with upper extremity (UE) and lower extremity (LE) orthopedic injuries were matched to each concussed player on position, team, and week of return to play. Concussed players were excluded if they sustained an orthopedic injury concurrently with a concussion or if there was no matched orthopedic control. Additional players were excluded from the study if they had no playing days on the injury logs for any other reason. This study analyzed 194 concussed players, comparing them with 187 LE and 105 UE injuries. An additional 444 non-injured controls with no injuries spanning 3 weeks prior were also evaluated. The rate of orthopedic injury was calculated as the number of orthopedic injuries during the 12 week period following return to play from their initial injury divided by 12 weeks. Results: LE and UE injuries were evaluated separately against the concussion group using a Wilcoxon Rank Sum test. RESULTS: In the 12 week period following return to play from injury, players who sustained a concussion had an average of 0.030.06 orthopedic injuries, while players who sustained a LE injury or uninjured controls had a rate of 0.010.04 and 0.002.01 orthopedic injuries respectively. There was a significant difference between the orthopedic injury rate among the concussed and LE injury groups (Z = 2.22, p-value = 0.03). In addition, the difference in orthopedic injury rate between the controls and concussion groups was significant (Z=9.79, p-value = 1.55e-22). No relationship between concussion and UE injury was found. CONCLUSION: The results of this study suggest a relationship between concussions and subsequent orthopedic injuries in NFL players compared to those with an incident LE injury or no incident injury.

Volleyball-Related Injuries in Adolescent Female Players

PURPOSE: This study determined the prevalence and type of musculoskeletal injuries and potential contributing risk factors to injury among adolescent volleyball players. METHODS: Female volleyball players (n=300; 10-18 yrs), with any level of volleyball experience were recruited. Participants completed a study-specific survey about their overall sport training type and volume, volleyball experience level (beginner, intermediate, advanced) and position, annual volume of volleyball play and injuries accrued during volleyball. RESULTS: Over 65% of participants reported sustaining one or more injuries, with ankle (38.8%), knee (19.7%), finger (18.8%), and shoulder (14.5%) injuries being most frequently-reported. Among injured players, 21.1% reported missing more than one month of play. Annual volume of volleyball play increased as skill level progressed from beginner to advanced (179.7 units to 478.1 units p<0.05). Also, the prevalence of injuries sustained by players increased as skill level increased from beginner to advanced (7.7% to 72.3%; p<0.05). Players who ranked themselves as ‘intermediate’ experienced higher odds of sustaining an elbow injury compared to other skill levels (OR 6.59; p=0.02). Outside hitters, defensive specialists, and those who play multiple positions were more likely to participate in multiple conditioning methods such as weight training, endurance and flexibility (OR 1.81, 1.93, 1.74, respectively; p<0.05) with advanced players indicating a trend to higher odds of participating in multiple conditioning methods (OR 1.49, p<0.05). Only 46.1% of participants participated.
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).

Conclusion: 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.

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 NATION-SP captured soccer-related injury data collected by athletic trainers (ATs) during the 2011/12-2013/14 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, 28 days and >28 days. Exposure of interest included sex, injury history, injury mechanism associated with concussion, and setting (competition vs. practice). We used multivariable logistic regression models to assess exposure effects on the odds of reporting specific symptoms as a function of exposures, as well as other observed symptoms. We then used multivariate logistic regression models to assess the odds of reporting specific symptoms as a function of exposures, as well as other observed symptoms.

Purpose: To predict time of substrate change using respiratory exchange ratio (RER) >0.85 from heart rate (HR), percent VO2max (%VO2max), sex, carbohydrate intake (CHO), fat intake (FAT) and protein intake (PRO). We also explored whether differences in substrate utilization existed among sport types during a VO2 max test in Masters Athletes.

METHODS: This was a cross-sectional study where 70 Masters Athletes (35 women; 35 men; 39 ±11 years of age) were measured for RER during a VO2 max treadmill test. A food frequency questionnaire (FFQ) was completed to determine average nutrient intake. Athletes from four sport types were included in our analyses: runners (20), triathletes (20), rowers (19) and CrossFit athletes (11). A multivariate linear regression model of least squares was used to predict time to RER >0.85 from HR, %VO2max, sex, CHO, FAT and PRO. An one-way ANOVA was used to determine whether differences existed among sport types. Bonferroni correction procedures were used to control the familywise error rate and maintain alpha levels at p<0.05.

RESULTS: Significant correlations were found between time and HR (r=0.632, p<0.001), time and %VO2max (r=0.616, p<0.001), time and sex (r=0.257, p=0.021), time and CHO (r=0.290, p<0.010), time and FAT (r=0.272, p=0.015), time and PRO (r=0.270, p=0.016) and were included in our multivariate model. HR, %VO2max, sex, CHO, FAT, PRO significantly predicted time to RER (R2=0.467, p<0.001). We also found significant differences in time to RER >0.85 between runners (4±16±0.58) and CrossFit athletes (2±52±1.03) (p=0.014), posthoc. CONCLUSION: We found a significant relationship between HR, %VO2max, sex, CHO, FAT, FAT, PRO and time to RER in Masters Athletes of various sports. We also found that significant differences existed in time to RER >0.85 between runners and CrossFit athletes. Future studies that are prospective and include diverse exercise intensities are needed. This study was not funded.

BACKGROUND: Starting aerobic exercise with low muscle glycogen content elicits greater fat and less carbohydrate utilization than exercise started with high muscle glycogen content, even when exogenous carbohydrate is ingested during exercise. The mechanisms contributing to greater fat utilization despite ingesting carbohydrate during exercise initiated with low glycogen are not delineated.

PURPOSE: Characterize transcriptional regulation of substrate metabolism in response to carbohydrate ingestion during steady-state exercise initiated with low muscle glycogen.

METHODS: In a randomized, crossover design, 12 men (mean ± SD, age, 21 ± 4 y; body mass, 83 ± 11 kg; VO2peak 44 ± 3 mL/kg/min) completed two cycle ergometry glycogen depletion trials, followed by a 24 h period of either high fat (1.5 g/kg carbohydrate, 3.0 g/kg fat) or high carbohydrate (6.8 g/kg carbohydrate, 1.0 g/kg fat) isocaloric refeeding to elicit low (LOW) or adequate (AD) glycogen content the following morning before initiating 80-min of cycle ergometry (64 ± 3% VO2peak) while...
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 3a expression was 40% lower (P<0.05; time-by-treatment interaction) in LOW than AD. 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.

**Effect Of Breaking-up Sedentary Activity On Metabolic Flexibility And Glycemia In Free-living Overweight/obese Adults**

Lara Schreck, Nathel DeJongh, Andrew Lange, Carlos Menendez, Thomas Glazer, David A. Goldstrohm, Edward L. Melanson, FACSM, Corey Rynders, Josiane Broussard, Daniel Bessese, Audrey Bergouignan. University of Colorado, Anschutz Medical Campus, Aurora, CO. (Sponsor: Edward L. Melanson, FACSM)

Effect of breaking up SB from being physically active, we also studied a group where participants performed a single energy matched continuous bout of exercise.

PURPOSE: Sedentary behavior (SB) triggers an inability to adjust substrate use to substrate availability (metabolic flexibility, MF), which may preclude glucose intolerance in the pathogenesis of insulin resistance. We and others have shown that frequent interruptions in SB leads to improved glycemic control, however the underlying role of MF in this process is unknown. This study examined the effects of breaking up SB on MF and glucose metabolism in free-living overweight and obese adults. To distinguish effects of breaking up SB from being physically active, we also studied a group where participants performed a single energy matched continuous bout of exercise.

METHODS: Physically inactive, adults (12F/7M, mean±SD: 33±8 yrs, BMI = 29±3.1 kg/m²) were randomly assigned to 4 groups. Each group performed a 4 week intervention designed 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±93, 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.

**Energy Metabolism With Or Without Slow Or Rapid Absorption Carbohydrate In Trained Endurance Runners**

Patrick Davitt, FACSM. University of the Sciences, Philadelphia, PA.

Sponsored by: Edward L. Melanson, FACSM

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±1.9 yr; 73.5±3.1 kg; %bf 15.3±2.1; VO₂max = 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 (W). Participants consumed a single 50g dose of either S or F prior to running 3hrs at 58% VO₂max. 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% VO₂max 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 (p=0.002; S 0.0012; F 0.00009 ± 0.0001 mmol/min) (p<0.001), in addition to a significant time x trial difference 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 between 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 S 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 consistant blood glucose and sustained exogenous energy supply during a sustained endurance run.
2758  May 31 2:15 PM - 2:30 PM
The Addition Of A Sodium Alginate-pectin Hydrogel To A Carbohydrate Beverage Significantly Enhances Gastric Emptying In Humans
Shaun Sutheall1, Stuart Galloway1, Andrew Boschi1, Yannis Pitsiladis, FACSM2. 1University of Cape Town, Cape Town, South Africa. 2University of Stirling, Stirling, United Kingdom.

PURPOSE: To investigate the effect of CHO encapsulation and osmolarity on the rate of gastric emptying while at rest.

METHODS: Eight healthy males were recruited to take part in this randomised, double-blind, cross-over study. A 500 mL bolus of an experimental drink was instilled while seated, and gastric emptying measured using the double aspiration method every 10 min for 90 min. The three drinks consisted of 180 g L-1 maltodextrin and fructose (POLY, ~700 mOsm kg-1), 180 g L-1 glucose and fructose (MON, ~1300 mOsm kg-1) and 180 g L-1 maltodextrin, fructose, sodium alginate and pectin (ENCAP, ~700 mOsm kg-1). All drinks also contained 1.5 g L-1 of sodium and had a CHO ratio of 1.08 (maltodextrin:glucose:fructose). Arteriovenous blood samples were collected prior to drink instillation and at regular intervals thereafter and analysed for glucose and non-esterified fatty acid (NEFA) concentration.

RESULTS: Time to empty half of the ingested bolus was faster for ENCAP (21.2 ± 8.5 min) than for POLY (36.3 ± 8.0 min, P = 0.003), which was faster than for MON (52.4 ± 16.5 min, P = 0.03). During the first 10 min, ENCAP emptied more than MON (ENCAP: 157 ± 50 vs. MON: 41 ± 50 mL, P = 0.05) but not more than POLY (108 ± 58 mL, P = 0.28). Thereafter, ENCAP emptied more than POLY and MON, reaching significance at 20 min (ENCAP: 258 ± 68, POLY: 182 ± 44 and MON: 141 ± 42 mL, P = 0.03) and 30 min (ENCAP: 307 ± 58, POLY: 196 ± 37, MON: 177 ± 50 mL, P = 0.01) after instillation. After 40 minutes, there were no longer significant differences between ENCAP and POLY, ENCAP and MON remained significantly different until 70 min but were not significantly different thereafter (458 ± 34 vs 406 ± 51 mL, respectively, P = 0.07). After 60 min, POLY had emptied significantly more than MON (380 ± 39 vs 290 ± 82, respectively, P = 0.05). Serum glucose concentration increased to a similar level on all trials, while serum NEFA concentration continually decreased over the 90 min to a similar extent on all trials.

CONCLUSIONS: These findings suggest that encapsulating CHO in alginate hydrogel is an effective method to enhance gastric emptying.

2759  May 31 2:30 PM - 2:45 PM
Acute Carbohydrate Consumption On The Ileal Regulatory Response To Exercise In Elite Keto-adapted Endurance Athletes
Alannah K. McKay1, Peter Peeling1, David B. Pyne, FACSM1, Marijke Welvaert2, Nicolin Tee3, Avish P. Sharma1, Megan L.R. Ross3, Laura A. Garvican-Lewis4, Rachel PL van Swelm5, Coby M. Laarakkers2, Louisie M. Burke, FACSM1. 1University of Western Australia, Perth, Australia. 2University of Canberra, Canberra, Australia. 3Australian Institute of Sport, Canberra, Australia. 4Australia Catholic University, Melbourne, Australia. 5Australia Institute Sport, Canberra, Australia. 6Radboud University Medical Center, Nijmegen, Netherlands. 7Radboud University Medical Center, Nijmegen, Australia.

It has been demonstrated adherence to a low carbohydrate (CHO) high fat (LCHF) diet can alter markers of iron metabolism in endurance athletes. PURPOSE: To investigate the impact of CHO re-introduction in athletes previously adapted to a LCHF diet on subsequent inflammatory and hepcidin responses to exercise. METHODS: In the three weeks prior to the exercise trials, twenty-three elite race walkers adhered to a CHO-rich (n=14) or LCHF diet (n=9). A 19-25 km race walking protocol was performed while the race walkers were still adhering to their allocated dietary intervention (Adapt). A second exercise test was performed three days later, where the LCHF consumed CHO 2 h prior to, and during the exercise protocol (in line with sports nutrition guidelines) for the first time in 3.5 weeks (CHO Restoration). Venous blood samples were collected pre-, post- and 3 h post-exercise and analysed for serum ferritin, interleukin-6 (IL-6) and hepcidin-25. RESULTS: Serum ferritin concentration was similar between trials (p=0.48) and dietary groups (p=0.93). The post-exercise IL-6 increase was greater in LCHF (p=0.001) than in both Adapt (LCHF: 13.1-fold increase; CHO: 8.0-fold increase) and CHO Restoration (LCHF: 18.5-fold increase; CHO: 6.3-fold increase); outcomes were not different between trials (p=0.34). 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.

2760  May 31 2:45 PM - 3:00 PM
No Correlations Between Gastrointestinal Complaints, Gut Injury Markers, And Carbohydrate Ingestion During a 60 Km Ultramarathon
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Acute Carbohydrate Consumption On The Ileal Regulatory Response To Exercise In Elite Keto-adapted Endurance Athletes
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±4.2 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 60 min, 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±8% and home way repeated measures ANOVA were used to test the effectiveness.

CONCLUSIONS: Lower-leg muscle training was found more effective to improve dynamic balance ability than thigh muscle training for community-dwelling females.
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<0.001) and, concurrently, positively address the childhood obesity epidemic. Arnolds et al. [2016] have demonstrated that regular physical activity during and after school can lead to improvements in health and well-being. PURPOSE: The current study aims to investigate the impact of a school-based health promotion programme “Join the Healthy Boat” on physical activity levels, possibly create a cardiovascular and metabolic health benefit and be an environmentally friendly transportation option. PURPOSE: To compare metabolic, cardiovascular, and ratings of perceived effort (RPE) when riding an e-bike for 3 minutes. Separate 1-way ANOVA examined differences in MVPA (i.e. scores 4) and overall PA across modules with Takey-Kramer post hoc analyses as appropriate. RESULTS: Overall PA differed significantly across modules (p = 0.02), with team sports producing higher 1.30 vs. 36) than dance (3.19 ± 0.08, p = 0.04). MVPA 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 = 0.09). 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 contributor to in-school PA for students, PE instructors and school health administrators can use our findings to choose appropriate modules to teach children PE and, concurrently, positively address the childhood obesity epidemic.

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 a cardiovascular and metabolic health benefit and be an environmentally friendly transportation option. PURPOSE: To compare metabolic, cardiovascular, 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.Conditioned for 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.

days in sufficient PA than children in the CG (3.1±2.1 days vs. 2.5±1.9 days; p=0.005). Children in the IG also performed significantly better in the three minute endurance run than their counterparts in the CON group (p<0.001). CONCLUSIONS: This teacher-centred health promotion using a low-dose bottom-up approach with action alternatives achieved significant positive effects in the reduction of BMI/CT 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.

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 (VO_{max}) and mitochondrial capacity within skeletal muscle. METHODS: Thirty-seven older (age=69.5±5yr) sedentary 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. VO_{max} 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 VO_{max}, ETS and OXPHOS were performed. RESULTS: After the intervention WLEX increased significantly NEPA compared with the other groups (NEPA: WLEX = 89.6±18.5 min/day; DIWL = 3.7±4.2 min/day; CON = 10.5±6.3 min/day; F = 8.87 for time x group interaction, P<0.001). Change in NEPA was positively correlated with change in mitochondrial capacity (OXPHOS, r = 0.453 and r = 0.468; P<0.05 for both) and absolute VO_{max} (r = 0.453, P=0.05). Both DIWL and WLEX experienced a significant WL (WLEX = -10.1±5.0 min/day and DIWL = -7.2±3.5 min/day; P<0.05). CONCLUSIONS: In addition to the beneficial effects of structured intentional exercise on cardiorespiratory fitness and 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 concurrent effect of exercise and NEPA to improve health outcomes.

May 31 2:15 PM - 2:30 PM
Intervention Effects Of A Kindergarten-based Health-promotion Programme On Physical Activity, Bmi Percentiles And Endurance Capacity
Susanne Kobel, Olivia Wartha, Christine Lämmle, Jens Dreyhaupt, Daniela Schmid, Jürgen M. Steinerack, FACSM. Ulm University, Ulm, Germany. (Sponsor: Jürgen M. Steinerack, FACSM)

INT and CON groups for all variables.

May 31 2:30 PM - 2:45 PM
Comparing Physical Activity Levels across Differing Physical Education Class Modules in Middle Schools using SOFIT
Stuart McCrory¹, Brydan Lindsey¹, Monica Guerra¹, Carol Pierce², Shane Caswell¹, Nelson Cortes¹, Jatin Ambegaonkar¹. ¹SMART Laboratory, George Mason University, Manassas, VA. ²Parkside Middle School, Prince William County Public Schools, Manassas, VA.

Over 1/3 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.

RESULTS: separating children by age and gender, BMIPCT 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.
max (Reg=-56 vs E-2-48 and E-3-40%), RPE (Reg=-12 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/min-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.

**F-13  Free Communication/Slide - Foot and Ankle**

**Friday, May 31, 2019, 1:00 PM - 3:00 PM**

Room: CC-202C

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**2770  Chair: Robert Gregory, Southern Connecticut State University, New Haven, CT.**

(No relevant relationships reported)

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**2771  May 31 1:00 PM - 1:15 PM**

**Differences In Foot Kinematics Between Forefoot Strikers In Minimalist And Conventional Running Shoes**

Trystyne Fokkema1, Jereme Outerleys2, Alessandra Bento Matias2, Adam C. Claseney3, 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)

Forefoot strike (FFS) runners in conventional shoes exhibit higher posterior and medial ground reaction force load rates than FFS runners in minimal shoes. This results in higher resultant load rates when forefoot striking in conventional shoes. The elevated cushioned heel and lateral outer sole flare of a conventional shoe may predispose the foot to greater plantarflexion (PF) and inversion (INV) at footstrike. This position may result in the increase in posterior and medial loading. PURPOSE: To determine the foot kinematic differences in the sagittal and frontal planes of FFS runners who are habituated to either conventional shoes (FFS-C) or minimal shoes (FFS-M).

METHODS: This is an ongoing study of which 9 FFS-M and 15 FFS-C have been recruited to date. Kinematic and kinetic data were collected as runners traversed a 30-m runway at 3.31 (±5%) m/s, while wearing their habitual type of shoe. Foot and ankle kinematics at footstrike as well as ground reaction force load rates were compared between groups, using Mann-Whitney U tests. Pearson correlations between kinematics and instantaneous load rates (IRL) in posterior and medial directions were calculated. RESULTS: FFS-C exhibited more plantarflexion at footstrike in the foot and ankle compared to FFS-M (Table 1). There were moderate correlations between the posterior IRL and the amount plantarflexion at footstrike in the foot and ankle (r=-0.511, p<0.011 and r=-0.582, p=0.003 respectively), where more PF resulted in a higher posterior IRL. There were no differences between FFS-C and FFS-M in the frontal plane at footstrike. Additionally, inversion at footstrike was not correlated with medial IRL (r=0.229, p=0.301). CONCLUSION: Based upon these preliminary results, running with a FFS pattern in conventional shoes promotes greater PF at footstrike, which is associated with greater posterior load rates. While greater INV at footstrike was not noted, medial load rates were greater.

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**2772  May 31 1:15 PM - 1:30 PM**

**Foot Contact Identification Using A Tibial Mounted Accelerometer During Running**

Kevin Aubol, Jillian L. Hawkins, Clare E. Milner, FACSM. Drexel University, Philadelphia, PA. (Sponsor: Clare Milner, FACSM)

Email: kga43@drexel.edu

(No relevant relationships reported)

It is often necessary to identify 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; 170 ± 0.08 m; 68.5 ± 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 resultant acceleration identified foot contact 2.1 ± 5.4 ms earlier than ground reaction force. The 95% limits of agreement 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

### Table 1. Mean (SD) comparison of kinematic and kinetic variables between FFS-M and FFS-C

<table>
<thead>
<tr>
<th>Variable</th>
<th>FFS-M</th>
<th>FFS-C</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot PF at initial contact (°)</td>
<td>-3.41 (2.4)</td>
<td>-8.94 (3.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Ankle PF at initial contact (°)</td>
<td>-6.05 (4.1)</td>
<td>-15.3 (5.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Peak ankle DF velocity (%)</td>
<td>444 (90.0)</td>
<td>579 (87.1)</td>
<td>0.004</td>
</tr>
<tr>
<td>Foot INV at initial contact (°)</td>
<td>16.7 (4.6)</td>
<td>16.0 (5.7)</td>
<td>0.861</td>
</tr>
<tr>
<td>Ankle INV at initial contact (°)</td>
<td>12.5 (4.5)</td>
<td>12.9 (5.5)</td>
<td>0.976</td>
</tr>
<tr>
<td>Peak ankle EV velocity (%)</td>
<td>-333 (86.7)</td>
<td>-465 (124.0)</td>
<td>0.012</td>
</tr>
<tr>
<td>Peak posterior load rate (BW/s)</td>
<td>15.5 (5.7)</td>
<td>26.5 (10.8)</td>
<td>0.022</td>
</tr>
<tr>
<td>Peak medial load rate (BW/s)</td>
<td>7.12 (2.5)</td>
<td>9.51 (2.7)</td>
<td>0.055</td>
</tr>
<tr>
<td>Peak resultant load rate (BW/s)</td>
<td>55.7 (12.0)</td>
<td>66.4 (17.8)</td>
<td>0.114</td>
</tr>
</tbody>
</table>
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 if 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 headset. 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 ± 2.4 cm/s) and approximate entropy (p = 0.1, Baseline = 0.13 ± 0.06, RPS = 0.10 ± 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).

**Gluteus Medius Activation During Gait Is Altered With Chronic Ankle Instability: An Ultrasound Imaging Study**

Alexandra F. DeJong1, L. Colby Mangum2, Jay Hertel, FACSM1. 1University of Virginia, Charlottesville, VA. 2University of Central Florida, Orlando, FL. (Sponsor: Jay Hertel, FACSM) Email: afdejong@virginia.edu (No relevant relationships reported)

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**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.

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**The Effects of Shock Pad and Synthetic Turf on Ankle Biomechanics in a 90° Cutting Movement**

Songning Zhang, FACSIM1, Thomas Elvidge1, Kevin Valenzuela1. The University of Tennessee, Knoxville, TN. 2California State University, Long Beach, CA.

Email: szhang@utk.edu (No relevant relationships reported)

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Songning Zhang, FACSIM1, Thomas Elvidge1, Kevin Valenzuela1. The University of Tennessee, Knoxville, TN. 2California State University, Long Beach, CA.

Email: szhang@utk.edu (No relevant relationships reported)

Shock pad (PAD) is a popular choice underlay used within a synthetic turf (TURF) field. The effects of PAD on impact attenuation and injury risks of human movements are still relatively unknown.

**PURPOSE:** To examine impact attenuation related ankle biomechanical characteristics of a 90° cutting movement on synthetic turf with shock pad compared to synthetic turf only.

**METHODS:** Twelve recreational football and soccer players performed five successful trials of 90° cutting movement in each of two approaching speed conditions: 3.0±0.3 (SLOW) and 4.0±0.4 (FAST) m/s on each of TURF and PAD surface conditions. Three-dimensional kinematic and ground reaction force (GRF) data were collected simultaneously. A 2° monofilament synthetic turf with 1.5" stitch gauge was used in TURF and PAD conditions. A foam-based shock pad was used in PAD condition.

**RESULTS:** No significant surface main effect or surface by speed interactions were found for any ankle kinematic and kinetic variables and peak GRFs (p > 0.05). Increased peak ankle eversion moment (0.65 vs. 0.84 Nm/kg, p<0.001) and inversion loading range of motion (ROM, 13.7 vs. 18.6 deg, p<0.001) were seen in FAST compared to SLOW. Increases for peak ankle sagittal-plane concentric pushoff power, and frontal-plane eccentric and concentric power were also observed in FAST compared to SLOW. Peak vertical (2.04 vs. 2.31 BW, p<0.023) and medial loading (0.79 vs. 1.11 BW, p<0.002) GRFs were higher in FAST than SLOW. Additionally, peak pushoff medial GRFs were increased from SLOW to FAST (0.91 vs. 1.20 BW, p<0.025), but pushoff vertical GRFs were decreased slightly (2.24 vs. 2.11 BW, p<0.011).

**CONCLUSIONS:** The lack of significant differences between TURF and PAD and their interactions for examined ankle and GRF variables suggest that adding a form-based shock pad does not impede cutting performance. These results also seem to indicate there is a neuromuscular accommodation in cutting mechanics on PAD surface, which cannot be reflected loading variables using inverse dynamics. As cutting speed increased, greater increases in medial peak GRFs, and frontal-plane peak ankle moment and ROM were observed compared to those in sagittal-plane, suggesting increased mediolateral loading to ankle complex in fast cut movement.

Supported in part by Brock International.

**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 Moors1, Branden Ziebell1, Jared Hornsby1, Will Peveler1, Jeff Simpson1, David Titcomb1, Andy Bosak1. Liberty University, Lynchburg, VA. University 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 (COPDisps) vs no ankle taping (NT) COPDisps, 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, BP%, ~ 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 and post- fatigue with eyes closed (EC) and open (EO) trials. Significant differences for COPDisps 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 (.137 cm) and AT POST EC (.166 cm) trials in the X direction were significant, p = .041. Significant differences also occurred when AT PRE EO (.133 cm) and AT POST EO (.175 cm) trials in the X direction, p < .039. No significant differences occurred in the Y direction for AT PRE EC-POST EC trials (p = .507) or AT PRE-POST EO trials (p = .196). No significant differences occurred in all NT PRE-POST EC and EO trials, p > .05.

**CONCLUSIONS:** The current results suggest AT caused an increase in the COPDisps across X direction, while there was no difference in the Y direction. Future studies may seek to determine the effects of AT and the resulting effects during a dynamic balance test.

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**Gluteus Medius Activation During Gait Is Altered With Chronic Ankle Instability: An Ultrasound Imaging Study**

Alexandra F. DeJong1, L. Colby Mangum2, Jay Hertel, FACSM1. 1University of Virginia, Charlottesville, VA. 2University of Central Florida, Orlando, FL. (Sponsor: Jay Hertel, FACSM) Email: afdejong@virginia.edu (No relevant relationships reported)

**Altered gait mechanics are frequently reported in individuals with chronic ankle instability (CAI), and increasing information suggests proximal muscle adaptations occur in this population. Ultrasound imaging (USI) offers a visual means to evaluate muscle activation during movement, and overcomes limitations of electromyography to detect hip muscle activity.**

**PURPOSE:** To identify gluteus maximum (GMAX) and medius (GMD) muscle activation using USI throughout walking gait in individuals with and without CAI.

**METHODS:** A descriptive laboratory study was conducted to evaluate gluteal muscle activation third point walking on 40 total participants during a single session. Twenty young adults with CAI (21.6±2.4 years, 10 males) and 20 healthy participants (21.2±2.8 years, 10 males) walked on a treadmill at a 1.35 m/s while researchers obtained 10-second clips of bilateral USI of the GMAX and GMD. USI clips were reduced to 35 frames consisting of 11-points over five full gait cycles. Muscle thickness values during walking were normalized to quiet bipedal standing USI images to obtain fractional activation ratios (FARs). FARs with 90% confidence intervals (CI) were plotted at 10% interquartiles from 0-100% of the gait cycle to compare groups and limbs. Group mean differences and Cohen’s d effect sizes were used to assess the extent of differences.

**RESULTS:** The CAI group had decreased GMD activation bilaterally from 0-40% of walking gait compared to healthy counterparts with large effect sizes (d: 0.62-0.95). CAI group FARs were below quiet stance levels (FAR<1.0) throughout the entire gait cycle. There were no differences noted between groups or limbs for GMAX measures.

**CONCLUSIONS:** Proximal stabilizing musculature was altered bilaterally in CAI individuals compared to healthy counterparts, which may contribute to movement.
dysfunction through centrally mediated adaptations. Previous studies using electromyography have not detected gluteal muscle alterations in CAI groups during stance phases of gait, however these findings suggest USI was able to detect proximal alterations during walking in this population.

### 2777 May 31 2:30 PM - 2:45 PM

**The Effect Of Persistent Pain Following Ankle Sprain On Lower Extremity Kinematics During Walking**

Kazandra M. Rodriguez1, Stephen C. Cobb2. 1University of Michigan, Ann Arbor, MI. 2University of Wisconsin-Milwaukee, Milwaukee, WI.

Abstract: This study was designed 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; 78.24 ± 25.05 kg) and nine matched uninjured controls (8F, 1M; 53.0 ± 5.79 years; 168.2 ± 0.66 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 first double-limb support, single-limb support, and second 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: Persistent ankle pain was significantly increased in those with persistent ankle pain when compared to controls during overground walking (p<0.05). Persistent ankle pain patients were in an inverted position at initial contact (2.91 ± 4.32°), while controls were in an everted position at initial contact (-3.75 ± 3.25°). No other group differences were noted. CONCLUSIONS: Persistent ankle pain subjects demonstrate significant increases in rearfoot inversion at initial contact when 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.

### 2778 May 31 2:45 PM - 3:00 PM

**Subjects with Chronic Ankle Instability Exhibit Less Loading Absorption After Drop Jump and Drop Landing**

Oscar Achiardi, Tomás Castillo, Jaime Hernández, Josefa Robert, Catalina Sepúlveda. Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile.

Abstract: Chronic Ankle Instability (CAI) is a condition characterized by neuromuscular, range of motion, and postural control deficits that predispose subjects to reinjury. Different kinematic landing strategies have been identified in people with CAI when compared to healthy controls. Whether these adaptations result in similar loading patterns than those without CAI, has not been documented. This knowledge would be of much use for programming physical rehabilitation protocols to prevent the progression of CAI.

**Methods:** To compare ground reaction force (GRF) parameters between subjects with and without CAI, after a drop jump (DJ) and a drop landing (DL). METHODS: After informed consent was obtained, 19 young participants (height 164.8 ± 7.4 cm; body mass 68.1 ± 12.0 Kg) were assessed, classified in a group of subjects with CAI (CAI, n = 14) and a control group (CON, n = 5), according to the recommendations of the International Ankle Consortium. Groups were similar in height, body mass and gender distribution. Each participant performed 5 DJ and 5 DL from a platform of 40 cm height, landing on a force plate recording GRF at a frequency of 100 Hz. The order of all 10 jumps for each subject was determined by an online random generator. The signal corresponding to the vertical GRF was low-pass filtered (4th order Butterworth, 20 Hz), normalized to body weight, and then processed to calculate the maximal GRF (FMax) and the loading rate (LR) from the time of initial contact to when FMax was achieved. Comparison among groups were performed using unpaired t test with normal distributed data; otherwise Mann-Whitney test was used. A p value <0.05 was considered as significant.

**Results:** FMax was larger for CAI after DJ (CAI: 3.35 ± 0.57 N*N^-1 v/s CON: 3.03 ± 0.29 N*N^-1; p<0.01), but was not different from CON after DL (CAI: 3.50 ± 0.27 N*N^-1 v/s CON: 3.39 ± 0.39 N*N^-1; p>0.57). LR was larger for CAI after both DJ (CAI: 25.74 ± 13.26 N*N^-1 v/s CON: 24.54 ± 10.01 N*N^-1; p<0.01) and DL (CAI: 41.33 ± 10.43 N*N^-1 v/s CON: 35.03 ± 5.94 N*N^-1; p<0.01).

**Conclusion:** According to our preliminary results, subjects with CAI exhibit less GRF absorption after dropping from a medium altitude, which might contribute as a risk factor for ankle reinjury. Patients with CAI might benefit from including loading absorption strategies in their rehabilitation protocols.

### 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**


Abstract: 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 with 392 (84%) participants. Multivariate modeling results demonstrated that total scores for symptoms of depression (β = −2.31, p < .01), anxiety (β = −1.35, p < .01), posttraumatic stress disorder (probable PTSD subgroup only; β = −14.55, p < .01), 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 = 8.87, p < .001). Withinsession 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.

### 2781 May 31 1:10 PM - 1:20 PM

**Resilience and Mental Health Screening in Collegiate Athletes**

Vicki Nelson, Franklin Sease, FACSM. Greenville Health System, Greenville, SC.

Abstract: 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 on 35 athletes completing all 6 screening tools. Significant differences in the 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 with 350 athletes (95.5%) completing all 6 screening tools. Significant differences in the mean BRS scores were seen among athletes screening negative vs. positive on 4/5 mental health screening instruments (PHQ-2: 3.08 ± 0.70 v
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 injuries 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" and 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=6; ND disorders: 8.9%, n=35; comborbid 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 comborbid 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 comborbid 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 prescreen should be referred to a mental health professional for further evaluation.

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 large 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±10.4 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” across 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 purgeing (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 (males: 3.4%, n=2; females: 5.2%, n=3; P=0.67). 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 purgeing. In this new and growing population education, prevention, and clinical interventions from qualified healthcare professionals should be accessible.
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 sports 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
Jessica E. Jochum, Lauren Blyly, Kendall Beckstein, Mallory Meyers. University of Indianapolis, Indianapolis, IN. (Sponsor: Amy Jo Sutterluety, FACSM)
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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, 31 from Division II, 23 from Division III, and 22 from the NAIA, (n_males = 54 (52.9%), n_females = 48 (47.1%)). An alpha level of p < .05 was set for statistical significance. The Kruskal-Wallis test was used to compare by division level and the Mann-Whitney U test was used to compare gender and credit hours. The Pearson chi-square test was used to compare gender and hours of sleep.

RESULTS There was not a statistically significant difference in stress, anxiety and depression scores by division levels (DI, DII, DIII and NAIA), p = .965, p = .383, 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 Comparison revealed no statistical difference between collegiate settings. However, female athletes are at greater risk of depression, anxiety, and stress than males.

2843 May 31 2:00 PM - 2:10 PM
Quantification of Ground Reaction Forces for Skilled Versus Recreational Baseball Hitting
Ethan Stewart¹, Megan Smidtbush², Jeffrey Simpson², Adam Knight¹, Harish Chandey¹, Robert Shapiro¹. ¹Mississippi State University, Mississippi State, MS. ²University of West Florida, Pensacola, FL. ³University of Kentucky, Lexington, KY.
Email: ems664@msstate.edu

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 across skill levels.

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 sports 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.

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.
(Note 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 eating disorders (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. Future studies are needed to determine the appropriate questions for screening in the collegiate athlete population.
correlated with max trail hip rotation angle during the swing ($r=0.570$, $p=0.006$). No correlation of peak XF and passive hip rotation measures or hip rotation angles during the swing reached significance set at $p=0.05$. CONCLUSIONS: Findings do not support the use of XF as an indicator of bat speed. The variation in XF values may result from coaching differences or joint mobility compensation patterns. Athletes with limited hip rotation may attempt to compensate through generation of a large XF, possibly increasing the risk of back and oblique abdominis injuries. Clinicians caring for baseball players should screen for trail hip joint rotational mobility limitations.

### 2846  Board #3  May 31 3:15 PM - 5:15 PM

**UCL Stiffness Response to a Moderate Pitching Bout**

Christopher J. Curran, Henry W. Zale, Patrick M. Rider, Anthony S. Kuñas, Zachary J. Domire. *East Carolina University, Greenville, NC.*

Email: curranch15@students.ecu.edu

(No relevant relationships reported)

**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. 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.

### 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.*

Email: dscarborough@mgh.harvard.edu

(Reported Relationships: D.M. Scarborough: Salary; figur8.)

**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 overhead 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.

**Table 1.** Pitcher characteristics and number of curveball kinematic sequences performed per pitcher. *LOP: Level of Play (P: professional, C: collegiate, HS: high school)*

<table>
<thead>
<tr>
<th>ID</th>
<th>LOP</th>
<th>Throwing hand</th>
<th>Ball speed (MPH)</th>
<th># pitch trials</th>
<th># of KS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P</td>
<td>Right</td>
<td>68.64</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>P</td>
<td>Left</td>
<td>71.68</td>
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<td>5</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>Right</td>
<td>59.24</td>
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<td>5</td>
</tr>
<tr>
<td>4</td>
<td>C</td>
<td>Right</td>
<td>65.90</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>C</td>
<td>Right</td>
<td>72.26</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>C</td>
<td>Right</td>
<td>62.36</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>C</td>
<td>Right</td>
<td>63.14</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>C</td>
<td>Right</td>
<td>70.06</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>C</td>
<td>Left</td>
<td>65.62</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>C</td>
<td>Left</td>
<td>66.68</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>HS</td>
<td>Right</td>
<td>64.62</td>
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<td>5</td>
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<tr>
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<td>61.04</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
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<td>HS</td>
<td>Left</td>
<td>57.4</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>14</td>
<td>HS</td>
<td>Left</td>
<td>59.4</td>
<td>3</td>
<td>5</td>
</tr>
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</table>

### 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**

Arnel Aguinaldo¹, Rafael Escamilla, FACSM. *Point Loma Nazarene University, San Diego, CA. ¹California State University Sacramento, Sacramento, CA.*

Email: arnelaguinaldo@pointloma.edu

(No relevant relationships reported)

The flow of mechanical energy of segmental 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 ± 0.49 m, and mass = 86.5 ± 7.4 kg) were biomechanically measured using 3D motion capture after written informed consents were provided by the participants.
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.

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**Table 1:**

<table>
<thead>
<tr>
<th>Group</th>
<th>GIRLoss</th>
<th>GERGain</th>
<th>TRMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>16°±12°</td>
<td>14°±9°</td>
<td>5°±13°</td>
</tr>
<tr>
<td>MUCL-injury</td>
<td>21°±14°</td>
<td>14°±10°</td>
<td>7°±19°</td>
</tr>
</tbody>
</table>

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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, 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° vs. 13°±8°; p=0.001), GIRLoss (14°±9° vs. 10°±9°; p=0.004), and TRMD (7°±13° vs. 3°±9°; p=0.008). For all pitching levels ~60% of subjects in control-group <GIRLoss 18°, compared to ~30% of subjects in control-group <GIRLoss 18°. Skilled pitchers were more efficient than novice throwers at generating and transmitting ground reaction force through the kinetic chain in order to maximize wrist velocity.

**RESULTS:**

- Skilled pitchers demonstrated larger FzPeak (1.61±0.19 vs. 1.34±0.13 N/BW, 16% difference, p<0.01) and higher wrist velocity (18.11±3.94 vs. 15.96±1.04 m/s, 23% difference, p<0.01) compared to novice participants. Furthermore, Fzpeak and wrist velocity were correlated for skilled pitchers only (r=0.47, p<0.01 vs. r=0.18, p=0.1). **CONCLUSIONS:** Skilled pitchers are more efficient than novice throwers at generating and transmitting ground reaction force through the kinetic chain in order to maximize wrist velocity.

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**Table 2:**

<table>
<thead>
<tr>
<th>Pitching Level</th>
<th>GIRLoss</th>
<th>GERGain</th>
<th>TRMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS</td>
<td>16°±12°</td>
<td>14°±9°</td>
<td>5°±13°</td>
</tr>
<tr>
<td>COLL</td>
<td>17°±11°</td>
<td>15°±10°</td>
<td>6°±14°</td>
</tr>
<tr>
<td>PRO</td>
<td>19°±13°</td>
<td>16°±10°</td>
<td>7°±14°</td>
</tr>
</tbody>
</table>

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**Abstracts were prepared by the authors and printed as submitted.**
The Impact of Varying Exercise Protocols on Neurogenesis and Angiogenesis in the Dentate Gyrus

Darrin A. Lenhart, East Stroudsburg University, Seton Hall University, East Stroudsburg, PA. (Sponsor: Shala Davis, FACSM)

Email: dlennhart@esu.edu

Not relevant relationships reported

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 after a six-week training protocol. Twelve college-aged males were randomized into either high intensity interval training (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 (ΔRA VLT=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 (ΔARAVLT=4.40, p=0.011; ΔBDNF=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 implications for pathologies that involve cognitive decline.

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Thematic Poster - Exercise and Neuroscience

Friday, May 31, 2019, 3:15 PM - 5:15 PM
Room: CC-101B

Board #1

May 31 3:15 PM - 5:15 PM
The Impact of Varying Exercise Protocols on Neurogenesis and Angiogenesis in the Dentate Gyrus

Darrin A. Lenhart1,2, Chad A. Witmer3, Shala E. Davis3, Devin Moir4, Christopher Esposito5, Sharhan P perch6, East Stroudsburg University, East Stroudsburg, PA; Seton Hall University, South Orange, NJ

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 after a six-week training protocol. Twelve college-aged males were randomized into either high intensity interval training (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 (ΔRA VLT=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 (ΔARAVLT=4.40, p=0.011; ΔBDNF=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 implications for pathologies that involve cognitive decline.
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 of 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 VO2 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) (r²=0.09, p=0.006). 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.

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/m²; VO2max: 328 ± 7.8 ml/kg/min) 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 Training and Tolerance). RESULTS: Tolerance scores were positively correlated with FS ratings (Preference for Exercise Training and Tolerance) = .02, p = .04). Lower-Tolerance individuals reported lower FS ratings. For ΔTOI, a significant interaction was found between Tolerance group (low-high) and Hemisphere (left-right), F(1, 42) = 12.9, p = .001. CONCLUSION: Tolerance scores were positively correlated with FS ratings above VT (r = .33, p = .04), such that lower-Tolerance individuals reported lower FS ratings. For ΔTOI, a significant interaction was found between Tolerance group (low-high) and Hemisphere (left-right), F(1, 42) = 12.9. Toltence in the right dLPFC was larger for low- vs high-Tolerance individuals (affective responses in non-exercise contexts.

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 orbital cortex and frontopolar area. In addition, there was significant activation of the superior frontal gyrus, middle frontal gyrus, cerebellum VIb, thalamus, caudate, and insula following RS in HS and LS. There were no unique areas of activation in HS following EX, 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 effective response. 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.

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 act as a single functional unit. PURPOSE: To determine the effect of moderate-intensity acute exercise on resting-state DMN functional connectivity (DMN-rsFC) 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]; MN1.2-54) 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 (ΔDMN-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 mm<sup>3</sup>) after exercise compared to rest. TST and SE explained 25% of the variance in exercise-induced ΔDMN-rsFC (β = -0.253, F(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.

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 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. ActiGraph 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 (TSC), 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, 57.9% Hispanic with a mean age of 9.2 ±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), TSC (β=55.145, p<.001), kcals (β=18.04, p<.001), and a reduction in SED (β= -9.21, p<.0001). This equates to an increase of approximately 3 minutes MVPA, 549 steps, 17.6 kcals, and a decrease of 9.4 minutes TMEASD. 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.

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. Subgroups were identified as: low ST, after-school ST<2 hours/day; high ST, after-school ST≥2 hours/ day; low PA, moderate-to-vigorous physical activity (MVPA)<60 minutes/day; high PA, MVPA≥60 minutes/day. 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 (48.23±8.44, increased symptom), followed by those in group 3 (47.10±8.05), group 2 (45.81±7.78), and group 1 (44.17±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 indexes (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.
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 (spearman’s rho=0.38). 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 12.9 (1.86) months, and average participation rate (sd) were 4.3 (2.45) times/week. We observed a negative association between age for onset of walking and participation in MVPA in childhood (β=-0.08, 95%CI=0.10, -0.07) independent of confounders. CONCLUSION: This finding indicate that earlier age for onset of walking may predict PA in childhood. However, while the association may be considered week, 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.

Purpose: Fundamental motor skills (FMS) are the building blocks for physical activity (PA), with higher FMS proficiency associated with increased PA. Time spent in sedentary behaviours (SB) are increasing, and PA levels declining in children leading to higher rates of adult onset lifestyle diseases. This study aims to assess the effectiveness of an 8-week FMS program on FMS, PA and SB in children. We hypothesised that an 8-week supervised FMS program will improve object control and locomotor skills in children aged 3-5 years, and that improvements will be associated with improvements in PA and/or SB. METHODS: Children aged 3-5 years were recruited from a FMS program and child care centres. Children from the FMS program participated in a supervised program aimed at developing FMS through sporting activities and games. This involved one-hour training sessions, once a week for 8 weeks. Children in the control group (CG) continued usual pre-school activities. FMS were assessed using the Test for Gross Motor Skill Development-2 and PA levels using the parent completed Pre-school Physical Activity Questionnaire at baseline, and 8 weeks. An analysis of variance was used to assess between group differences. Simple linear regression was used to identify any relationships between FMS and PA. RESULTS: Forty-six children participated in the study with 24 allocated to the CG (mean age 4.2±0.6 y) and 22 to the intervention group (IG) (mean age 4.3±0.7 y). After 8 weeks of FMS training the children in the IG were significantly better than the CG in the gallop (p=0.04) and strike (p=0.02), as well as locomotor (p=0.01), object control (p=0.01) and gross motor quotient (p=0.007) percentages. In addition, children in the IG spent more time in SB (p=0.04), with the change being inversely and significantly associated with gallop skill performance (r=-0.34, p=0.04) and gross motor quotient (r=-0.35, p=0.03). CONCLUSIONS: An 8-week supervised FMS program is associated with an improvement in locomotor and object control skill proficiency, and improvements are associated with a reduction in time spent in SB. Further research is needed to explore if the improvements made during the program are maintained over time and whether children who attended the program are more likely to remain physically active throughout childhood.

Purpose: To examine whether age for onset of walking predicts PA in infancy. 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 (spearman’s rho=0.38). 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 12.9 (1.86) months, and average participation rate (sd) were 4.3 (2.45) times/week. We observed a negative association between age for onset of walking and participation in MVPA in childhood (β=-0.08, 95%CI=0.10, -0.07) independent of confounders. CONCLUSION: This finding indicate that earlier age for onset of walking may predict PA in childhood. However, while the association may be considered week, 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.

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; 57% 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; 57% 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-cohen) was >0.2, and as NR when d-cohen 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 obesity that participated in the lifestyle intervention programs for improving obesity associated comorbidities in children should include exercise training to improve their hepatic health.

Purpose: To describe, in a representative, statewide sample, South Carolina parents’ perceptions of their children’s PA behaviors. METHODS: Items from the 2013 statewide South Carolina’s Health Assessment Survey pertaining to children’s PA, sport participation, sedentary activity, screen time, recreational time and coordination were analyzed for a total of 711 parent-reported children (342 males, 369 females) ages 5-17 years. Weighted percentages were calculated for the total sample and population subgroups (age, parent education, race, and weight status) and for the children’s health-related PA behaviors items: weighted percent’s ages 5-10 and 11-17 years; parent education: high school & less, and college or more; race: white, black, and other; weight status: below receiving, normal weight, overweight, and obesity. RESULTS: Over half of the sample were reported as being active on ≥ 5 d/wk. Males were reported accumulating ≥ 60 min/d of PA as compared to females (80.5% and 72%). The 5-10-year-old age group reportedly had the highest percentage of accumulating ≥ 60 min/d of PA (90%), choosing PA during leisure time (64%), and a higher percentage (80%) spent >120 min/d engaged in screen time compared to the other age groups. For the total group, those reportedly meeting the guideline were more likely to be active ≥ 5 d/wk (47%), choose PA during recreational time (44%), participate in sports and/or PA classes (52%), spend

Despite known health benefits, most children are not meeting the recommended physical activity (PA) guidelines. Parents play a crucial role in supporting and encouraging their children’s PA and it is essential to understand parents’ perceptions of the factors that may influence their children’s PA. PURPOSE: To describe, in a representative, statewide sample, South Carolina parents’ perceptions of their children’s PA behaviors. METHODS: Items from the 2013 statewide South Carolina’s Health Assessment Survey pertaining to children’s PA, sport participation, sedentary activity, screen time, recreational time and coordination were analyzed for a total of 711 parent-reported children (342 males, 369 females) ages 5-17 years. Weighted percentages were calculated for the total sample and population subgroups (age, parent education, race, and weight status) and for the children’s health-related PA behaviors items: weighted percent’s ages 5-10 and 11-17 years; parent education: high school & less, and college or more; race: white, black, and other; weight status: below receiving, normal weight, overweight, and obesity. RESULTS: Over half of the sample were reported as being active on ≥ 5 d/wk. Males were reported accumulating ≥ 60 min/d of PA as compared to females (80.5% and 72%). The 5-10-year-old age group reportedly had the highest percentage of accumulating ≥ 60 min/d of PA (90%), choosing PA during leisure time (64%), and a higher percentage (80%) spent >120 min/d engaged in screen time compared to the other age groups. For the total group, those reportedly meeting the guideline were more likely to be active ≥ 5 d/wk (47%), choose PA during recreational time (44%), participate in sports and/or PA classes (52%), spend
Association Between Meeting Physical Activity, Sleep, And Dietary Guidelines And Cardiometabolic Risk Factors And Adiposity In Adolescents

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2869 Board #8 May 31 3:15 PM - 5:15 PM

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); resting blood pressure (BP); 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 overweight or obesity (47%), and slightly more were girls (53%). Many met the sleep guideline (50%), but few met the PA (11%) or dietary (3%) guidelines. Most met the PA guideline (50%), and few met the PA and dietary guidelines (10%). There were no associations between meeting guidelines and cardiometabolic risk factors or adiposity in adolescents. 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.

2872 Board #2 May 31 3:15 PM - 5:15 PM

Whey Protein Consumption Before, Rather than Within a Post-Exercise Meal Increases the Postprandial Aminoacidemia

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F-34 Thematic Poster - Protein Metabolism

Friday, May 31, 2019, 3:15 PM - 5:15 PM
Room: CC-102A

Chair: Floris Wardenaar. Arizona State University, Phoenix, AZ

(No relevant relationships reported)

The Association of Protein Intake and Change in Lean Mass During 9-mos. of Resistance Training

Lauren T. Pomey, Felicia L. Steger, Erik A. Willius, Debra K. Sullivan, Jeffery J. Honas, Joseph E. Donnelly, FACSM, Richard A. Washburn, FACSM. 1, University of Kansas Medical Center, Kansas City, KS; 2, National Cancer Institute, Bethesda, MD.

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(No relevant relationships reported)

PURPOSE: The purpose of the study was to assess the association of protein intake with change in lean mass (LM) during a 9-mo. resistance training (RT) protocol.

METHODS: Normal/overweight sedentary, previously untrained young adults (n = 78; age =22 yrs; BMI = 25 kg/m2) completed a 9-mo., supervised efficacy trial (1 or 3 sets RT, 9 exercises, 3 d/wk.); participants were required to complete ≥80% scheduled RT sessions and asked maintain usual ad-libium diets. Body composition (DEXA) and dietary intake (digital photography plus recall) were assessed at baseline, 4.5 and 9 mos. Multiple linear regression models were used to examine the associations between protein intake and changes in LM. Intake variables from the assessment periods were aggregated over the 9-month intervention. Protein intake was examined by using the nutrient residual energy-adjustment method, in which the protein residuals obtained by regressing absolute protein intake on total energy intake are added to mean protein intake and used as the independent variables Models were adjusted for age, sex, race, randomization group, baseline LM, and height. To allow determination of whether the associations were independent of change in overall mass, models were also adjusted for changes in FM.

RESULTS: Participants completed 92 ± 6% 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). Equals of total protein (β=0.01 SE=0.01, p=0.34), animal protein (β=0.02 SE=0.02, p=0.15), vegetable protein (β=0.03 SE=0.04, p=0.44), and isoleucine (β=3.4 SE=1.97, 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.
Dietary protein consumption maximizes the anabolic response during resistance training (RT) by triggering muscle protein synthesis and providing the indispensable amino acids for protein deposition. 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 evidence on 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 (VEG; 26±5 kg; 72.7±7.1 kg, 1.78±0.05 m) and nineteen omnivores (OMN; 26.4±4 kg; 73.3±7.8 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 1.6 g/kg/d of mixed-matched protein groups via supplementing either soy (VEG) or whey (OMN) protein. Leg lean mass (LLM, by DXA) and lower-limb maximal strength (leg-press one-repetition-maximum, by 1RM) 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 VEG (PRE=19.1±2.4 kg; POST=20.3±2.7 kg, ∆%=6.1±3.9 %, p<0.0001) and OMN (PRE=19.1±2.4 kg; POST=20.3±2.7 kg, ∆%=6.1±3.9 %, p<0.0001) by DXA and lower-limb maximal strength (leg-press one repetition-maximum, by 1.7±0.6 m) was increased in both groups via supplementing with (1.5 g; LEU; n=12) or without (1.5 g; n=12) 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-[1-13C]-leucine (by HPLC) and intrinsically L-[1-13C]-phenylalanine labeled milk protein. RESULTS: 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.

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 muscle mass and strength. Consequently, more protein may be required to increase muscle mass and strength. PURPOSE: To determine the effects of nighttime protein supplementation of casein protein (CP) and a placebo (PLA) supplement on next-morning measures of resting metabolic rate (RMR) and appetite in sedentary premenopausal women. METHODS: This study was a randomized crossover double-blind placebo-controlled trial. Seven premenopausal (age: 19.9±1.2 yrs, BMI= 23.1±2.6 kg/m²) women participated. Subjects had body composition (DXA), RMR (indirect calorimetry), and appetite (visual analog scale, VAS) measured. Subjects consumed either CP (35 g, 130 kcal) or PLA (7.2 g, 10 kcal) 30 min prior to bed time on two separate occasions separated by 48-hours. RMR and measures of hunger, desire to eat, and satiety were analyzed using paired T-tests. Significance was accepted at p<0.05. RESULTS: RMR (CP:138±136 mL·min⁻¹·kg⁻¹; PLA:134±159 kcal·day⁻¹) and relative oxygen consumption (CP:3.41±0.44; PLA:3.36±0.38 ml·kg⁻¹·min⁻¹) were not different between CP and PLA. RMR were also no effects of CP and PLA on measures of appetite (Hunger: CP: 3.8±1.3; PLA: 3.8±1.2 cm; Satiety: CP: 4.1±3.3; PLA: 4.7±2.7 cm; Desire to Eat: CP: 3.7±3.3; PLA: 2.8±2.1 cm). CONCLUSION: There were no differences in RMR and measures of appetite between CP and PLA. There is growing evidence that a small snack before sleep (150-200 kcal) is not harmful to metabolism or appetite. This study was supported by Dymatize Nutrition.

Purpose: It has recently been speculated that protein supplementation may further augment physiological adaptations to prolonged endurance exercise training. We assessed the impact of protein supplementation during prolonged endurance exercise training on whole-body oxidative capacity (VO₂max) and exercise performance. METHODS: Sixty recreationally active males (age: 27.6±7 yrs; BMI: 23.8±2.6 kg·m⁻²; VO₂max: 47.6±6 mL·min⁻¹·kg⁻¹) were subjected to 12 weeks of triweekly endurance exercise training. After each session and each night prior to sleep, participants ingested either a protein supplement (PRO; 29 g casein protein) or an isocaloric carbohydrate placebo (PLA). Before and after the 12 weeks of training, VO₂max and endurance exercise performance (~10-km time-trial) were assessed on a cycle ergometer. Muscular endurance (total workload achieved during 30 reciprocal isokinetic contractions) was assessed by isokinetic dynamometry and body composition by DXA. Exercise training was assessed at baseline and during the intervention period. Repeat measures ANOVA was applied to assess whether training adaptations were different between groups. RESULTS: Protein intake increased in PRO (1.2±0.4 to 1.6±0.3 g·kg⁻¹·d⁻¹) but not in PLA (1.3±0.4 to 1.2±0.3 g·kg⁻¹·d⁻¹) (time effect, P<0.001), with no differences between groups (PRO: 48.6±5 to 53.7±1 mL·min⁻¹·kg⁻¹; PLA: 46.5±5 to 51.6 mL·min⁻¹·kg⁻¹; time x treatment interaction, P=0.50). Total time to complete the time-trial was reduced by 14±7% (time effect, P<0.001), with no differences between groups (time x treatment interaction, P=0.15). Muscle endurance increased by 6±7% (time effect, P<0.001), with no differences between groups (time x treatment interaction, P=0.84). Whole body lean mass was unchanged over time (P=0.907). However, leg lean mass showed an increase following endurance exercise training (P<0.001), which tended to be greater in PRO (P=0.50±0.7 kg; PLA: 0.2±0.6 kg; time x treatment interaction, P=0.073). CONCLUSION: Protein supplementation after exercise and before sleep does not further augment the gains in whole-body oxidative capacity and exercise performance following prolonged endurance exercise training in healthy, young males.
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 (RDA) is believed to optimally facilitate resistance training adaptations; however, the suitability of consuming these protein amounts for middle-aged adults remains unclear.

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>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>
<td>16.2 ± 1.4</td>
<td>17.2 ± 1.4*</td>
<td>18.1 ± 1.4</td>
<td>18.8 ± 1.4*</td>
</tr>
<tr>
<td><strong>One Repetition Maximum (kg)</strong></td>
<td>Leg Press</td>
<td>100.8 ± 9.0</td>
<td>151.1 ± 18.8*</td>
<td>100.5 ± 10.1</td>
</tr>
<tr>
<td></td>
<td>Leg Curl</td>
<td>57.1 ± 4.5</td>
<td>72.5 ± 6.5*</td>
<td>65.6 ± 6.04</td>
</tr>
<tr>
<td></td>
<td>Leg Extension</td>
<td>63.3 ± 5.0</td>
<td>94.4 ± 10.3*</td>
<td>66.1 ± 5.4</td>
</tr>
<tr>
<td></td>
<td>Chest Press</td>
<td>39.6 ± 5.4</td>
<td>48.4 ± 6.2*</td>
<td>41.4 ± 5.5</td>
</tr>
<tr>
<td></td>
<td>Shoulder Press</td>
<td>16.9 ± 3.17</td>
<td>25.3 ± 3.9*</td>
<td>16.7 ± 2.3</td>
</tr>
<tr>
<td></td>
<td>Seated Row</td>
<td>41.5 ± 4.2</td>
<td>53.6 ± 4.3*</td>
<td>46.2 ± 5.1</td>
</tr>
<tr>
<td></td>
<td>Bicep Curls</td>
<td>16.4 ± 1.3</td>
<td>22.1 ± 2.2*</td>
<td>19.6 ± 2.1</td>
</tr>
</tbody>
</table>

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 ARE 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±8% and 83.5±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</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; *p &lt; 0.001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**2881** Board #3  May 31 3:15 PM - 5:15 PM

**Reactive Strength And Leg Stiffness Correlates Running Economy In Well-Trained Long Distance Runners**

Fei Li, YUE SHI, Haiyong Ding. ShangHai University of Sport, ShangHai, China.

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**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 height (CMJ), drop jump height (DJ), reactive strength index (RSI) and RE.

**Methods:** Twenty-eight male long-distance runners (23.1±3.8 years; BMI:20.5±2.6 kg·m⁻²; VO₂max: 66.4±7.0 ml·kg⁻¹·min⁻¹) were participated in this study. Each subject performed two-day test including 12, 14 and 16km h⁻¹ RE test, 1RM back squat test, CMJ and DJ test on the first day, and performed leg stiffness measurement using two-dimensional (2D) motion capture experiments on the second day. The data were analyzed using Pearson correlation coefficients.

**Results:** A statistically significant negative correlation was found between DJ and 16km h⁻¹ RE (r=-0.67, p<0.01). RSI was related to RE at 14 and 16km h⁻¹ speeds (r=−0.72 and -0.76, p<0.01, respectively). In addition, there were a significant negative correlations (r=-0.81 and -0.84, p<0.01, respectively) observed between leg stiffness and RE at 14 and 16km h⁻¹ speeds. There were no significant correlations between relative maximal strength, CMJ and RE.

**Conclusions:** The present data highlight that reactive strength and leg stiffness maybe most important neuromuscular factors related to the better RE. Strength training such as heavy resistance training and plyometric exercises should be considered a component to neuromuscular function for developing RE in long-distance runners.

**2882** Board #4  May 31 3:15 PM - 5:15 PM

**Cardiometabolic and Perceptual Responses to Maximal Exercise: Comparing Graded Walking to Ungraded Running**

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**No relevant relationships reported**

Graded exercise testing for determination of aerobic capacity can be conducted in numerous ways with treadmill testing representing the primary modality. Achieving maximal effort on a treadmill can be accomplished by increasing speed and/or grade. Research to date comparing graded walking maximal tests to ungraded running tests is limited. **PURPOSE:** Compare the cardiometabolic responses to two treadmill-based maximal tests, namely graded walking and ungraded running. METHODS: 20 healthy participants (11 females, 9 males; mean BMI = 25; mean age = 24) completed two counterbalanced cardiometabolic exercise tests. The WALK trial started with a brisk and comfortable walking speed and increased grade by 2% every minute until exhaustion and the RUN trial started with a comfortable walking speed and increased by 0.5 mph every minute until exhaustion.Expired gases, HR, overall RPE (RPE-O), and legs only RPE (RPE-L) were assessed during the test. RESULTS: Data was analyzed using dependent t-tests. The RUN and WALK trials produced similar maximal values for RPE-O, RPE-L, and VO2 (all p-values > 0.05; all ES values < 0.2), though HR was significantly higher in the RUN trial (p < 0.05; ES = 0.4), and RER was significantly higher in the WALK trial (p < 0.01; ES = 0.8). **CONCLUSIONS:**

Maximal aerobic capacity (VO₂max) and running economy (RE) are markers of running performance. A valid evaluation of RE may occur through allometric scaling of body mass (alvo₂, kg·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, and RE, 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 <3:00 males, <3:30 females; five females) completed treadmill marathon-intensity-effort (MIE) and VO₂max tests at 10 and 1-2 weeks 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 20.8±2.0% to 20.2±2.0%. 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 alvo₂ (r = -0.779, p = 0.039) but not with %VO₂max (r = 0.071, p = 0.867). CONCLUSIONS: Experienced competitive runners may increase VO₂max and decrease %BF after a marathon-specific training cycle. The decrease in %VO₂max in a MIE is likely due to a higher VO₂max, as other measures of RE did not change significantly. In this cohort, alvo₂ was negatively related to race performance.

**2883** Board #5  May 31 3:15 PM - 5:15 PM

**Effects of Marathon Training on Maximal Aerobic Capacity and Running Economy in Experienced Marathon Runners**

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(Sponsor: Eric M. Snyder, FACSM)

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**No relevant relationships reported**

Findings indicate that both walk-based and run-based exercise tests produce similar perceptual responses that indicate maximal effort, and similar VO₂max values despite very different approaches to creating intense work. The observed difference in HR suggests that a run-based maximal exercise test produces a greater cardiovascular response, while the higher RER value within the walk-based maximal exercise test suggests greater metabolic acidosis. Results support treadmill exercise testing as a flexible multiple assessment modality.

**2884** Board #6  May 31 3:15 PM - 5:15 PM

**The Influence of AlterG Treadmill Training on Cardiorespiratory Performance in Cross Country Runners**

Tracy A. Dierks1, Trent E. Cayot2, Vincent C. Nittoli2, Todd W. Arnold2, Joseph Stimler1. Indiana University, Indianapolis, IN. 1University of Indianapolis, Indianapolis, IN. 2University of Indianapolis, Indianapolis, IN. (Sponsor: Robyn Fuchs, FACSM)

Email: tdierks@iu.edu

**No relevant relationships reported**

Running on an AlterG® Treadmill (AGT) at reduced bodyweight allows runners to aerobically train with reduced orthopedic stress. However, to maintain the training stimulus, the speed must be increased if heart rate (HR) response is to match overground running. This allows one to run at faster speeds for longer durations, without increasing impact forces or HR intensity beyond typical training. Yet it is unknown how this speed intensity chronically influences cardiorespiratory performance. **PURPOSE:** Investigate the effect of an AGT training program on cardiorespiratory performance. METHODS: As an offfseason supplement, 19 healthy unjured high school boy cross country runners replaced 2 overground running sessions/week for 6 weeks with AGT runs at 80-85% of bodyweight. Speed was increased to elicit a HR intensity and distance/time consistent with each runner’s mile pace for that day. Pulmonary gas exchange and HR data were collected during treadmill graded exercise tests (GXT) at pre and post AGT training program. Paired t-test were used to assess pre-post changes in cardiorespiratory and HR variables from the GXT (p<0.05). RESULTS: The mean speed of AGT runs was 9.0 ± 0.5 mph at a mean distance of 4.2 ± 0.6 miles. The mean of the fastest speed for each runner was 9.8 ± 0.6 mph (range 8.6-11.4) at a mean run time of 27.6 ± 8.4 min. (range 16-40 minutes). HR [180 ± 9 vs. 167 ± 10 bpm] significantly decreased while oxygen uptake remained unchanged [46.6 ± 3.6 vs. 47.0 ± 3.2 ml·kg⁻¹·min⁻¹] at the anaeorobic threshold (AT) post AGT training. However, peak oxygen uptake [60.8 ± 6.4 vs. 62.7 ± 5.0 ml/ kg·min], peak minute ventilation [124.7 ± 22.6 vs. 132.2 ± 24.9 L/min], and peak respiratory frequency [61 ± 10 vs. 64 ± 11 breaths/min] significantly improved post AGT training, while peak HR remained unchanged [196 ± 20 vs. 192 ± 12 bpm]. **CONCLUSION:** AGT training with reduced bodyweight at faster speeds had little influence on cardiorespiratory performance variables occurring at lower levels of

Abstracts were prepared by the authors and printed as submitted.
intensity (AT). However, all peak cardiopulmonary performance variables at higher levels of intensity improved, likely due to training at faster than normal speeds. This was achieved by trained runners by allowing training to occur with reduced orthopedic loading at typical HR intensities, and yet still concurrently improve peak cardiopulmonary 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. Coury, Monica O’Rourke. California Baptist University, Riverside, CA.

Email: keith@questspeed.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, & Eggett, 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. The purpose of this study was to identify an appropriate correction factor to improve iso-efficient TMV identification during inclined running in trained runners. **Methods:** 11 collegiate distance runners (7 male, 4 female; 63.2±9.5 kg; 174.8±7.5 cm; 64.6±6.5 m/$\text{kg}/\text{min}$) completed three 4-min treadmill runs at 0%, 4%, and 8% incline with a 4 min recovery period between runs. Expired gases were collected during the final minute of each run to determine relative VO$_2$. Actual TMV at 0% was inserted into the ACSM running equation to determine predicted VO$_2$ for the 0% run [VO$_2$ (Sx0.2)+(SxGx0.9)+3.5]. That value was then divided by the actual VO$_2$ measured at 0% to develop a correction factor. TMV for the 4% and 8% trials was determined by inserting the measured 0% VO$_2$ value into the ACSM equation [S=(VO$_2$-3.5)(0.2+0.9G)] and multiplying the resultant velocity by the correction factor to maintain iso-efficiency. Differences within 0%, 4%, and 8% values were assessed using a paired sample t-test, while a one-way ANOVA compared VO$_2$ values between grades (p<0.05).

**Results:** Actual VO$_2$ at 0% grade was 15% lower than predicted by the ACSM equation (5.2±2.7 vs. 4.6±2.9 m/$\text{kg}/\text{min}$), resulting in a correction factor of 1.2±0.1. Predicted TMV at 4% (183.6±21 m/min) and 8% (159.3±18.3 m/min) was 18% lower (p<0.05) than the corrected velocities for each grade (216.9±22 and 188.2±14.4 m/min). VO$_2$ values for each grade were 46.8±5.4, 46.3±4.8, and 48.0±4.9 m/$\text{kg}/\text{min}$, respectively, with the 8% VO$_2$ being greater than 4% (p<0.05).

**Conclusion:** The ACSM running equation may underestimate TMV when attempting to maintain metabolic iso-efficiency during incline running. These data suggest that application of a correction factor to the TMV derived from the ACSM equation may provide a closer approximation of TMV to maintain iso-efficiency during incline running.

**F-36** Free Communication/Slide - Energy Balance-Weight Control

Friday, May 31, 2019, 3:15 PM - 5:15 PM

Room: CC-105A

**2887** Chair: Edward L. Melanson, FACSM. University of Colorado Denver, Denver, CO.

(No relevant relationships reported)

**PURPOSE:** The objective of this study was to identify the impact of exercise training on eating behaviors, as measured by the behavioral assessment tools developed by the University of California, San Francisco. The study was designed to test the hypothesis that exercise training impacts eating behaviors, specifically through a reduction in overeating and emotional eating.

**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 at random times).

**RESULTS:** 39 participants (EX: n=19, CON: n=20) completed the study (age: 28.8±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: -1.1±3.5% vs. CON: -0.2±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: p<0.005, SE=0.02, 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±2.3, p=0.02).

**CONCLUSIONS:** Exercise could potentially be a valuable intervention for reducing overeating and emotional eating, as both conditions have been associated with weight gain and obesity.
training reduced the likelihood of overeating, and eating in response to emotional or cognitive cues, in women who self-identified as stress eaters. Thus, this may be one pathway by which exercise impacts body weight.

2889
May 31 3:30 PM - 3:45 PM
Compensatory Reduction in Non-Exercise Energy Expenditure Among Weight-Stable Overweight and Obese Adults
Gregory A. Hand, FACSM,1 Daniel P. O’Connor, FACSM,1 Robin P. Shook,2 Stephanie Burgess3,1 Steven N. Blair, FACSM,1 1West Virginia University, Morgantown, WV. 2University of Houston, Houston, TX. 3Children’s Mercy, Kansas City, MO. 4University of South Carolina, Columbia, SC.

PURPOSE: Increasing daily total energy expenditure is a critical component of weight management strategy. There is disagreement as to a potential compensatory reduction in non-exercise energy expenditure that could blunt the anticipated increase in total daily energy expenditure (TDEE) resulting from exercise participation. The purpose of the present study was to examine the effect of varying doses of exercise energy expenditure (EEex) on TDEE and non-exercise energy expenditure when body weight is maintained. METHODS: Seventy healthy, overweight or obese, young adult women and men participated in a 26-week intervention based on the individual daily EEex, participants were stratified into tertiles (T1, T2, T3) of increasing EEex. Paired sample t-tests determined significant within-tertile differences between pre/post data for each variable. Linear regression models, adjusted for age, sex and race, determined the significance of changes over time in selected variables. RESULTS: Average daily EEex was different among tertiles (39.9±9.7, 17.5±8.8, 28.2±9.8 kcal, respectively; p<0.001). No main effect of tertile was found for change in sedentary activity EE (p=0.228), moderate/vigorous EE (p=0.698), or TDEE (p=0.762). A negative main effect of tertile was found for a change in light activity EE (p=0.016) and for non-exercise energy expenditure (p=0.012), with a greater decrease in non-exercise energy expenditure in T3 (p=0.09). CONCLUSION: These data indicate that, when body weight is maintained, participation in the exercise program resulted in a compensatory reduction in light and non-exercise moderate/vigorous energy expenditure, as well as a less-than-expected increase in TDEE. These findings suggest that maintenance of non-exercise energy expenditure is critical for correctly estimating the caloric deficit anticipated from participation in exercise as part of a weight loss program. Supported by an unrestricted grant from the Coca Cola Company.

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. Participants were placed on natural/spontaneous bodily movements (i.e. fidgeting) to reveal the fundamental contrast between sitting and standing whilst maintaining a comfortable posture. METHODS: Metabolic requirements were quantified via indirect calorimetry from expired gases in 46 healthy men and women (age 27±12 y, mass 79.3±14.7 kg, body mass index 24.7±3.1 kg·m⁻², waist:hip 0.81±0.06) under basal conditions (i.e. resting metabolic rate; RMR) and then, in a randomized and counterbalanced sequence, during lying, sitting and standing. Critically, no restrictions were placed on natural/spontaneous bodily movements (i.e. fidgeting) to reveal the fundamental contrast between sitting and standing in situ whilst maintaining a comfortable posture. RESULTS: The mean [95% CI] increment in energy expenditure was 0.18 [0.06 to 0.31] kJ·min⁻¹ from RMR to lying, 0.15 [0.03 to 0.27] kJ·min⁻¹ from lying to sitting and 0.65 [0.53 to 0.77] kJ·min⁻¹ from sitting to standing. The observed energy cost of each posture above basal metabolic requirements exhibited marked inter-individual variance, which was inversely correlated with resting heart rate for all postures (r=0.5 [0.7 to 0.1]) and positively correlated with self-reported physical activity levels for lying (r=0.4 [0.1 to 0.7]) and standing (r=0.6 [0.3 to 0.8]). CONCLUSION: Intervention designed to reduce sitting typically encourage 30-60 min of more standing in situ (rather than perambulation), so the 12% difference from sitting to standing reported here does not represent an effective strategy for the treatment of obesity but may have a role in primary prevention by maintaining long-term energy balance.

Visceral adipose tissue (VAT) is considered to have biochemical characteristics that influence several pathophysiological processes of the body and high levels are associated with increased risk for metabolic syndrome, cardiovascular disease, and certain cancers. There is data to suggest that supervised aerobic exercise may reduce VAT in the absence of calorie restriction. PURPOSE: To examine whether VAT is reduced within the context of a comprehensive weight management program, varied by prescribed levels of home-based moderate-to-vigorous physical activity (MVPA) in adults who were overweight or obese across 12 months. METHODS: Data were examined from sedentary adults (N=309; BMI: 32.3±3.8 kg·m⁻²; age=45.1±17.9 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...
no difference between groups. VAT decreased across time (Baseline: 1518±907 cm³, 6-month: 1018±617 cm³, 12-month: 971±684 cm³; p<0.001) with no difference between groups.

CONCLUSIONS: The interventions were successful at reducing body weight and improving body composition in adults with obesity. The lack of additional weight loss, reductions in body composition and VAT with participation in MVPa at two different doses may suggest that there is a compensatory response in factors influencing energy balance that warrant further investigation. Supported by: NIH (R01 HL103646)

METHODS: Participants (N=270; age=45±3.7 kg/m²) 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)

PURPOSE: To establish the effects of a diet combining intermittent fasting (IMF) 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/m²) were randomised to one of three conditions for 20 days: 1) daily calorie restriction (75:75; 75% of habitual intake daily), 2) IMF with calorie restriction (0:150; alternating 24-h periods of fasting and feeding to 150% of habitual intake), 3) IMF without calorie restriction (0:200; alternating 24-h periods of fasting and feeding to 200% of habitual intake). In the IMF groups, transitions from feeding to fasting 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: -962±904 kcal/d, 0:150 = -410±707 kcal/d, 0:200 = +247±594 kcal/d; p=0.07) but was unaffected by 75:75 v 0:150, p=0.01 75:75 v 0:200, p=0.04 0:150 v 0:200). However, the decrease in body mass (75:75 = -1.9±1.0 kg, 0:150 = -1.6±1.1 kg, 0:200 = -0.5±1.1 kg; p=0.46) was similar in all groups. Energy expenditure decreased following 0:150 when compared to 0:200 (-63±1439 kcal/d; p<0.01 v 75:75, p<0.01 v 0:150), a pattern mirrored by changes in resting energy expenditure (-3275±2039 kcal/d; p=0.01 v 0:150). Consequently, the changes in energy expenditure and body mass were significantly correlated (r=0.79, p<0.001).

CONCLUSIONS: The addition of 0:150 IMF to energy restriction resulted in significant weight loss, reduced energy expenditure, and improved the metabolic profile. Therefore, IMF may be a suitable addition to an energy restricted diet. Supported by: NIH (R01 HL103646).

Impact of Intermittent Fasting on Energy Balance and Associated Health Outcomes in Lean Adults

Iain Templeman1, Sue Reeves2, Jean-Philippe Wallin1, Harry Smith1, Harriet Carroll1, Peter J. Rogers2, Jeffrey M. Brunstrom3, Leonidas G. Karagounis2, Kostas Tsinzas2, Dylan Thompson2, Javier Gonzalez2, James A. Betts2, FACSIM2, University of Bath, Bath, United Kingdom. 2University of Roehampton, London, United Kingdom. 3University of Bristol, Bristol, United Kingdom. 4University of St Mark and St John, Plymouth, United Kingdom. 5University of Nottingham, Nottingham, United Kingdom. (Sponsor: Dr James A Betts, FACSIM)

No relevant relationships reported

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, FACSIM. University of Pittsburgh, Pittsburgh, PA. (Sponsor: John Jakicic, FACSIM)

No relevant relationships reported

May 31 4:45 PM - 5:00 PM

Reductions in Energy Expenditure After Aerobic and Resistance Exercise in Resistance-trained Males

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No relevant relationships reported

May 31 5:00 PM - 5:15 PM
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 ± 5.6 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 4 (2 x 5 s) reps with 30 s intra-set rest and 90 s 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, set 5 (± 5 s), 15 (± 15 s), 30 (± 30 s), and 60 (± 60) min post-exercise and analyzed for interleukin (IL)-β, IL-2, IL-6, IL-8, IL-10, and IL-15. Data were analyzed using repeated measures ANOVAs (2 x 9). RESULTS: Significant main effect time (p<0.05) was found for IL-1β, IL-8, IL-10, and IL-15. Concentration of IL-1β was smaller at 10.2 ± 1.0 (pre) compared to 15.5 ± 1.2 (post, p<0.05). IL-2 was greater after set 1 (10.8 ± 1.0 ng/mL), and set 2 (11.0 ± 1.2) compared to PRE (10.2 ± 1.0), and smaller at 30 (9.9 ± 0.3) compared to PRE (11.0 ± 1.0). IL-8 was greater after set 1 (8.4 ± 0.6 ng/mL), set 2 (8.6 ± 0.7), and set 3 (8.5 ± 0.7) compared to PRE (8.0 ± 0.6). IL-10 was smaller at 30 (31.3 ± 7.4 ng/mL) compared to PRE (34.0 ± 7.4), and also smaller at 15 (32.6 ± 7.9) +30 (31.7 ± 7.4) and +60 (33.4 ± 8.6) compared to IP (38.0 ± 8.6). IL-15 was greater at IP (15.5 ± 4.0 ng/mL) compared to PRE (13.4 ± 3.5), and smaller at PRE (13.4 ± 3.5), +30 (11.9 ± 3.3), and +60 (11.6 ± 3.2) compared to IP (15.5 ± 4.0). No correlation was observed between TNFα PRE-60 and TNFα PRE-90 with changes in cytokine concentration. Time spent above critical TcS was calculated for TS and CS. Data were analyzed as Pearson Product Moment Correlations between AUC for IL-1β, IL-15 and TNFα with changes in cytokine concentration. Time spent above specific critical temperatures for TS and CS were 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 TS and CS. PRE-60 (r=0.576; p<0.001; r=0.575; p=0.001; respectively) and CS (r=0.651; p=0.001, r=0.516; p<0.001, respectively) but not TS. Time spent with TS 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 TS (r=0.593, p<0.001). Time spent with TS above 38.5°C was correlated to, but not predictive of increases seen in TNFα from PRE to 60 and PRE to 90 (p=0.030, p=0.020). Time spent above 38.5°C for CS displayed significant correlations with increases seen in IL-6 PRE-60 (r=0.479, 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 TcS of 33.5°C and 35°C. Increases in IL-6 appear to be related to time spent above TcS of 38.5°C.
A Single High-Intensity Exercise Bout Reduces Tumour Hypoxia in Mice.

Simon Lønbro1,2, Pernille Byralsen Elming1, Thomas Wittenborn1, Michael R. Horsman1, Aarhus University, Aarhus C, Denmark. 1Aarhus University Hospital, Aarhus C, Denmark. 2Aarhus University, Aarhus C, Denmark. 1Aarhus University, Aarhus C, Denmark. 2Aarhus University Hospital, Aarhus C, Denmark. Email: loenbro@oncology.au.dk (No relevant relationships reported)

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.

METHODS: Female CDF1 mice were injected with the C3H mammary carcinoma in the mammary fat pad and allocated to either a Control group (no exercise) or a group performing low (6 m/min), moderate (12 m/min) or high intensity (18 m/min) treadmill running for 30 minutes (n=11/group). Prior to running, all mice were injected with Pimonidazole and immediately after exercise injected with Hoechst 33342 to analyze the Hoescht 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 this exercise regime on tumor radiation response.

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Supported by: New Faculty Start-up Funds.
F-38  Clinical Case Slide - Rehabilitation 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 Pettrizzo¹, Jeremy Koppel², Erica Christen², Inna Koppel², Robert M. Otto, FACSM³, John Wygand, FACSM³.¹ isbn: Adelphi University, Garden City, NY. ²Feinstein Institute for Medical Research, Manhasset, NY. (Sponsor: Robert M. Otto, FACSM) Email: jpettrizzo@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, Levothyraxine for her hypothyroidism, Latanoprost for her glaucoma as well as Laxis 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, showed that she was unable to transfer from sit-to-stand without the use of her upper extremities. The subject reported sleeping, on average, less than 5 hours per night.

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 10/12.

HISTORY: 65 year old male underwent an initial medial unicompartmental knee arthroplasty and physical therapy manual therapy and exercise. The patient had 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 plate 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.

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)


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 neoplasia. 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 increases with peak RPE of 15/20 although physically he 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 60.30 minutes. RER reached 1 at 13.15 mins. Ventilatory equivalent was high, and occurred early - implying early anaerobic dependent metabolism, likely from compromised aerobic energy system. Liver dysfunction with effects on glycojenolysis and gluconeogenesis unknown.

FINAL WORKING DIAGNOSIS: General deconditioning of multiple eitologies 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 Pettrizzo. Adelphi University, Garden City, NY. (Sponsor: John Wygand, FACSM) Email: maquino@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, neurologic history, prior orthopedic injuries/surgeries, or major cardiac events/surgeries. Her

Abstracts were prepared by the authors and printed as submitted.
A Female 68 yrs old was presented to the exercise rehabilitation clinic with:

Mitochondrial Disease (ragged red muscle fibers, excessive mitochondria)

Osteoporosis

Fatigue

Differential Diagnosis:

Severe cervical kyphosis and mild thoracic kyphosis and anterior pelvic tilt, low muscle strength.

The client attended a community clinical exercise rehabilitation program

Outcomes:

- 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 30 reps, Right arm was 20 reps; Romberg balance test: <3 seconds for each leg, Tandem stance balance test: not possible without 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 stand 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-scores 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 23 year old otherwise healthy male basketball player developed acute onset of sharp right-sided low back pain upon landing after performing a slam dunk. He had no lower extremity radicular pain, focal weakness, or sensory loss; no constitutional symptoms. At first presentation he was diagnosed with mechanical low back pain. The prescribed physical therapy intervention was beneficial however his pain progressed.

He returned to Sports Clinic one year later; the pain had spread to his right gluteal region and was exacerbated by impact exercise. He could no longer play basketball and pain interfered with daily activities.

At first presentation he was diagnosed with mechanical low back pain. The prescribed physical therapy intervention was beneficial however his pain progressed.

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Physical Examination:

On initial examination: tight hip internal and external rotators bilaterally, negative Stinchfield and FABER tests bilaterally, and tenderness to palpation over right lumbar paraspinals with an otherwise normal exam. One year later: strength, sensation, and reflexes remained intact. Focal tenderness over right SIJ. Normal lumbar ROM. FABER and Stinchfield tests reproduced right-sided SI region pain. FADIR and labral scour maneuvers negative.

Differential Diagnosis:

1. Mechanical low back pain
2. Spondylolysis
3. Sacroilitis
4. Femoral acetabular impingement
5. Lateral pathology
6. Avascular necrosis

Tests and Results:

- Pelvic radiographs, 2018: Mild iliac-sided sclerosis and irregularity bilateral SIJs, more prominent on right. No fracture or dislocation.

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:

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 balance test: <3 seconds for each leg, Tandem stance balance test: not possible without tandem stance.

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 stand 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.

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Differential Diagnosis:

Severe cervical kyphosis and mild thoracic kyphosis and anterior pelvic tilt, low muscle strength.

The client attended a community clinical exercise rehabilitation program

Outcomes:

- 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 30 reps, Right arm was 20 reps; Romberg (eyes open): <3 seconds for each leg, Tandem stance balance test: not possible without modification.

Results:

- 30-second Sit to stand test: 6 reps in 30 seconds (100% increase); 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.

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:

- 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.
Differential Diagnosis:

1. Primary osteoporosis
2. Hyperparathyroidism
3. Hypothyroidism
4. Pitiatory dysfunction
5. Multiple myeloma

**Tests 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)
- 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)

**Other Tests:**

- Bone densitometry: L1-L3 t-score -2.2
- BMP: 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)

**Laboratory Tests:**

- TSH, T4, Cortisol, Calcium, Phosphate, Albumin, Creatinine, Glucose, Hemoglobin, ESR, CRP, BMP, PTH, TSH, T4, Cortisol, Calcium, Phosphate, Albumin, Creatinine, Glucose, Hemoglobin, ESR, CRP

**Comments:**

- The patient's pain is managed with a combination of medication and physical therapy. The patient is advised to continue with a regular exercise program to maintain bone density.

**Address:**

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**Funding:**

No relevant relationships reported
Elite Weightlifter With Acute Back Pain

Taoufik Bel Fekih, Nidal Hammad, Louis Holtzhausen, FACSM, Yasin Al Malchadma, Aspetar; Doha, Qatar. (Sponsor: Louis Holtzhausen, FACSM)
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TREATMENT AND OUTCOMES:
1. Referral to rheumatology
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

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 in the low back during back squat training (150 kg), with an episode of numbness and paraesthesia in the right lower limb during the same exercise.

PHYSICAL EXAMINATION: No gait abnormality. No neurological deficit. Straight leg raise test negative. Pain was localized in the right lateral L4/L5 area, with intensity rated 8/10 on a Numerical Pain Scale. The pain was localized in the right lateral L4/L5 area, with intensity rated 8/10 on a Numerical Pain Scale.

Physical examination included:
- Tenderness on palpation of spinous process and L4-L5 facet area on the right side.
- Extension, lateral flexion to the right.
- Para-spinal muscular spasm and a mildly limited ROM in right rotation, lumbar spine extension, lateral flexion to the right.
- Pain-free sacroliliac 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.

DIFFERENTIAL DIAGNOSIS:
- Spondylosis
- Acute deterioration of spondylolisthesis
- Burst fracture
- Intervertebral disc prolapse

LABORATORY TESTS:
- Vitamin D: 37
- CBC: within normal limits
- CRP: 6.8 (normal)
- ESR: 16 (normal)

FINAL WORKING DIAGNOSIS: Spondyloarthrits

TREATMENT AND OUTCOMES:
1. Referral to rheumatology
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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Orlando, Florida
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 cerebrovasculature.

2925 May 31 3:55 PM - 4:05 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.

No relevant relationships reported

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: We tested 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 322 ± 27 µM, respectively)

Abstracts were prepared by the authors and printed as submitted.
Flow-mediated dilatation (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 Kids’ 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: 6.2±3.17mm, p=0.002) and no differences were observed between years 1, 2 and 3 (year 1: 6.2±3.17mm, year 2: 6.2±3.14, year 3: 6.3±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.

**Funding:** CIHR

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**Pilot examination to characterise local cerebrovascular shear stress in children.** Damian M. Bailey1, Takuro Washio2, Kazuya Suzuki3, Shigehiko Ogoh, FACSM.1, University of South Wales, Pontypridd, United Kingdom. 2Toyo University, Kawasaki, Japan. Email: damian.baily@southwales.ac.uk (No relevant relationships reported)

**Purpose:** High-intensity interval training (HIIT) is considered a more time-efficient alternative to moderate-intensity continuous training (MICT) that can optimize metabolic and cardiovascular health though its impact on the cerebrovasculature is unknown.

**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 and 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 (VO2) were recorded continuously photo plethysmography and respiratory gas analysis. **RESULTS:** Exercise-induced increases in HR, MAP and VO2 were comparable between HIIT and MICT and were accompanied by an experienced, progressive decrease 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 local vasoconstriction (ΔHIIT: 7.75 vs. ΔMICT: 3.39 cm.s-1) and corresponding elevation in shear rate (ΔHIIT: 38 vs. ΔMICT: 9 %/sec). **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 vasoconstriction 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).

**Impairments in lower limb microvascular function associated with cycle phases in young healthy women.** Rogerio N. Soares, Anmol T. Mattu, Juan M. Murias. University of Calgary, Calgary, AB, Canada. Email: rogerio.soares@ucalgary.ca (No relevant relationships reported)

**Purpose:** Impairments 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.
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 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 = .096, CMJ: p = .200, AVJ: p = .187, 9C: p = .127). 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 = .000; CMJ: 17.5 vs 18.4, p = .000; AVJ: 21.0 vs 23.1, p = .001) and agility times decreased (9C: 25.3 vs 23.6, p = .000) following the 8-week HIIT-PT 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.

METHODS: Jump (SLJ) and 90° push-up (PU) test to accurately predict changes in lean mass and body mass, and pubertal stage using the Pubertal Development Scale (PDS). RESULTS: A mean change of 2198.82 g of lean mass (range = −1193.60, 7307.70; SD = 1816.67) was shown using DEXA. The SLJ and PU had a mean change of 5.11 cm (range = −36.00, 35.70; SD = 16.40) and 0 repetitions (range = −13.11, SD = 5.30) respectively. Both SLJ (r = 0.340, p = .011) and PU (r = .315, p = .018) had significant moderate relationships to SLJ. The inclusion of SLJ and PU in the model accounted for an additional 8.8% of the variability (R² = .551 to .463) and 4.2% (R² = .593) respectively. The overall model explained 59.3% of the variability in lean mass change and resulted in the following predictive equation: ΔLM = 1237.59 + (-630.44 x age) + (-1693.34 x PDS) + (847.31 x gender) + (33.89 x height) + (199.04 x BMI) + (29.07 x SLJ) + (73.13 x PU). CONCLUSIONS: Along with anthropometric developmental factors, the SLJ and PU tests can be used to estimate changes in lean muscle mass. However, these factors only account for approximately 60% of the change in lean muscle mass leaving the remaining 40% attributable to other (neural, mechanical, motivational) factors. Nevertheless, this prediction equation can assist in monitoring changes in lean muscle mass during adolescence.

RESULTS: With physical training and normal adolescent growth, gains in lean muscle mass can be seen among the healthy adolescent population. As it is already known to be in adults.

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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 14.31 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 with High Risk for BMI, with 90% 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 14.31 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.

### 2960 Board #6 May 31 2:00 PM - 3:30 PM A Comparison Of Health-related Fitness Variables Between Youths In Singapore And Taipei

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(No relevant relationships reported)

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 1559 youths from SGP (age: 13.49 ± 1.21 years, height: 159.76 ± 8.94 cm, weight: 51.91 ± 13.38 kg, Body Fat (BF) %: 21.51 ± 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 percentages of youths from TP were in the normal (TP: 54.88%, SGP: 46.89%) and overweight (TP: 12.70%, SGP: 12.07%) BMI range, while there was a higher percentage of underweight youths in SGP (46.89%) compared to TP (26.98%). 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 ± 13.38 kg, TP: 55.57 ± 13.35 kg, p < 0.0005), BF% (SGP: 21.51 ± 10.25 %, TP: 23.29 ± 10.30 %, p < 0.0005), SRT (SGP: 159.76 ± 8.94 cm, TP: 160.89 ± 7.86 cm, p < 0.0005), and PACER (SGP: 40.93 ± 23.90 laps, TP: 37.75 ± 18.86 laps, p < 0.0005). No significant difference was found in HS between youths in both countries (SGP: 51.91 ± 13.38 kg, TP: 55.57 ± 13.35 kg, BMI (SGP: 20.19 ± 4.21 kg/m², TP: 21.35 ± 4.82 kg/m², p < 0.0005), BF% (SGP: 21.51 ± 10.25 %, TP: 23.29 ± 10.30 %, p < 0.0005), SRT (SGP: 159.76 ± 8.94 cm, TP: 160.89 ± 7.86 cm, p < 0.0005), and PACER (SGP: 40.93 ± 23.90 laps, TP: 37.75 ± 18.86 laps, p < 0.0005). No significant difference was found in HS between youths in both countries (SGP: 21.51 ± 10.25 %, TP: 23.29 ± 10.30 %, p < 0.0005), SRT (SGP: 159.76 ± 8.94 cm, TP: 160.89 ± 7.86 cm, p < 0.0005), and PACER (SGP: 40.93 ± 23.90 laps, TP: 37.75 ± 18.86 laps, p < 0.0005). 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.

### 2961 Board #7 May 31 2:00 PM - 3:30 PM High Intensity Interval or Moderate Continuous Training in Health Indicators of Adolescents with Central Obesity

Fabricio Boscolo Del Vecchio1, Flávio R. Guilherme1, Wilson Rinaldi2, 1 Federal University of Pelotas, Pelotas, Brazil. 2 State University of Maringá, Maringá, Brazil.

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(No relevant relationships reported)

PURPOSE: To evaluate the effects of HIIT and moderate intensity continuous training (MICT) on health indicators from adolescents with central obesity.

METHODS: This is a randomized clinical trial, with three evaluations: baseline, after 16 weeks of training (3 sessions/week), 34 adolescents finished the program (HIIT, n = 21; MICT, n = 13). The HIIT group performed different models of interval training, progressively organized, and the MICT trained 60 to 80% of HRmax. Anthropometric data (BMI, Waist Circumference [WC], Height Waist Ratio [HWR], Body Fat Percentage [%BF]), cardiorespiratory fitness (CRF), blood pressure (systolic and diastolic) and metabolic profile (fasting blood glucose [FBG], high density lipoproteins [HDL-C], low density lipoproteins [LDL-C], total cholesterol, non-HDL cholesterol and triglycerides [TG]) were analyzed.

RESULTS: Sixteen weeks of aerobic training resulted in significant reductions in BMI (HIIT = -4.5% [ES = -0.26] vs MICT = -3.9% [ES = -0.24]), WC (HIIT = -6.9% [ES = -0.64] vs MICT = -6.6% [ES = -0.61]), HWR (HIIT = -10.5% [ES = -1.00] vs MICT = -5.2% [ES = -0.50]), %BF (HIIT = -14.3% [ES = -0.59] vs MICT = -9.8% [ES = -0.60]), FBG (HIIT = -6.1% [ES = -0.65] vs MICT = -11.1% [ES = -0.89]) and total HDL cholesterol (-17.0% [ES = -0.87], LDL-C (-13.3%, ES = -0.34) and total cholesterol (-11.9%, ES = -0.47), but only MICT changed positively (TG = -23.4%, ES = -0.84). No changes were observed for systolic blood pressure and HDL-C. No differences were found in all variables between groups. Relating to inadequacy cases, both groups changed TG (HIIT = 20 vs 11, MICT 13 vs 6), but only HIIT decreased the number of adolescents in inadequacy from CRF and blood pressure (from 14 to 3).

CONCLUSIONS: 16 weeks of HIIT or MICT positively impact anthropometrical variables, metabolic profile and CRF in obese adolescents.
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 for 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 a regression model. 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 557 children with complete raw scores. The results showed the GFI=0.97, CFI=0.95, NFI=0.93, TLI=0.95, RMSEA=0.05. Regression models showed that interpretive 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 NPO/SPSS 15CYT011, Humanities and Social Sciences by Ministry of Education 17YC890020, and Fundamental Research Funds for the Central Universities 1709240.
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 tee balls 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%), 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 of 40 items showed significantly different scores between the upper and lower group. 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 child care.

METHODS: Forty-two aged 6-year-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: Statistical analysis 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 seven items showed significant differences between the use group and the non-use group.

CONCLUSIONS: The results of this study were found to be consistent with the results of the literature review. Seasonal variations in physical activity were found in both groups, and the differences between the use group and the non-use group were not significant. In addition, the correlation coefficient between physical activity and physical fitness was found to be 0.41. These results indicate that extended-hours childcare has a positive impact on physical activity and physical fitness in children.

PURPOSE: The purpose of this study is to investigate the seasonal variations in physical activity levels among elementary school children in the Arctic areas.

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 of 40 items showed significantly different scores between the upper and lower group. 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.
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 min, as previously used (Ekulnd 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 ≥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 summer season 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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(No relevant relationships reported)

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) and for age (PR: 0.98, 95% CI: 0.96-0.99). For 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 for 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: 0.08-0.94) and violent (PR: 0.23, 95% CI: 0.08-0.62) risk behaviors. CONCLUSIONS: It was observed that characteristics of sport 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
Comparison Of Physical Activity, Cardiovascular Endurance And Perception Of Quality Of Life Between Adolescents Engaged And Non-engaged in After School Sports Program
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Objective: To compare the level of physical activity, cardiovascular endurance and perception of quality of life of male and female adolescents, of three different groups: 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 ± 0.63) and 176 girls (16.19 ± 0.67). The QAFAS 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 Scheffe 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 ± 4.70 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: 635.43 ± 467.78 min/week; 32.96 ± 4.56 ml/kg/min, respectively), p < 0.01. Boys (77.51 ± 8.45 points) and girls (74.84 ± 8.90 points) engaged in after school sports programs 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 Araujo.

Board #29
May 31 2:00 PM - 3:30 PM
Relationship Between Physical Fitness Level At Age 6 And Motivation And Perseverance
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Objectives: 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 addition, in order to objectively investigate young children’s personalities 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 x grade) that corresponded to “M” and “P” was performed for all observed significant main effects. The statistical significance level of this study was less than 5%.

Results: 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 PF level groups showed that “M” and “P” were significantly higher in the higher PF level group, and it is motivated at the ages of 4 (0.477), 5 (0.631), and 6 (0.870), the patience. In terms of strength, the effects increased at the ages of 4 (0.655), 5 (0.904), and 6 (1.232). 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]
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 (VO2peak) 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 3 min skipping and additional 1-min post-exercise HR (PHR) were monitored continuously using Polar HR monitor. Students also completed a treadmill VO2peak test using calibrated direct VO2 metabolic measuring system (COSMED K4b2). Moderate to vigorous physical activity habits (MVPA), in term of average min per day were assessed by questionnaire. VO2peak 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, VO2peak was best correlated with PHR at 20s after the exercise, followed by MVPA, gender, and BMI. The best equation was: VO2peak = 70.422 + (7.542* gender) + (1.26*MVPA) - (0.47*BMI) + (0.167*PHR@20s); R = .870, SEE = 4.54 ml·kg⁻¹·min⁻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 VO2peak of secondary school students using post-exercise heart rate at 20 seconds after the exercise, gender, and MVPA, and BMI. This test is particularly suitable for athletes of rope skipping to evaluate aerobic fitness due to its' good validity and specificity.

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**Board #24 May 31 2:00 PM - 3:30 PM**

**Acute Physiological And Perceptual Responses To Body-weight Circuit And Treadmill-based High-intensity Interval Exercise In Children**

Jeanette M. Ricci1, RamiStanbridge1, Emily L. Kryskal, Todd A. Astorino2. 1Michigan State University, East Lansing, MI; 2California State University - San Marcos, San Marcos, CA. (Sponsor: Karin A Pleiffer, FACSM) (No relevant relationships reported)

Research examining acute responses to non-laboratory-based high-intensity interval exercise (HIIE), such as body-weight exercise, in children is lacking. PURPOSE: To compare the acute physiological and perceptual responses between body-weight circuit (CIRC) and treadmill high-intensity interval running (TM) in children. **METHODS:** Physically active boys (n=17; age = 9.7 ± 1.3 years) completed a graded exercise test to determine maximal heart rate (HRmax), peak oxygen uptake (VO2peak) and maximal aerobic speed (MAS). Time-matched (8-min) CIRC and TM were completed in a randomized order on separate days within a 1 to 2-week period. CIRC consisted of two sets of 4 bouts of 30 s of maximal repetitions of mountain climbers, jump squats, jumping jacks, and burpees, whereas TM included 30 s bouts at 100% MAS. Both had a 30 s recovery between bouts. HR and gas exchange data were continuously assessed using a portable metabolic analyzer and HR monitor, and blood lactate concentration (BLA) was measured pre- and post-exercise. Global affect (PANAS) and exercise enjoyment (PACES) were assessed at baseline and post-exercise. Rating of perceived exertion (RPE), affect (Feeling Scale) and enjoyment (Exercise Enjoyment Scale) were recorded pre- and post-exercise and at 38% and 75% of session completion. **RESULTS:** Mean peak HR and VO2 were 87% HRmax and 74% VO2max for CIRC and 89% HRmax and 73% VO2max for TM, respectively, with a significant difference between regimens (p<0.05). Yet, there were no differences in session HR, VO2 or V̇O2peak in the two groups (p>0.05). Post-exercise BLA was significantly higher following CIRC vs. TM (mean difference = 3.0 ± 2.2 mM, p<0.05). RPE, affect and enjoyment responses did not differ between regimens during exercise, and affect did not differ from pre- to post-exercise within or between regimens (p>0.05). Post-exercise enjoyment was significantly lower after CIRC vs. pre-exercise (mean difference = 3.9 ± 1.1, p<0.05). **CONCLUSION:** Although HR was similar, there was a higher peak VO2 in response to TM, paralleling previous work in adults. The greater BLA accumulation in CIRC may be explained by...
greater muscle recruitment required for multi-joint, dynamic movements and could explain the reduced post-exercise enjoyment. Future research should investigate higher volume protocols utilizing different body-weight exercises.

2979 Board #25 May 31 2:00 PM - 3:30 PM The Effect Of Comprehensive Coordination Training On Children's Cognitive Function

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PURPOSE: The aim of this study was to investigate the impact of comprehensive coordination training on children’s cognitive function by adding two extracurricular exercises per week.

METHODS: A sample of 120 children aged 7-9 years old who participated in the “MO101” program were randomly divided into two groups. The experimental group consisted of 58 people and the control group of 62 people. The experimental group participated in extracurricular comprehensive coordination training for 12 weeks, 2 times a week, and 1 hour each time. The control group did not participate in specialized training courses (not limiting students’ self-exercise). The height, weight, 50-meter run, and Body Comprehensive Coordination Test (BCCT) and the Eriksen Flanker test were tested in the pre-post experiment. The independent sample T-test and factor analysis were used to analyze the change values between the experimental group and the control group.

RESULTS: The two groups had no significant demographic differences in age, gender, height, weight, physical fitness tests or BCCT before the experiment. After the experiment, height, weight, and 50-meters run had significantly changed in two groups (p<0.05). However, regarding a body comprehensive coordination test, only the experimental group has significant differences before (29.75± 6.75) and after (32.80± 5.21) the experiment (p<0.05). The results of Flanker test indicated that the post-test period had a higher accuracy rate in both groups (95.27 ± 9.76) and incongruent (91.03 % ± 6.97) trials compared with those in the pre-test period (84.7% ± 10.29 and 73.69 % ± 7.79, respectively) in the experimental group. Additionally, no significant differences were found in the reaction time between the experimental group and the control group.

CONCLUSIONS: Comprehensive coordination training has a great impact on the development of children’s coordination skills. In addition, behavioral testing results also suggest that coordinative training may specifically benefit prefrontal-dependent tasks in the immature brain state of children aged 7-9 years old by increasing the allocation of attention resources and enhancing the efficiency of neurocognitive processing. (This study was supported by NPOSS Grant 15CTY011.)

2980 Board #26 May 31 2:00 PM - 3:30 PM Clarify The Influence Of Changing Parental Consciousness On Opportunities Of Children's Exercise

Shintaro Furuta. Gifu University Graduate Student, Gifu, Japan. (Sponsor: Kiyoji Tanaka, FACSM)

PURPOSE: This study was to clarify the influence of changing parental consciousness on children’s exercise opportunities.

METHODS: We urged a change in parental consciousness by showing them how pleasantly children exercise in various exercise programs. The participants included 32 children and their parents. The selection method firstly extracted the lowest 50% ranked by three test (50 m run, standing long jump, and soft ball throw) total scores out of the 103 elementary school 1st and 2nd graders who intending to participate in extracurricular comprehensive coordination training for 12 weeks. We then used based on the results of a questionnaire on extracted person, participants ranked by three test (50 m run, Body Comprehensive Coordination Test (BCCT) and the Eriksen Flanker). Data was collected on all willing 6-8 graders from the years 1992 to 2002, for a total of 10 years. The performance test was Body Comprehensive Coordination Test (BCCT) and the Eriksen Flanker test. We examined the following three issues using the collected data: whether the program. We then used the results of a questionnaire on extracted person, 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, 77.3% met the HFZ for one-mile run, and 96.5% met the HFZ for curl ups. 6th 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 ± 7.3 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 85.3% met the HFZ for curl ups. 8th grade girls had a mean BMI of 22.6 ± 4.9 kg/m², one-mile run of 10.8 ± 1.8 minutes, and curl ups of 38.0 ± 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.

2981 Board #27 May 31 2:00 PM - 3:30 PM Body Mass Index and Physical Fitness Measures of 6th, 7th, and 8th Grade Boys and Girls

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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. Data included height, weight, one-mile run, Body Comprehensive Coordination Test (BCCT) and the Eriksen Flanker test. 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, 77.3% met the HFZ for one-mile run, and 96.5% met the HFZ for curl ups. 6th 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 ± 7.3 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 85.3% met the HFZ for curl ups. 8th grade girls had a mean BMI of 22.6 ± 4.9 kg/m², one-mile run of 10.8 ± 1.8 minutes, and curl ups of 38.0 ± 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.
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 switched to 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 sport 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 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) and 6 weeks (p < 0.001). Mean 20mSRT score (total number of shuttles) increased (p < 0.001) by 16% (53.5 ± 14.7 vs. 62.0 ± 15.4) in boys (n = 14,378) and 19% (37.2 ± 11.8 vs. 44.1 ± 12.6) in girls (n = 14,698) (p < 0.001). CONCLUSIONS: A 6-week school-based exercise intervention designed and implemented by teachers resulted in a significant improvement in 20mSRT performance in 12-year old boys and girls.

The Pediatric Inactivity Triad (PIT) has recently been proposed as 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 Basic), body image (Social Physique Anxiety Scale for Children: SPAS) and anthropometrics (BMI, waist circumference). Results: One-third of participants (10 out of 30) were identified as not being competent by the PLAY Basic. 40% of participants did not achieve the federal guideline for physical activity in youth. 37% of participants were in the lowest 25% percentile for hand grip and vertical leap. 5 (17%) participants displayed physical inactivity, dynapenia, and physical illiteracy. SPAS was correlated with BMI (r = 0.38, p = 0.04) and PLAY Basic (r = 0.42, p = 0.02). PLAY Basic was also correlated with EASY (r = 0.44, p = 0.01) and vertical leap (r = 0.39, p = 0.04). Conclusions: A 6-week school-based exercise intervention designed and implemented by teachers resulted in a significant improvement in 20mSRT performance in 12-year old boys and girls.

Changes in skeletal muscle occur during the process of maturation that influence the expression of muscular strength. The isometric mid-thigh pull (IMTP) is used to measure force-time characteristics [peak force (PF) and rate of force development (RFD)], while the bioelectric properties of body tissues can be used to estimate lean body mass (LBM) and cellular health via phase angle. Purpose: To evaluate the contributions of segmental LBM, phase angle, and potentially relevant developmental indicators on IMTP performance in adolescents. Methods: Twenty-three high school students (14 girls and 9 boys; age: 15.4 ± 0.9 yrs.; height: 1.7 ± 0.07m, body mass: 68.9 ± 14.9kg) underwent anthropometric measurements to determine 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 specific developmental indicators were included in the regression model. Significant independent simple 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 (p < 0.05) were shown to a maturity offset (female: 25 ± 6.6y; male: 19 ± 4.5y) and overall LBM (female: 103.1 ± 15.9kg; male: 117.8 ± 18.3 kg). LBM (female: 10.2 ± 2.6 kg; male: 12.7 ± 2.7 kg). RFD (female: 1596.1 ± 714N•s−1; male: 2742.4 ± 714N•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 < 0.005). Neither chronological age nor somatic maturity were associated with any of the IMTP variables, while RFD was significantly correlated with both whole body phase angle (r = 0.495; p = 0.047) and segmental LBM (r = 0.476). Conclusions: 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.

Step-wise graded exercise tests are common protocols to measure aerobic fitness in children but have limitations due to the nature of the increments. Modifying these tests into a ramp protocol could limit these limitations. Purpose: To examine physiological and perceptual responses to step-wise and ramp graded exercise tests in children (n = 8; age: 13.3 ± 2.2 yrs.). Methods: The standardized James protocol (STEP) and a modified-ramp James protocol (RAMP) were performed on a cycle ergometer on separate days. Protocol order was counterbalanced. STEP commenced with three 3-min stages, followed by 1-min stages. Work rate increases were based on body surface area. For RAMP, work rate was ramped to match the 3-min and 1-min stages of STEP. Work rate was increased until volitional exhaustion for both tests. Oxygen consumption (VO2), heart rate (HR), respiratory exchange ratio (RER) and OMNI ratings of perceived exertion for chest (RPE-chest), legs (RPE-legs) and overall (RPE-overall) were recorded at the end of each 3-minute stage and peak exercise. Physiological and perceptual responses between tests were compared using two-way repeated-measure ANOVAs and test time (TT) and peak power (PP) were compared using repeated measure t-tests. Significance was established at p < 0.05. Results: The physiological and perceptual responses were similar between tests at the end of each 3-min super-maximal stage (p > 0.05). At peak exercise, absolute and relative VO2 for STEP were 2.17 ± 0.67 mL·min−1 and 47.5 ± 9.5 mL·kg−1·min−1, respectively, and RAMP (5.6 ± 3.4, 8.5 ± 2.3 and 8.0 ± 1.8, respectively) (p > 0.05). TT and PP for STEP were 11.3 ± 2.5 min and 196.8 ± 70.7 W and 12.4 ± 2.4 min and 210.3 ± 65.5 W for RAMP (p > 0.01 and p > 0.12, respectively). Conclusion: Although limitations in step-wise protocols...
exist, submaximal and peak physiological and perceptual responses were similar to a ramp protocol. Both protocols may be appropriate in children to measure aerobic fitness.

Several studies have demonstrated that cardiorespiratory fitness (CRF) 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 (\(\Phi\)) is used to evaluate nutritional status and is an indicator of cellular health. **PURPOSE:** In this study, we test if body composition and CRF 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). CRF was assessed with the Leger test. Bioelectrical impedance analysis provided parameters to calculate the values of \(\Phi\) and fat-free mass (FFM). Bivariate correlation was used to verify the association between \(\Phi\) and \%FM, FFM and CRF. We used partial correlation to evaluate if PHV was a mediator of the relationship between \(\Phi\), \%FM and CRF. A linear regression analysis adjusted by \(\Phi\) was used to verify if variables (\%FM, FFM and CRF) 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 \(\Phi\) 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 CRF in girls (\(r = 0.54, p < 0.001\)) and boys (\(r = 0.20, p = 0.01\)). Linear regression of the \(\Phi\) adjusted by the PHV had an effect on variables (\%FM, FFM and CRF) influenced cellular health among adolescents of both genders. **CONCLUSIONS:** We discovered that PHA when controlled by somatic maturation seems to be more influenced by \%FM in girls, CRF in boys, and FFM in both genders of adolescents. Interestingly, cellular health and CRF (for girls) and \%FM (for boys) were not associated with \(\Phi\). This has implications for physical activity behavioral for improved health in adolescents of both genders. Supported by CAPES (No. 23001.000422/98-30).

### 2998 Board #34 May 31 2:00 PM - 3:30 PM

**Resting Energy Expenditure and Metabolic Equivalents in Youth: Impact of Inconsistent Operational Definitions**

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(No relevant relationships reported)

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 (MET\(_{BMR}\)) versus RMR (MET\(_{RMR}\)). **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 equation. RMR was assessed during 30-min supine rest while wearing a portable metabolic unit (Cosmed K4b\(_2\)). Participants also performed structured physical activities (PA) ranging from sedentary behaviors (SB) to vigorous PA. MET\(_{BMR}\) and MET\(_{RMR}\) were calculated by dividing steady state oxygen consumption by BMR and RMR, respectively. Values were compared using two-way (Activity X MET\(_{BMR}\)) calculation analysis of variance on a mixed-effects model. Post-hoc tests were performed with Bonferroni correction (\(\alpha = 0.05\)). MET\(_{BMR}\) and MET\(_{RMR}\) values were also classified as SB (\(\leq 1.50\) MET), light PA (1.51-2.99 MET), moderate PA (3.00-5.99 MET), or vigorous PA (\(\geq 6.00\) MET). Classifications were compared with a confusion matrix. **RESULTS:** There was a significant interaction (F(30) = 19.1, p < 0.001) between activity and MET\(_{BMR}\) calculation. MET\(_{BMR}\) and MET\(_{RMR}\) 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, MET\(_{BMR}\) and MET\(_{RMR}\) gave the same classification in 61.4% of cases (see table). **CONCLUSION:** MET\(_{BMR}\) and MET\(_{RMR}\) are comparable for low and moderate PA for SB, but becomes progressively higher than MET\(_{RMR}\) as intensity increases, reaching differences >40% for MET\(_{BMR}\) and MET\(_{RMR}\) are not interchangeable units, and care is necessary when interpreting and comparing the findings of studies that use MET\(_{BMR}\).

### 2989 Board #35 May 31 2:00 PM - 3:30 PM

**Comparative Study On Body Composition Distribution Between Obese And Normal Children In China**

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(No relevant relationships reported)

The prevalence of obesity among Chinese children is on the rise, and Asian are more likely to have centripetal obesity. **PURPOSE:** To compare the body composition and distribution of obese children and normal children, and to find out the changing rules among different ages. **METHODS:** We recruited 219 Chinese children (12.18±3.05 yrs; height: 155.24±15.60 cm; mass: 48.60±14.41 kg; boys: 48.4%). The age ranges from 7 to 17, and is divided into three age groups, including 7-9, 10-13 and 14-17. According to national standards, <Screening for overweight and obesity among school-age children and adolescents >, they are divided into normal group(n=161) and obesity group(n=58). Their body composition was measured using dual-energy X-ray absorptiometry (DEXA), the main indicators were bone mineral content (BMC), fat mass(FM) and lean mass(LM) of trunk and limbs, and body fat percentage(BFP), trunk fat Percentage(TFP), trunk LBM Percenteg(TLP), trunk BMC Percentage(TBP). Paired samples t test and correlation analysis with age control was used for statistics. **RESULTS:** BFP and FM in obesity group were higher than those in normal group with significant difference (p<0.01). BMC and FM were higher in obesity groups, but there was no significant difference. The TFP of normal group was significantly lower than that of obesity group in each sex (p < 0.01). Boys TBP normal group was significantly lower than obesity group(p<0.05), and TLP had no significant difference. Girls have completely opposite results. In 7-9 years old group, there was no significant difference in all indexes between obesity group and normal group. In 10-13 years old group, TFP in obesity group was higher than that in normal group(boys p<0.01, girls p< 0.05). In 14-17 years old group, there was no significant difference in TFP ratio between obesity group and normal group. There was a moderate negative correlation between FM and BMC in the trunk of overweight women (r = 0.515, p<0.05). TFP was negatively correlated with LM in obesity group(boys r = -0.460, p<0.01, girls r = -0.545, p<0.01) but there was no correlation in normal group. **CONCLUSIONS :** TFP was higher in obese children, and the trend of fat centripetal distribution increases first and then decreases with age. Children with centripetal obesity tend to have lower LM, and girls also have lower BMC.

### 2990 Board #36 May 31 2:00 PM - 3:30 PM

**Systolic Blood Pressure Mediates the Relationship Between Body Mass Index and Inhibitory Control in Children**

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(No relevant relationships reported)

Increased body mass index (BMI) and systolic blood pressure (SBP) have been shown to be associated with poorer inhibitory cognitive control throughout childhood and impact children’s health. Further statistical procedures may help to understand the nature of relationship between these variables in children. **PURPOSE:** Here, we verify the mediation role of the SBP in the relationship between BMI and inhibitory control. **METHODS:** Twenty non-normotensive (NT) children (age: 10.86 (10.18-10.98) years; 8 hypertensive stage I; 1 hypertensive stage II and 11 pre-hypertensive) were paired with 20 normotensive (NT) children (age: 10.40 (9.86 – 10.69) years) by cardiorespiratory fitness, BMI, somatic maturation, scholastic performance and age. They differed on SBP (NNT: 120.53±6.73 mmHg vs NT: 106.64±7.04 mmHg; p<0.01) and diastolic blood pressure (DBP) (NNT: 75.83±8.81 mmHg vs NT: 64.8±0.94 mmHg; p<0.01). BFP was calculated in both (SB) and controls (TC). Participants performed a stabilization task, and a Go/No-go task. The Go stimuli were presented as office and bathroom pictures, whereas the No-go (inhibition) stimuli were food and toys images. Performance

**Abstracts were prepared by the authors and printed as submitted.**
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 (\( \beta = 0.38, SE = 0.16, \ p < 0.02 \)) was found. However, when considering SIBP, this relationship was no longer statistically significant (\( \beta = 0.24, SE = 0.16, \ p < 0.13 \)). 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 cognitive 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

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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 and achieving 30 minutes of MVPA, while controlling for age and sex (model one) 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 (\( \beta = -2.98, P < 0.01 \)) after controlling for age and sex. Of the remaining biomarkers, only fasting insulin was associated with achieving 30 minutes of MVPA (\( \beta = -3.81, P = 0.05 \)), but this relationship became non-significant (\( \beta = -2.36, P = 0.16 \)) when adding percent body fat to the model (\( \beta = 0.50, P < 0.05 \)). 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.

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2993 Board #39 May 31 2:00 PM - 3:30 PM Stressed Out over Stress Fractures? Potential Predictive Model To Determinethose At Risk

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PURPOSE: Stress fractures are injuries caused by cumulative, repetitive stress that leads to abnormal bone remodeling. There are two causes of stress fractures, excessive stresses causing weakening of bone material and typical stresses acting on abnormal bone. Stress fractures are more common in certain populations including women, minority personnel, high-level athletes, and the middle aged/elderly. Stress fractures have a large socioeconomic impact as they cause prolonged periods away from competition and a significant amount of healthcare spending. A reliable, reproducible method to determine which individuals are most susceptible within the predisposed populations would provide cost-effective prevention strategies. Advanced numerical simulation tools may be key to modeling the mechanical behavior of bones under different loading conditions.

METHODS: The hybrid finite-discrete element method (FDEM) combines aspects of the finite element method to model the elastic behavior of materials and the discrete element method to model the initiation and propagation of fractures. The FDEM is used to simulate the deformation and fracturing in materials such as bone and rock. This can capture the transition of a solid from a continuous to a discontinuous state by directly simulating fracturing processes. See the Image 1 for further explanation of methods.

RESULTS: Refer to Image 2 for graphs and model results.

CONCLUSION: The FDEM model shows promise to help predict stress fractures. Further studies are needed; including realistic bone loadings to real life situations.
Patellofemoral pain (PFP) 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 osteoarthritis, 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, pain in patients with PFP compared to healthy adults; n=3 healthy, age: 21.0±1.0yrs) underwent a 30 minute run at a self-selected velocity using a 12MHz linear probe to obtain the knee cartilage images before and after 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 cartilage deformation immediately after physical activity. No research has analyzed femoral cartilage deformation followed by running in patients with PFP.

**RESULTS:** 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.

**CONCLUSIONS:** Early Microfractures Of Talus And Calcaneus As A Predictor Of The Foot Injuries

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**PURPOSE:** The aim of this study was to investigate whether the early detected microfractures of talus and calcaneus may be a predictor for foot injuries.

**METHODS:** Five sportsman with microfractures of talus and five with microfractures of calcaneus that undergo foot injuries were included in the evaluation. Uninjured side served as a control. The reconstructions of the bones were performed and custom made software was used to align the talus and calcaneus of the uninjured and injured side based on principal axis of inertia and moments of inertia. Thereafter, the curvature radius and arch length of each talus and calcaneus were measured in coronal and sagittal plane. Paired sample t test was used to compare the results in uninjured and injured side.

**RESULTS:** The analysis of the calcaneus have showed that there was no difference between uninjured and injured cases for curvature radius neither in coronal plane (60.10 mm vs. 61.11 mm, respectively) nor in sagittal plane (58.13 mm vs. 58.12 mm) (p>0.05). In addition, there was not statistical difference between uninjured and injured cases for the arch length neither in coronal plane (23.3 mm vs. 21.3 mm) nor in sagittal plane (19.5 mm vs. 17.5 mm) (p>0.05). The analysis of talus has shown that there was not significance between uninjured and injured side for the curvature radius measured in coronal plane (55.7 mm vs. 56.8 mm) and in sagittal plane (34.4 mm vs. 34.7 mm) (p>0.05). Additionally, there was not significance between uninjured and injured side for the arc length measured in sagittal plane (29.4 mm vs. 28.4 mm) (p>0.05). Importantly, there was statistical significance between uninjured and injured side for the arch length measured in coronal plane (29 ±4 mm vs. 21 ±4 mm) (p<0.05).

**CONCLUSIONS:** Microfractures of the talus and consequent decrease in its arch length measured in the coronal plane may be a predictor of the foot injuries.

**Background:** Achilles tendinopathy is a very common condition. The pathology of overuse tendinopathy has been described as a continuum that comprises 3 stages: reactive tendinopathy, tendinopathy, and degenerative tendinopathy with tendinosis. The precise location of tendinosis in the Achilles tendon tends to vary from patient to patient: plantar tendinosis, insertion, anteriorly or posteriorly in the tendon. Aim This study describes the variation in the location of the intratendinous zone of tendinosis in the Achilles tendon. Patients and methods All ultrasound scans of all patients who presented with pain in the Achilles region were retrospectively analyzed and classified. In this respect, classification occurred into the following three categories: tendinosis, reactive tendinopathy or other (e.g. normal scan, pertenindinopathy, bursitis, ...). The tendinosis group was subdivided according to the location of the tendinosis zone into proximal or distal, which were further subdivided into anterior, posterior or both. Results In total we recorded and examined the ultrasound scans from 395 tendons from 325 patients, meaning 70 patients had bilateral complaints. 209 of them were men and the mean age of this population was 43 years. In 41 patients we found two zones of tendinosis. In 55.5% of the patients with pain in the Achilles region tendinosis was seen, in 21% reactive tendinopathy and in 25.7% something else. The results showed that in 68.2% of the sample the tendinosis zone was proximal, whereas in 31.8% it was insertion. The proximal tendinosis zone was mostly found right across the width of the tendon (57%), but also anteriorly (15.2%) and posteriorly (27.8%). The insertion tendinosis zone, however, was mostly found posteriorly (49.3%), followed by anteriorly (27.3%) and across the width of the tendon (25.4%). Conclusions Although we already know that the tendinosis zone in Achilles tendinopathy occurs at different locations, the relative distribution of these zones remained relatively unclear. The distribution described raises concern about the fact that all these patients are often treated with the same protocol. Further research is needed to determine whether a difference in approach according to the location of the tendinosis zone is appropriate.

**Side Differences in the Y-Balance Test Performance in Patients with Unilateral Low Back Pain**

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**PURPOSE:** Diminished balance is a well-recognized impairment in individuals with low back pain (LBP). Clinically, the Y-balance test (YBT) has been recommended as an outcome measure to assess dynamic balance deficits in the LBP population. Specifically, the reach distances of the 3 testing directions collected from both limbs often are averaged to represent a patient’s balance performance. However, it is unclear if these patients perform the YBT differently when they stand on their painless limb versus on their non-painful limb. The purpose of the study was to compare the differences in the YBT between the painful versus non-painful limbs of patients with LBP under two separate conditions: performing the YBT on the dominant leg and on the non-dominant leg. METHODS Thirty-one right-leg-dominant adults (37.1 ± 12.5 years) with unilateral LBP completed the study, including 14 participants with LBP on the right side (9 men, 5 women) and 17 participants with LBP on the left side (8 men, 9 women).
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 posterovertical (PV). Each participant performed a total of 9 trials for each direction and for each limb, but only the last 3 trials were measured and normalized to the corresponding leg length for later statistical analysis. Two separate 2 (group) x 3 (direction) ANOVAs with repeated measures were used to determine differences between groups, one for the dominant (right) leg, and the other for the non-dominant (left) leg. There were no significant differences in age and body mass index (p > 0.05) 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 (101.2 ± 5.2 cm). There were no significant differences in the ANT and PA 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.

Total hip arthroplasty (THA) leads decrease of physical activity and muscle function, and 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 both side THA with several year’s 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, walking, swimming were included 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 (58.7 ± 17.8 u. vs. 89.9 ± 17.3 u. P > 0.05) and KE (38.3 ± 13.8 kg vs. 41.3 ± 12.3 kg, P > 0.05). 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.

Delayed onset of muscle soreness (DOMS) has debilitating symptoms that produce muscle damage and performance deficits among athletes. Deep oscillation therapy (DOT) is a therapeutic intervention that utilizes an electrostatic wave to create a deep oscillation massage at the cellular level with proposed physiological benefits. There is little evidence to support the use of DOT on exercise-induced DOMS. PURPOSE: To examine the effects of DOT on girth, pain pressure threshold (PPT), perceived pain, strength, and range of motion (ROM) following a bout of eccentric exercise-induced DOMS when compared to control. METHODS: Moderately active participants (age: 22±2.5 years; male: n=5, female: n=5) completed an eccentric exercise protocol for the elbow flexors to induce DOMS as part of a randomized counter-balance design study. Control group (C: no treatment) and a treatment group (T: DOT). T group received a 20-minute DOT treatment for 6 days. Visual analog scale assessed pain and a manual algometer assessed PPT and girth was measured at 3 sites on the biceps (5, 9, 13 cm proximal from the antecubital line). A goniometer assessed ROM for extension and flexion. Isokinetic dynamometer measured strength for 2 maximum voluntary isometric contractions at 3 angles (30°, 90°, 130°). A 2 x 6 repeated measures ANOVA to examine differences for girth, PPT, perceived pain, ROM, maximum voluntary isometric contraction (MVC) and maximum isokinetic contraction (MIC). RESULTS: A significant main effect was found for perceived pain and PPT between groups (P<0.01; P<0.002); with significant interactions between days (P<0.01; P<0.01). Both displaying improvements for the T group. Girth was significantly different over time for both C and T (2.55 vs. 1.42, P<0.03) and T resulted in a reduction for days 2-6 (P<0.04). Mean ROM significantly changed over time, with Days 2-6 significantly less than Day 1 (P < 0.05), but no significant differences occurred between groups. No differences were found in MVC and MIC at any angles over time or between groups. However, MIC at 30° was decreased over time (5.68 and 41, P<0.001), with Day 2 significantly lower than Day 1 (mean difference 14.5±4.1, P=0.008), with a resulting increase for T when compared to C. Conclusion: There are positive effects from DOT on symptoms of exercise-induced DOMS.
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 hours, 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 (NS:SD).

**Differences between Posttest and Pretest in Selected Fitness Variables**

<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 (cm)</th>
<th>S&amp;R (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0.85±1.50</td>
<td>0.02±1.01</td>
<td>0.13±.49</td>
<td>0.70±.81</td>
<td>1.83±1.69</td>
<td>0.10±.07</td>
<td>2.42±1.05</td>
</tr>
<tr>
<td>Training</td>
<td>0.92±2.04</td>
<td>0.06±.3</td>
<td>0.31±.66</td>
<td>4.10±1.36</td>
<td>4.11±2.17</td>
<td>0.18±.06</td>
<td>4.42±1.19</td>
</tr>
<tr>
<td>Effect size</td>
<td>-.26</td>
<td>.09</td>
<td>-.66</td>
<td>84</td>
<td>.51</td>
<td>.49</td>
<td>.67</td>
</tr>
<tr>
<td>F</td>
<td>7.388**</td>
<td>5.177</td>
<td>6.886*</td>
<td>18.64**</td>
<td>41.83**</td>
<td>1.045</td>
<td>2.153**</td>
</tr>
</tbody>
</table>

*p<.05, **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

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### 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 Sheridan2, Ka Wing Chan1, Stephen H.S. Wong, FACSM1.

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Email: ericpoonct@gmail.com

(No relevant relationships reported)

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% HRR separated by 1-minute active recovery. MICE sessions involved 50-minute continuous exercise at 65-70% HRR. Health-related variables including cardiovascular fitness (VO\textsubscript{2max}), 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 control the group difference in outcome variables after controlling for baseline values.

**RESULTS:** Both groups showed similar VO\textsubscript{2max} 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	extsuperscript{-1}·min	extsuperscript{-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 p < 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 group only decreased weight, BMI, and VCO\textsubscript{2} by 2.7L/min, 3.9L/min, 2.9L/min and 2.0L/min. The gaseous metabolism of OW group during whole 5 minutes recovery period were significantly higher than NW group by 2.7L/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 rest state, the respiratory function of overweight women was weaker than normal weight working 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.

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### 3004 Board #50

**May 31 3:30 PM - 5:00 PM**

**Effects of two Different Stretching Methods Program on Range of Motion in Militaries**

Paula Paraguassu Brandão1, Carlos José Nogueira2, Adriane Oliveira Sampaio2, Alisson Gomes Da Silva3, Mário César Conceição4, Gilmar Weber Senna4, Estêlio Henrique Martin Dantas5. 1. Celo Lisboa University, Rio de Janeiro, Brazil. 2. Air Force – FAB - Air Cadets Preparatory School, Barbacena, Brazil. 3. Federal University of the State of Rio de Janeiro, Rio de Janeiro, Brazil. 4. Catholic University of Petrópolis, Petrópolis, Brazil. 5. Tirtadentes 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 militaries. **METHODS:** 90 young male militaries (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 (FNP) and control (CG). The ROM was measured by goniometry based on LABABIE 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 (PERFX) (0 - 110) was used to control the intensity in both groups, SG (31 - 60) and FNP (61 - 80). The exercise duration was 5 seconds for the SG and 8 seconds for each phase (contraction-relaxation) for the FNP. **RESULTS:** There were no significant differences among 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 FNP: SHF (Δ% = 4.6, p < 0.001), SHE (Δ% = 6.5, p < 0.002), LSF (Δ% = 5.1, p < 0.001). **CONCLUSION:** It was concluded that the program of flexibility training by FNP 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 for more than 4 days, including at least 3 workdays and 1 weekend, for at least 8 hours per day. Sedentary Behavior (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 765.16±122.96min. The time of SB, LPA, MPA, VPA, MVPA, TPA and SC was 470.27±150.24min, 244.65±74.52min, 42.99±20.53min, 16.27±12.50min, 59.26±30.91min, 304.93±94.65min and 8005±3160 steps, respectively. In 4520 days, 43.84% of MVPA and 90.44% of TPA 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 = 0.987 (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 0.590, corresponding to the SC of 7668 steps. The specificity was 0.8505 and sensitivity was 0.7395. When setting the SC standard as 8000, which is close to 7668 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-c/2015/010) and General Administration of Sport of China Scientific Research Project (2015B072).

CONCLUSIONS: The results of this study provided two valuable insights. First, this study provided evidence of the effectiveness of online courses in influencing students’ intention to continue exercising and exercise self-efficacy. Second, these results demonstrated students can receive similar benefits from online courses as they receive from face to face activity courses.

Lifelong physical activity (PA) is an important outcome of physical education (PE) programs. To effectively promote student PA, educators must possess adequate health-related fitness knowledge (HRFK), utilize effective instructional practices related to HRFK, and model a physically active lifestyle. Research among US adults shows that females tend to be less physically active than male counterparts, however, no research has documented gender differences in HRFK nor instructional practices related to HRFK.

PURPOSE: To determine the relationship of HRFK, PA, and HR FK 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=2.85, p<0.002 [r=10.2, d=2.1]), and reported less weekly minutes of vigorous PA (142.2 min/wk, F(2,794)=21.78, d=1.27) 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, t=2.37, p<0.009, [r=0.9, d=1.7]) and assessment of HRFK than male physical educators, approaching significance (9.7 vs. 9.3, F(2,794)=1.24, t=1.57, p=0.058, [r=0.9, d=1.1]). No differences in moderate and light PA were observed.

CONCLUSIONS: In spite of participating in less vigorous PA, female physical educators in the study demonstrated greater HR FK and emphasized teaching and assessing HRFK more, thus may be more effective in promoting health-related fitness and lifelong student PA.

College athletic staff are confronted with numerous day to day perils in attempting to advance the performance of their athletes with suitable nutrition playing a dynamic role in that task. Having adequate nutrition knowledge is key to providing satisfaction and appropriate information to improve performance. The ideal providers of such knowledge are Registered Dietitians with a specialty in Sports Dietetics who may not be obtainable or have scarce contact to athletes on a smaller, less resourced Division II campus. Purpose: First establish the knowledge base of those that have regular contact and appropriate information to improve performance. The ideal providers of such knowledge are Registered Dietitians with a specialty in Sports Dietetics who may not be obtainable or have scarce contact to athletes on a smaller, less resourced Division II campus. Purpose: First establish the knowledge base of those that have regular contact, who consistently provide nutrition education to athletes and formally explore if nutrition education sessions improve the knowledge that athletes possess. Methods: Division II athletic staff were asked 20 sports nutrition knowledge questions focusing on macronutrients, micronutrients, supplements, weight management, eating disorders, and hydration. One-way ANOVA along with post-hoc tests were conducted and gender comparisons made.

RESULTS: Female athletic staff scored significantly higher in HRFK (85% HRFK, [F(2,794)=4.17, r=2.85, p<0.002 [r=10.2, d=2.1]), and reported less weekly minutes of vigorous PA (142.2 min/wk, F(2,794)=21.78, d=1.27) 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, t=2.37, p<0.009, [r=0.9, d=1.7]) and assessment of HRFK than male physical educators, approaching significance (9.7 vs. 9.3, F(2,794)=1.24, t=1.57, p=0.058, [r=0.9, d=1.1]). No differences in moderate and light PA were observed.

CONCLUSIONS: In spite of participating in less vigorous PA, female physical educators in the study demonstrated greater HR FK 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
**Gender Differences in Golf Performance After Various Warm-ups**
Andrea Fradkin, FACSM. Bloomsburg University, Bloomsburg, PA. Email: afradkin@bloomu.edu

No relevant relationships reported.

**DISTINCT INJURY DIFFERENCES EXIST BETWEEN GENRES IN GOLF, HOWEVER, PERFORMANCES 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), ST, and SP (p<0.01), however, ST+SP showed non-significant increases. For launch angle (LA), AE, ST, AE+SP, and ALL (female) showed non-significant decreases, whereas ST+SP, AE+ST, and ALL (male) showed non-significant decreases. Finally, in backspin (BSPIN), AE, ST, AE, SP, ST+SP, 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
**Actions of The Nasf-ab In A City of The Extreme North of Brazil**
Ana Paula de Azevedo Albuquerque1, Paula Paraguassú Brando2, Valdieri Nascimento Viana1, Thiago Santos Cardoso1, Isadora Canto1, Rodrigo Gomes de Souza Vale1, 1Universidade Federal do Amapá, Faculdade de Macapá-FAMA, Macapá, Brazil. 2University Federal do Estado do Rio Janeiro, Rio de Janeiro, Brazil. The present study is a descriptive and explanatory research. It includes 20 children were enrolled in the KIDS (12 girls; 8 boys; 9.97±1.27 yrs.; 52.5±10.3 kg; 143.6±10.94 cm). The KIDS team was composed by a Physical Educator, Nutritionist, Psychologist, Physiologist and a Pedagogue which developed the multidisciplinary activities for parents and children. The parents attended the KIDS on the first two days to raise awareness about the healthy habits for the whole family. The children stayed for another five days. The blood sample for lipid profile and anthropometric data were collected before and after KIDS. The Student t test was applied to compare pre and post KIDS data. The level of significance was set at p<0.05. **RESULTS:** The results are presented at table 1. Table 1- Anthropometric data and lipid profile (Means/SD) before and after seven-day KIDS (n=20).

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Pre</th>
<th>Post</th>
<th>Δ (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>BW (kg)</td>
<td>52.52±10.27</td>
<td>51.85±9.76</td>
<td>-1.13</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>BMI (kg m⁻²)</td>
<td>25.23±2.35</td>
<td>24.94±2.24</td>
<td>-1.13</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>ΣST (mm)</td>
<td>64.85±15.0</td>
<td>58.53±12.28</td>
<td>-9.22</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>BF (%)</td>
<td>45.11±8.18</td>
<td>41.65±6.71</td>
<td>-7.25</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>FATM (kg)</td>
<td>24.05±7.40</td>
<td>21.94±6.45</td>
<td>-8.77</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>LBM (kg)</td>
<td>28.47±5.46</td>
<td>29.91±4.83</td>
<td>+5.05</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>TC (mg/dL)</td>
<td>161.35±32.45</td>
<td>130.74±27.0</td>
<td>-23.0</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>TG (mg/dL)</td>
<td>130.32±96.0</td>
<td>50.05±19.86</td>
<td>-50.8</td>
<td>&lt;0.026</td>
</tr>
<tr>
<td>LDL-C (mg/dL)</td>
<td>93.22±26.37</td>
<td>48.42±10.3</td>
<td>-26.5</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>HDL-C (mg/dL)</td>
<td>46.79±11.50</td>
<td>69.89±22.0</td>
<td>+53.0</td>
<td>&lt;0.000</td>
</tr>
</tbody>
</table>

**PURPOSE:** To investigate the effects of lipid profile and anthropometric measures in obese children based on a seven day participation at a health education camp (KIDS).

**METHODS:** Twenty children were enrolled in the KIDS (12 girls; 8 boys; 9.97±1.27 yrs.; 52.5±10.3 kg; 143.6±10.94 cm). The KIDS team was composed by a Physical Educator, Nutritionist, Psychologist, Physiologist and a Pedagogue which developed the multidisciplinary activities for parents and children. The parents attended the KIDS on the first two days to raise awareness about the healthy habits for the whole family. The children stayed for another five days. The blood sample for lipid profile and anthropometric data were collected before and after KIDS. The Student t test was applied to compare pre and post KIDS data. The level of significance was set at p<0.05. **RESULTS:** The results are presented at table 1. Table 1- Anthropometric data and lipid profile (Means/SD) before and after seven-day KIDS (n=20).
3014 Board #60 May 31 3:30 PM - 5:00 PM Moving Beyond Healthcare To Health: A Preliminary And Descriptive Statistical Report On The Health Peers Programme In The War On Diabetes In Singapore In 2017 Fadzil Hamzah, Loh Win Nie, Michelle Lauw, Felicia Kua, Valencia Lim. Changi General Hospital, Singapore, Singapore.
Email: fadzil_hamzah@cgh.com.sg (No relevant relationships reported)

INTRODUCTION: The Health Peers Programme illustrates how healthcare providers from multiple disciplines work together to pilot a community health programme in partnership with community stakeholders supported by government health initiatives in the early intervention of diabetes. PURPOSE: To determine the impact of a multidisciplinary community health programme focusing on early intervention of diabetes in individuals who are at risk or who have been diagnosed with diabetes. METHODS: 137 volunteers were trained as Health Peers in 2017 through a structured programme developed by a psychologist, a dietician, and a clinical pharmacist. Health Peers were trained to conduct health coaching and to recognize high risk diabetes patients. A preliminary report was conducted at 6 months post-outreach to assess the results of the Health Peers programme focusing on diabetes.

RESULTS: All Health Peers showed improved competency in health coaching. Their confidence levels in health coaching showed increasing trends throughout the period of assessment. 88.9% of the residents reported an improved, positive experience when interacting with the Health Peers. All of them reported that they would consult the Health Peers for assistance in their health goals. 87.3% agreed that the Health Peers have impacted their knowledge and awareness of diabetes and healthy living. 83.3% made positive changes to their eating habits and exercise based on the national recommendations after 6 months of health coaching. CONCLUSION: A successful and sustainable community health programme must aim to appeal and evoke ownership of its participants to champion chronic disease management and prevention by engaging them through their own experiences. This is achieved through a dynamic and structured programme developed by various expertise within the healthcare profession in collaboration with community stakeholders and supported by government health initiatives.

3015 Board #61 May 31 3:30 PM - 5:00 PM Effect of 6-week Hypoxic Training on Plasma Metabolites in Overweight Females Ge Hu, Hui Cao, Jianmin Cao, Liwen Lian, Kunshun Guo. Beijing Sport University, Beijing, China.
Email: wizardhuge@outlook.com (No relevant relationships reported)

Overweight female population in China ranks first in the world. Overweight is a risk factor for many diseases. Hypoxic training can reduce body weight and improve metabolism. However, the mechanism of weight loss in hypoxia remains unclear.

PURPOSE: To examine the effect of hypoxic training on plasma metabolites in overweight females. METHODS: 40 overweight females (age: 31.3±0.5 years, BMI: 29.2±5.3 kg/m²) were selected and grouped into hypoxic training group (HT, n=20) and normoxic training group (NT, n=20). All subjects underwent a 6-week training, which included resistance and endurance training. RESULTS: A survey was conducted at 6 months post-outreach to assess the results of the Health Peers programme focusing on diabetes.

CONCLUSION: A successful and sustainable community health programme must aim to appeal and evoke ownership of its participants to champion chronic disease management and prevention by engaging them through their own experiences. This is achieved through a dynamic and structured programme developed by various expertise within the healthcare profession in collaboration with community stakeholders and supported by government health initiatives.
CONCLUSION: Test-retest reliability was demonstrated for the traditional and sub-maximal methods when used on separate days. The optimal method trial performed each method once in random order on different days. No between-group differences were identified at baseline with the traditional and sub-maximal methods. Subjects in the reliability trial performed either TDT or BT 1RM testing on 3 occasions separated by at least 3 days, while subjects in the optimal method trial performed each method once in random order on different days. RESULTS: No between-group differences were identified at baseline with respect to age, BMI, previous training experience, or predicted leg and chest press 1RM for either trial. For the reliability trial, no significant between-group differences were identified in coefficient of variation over the three testing days for either the CP or LP. However, the BT group produced significantly higher CP and LP 1RM values on the second testing day (Cohen’s d = 0.67, p = 0.01; Cohen’s d = 0.70, p = 0.01, respectively). For the optimal method trial, no order effect across days was identified between BT or TDT. However, significantly higher CP 1RM values were obtained using TDT (Cohen’s d = 0.92, p = 0.05). Untrained individuals in this sample obtained significantly higher LP 1RM values using TDT (Cohen’s d = 2.72, p < 0.001) and older individuals obtained significantly higher CP values (Cohen’s d = 1.37, p = 0.028) using TDT. CONCLUSION: TDT may produce higher and more reliable 1RM values than BT across a wide spectrum of ages and experience levels.
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 obliged 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 Jennifer J. Brown, Trevian D. Long, Jonquin L. Elliott, Kelly N. Brewer, Demond L. Holley, Samara D. Hauser. Elizabeth City State University, Elizabeth City, NC.

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(No relevant relationships reported)

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 = 0.93, P < 0.01). A belief that exercising regularly could reduce risk strongly correlated to controlling weight gain (r = 0.93, P < 0.01), as did eating healthy and reducing the risk of diabetes (r = 0.92, P < 0.01). Increased consumption of sweets (N = 295, r = 0.157, P < 0.007) and processed meals (N = 295, r = 0.125, P < 0.032) correlated with beliefs related to a lack of control. A negative correlation was demonstrated between this perception and a willingness to make change (r = 0.93, P < 0.001). A correlation was also demonstrated between perceived control and believing that you have accepted your health risk (r = 0.89, P < 0.001).

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 Ho Han1, Heontae Kim, Harold W. Kohl II, FACSM. 1.Oklahoma State University, Stillwater, OK. 2.The University of Mississippi, University, MS. 3.University of Texas Health Science Center at Houston, Austin, TX. (Sponsor: Harold Kohl III, FACSM) Email: hohan@okstate.edu

(No relevant relationships reported)

Differences in Strategic Constructs of the Transtheoretical Model across the Levels of Sitting Time

Ho Han, Heontae Kim, Harold W. Kohl II, FACSM

Oklahoma State University, Stillwater, OK, The University of Mississippi, University, MS, University of Texas Health Science Center at Houston, Austin, TX

The strategic constructs, such as processes of change, self-efficacy, and decisional balance, of the TransTheoretical (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 quintiles of 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 isolation [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 quintiles. 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 Takahiro Nakano1, Tomoaki Sakai2, Koshio Kasuga1. 1.Nagoya Gakuin University, Nagoya, Japan. 2.‘Gifu University, Gifu, Japan. (Sponsor: Kiyoshi Tanaka, FACSM)

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(No relevant relationships reported)

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 the decline in children’s physical fitness observed in Japan. 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 findings of 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 year were examined using a T-test and chi-square tests. A 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 Cherif2, Suzan Sayegh2, Daniel P. Bailey2. 1. Qatar University, Doha, Qatar. 2. ASPETAR - Orthopaedic and Sports Medicine Hospital, Doha, Qatar. (Sponsor: Kiyoji Tanaka, FACSM)

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(No relevant relationships reported)

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: To investigate the effects of an economic valid PA intervention using a three-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.
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), and 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, 2.5-5-h, 5-h). Data is reported as effect size; ±90% confidence 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 (-0.49). 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. Bernacki1, Jessica L. Kainer2, Hannah N. Smith2, Annette M. Zaharoff2, Sandeep Subramanian1. 1UT Health San Antonio Texas, San Antonio, TX. 2The Non-Surgical Center of Texas, San Antonio, TX.

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 corticosteroids 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 the relationship between the dose and effect of exercise.

RESULTS: The corticosteroid groups demonstrated greater benefits in the short-term follow up (36 months; level 1A) and the regenerative injection therapy groups 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
Zhiping Zhen1, Chao Luo1, Liangyu Hu1, Hanran Li2, Yuhan Cao1, Qixian Chen1, Qingjia Song1, Dan Xu1, Yiqing Lan2, Chenzhi Zhao1, 1Beijing normal university, Beijing, China. 2China University of Mining and Technology, Beijing, China.

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.
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 partner, process between the coach and the client, it emphasizes behavior change to better client health. Coming up as a new approach that focus 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), and a significant increase in muscle mass (0.25 kg). Significant declines in power between repetition 2 and repetitions 4 (Mdiff = 0.002 ± 0.001; p = 0.029). Pairwise comparisons showed significant declines in power between repetition 2 and repetitions 4 (Mdiff = 0.002 ± 0.001; p < 0.001). **CONCLUSIONS:** HWC was able to promote weight loss, fat loss, to maintain fat-free mass and to improve quality of life in a 12week 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.
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, Psychinfo 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. **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 use 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 reported 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.
## 3035 Board #81
**Are Fitness Club Members More Likely To Meet Physical Activity Guidelines Than The General Adult Population?**

### Purpose
There is a need for research examining if having a fitness club membership is associated with meeting the physical activity recommendations. Hence, the aims of the present study were 1) to assess total physical activity level at onset and after 12 months of fitness club membership and 2) to investigate if having a fitness club membership is associated with increased physical activity and higher prevalence of meeting current physical activity recommendations than the general population. In addition, we wanted to identify demographic and social-economic variables and compare this in participants with high and low exercise involvement.

### Methods
The participants (n=250) answered an electronic questionnaire at inclusion covering demographic and social-economic factors. Self-reported exercise activity were reported by 54.4% (in mean 1.9 (±1.0) days/week) and 44.3% (in mean 1.5 (±1.0) days/week) at inclusion and after 12 months of fitness club membership. Total exercise involvement at the fitness club was obtained after three, six and 12 months.

### Results
At inclusion covering demographic and social-economic factors. Self-reported exercise activity were reported by 54.4% (in mean 1.9 (±1.0) days/week) and 44.3% (in mean 1.5 (±1.0) days/week) at inclusion and after 12 months of fitness club membership and 2) investigate if having a fitness club membership is associated with meeting the physical activity recommendations. Hence, the aims of the present study were 1) to assess total physical activity level at onset and after 12 months of fitness club membership and 2) to investigate if having a fitness club membership is associated with increased physical activity and higher prevalence of meeting current physical activity recommendations than the general population. In addition, we wanted to identify demographic and social-economic variables and compare this in participants with high and low exercise involvement.

### Conclusions
Conclusion: FD PA counselling practise is low and attitude was particularly poor toward the priority order compared to other jobs. Lack of training and support from consultants were major hindrances noted. Unexplored opportunities exist for foundation doctors to champion PA both in primary and secondary care.

## 3036 Board #82
**How Best to Use Your Limited Cardiovascular System Training Equipment Budget: A Case Study**
Megan Boshard, Michael Bohne, Ellis Jensen. Utah Valley University, Orem, UT.

### 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 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 has 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.
board #84 may 31 3:30 pm - 5:00 pm
the correlative relationship between fitness goals and wearable usage: an observational double-blind study
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(no relevant relationships reported)

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.

method:
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 (67.9%). 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 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 #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
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(no relevant relationships reported)

low levels of physical activity and physical fitness are associated with adverse medical conditions including type 2 diabetes and cardiovascular disease. significant declines in physical activity are most notable in children as they transition to adolescence in middle school making this a critical age to promote a physically active lifestyle that confers health benefits. several existing programs have used multiple courses and activities to promote active lifestyle behaviors in middle school adolescents. we theorized that a single in-school elective course may be an effective strategy to promote health outcomes in adolescents. purpose: to examine the effects of a multidimensional translational health in nutrition and kinesiology (think) in-school pilot program encompassing nutrient/exercise physiology education, laboratory experiences, and structured physical activities on physical fitness, physical literacy, and nutrition knowledge.

methods:
participants from a public middle school were enrolled in the think elective course (n=33, 22 males; 11 females; 11.97±0.03 yrs). the program was administered two hours/day, two days/week for 16 weeks. participants were evaluated at baseline and post-intervention for physical fitness, elements of physical literacy, and nutritional knowledge. rhes: think students evidenced a 5.88 mmHg reduction in mean arterial pressure (p<0.05), along with the following improvements in physical fitness: a 4.55 lb increase in muscular strength, a 72.19 ft increase in distance covered during the NIH 2-minute walk test, a 2.34 increase in lower body power, and 3.64 increase in the number of sit-ups performed in one minute (p<0.01 for all). there were no significant changes in BMI or flexibility. additionally, think students exhibited significant increases in nutrition and kinesiology (p<0.001) signifying a better understanding of the value of physical activity and nutrition for health promotion/ disease prevention. conclusions: a multidisciplinary think program employing kinesiology/nutrition science education, laboratory skills, and physical activities in one course can result in significant improvements in physical fitness, physical literacy, and nutrition science education.

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 vides2, kimberly espartero1, rebekkah reichert1, maria alvarez1, priscilla franson1, arianna mazzarini1, andrew denys1, vanessa yingling, facsm1.
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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 or more than needed amount of exercise, have greater muscle and bone strength.

methods:
seventy 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 detect 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), RGS: 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.

board #87 may 31 3:30 pm - 5:00 pm
investigating the relationship between social media use and reported rates of exercise
lauren pritting, anton-luigi picazo, milagro JeanMarie-Tucker, Zakkoyya H. Lewis. loyola marymount university; los angeles, ca.
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(no relevant relationships reported)

purpose: social media has a large impact on body image and confidence. this study aims to gather information and examine correlations on the relationship between social media use and reported rates of exercise.

methods: an observational study of participants (n=33) that own a wearable fitness device was conducted. approximately 79% of participants were female, 52% of participants were aged 18-24, 30% aged 25-34, 12% aged 35-54, and 6% aged 55 and older. participants completed a questionnaire asking them to describe their exercise and social media habits. participants classified themselves as having an intermediate

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

FRIDAY, MAY 31, 2019

One hundred and nineteen students were recruited from the main fitness utilizing campus recreational facilities and examine whether music used as a motivator

PURPOSE: The purpose of this study was to assess the risk of NIHL among students

Music has an ergogenic effect on exercise performance, improves motivation,

of incarcerated young women.

setting. Establish current attitudes and behaviors related to sleep and physical activity

Determine whether wearable technology can be applied in a close custody

PURPOSE: Youths Development models. Implementing such a program requires understanding

Both regular exercise and adequate restorative sleep have been shown to reduce

"built for exercise" and "have the skills for exercise." There was strong agreement

0.8. The majority of girls felt that they “needed

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 that “when active they enjoy it” at 4.2±0.8. The majority of girls felt that they “needed more sleep.” And being “sleepy” significantly correlated with self-reported being “grumpy” (p less than 0.001). Girls do not have access to computers, and we were able to implement a system of recharging and downloading the wearable units that was feasible and acceptable for staff. Girls used the Fitbits as directed. Only 2 of 9 girls achieved the goal of at least 8 hours sleep per night, despite the prescribed lights out and awakening times that should allow more than 9 hours sleep each night. Only one girl achieved more than 10,000 steps each day. CONCLUSION: Incarcerated young women’s sleep and physical activity do not meet recommended guidelines. Both are domains where these high-risk emerging adults still can make choices despite close custody. A Positive Youth Development program to enhance these behaviors and increase their self-efficacy for health choices could add to existing programs to deter future drug use and other harmful behaviors. Supported by the Paul R. Vogt endowment and Ramona and Thomas McDonald donations.

LISTENING TO MUSIC WHILE EXERCISING INCREASES THE RISK FOR NOISE-INDUCED HEARING LOSS

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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 (29.5% males vs 16.7% 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.

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: The process of delivering a CH intervention to support in-person exercise consultations in a case study example. Methods: A 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 (SE) over the 24-week period with an initial prescription (Weeks 1-4) of 8,000+ steps/day and SE on 2+ days/week (60-90 minutes/week). Results: The mean daily step count was 12604 and 14630 steps/day and the mean PA minutes were 106 and 90 minutes/week for Weeks 1-2 and Weeks 13-24 respectively. Baseline, 12, and 24-week 6-MWT distances were 514.6, 567.7, and 630.9 meters, respectively. A paired samples t-test revealed that mean 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 protocol 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)  

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 (r2 = 0.26, p = 0.526), 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 = 0.001), 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
Milagro Jean-Marie-Tucker, Anton-Luigi Picazo, Lauren Pritting, Zakkoiyya H. Lewis, Loyola Marymount University, Los Angeles, CA.  
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Methods: Participants (n=11, 17.2 ± 3.0 years of age; 164.2 ± 8.1 cm in height, 69.8 kg in weight; n=33, 38.8% Female, 51.2% aged 18-24 years, 56.3% White, 27.0%±6.7 kg/m²) were randomly assigned to a control group (n=11) or STS group (n=13). STS participants were required to stand at the desk for a minimum of 12 hours per workday. The Leisure Diagnostic Battery (LDB) 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.

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. Besenyő3, Kansas State University, Manhattan, KS. 1Appalachian State University, Boone, NC. (Sponsor: Craig A. Harms, FACSM)  

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 and resources needed. Descriptive statistics and independent samples 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 lot/all of check-ups (N=5, 55.6% vs SD=1.5). However, private providers ask about PA habits and provide verbal counseling more often than public providers, t(168.4)= 2.10, p=0.038 vs t(168.10)= 3.20, p=0.002 respectively. Very few providers gave written PA prescriptions (10.8%). Few providers knew about ParkRx programs (13.9%), but 81.6% expressed interest in program development. Public providers were more willing to implement a ParkRx program (18.9%) vs 4.0%, p=0.017. When implementing ParkRx, public providers place greater importance on evidence of park-based PA (22.1%) vs 2.40, p=0.017, evidence of patient interest (22.1%) vs 2.30, p=0.022, a patient portal with PA resources (22.1%) vs 2.84; p=0.005, and incorporation into EHR electronic t(178.9)=2.55, p=0.012.

3049
Board #95
May 31 3:30 PM - 5:00 PM
The Effects of Sit To Stand Workstations on Perceived Leisure
Constance Haynes, Cara Daniels, Larissa Boyd, Melissa Powers, University of Central Oklahoma, Edmond, OK.  

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 = 11) or STS group (n = 13). STS participants were required to stand at the desk for a minimum of 12 hours per workday. The Leisure Diagnostic Battery (LDB) 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
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 < .05). 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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(No relevant relationships reported)

POURPOSE
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 BMI, respectively. Median household income was negatively associated with the percentage of students who achieved HFZ classification on BMI, respectively.

RESULTS
Bureau American FactFinder tool, and Geographic Information System (GIS) mapping that support physical activity were retrieved using Google search engine, US Census zip codes, corresponding median household incomes, park density, and park amenities that support physical activity (PA).

CONCLUSIONS:
- The number of park amenities that support physical activity (β = .005; p = .01) were positively and negatively associated with the percentage of students who achieved HFZ classification on BMI, respectively.
- The CG decreased by .05 points from pre-test to 6 (t(22) = 5.14, p = .01). A significant time effect did occur from pre-test to 6 (t(22) = 5.14, p = .01). The STS group significantly decreased by .26 points from baseline to 12 months (t(22) = 5.14, p = .01). 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.

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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(No relevant relationships reported)

POURPOSE
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 accelerate and decelerate. 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±4.01 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 bouts energy costs of different speeds (7km/h, 8km/h, 9km/h) were measured. The energy costs of subjects were measured by a portable gas analyzer (MetamaxTM 3B, Germany). Overground trials were completed in an indoor sports stadium, and treadmill (R60L3000E, 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. 0.225±0.02 ml/kg/m, p<0.01; 0.249±0.02 vs. 0.235±0.02 ml/kg/m, p<0.01; 0.244±0.02 vs. 0.215±0.02 ml/kg/m, p<0.01). We also found significant differences of female between the two modes with the treadmill being lower (0.231±0.02 vs. 0.217±0.02 ml/kg/m, p<0.01; 0.232±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 9kn/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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(No relevant relationships reported)
body. METHODS: Total 20 participants were randomly assigned to single set (ST, n=10), and multiple sets groups (MT, n=10). The ST group trained for one set with a maximum of six reps. The first rep started at 70% of one repetition maximum (IRM) and increased by 5% after each rep until they reached 90% of their IRM and then the last rep was performed at 100% of IRM. The MT group trained at 70% of IRM for 10 reps with 3 sets. Both groups trained 3 times per week for 8 weeks using the squat and chest bench press. IRM squat, IRM bench press, anaerobic power, vertical jump, and medicine ball throw in upper and lower body were measured at baseline and after 8 weeks of training. Two-way repeated measures ANOVA were used to determine an interaction effect between trial and treatment groups factors for each dependent variable. Main effects of trials and the treatment groups were also tested. RESULTS: There was no significant interaction effect between trial and treatment groups for all dependent variables. Main effect results show that both ST (percentage change = 20%, p < .001) and MT (24.05%, p < .001) groups significantly increased IRM squat, compared to their baseline. IRM bench press was also increased in both ST (6.82%, p < .005) and MT (13.9%, p < .002) groups. No significant differences in IRM squat and IRM bench press were found between the two training groups. Anaerobic power in ST (22.8%, p < .001) and MT (8.6%, p < .002) groups was significantly increased, compared to their baseline. However, there were no significant differences in anaerobic power of upper body. Vertical jump in ST (13.54%, p < .001) and MT (6.43%, p < .049) groups was significantly increased, compared to their baseline. There was no significant increase in the medicine ball throw from both groups. CONCLUSIONS: The results imply that low volume progressive single set training (ST) protocol is as effective as traditional multiple sets training (MT) protocol for increasing muscle strength and power.

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 Jessica Pope1, Steven Morrison2, Amanda Estep3, Jatin P. Ambegaonkar4, Shane V. Caswell5, Nelson Cortes6. 1George Mason University, Manassas, VA. 2Old Dominion University, Norfolk, VA. 3Austin Peay State University, Clarksville, TN. Email: ncortex@gmu.edu

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, 75.1±27.2 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, stretch, 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 (p < .05).

RESULTS: Main effects were attained for time and age group (p<.05). Participants were stronger (RLS, pre=24.3±5.8, post=28.3±8.8, p<.001; LLS, pre=23.0±4.8, post=27.1±7.9, p=.001) and improved leg endurance (STS, pre=12.6±3.2, post=14.5±4.0, p<.001) after INT. FRT was faster from pre (306.6±49.8) to post (299.6±43.6). For age group, 60-69 had greater improvements in leg endurance (STS, pre=12.36±3.22, post=14.54±1.54) and 80-89 (9.09±2.12). No other statistically significant differences were found (p>.05).

CONCLUSION: In line with previous literature, SAIL was effective at reducing falls risk factors, supporting SAIL to be an effective INT. Multifactorial INT is 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 Wenzhi Liu1, Nan Zheng2, Zachary C. Pope1, Daniel McDonough1, Zan Gao, FACSM1. 1University of Minnesota Twin Cities, Minneapolis, MN. 2Colorado State University, Fort Collins, CO. (Sponsor: Zan Gao, FACSM) Email: liu444@umn.edu

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; Mages=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 Brunel 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], mood (η2 = 0.07) and all mood variables [F (2, 96) = 3.84 - 278.56, p < 0.05, η2 = 0.07 - 0.85], except for tension (p > 0.05). Post hoc analysis comparisons indicated immersive VR had significantly higher anger compared to non-immersive VR (1.09 ± 2.15 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 ± 0.53, 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); immersive VR (1.86 ± 0.72) was stronger (RLS, pre=.24±.08, post=.28±.09; LLS, pre=.23±.08, post=.27±.09) and significantly higher vigor compared to traditional VR (3.70 ± 0.93 vs 1.15 ± 0.38, p < 0.01), respectively; 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.

3056 Board #102 May 31 3:30 PM - 5:00 PM High Intensity Interval Training in a Natural Setting: An Intrapersonal Perspective Maureen W. Howard, Debra M. Vinci. University of West Florida, Pensacola, FL. Email: mwhoward4@uwf.edu

High intensity interval training (HIIT) is an extremely challenging workout associated with negative affect for participants (Ekkekakis et al., 2011; Foster et al., 2015). HIIT is often perceived as appropriate only for people who are experienced and relatively fit exercisers and as a poor option for deconditioned or previously sedentary exercisers (Hardcastle et al., 2014). Almost all HIIT research has been conducted in controlled, laboratory settings and focused on physiological adaptations. Little is known about the affective experiences of HIIT participants in real-life settings. PURPOSE: To examine the experiences of HIIT participants in a real-life outdoor boot camp. METHODS: Qualitative interviews were conducted with 16 boot camp participants whose length of time participating in HIIT ranged from two months to eight years. RESULTS: Three main findings: 1. People of widely varying fitness levels, ages, body types, and exercise backgrounds were able to enjoy and successfully perform HIIT workouts. According to body mass index categories, 64% of study participants were either overweight or obese. Ages ranged from 26 to 58 years; 2. Participants reported the alternating intensity levels were motivating and allowed them to work at near maximal intensity for short intervals, knowing low intensity intervals would soon provide needed recovery. The ability to customize the intensity and duration of intervals made HIIT workouts easier to complete than moderate intensity workouts extending over long periods of time; 3. Social support within the boot camp was crucial to successful performance and enjoyment of HIIT workouts. Participants reported that social support enabled them to endure workouts at higher intensity levels than would have been possible if exercising alone. CONCLUSIONS: HIIT is appropriate for people of varying fitness levels and exercise experience. Built-in recovery intervals motivate people to maximize effort during high intensity intervals. Social support during HIIT was critical to participants’ ability to complete difficult workouts.
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 relationship is not well understood. PURPOSE: To examine the relationship between weight loss, MVPA participation, and depressive symptoms over time in subjects enrolled in a BWLI.

METHODS: Secondary analyses of depressive symptoms and weight loss in sedentary subjects (n=379; 45.0±7.9 years; BMI=32.4kg/m²;≤3.8) enrolled in a BWLI and randomized to a reduced calorie diet (DIET, N=104), diet plus a moderate dose of MVPA (MOD-EX, N=97), or diet plus a high dose of MVPA (HIGH-EX, N=102) were completed. All groups reduced energy intake (1200-1800 kcal/day), received weekly intervention sessions (months 1-6), followed by 2 group and 2 telephone contacts per month (months 7-12). MOD-EX was prescribed unsupervised MVPA that progressed to 150 min/wk, and HIGH-EX was progressed to 250 min/wk. Depressive symptoms (CES-D) and weight were assessed at 0, 6, and 12 months.

RESULTS: Weight decreased [-0.03 ± 0.58 kg: 12mo; -0.07 ± 0.8 kg] and depressive symptoms modestly increased from baseline to 6 months [BL: 6.45± 2.34; fimo: 7.05 (p<0.001) and baseline to 12 months [BL: 6.45 ± 2.34; 12mo: 6.93 (p<0.05), with no significant differences between randomized groups. There was a modest, yet significant correlation between baseline CES-D score and weight change at months 6 (r=0.26; p<0.05) and months 12 (r=0.26; p<0.05). Subjects who completed 6 months of the intervention (n=337) had significantly lower baseline CES-D scores compared to the non-completers (n=42) (p<0.05), but there were no differences for 12 month completers (p=0.49).

CONCLUSIONS: The data revealed an inverse relationship between baseline depressive symptoms and success in the BWLI. This relationship was not different between DIET, MOD-EX, and HIGH-EX, indicating that exercise participation may not influence this relationship. While depressive symptoms increased slightly over time regardless of group assignment, the 6 month completors had lower baseline depressive symptoms than non-completers. Thus, baseline depressive symptoms may be an important marker of both success and attrition in a BWLI.

Dementia, particularly Alzheimer’s disease (AD), is one of the major causes of impairment and dependence in the world. Besides the cognitive decline, that characterize AD, this neurodegenerative disease progresses along with functional impairment, and adversely affects physical conditioning. Recent guidelines reinforce the need to implement effective interventions to mitigate the impact of AD. Physical exercise could be significant in improving functional and cognitive performances in these individuals. Cardiorespiratory fitness has been directly associated with different health-related parameters, brain health, neurocognitive performance and ability to perform daily activities. Submaximal incremental treadmill tests have been used to measure aerobic fitness in healthy older adults and seems to be appropriate for those diagnosed with dementia. PURPOSE: The aim of this study was to evaluate the impact of a multicomponent exercise program on peak oxygen consumption. METHODS: According to the 2011 NINCDS-ADRDA criteria, and in a mild to moderate stage of disease, 15 community-dwelling individuals diagnosed with probable AD were referred from the Neuroligogy Department of a Hospital Centre to participate in this study. VO2 peak was measured trough an incremental treadmill test using a modified Bruce protocol, designed for older individuals, previously tested with AD subjects. RESULTS: Results from Wilcoxon Signed Rank test revealed a slight increase on VO2 peak [19.11±(3.61); 20.60±(4.40); p=0.594] and on time to reach it [5.58±(1.48); 6.17±(2.23); p=0.575] which may be explained by a potential benefit of exercise on peripheral factors such as muscular resistance and coordination, both essential to success on endurance tests. CONCLUSIONS: Data from both evaluation moments suggest that AD subjects cardiorespiratory fitness is under the established standards for independent healthy older adults. These results reinforced the importance to create cost-effective strategies, and to use gold standard evaluation instruments, to mitigate or prevent the physical conditioning decline, determinant to their autonomy on activities of daily living.

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 interdisciplinarian program (IP) to treat obesity on sedentary and physical activity (PA) time. METHODS: A total of 14 obese women (39.33±3.57 years and BMI 34.14±3.99) 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 participation determinants were an accelerometer for seven consecutive days before and during the last week (LW) of IP. The difference between Pre and LW values was determined by a repeated measure one-way ANOVA. 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, weight body 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±28.35; Post 93.97±26.56 Kg). Neither the time (min/day) spent sedentary (Pre: 538±53, 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: 6392±1530; LW: 6808±2874) 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 (r=-0.068), light (-0.234) moderate/vigorous (-0.292) PA and steps/day (-0.289) was also not 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 life style after participating in an IP.

Funding: FAPESP 2015/06630-1, 2017/04528-0 and CAPES.

Resistance training (RT) may induce arterial stiffness (AS) which is associated with increased risk of myocardial infarction and stroke, the two leading causes of death in the developed world. However, there are a lot of variables and situations that can influence AS such as water intake (WI).

PURPOSE: To determine the influence of WI during RE on arterial stiffness. METHODS: Young adult men (n=17, 23.1±6.3 years old; 174±0.5 cm height; 76.4±13.3 kg weight) with at least 1 year of previous experience in RT and previously hydrated performed in different occasions (one week interval between them) an RT session (3 sets, 8-12 repetition of 12 exercises for all major muscle groups at 70-80% of 1RM) with [WI session (500ml of water)] and without (NW session) water intake. Aortic stiffness was measured before, immediately after, and 30 and 60 min after the RT session via Ankle-brachial pulse wave velocity (PWV). Repeated measures ANOVA was conducted to compare RT sessions differences (Rest, after, 30min, 60 min). Between-RT sessions differences at each moment were examined using appropriate post hoc analyses.

RESULTS: Increase in post-exercise PWV for the NW session compared to rest was observed. Moreover WI values were lower than NWI for all post-exercise measures. Table 1. Pulse wave velocity (PWV) in meters per second (m/s) before, immediately after, 30 and 60 min after WI and NWI resistance training sessions.
RESULTS: Both groups met the recommendations of MVPA in high proportion (%MVPA: Intervention 76.0 ± 10.9%; CO 76.0 ± 7.5%) and time (paired T-test, Wilcoxon). There were no significant differences in MVPA between groups at baseline and after 12 weeks. MVPA (in time and percentage) and time in sedentary activities decreased, however, the percentage of sedentary levels between groups at baseline and after 12 weeks. MVPA (in time and percentage) and time (paired T-test, Wilcoxon).

RESULTS:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Intervention (n=12)</th>
<th>Control (n=7)</th>
<th>p</th>
<th>Intervention (n=12)</th>
<th>Control (n=7)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVPA (min/day)</td>
<td>46.7 ± 21.9</td>
<td>50.1 ± 23.4</td>
<td>0.755</td>
<td>45.9 ± 21.1</td>
<td>49.7 ± 18.5</td>
<td>0.698</td>
</tr>
<tr>
<td>MVPA (%)</td>
<td>5.6 ± 2.5</td>
<td>5.8 ± 3.0</td>
<td>0.966</td>
<td>5.5 ± 2.6</td>
<td>5.7 ± 2.4</td>
<td>0.862</td>
</tr>
<tr>
<td>Sedentary (min/day)</td>
<td>536 ± 67.5</td>
<td>573.1 ± 64.7</td>
<td>0.257</td>
<td>529.5 ± 76.0</td>
<td>558.8 ± 87.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Sedentary (%)</td>
<td>63.6 ± 5.1</td>
<td>66.1 ± 6.8</td>
<td>0.383</td>
<td>64.6 ± 7.8</td>
<td>64.2 ± 7.1</td>
<td>0.904</td>
</tr>
</tbody>
</table>

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.

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.

CONCLUSIONS: From this investigation alone we cannot determine whether WI is influencing the PW measurement or which physiological mechanisms were influenced by WI.

A single exercise session evokes blood pressure (BP) reductions that are immediate and persist for ≥24hr, termed postexercise hypotension (PEH). Self-monitoring of PEH may foster positive outcome expectations of exercise, and thus, enhance exercise adherence among adults with hypertension. PURPOSE: To compare the efficacy of self-monitoring of exercise (EXERCISE) versus exercise plus PEH (EXERCISE+PEH) for exercise adherence and BP control among adults with hypertension. METHODS: Adults with high BP were randomized to EXERCISE (n=12) or EXERCISE+PEH (n=12). Subjects underwent supervised, moderate intensity aerobic exercise training for 40-50min/session. 3d/wk for 12wk, and were encouraged to exercise unsupervised at home ≥20min/d, 1-2d/wk. All subjects self-monitored exercise using a calendar recording method. EXERCISE+PEH also self-monitored BP before and after exercise. Adherence was calculated as [# of exercise sessions performed / # of possible exercise sessions] X 100%. BP was measured pre- and post-training.

RESULTS: Healthy, middle-aged (52.3±10.8y) men (n=11) and women (n=13) with hypertension (136.2±10.7/85.2±8.9mmHg) completed exercise training with 87.9±12.1% adherence. EXERCISE+PEH demonstrated greater adherence to supervised training (94.3±6.6%) than EXERCISE (81.6±13.2%; p<0.007). In addition, EXERCISE+PEH performed 32.6±22.5min/wk more unsupervised home exercise than EXERCISE (p=0.004), resulting in greater overall study exercise adherence (106.2±24.7%) than EXERCISE (82.7±12.6%; p=0.092). Post-versus pre-training, BP was reduced -7.4±11.3/-4.9±9.9mmHg (p<0.025) with no statistical difference between EXERCISE+PEH (-5.2±13.3/-6.1±6.6mmHg) and EXERCISE+PEH (-9.9±11.3/-6.1±9.9mmHg; p=0.344). CONCLUSIONS: This study is the first to demonstrate that PEH self-monitoring is an efficacious tool to improve exercise adherence among adults with hypertension. Future research among a larger, more diverse sample is needed to confirm these novel findings and determine whether EXERCISE+PEH translates to better BP control relative to EXERCISE self-monitoring alone.

PURPOSE: To observe longitudinal changes in health and fitness among deconditioned professional American firefighters using High Intensity Functional Training (HIFT). METHODS: This HIFT was part of a credit-bearing educational experience (course-based) in which 13 undergraduate students participated in a service activity that met the needs of a community partner (Fire Services) and allowed them to gain deeper understanding of course objectives, knowledge and skills at a Committee on Accreditation for the Exercise Sciences accredited university, under the supervision of two ACSM exercise physiologists and one CSCS certified professors. Behavior change (BCG transcetheoretical model), body composition (BC skinfolds, waist/hip ratio, circumferences), aerobic capacity (AC Bruce, step test), balance (BL, BESS), muscular strength (MS, handgrip), muscular endurance (ME, push-up, leg press), and flexibility (FX, seat reach) of firefighters (n=13) were collected at 23 male firefighter stations ≥17 yd, ≥33 ± 10.2 y; height, 182.3 ± 6.5 cm; body mass index, 29.9 ± 4.9 at baseline, at 10 and 20 weeks. RESULTS: Measures of BCG, BC, AC, BL, MS, ME and FX significantly changed over time (MANOVAS: p<0.05). Follow-up post hoc analyses indicated that all measures significantly improved from baseline to the end of training (p<0.05). CONCLUSIONS: The results of the current longitudinal study suggest that measures of health and fitness among deconditioned U.S. firefighters significantly improved over 20 weeks. These results highlight the importance of (1) developing...
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.

**INTRODUCTION:** The holiday season is linked to weight gain which has also been related to distress about self-attitudinal aspects of body image (BI) inclusive of physical appearance and perceptions about physical fitness and health. The impact 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 media 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 to 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; B2=79.9±12.8 kg; F2=79.9±12.4 kg; p=33; ESB1-F2=0.09). However, change in weight was related to change in both Fitness and Health Orientation (B1 to F2; r=-.76; p=0.004; ESB1-F2=.52). Increased. No changes in the subscales of Body Areas Satisfaction, Overweight Preoccupation and Self-Classified Weight subscales were detected (all p ≥ .05). Change in weight was related to change in both Fitness and Health Orientation (B1 to F2; r=.56; p=0.03; and r=.54; p=0.02, respectively), but it was not related to changes in Appearance Evaluation (r=.22, p=.37). CONCLUSIONS: The holiday season is linked to weight gain which has also been related to distress about self-attitudinal aspects of body image (BI) inclusive of physical appearance and perceptions about physical fitness and health. The impact of a weight management intervention on holiday weight change and BI in midlife females has not been investigated.

**Association between Quadriceps Strength and Self-Reported Physical Activity in Individuals with Knee Osteoarthritis**

Malia N. M. Blue, Abbie E. Smith-Ryan, FACSM, Hope C. Davis, Troy Blackburn, Brian Pietrosimone, FACSM. University of North Carolina, Chapel Hill, NC. (Sponsor: Abbie Smith-Ryan, FACSM)

Email: mmm3303@email.unc.edu

**RESULTS:** 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 strengths and self-reported PA in individuals with knee OA. Secondary analyses evaluated the association between a change (A) 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 at McMaster Universities Arthritis Index pain subscale, and a quadriceps maximal voluntary isometric contraction (MVIC) performed at 70° of knee flexion measured 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 media 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.

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**Impact Versus Resistance Training For Bone In Young Women: Preliminary Findings Of The OPTIMA-Ex Trial**

Coron Lambert, Belinda R. Beck, FACSM, Amy T. Harding, Steven L. Watson, Benjamin K. Weeks. Griffith University, Gold Coast, Australia.

Email: ss.mao@163.com

**RESULTS:** A total of 51 women (age=22.2±3.6 years; height=1.64±0.62 m; weight=58.8±7.3 kg) had been randomised (IT=17, RT=17, CON=17) with no between-group differences at baseline. However, significant within-group differences in aBMD for both IT (mean difference ± SD, statistical significance set at p ≤ 0.05).

**CONCLUSIONS:** The holiday season is linked to weight gain which has also been related to distress about self-attitudinal aspects of body image (BI) inclusive of physical appearance and perceptions about physical fitness and health. The impact of a weight management intervention on holiday weight change and BI in midlife females has not been investigated.

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Malia N. M. Blue, Abbie E. Smith-Ryan, FACSM, Hope C. Davis, Troy Blackburn, Brian Pietrosimone, FACSM. University of North Carolina, Chapel Hill, NC. (Sponsor: Abbie Smith-Ryan, FACSM)

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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.

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The Feasibility and Efficacy of a Behavioral Intervention to Promote Appropriate Gestational Weight Gain
Rebecca A. Schlaff, Meghan Baruth, Samantha J. Deere. Saginaw Valley State University, University Center, MI. Email: raschla@svsu.edu

Nearly half of all women gain above gestational weight gain (GWG) recommendations and physical activity (PA) has been shown to decline 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%), with a mean of 2.3 (SD=2.4) weekly sessions. Weekly mean steps was high (10,230 ± 6,512 steps/day). Significant changes occurred in HDL and LDL over time and a significant change in BG across all groups took place over time (F2,23=8.05, p<0.05). Small, non-significant improvements occurred for the IG compared to a control group (CG) or an intervention group (IG). 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: Continued efforts for promoting PA and appropriate GWG are needed. Although acceptable, the intervention was not efficacious. Future intervention research should consider/report feasibility and acceptability indices through process evaluation. Trainings for, or input from, prenatal healthcare providers on how to best encourage and support patients’ engagement in healthy behaviors, such as PA, are warranted.

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Blood Lipid Profile Differences After a 12-Month Sit-to-Stand Workstation Intervention
Cara Daniels, Constance Haynes, Larissa Boyd, Jacilyn Olson, Melissa Powers. The University of Central Oklahoma, Edmond, OK.

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 per work day. Blood lipid profiles were used to measure high-density lipoprotein cholesterol (HDL), low-density lipoprotein cholesterol (LDL), total cholesterol (TC), and blood glucose (BG) at baseline, 6, and 12-months of the intervention. The data was analyzed using a repeated-measures ANOVA. RESULTS: No significant differences were found between groups (p>0.05). Small, non-significant improvements occurred for the IG in HDL and LDL over time and a significant change in BG across all groups took place over time (F2,23=8.05, p=0.00). Descriptive statistics can be found in Table 1. One outlier was removed from analysis. CONCLUSION: Significant differences did not occur between STS participants and those using a typical workstation; however, some benefits may be gained from breaking up bouts of sedentary behavior. Future research may examine the effects of longer standing time to ascertain the efficacy of the STS.

Table 1

<table>
<thead>
<tr>
<th>Blood Lipid Profile Statistics at Baseline, 6 months, and 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HDL pre (mg/dL)</strong></td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>60.54 (19.84)</td>
</tr>
<tr>
<td><strong>LDL pre (mg/dL)</strong></td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>104.50 (46.25)</td>
</tr>
<tr>
<td><strong>TC pre (mg/dL)</strong></td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>175.91 (24.08)</td>
</tr>
<tr>
<td><strong>WC (mean ± SD)</strong></td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>-3.2 ± 4.3 cm</td>
</tr>
<tr>
<td><strong>LDL pre (mg/dL)</strong></td>
</tr>
<tr>
<td>104.25 (46.38)</td>
</tr>
<tr>
<td><strong>TC pre (mg/dL)</strong></td>
</tr>
<tr>
<td>14</td>
</tr>
<tr>
<td>95.73 (8.66)</td>
</tr>
<tr>
<td><strong>WC (mean ± SD)</strong></td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>-3.2 ± 4.3 cm</td>
</tr>
</tbody>
</table>

Note: M=mean, SD=standard deviation, n=population

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Effects of a Brief Lifestyle Intervention for Office Workers
Cassandra M. Beattie, Lucas J. Dudgeon, Sarah J. Cosgrove, Katie M. Heinrich. Kansas State University, Manhattan, KS. Email: cbbeattie@ksu.edu

PURPOSE: Our study assessed the impact of a brief lifestyle intervention (LI) using a novel fitness application on body composition and fitness in office workers. METHODS: Insufficiently active office workers (n = 22) participated in a four-week randomized pilot trial. Individuals were randomized to either information-only control (CON; n = 10, age = 34.3 ± 14.6 years, 63.6% female, 80% white) or intervention (LI; n = 12, age = 37.6 ± 14.8 years, 91.7% female, 100% white) groups. CON was provided access to online physical activity and nutrition information with short assessments. LI was trained in-person on a mobile fitness application, that provided short (~2 minutes) daily workouts, alternating muscle groups each day; daily logging of wrist circumference, and a tracking system for “treats” (i.e., high sugar/starch foods). In person measures were conducted pre- and post-intervention. Anthropometric measures included height, weight, body fat percentage, and wrist circumference (WC). Fitness was measured via handgrip dynamometry (strength), sit-and-reach (flexibility), and 30-second chair stand test (muscular endurance). 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 LI on WC (mean Δ = -3.2 ± 4.3 cm; t = 2.57, p < 0.05), chair stand (mean Δ = 4.9 ± 4.8 repetitions; t = 3.52, p < 0.01), and flexibility (mean Δ = 2.9 ± 3.6 cm; t = 2.84, p < 0.05). Significant changes were found for CON for chair stand (mean Δ = 2.9 ± 3.1 repetitions; t = 2.92, p < 0.05). No significant between group differences were found for change scores. CONCLUSION: Our data suggest the novel fitness application could be a viable option to improve body composition and fitness among insufficiently active office workers. Future investigations should aim to validate our pilot study with larger sample sizes and consider additional measures of health and fitness.

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Muscle Damage and Inflammatory Response from Volume-Equated Resistance Exercise with Short vs Long Rest Interval
Gilson W. Sena,1 Paula P. Brandão2, Estevão Scudese2, Matheus Baffi3, Luiz Claudio P. Ribeiro3, Estevão H.M. Dantas5
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Resistance exercise is considered the most efficient method for the improvement of muscular strength, power and endurance. However, it is not possible to explain in their entirety the mechanisms that bring the benefits of neuromuscular fitness levels. PURPOSE: The aim was to analyze the effects of rest period length between resistance exercise (RE) sets on inflammatory response (cytokines and leukocyte)
and muscle tissue damage. METHODS: Ten trained men with at least one year of consistent resistance training experience were selected to participate (26.40 ± 4.73 years, 80.71 ± 8.95 kg, 166.61 ± 6.83 cm, 9.86 ± 2.35% body fat, bench press relative strength: 1.27 ± 0.27 kg/kg-1 of body mass) and to perform two workouts separated by one week. Each session consisted of five sets of 10 repetitions performed at 85% of 10 repetition maximum on barbell bench press followed by the leg press exercise, with either 1- or 3-minute of rest between sets. Circulating concentrations of creatine kinase (CK), lactate deshydrogenase (LDH), Interleukin 6 (IL-6), and tumoral necrosis factor alfa (TNF-α), were measured at pre-exercise (Pre), and post 3h (except for IL-6), 6h, 12h and 24h. The rate of perceived exertion (RPE) was recorded after each set on both visits. RESULTS: After the statistical analysis, we found increases triggered by the 1-minute of rest period length in CK main-effect for time-points (p = 0.001) and rest conditions (p = 0.004), occurring in 6h to 24h post-exercise compared with the Pre-exercise. For CK, the Pre- vs. Post-differ (p = 0.0005) between the 1-minute (4572.4 ± 1169.5 u/L-1) and 3-minute (3330.1 ± 715.9 u/L-1) rest conditions. In addition, we observed an increase in TNF-α for different time-points, mainly in 6h and 12h. Similarly, increases in IL-6 were observed for all post-exercise time-points (6h, 12h and 24h) and 1-minute Pre- to Pre-exercise data. For the RPE, the short rest period length demonstrated significant increases compared to the longer rest condition (SH, p < 0.001; LP, p < 0.001). CONCLUSION: The short rest condition promoted a greater overall damage of muscle tissue with a longer duration of the inflammatory process of this tissue. Supported by CAPES Brazil: 2034.476.

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 Horvath.1 Temple University, Philadelphia, PA. 2State University of New York at Buffalo, Buffalo, NY. (No relevant relationships reported)

BACKGROUND: Interactive video game technology has been extensively utilized in rehabilitative settings. However, few studies have explored the potential benefits of interactive video games as an exercise instrument for middle-aged adults who do not have a gym membership or who otherwise cannot regularly make it to their local fitness center. Features of interactive “exergaming” (modeling proper exercise biomechanics, increasing self-monitoring of behavior, encouraging participants to set health-related goals, and rewarding regular use) may help promote physical activity and consequently improve balance, cardiovascular health and functional fitness.

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, 162.1±10.9 cm, 79.2±19.1 kg, 39.6±7.7% fat mass).

METHODS: Subjects initially underwent balance, cardiovascular health 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 (14.2±1.7 to 16.8±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 distraction from school and possibly improved sleep but was found to be boring and at times more stressful due to time being taken away from academic work and 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, improved pain and mobility and served as a way 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-Rinicker. Hardin Simmons University, Abilene, TX. (Sponsor: Dennis G O’Connell, FACSMM) Email: xsh05@acsu.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 (Ns) 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. PS 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-hand 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 95, 2.9, 11, and 7.8 hrs, respectively. Statistically significant increases were noted in PF in 4 Ps: P1: Resting HR (BL-W6-W8 9.3 b/min); Resting SBP (BL-W6-W8 88 mmHg); WKR (BL-W6-W8 84 mmHg), post-walk SBP were restyled SBP (BL-W6-W8 167 mmHg), distance traveled in T6MWT (BL-W4-W6-W8 153.7 m), VO2 max (BL-W6-W8 7.7 mL/kg min); P2: resting SBP (BL-W2-W6-W8 99 mmHg); WKR (BL-W6-W8 84 mmHg); P3: resting HR (BL-W6-W8 5.8 b/min); weight (BL-W6-W8 0.5 kg); post-walk HR (BL-W2-W4-W6-W8 68.6 b/min), post-walk SPP (BL-W2-W4-W6-W8 22.5 mmHg). P4: resting HR (BL-W6-W8 5.8 b/min); weight (BL-W6-W8 0.5 kg); post-walk HR (BL-W2-W4-W6-W8 68.6 b/min), post-walk HR (BL-W2-W4-W6-W8 119.4 mmHg); distance traveled in T6MWT (BL-W2-W4-W6-W8 153.7m). PASE increased from BL in P1, P2, P3, 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. Arguelles1, Gregory Cloutier2, Alvin Morton1,2, 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-standing 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 ± 5.7 kg/m2) were cluster randomized to one of 3 groups: (i) seated desk control (C) (N=21), (ii) sit-to-standing desk (D) (N=23), or (iii) treadmill desk (T) (N=22). Change in average daily SED, standing and stepping time were measured using actiPALTM 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
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 hypothesis 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 or mean standing time at M12. Similarly, group T increased mean standing time from B to M3 (Mean ± SD = 1.23 ± 2.56 h [13.28 %]; p = 0.025, Cohen’s D = 0.48), but these increases were negated at M12. Mean daily stepping time increased significantly in group D from B to M12 (Mean ± SD = 0.81 ± 1.61 h [2.65 %]; 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 on Long Term Increase In Physical Activity In Previsouly Sedentary Adults

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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 to study if this increase in MPA has been sustained in the long term in these 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 Yekutiel 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 the end of 12 weeks compared to baseline in Pedometer and pedometer + website group. These gains were however not seen at the end of 52 weeks with the exception of physical activity in bouts. There is statistically significant increase in the physical activity in bouts at the end of 12 and also at 52 weeks compared to baseline in both pedometer and pedometer + website groups.

Conclusions: 12 week pedometer based interventions have shown long term increase activity in physical activity in bouts at the end of 52 weeks.

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 Francis1. 1Leeds Beckett University, Leeds, United Kingdom. 2University of St. Mark and St. John, Plymouth, United Kingdom. Email: c.oddy@leedsbeckett.ac.uk (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 female runner with plantar fasciitis, we trialled an alternate day treatment strategy of barefoot running on a grass surface (10 - 15 minutes). This approach was successful and was published as a medical case report. This abstract aims to describe the results of an emerging case series (n=4) using a similar approach.

Methods: Four amateur runners (2 male, 2 female, age 27-45 years) were diagnosed as having plantar fasciitis. In all cases, the failure of conservative management led to them being prescribed a barefoot running intervention on grass. Patients were instructed to complete 10-15 minutes (dependent on pain tolerance) of barefoot running every second day and record pain scores using the visual analog scale (VAS) every morning. Results: Mean pain intensity (scored out of 10) at the beginning of the intervention was 5.4 ± 1.5 (range 3.5 - 7). After 6 sessions of barefoot running, mean pain intensity had reduced to 2.0 ± 1.6 (range 2.0 - 4.0). All patients demonstrated an improvement in 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, 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 VO2 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 a HIIT protocol. Improvements in cardiorespiratory fitness and exercise economy were observed in all three individuals. 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>
</tr>
<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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<tr>
<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>
</tr>
<tr>
<td>GXT Stage 1 HR (bpm)</td>
<td>138.91 ± 5.88</td>
<td>136.64 ± 5.22</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>GXT Stage 2 VO2 (mL/kg/min)</td>
<td>21.74 ± 3.11</td>
<td>19.25 ± 3.50</td>
<td>0.031</td>
</tr>
<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>
</tr>
<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>

Renal transplanted children are at increased risk for cardiovascular diseases due to reduced cardiovascular fitness. Purpose: 1) To evaluate cardiovascular fitness, motor coordination, physical activity and health-related quality of life (HRQL) in pediatric renal transplant recipients and 2) to find out, if active video gaming provides a sufficient stimulus for an improvement in these items. Methods: Twenty renal
transplant recipients (TX, 13.5 ± 3.4 y; 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 y; 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 y; 152.1 ± 21.5 cm; 53.8 ± 22.2 kg) participated in a 6-week exercise game intervention. They were instructed to exercise 5x/week 60 min and were contacted weekly for adherence. All tests were repeated after the intervention.

**RESULTS:** Cardiovascular fitness (VO\(_{peak}\): 28.6 ± 7.8 vs. 41.7 ± 8.5 mL·min\(^{-1}·kg\(^{-1}\); \(P < 0.001\)), motor coordination (MQ\(_{total}\): 59.7 ± 17.5 vs. 105.8 ± 14.9; \(P < 0.001\)), physical activity (steps/h: 458 ± 171 vs. 687 ± 280; \(P = 0.001\)) and HRQL (75.0 ± 18.6 vs. 85.2 ± 7.8; \(P = 0.017\)) were significantly reduced in TX compared to CON. Maximal hand grip strength was similar in both groups. After six weeks of exercise, daily physical activity significantly increased from 481 ± 176.5 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.

**3080 Board #126** May 31 3:30 PM - 5:00 PM Effect of Dual-Task Performance Among Young Adults

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(No relevant relationships reported)

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-paced walking (2 task - congruent/incongruent x 3 intensities). Dual-task reaction time was measured during GNG movement tasks required subjects to strike virtual stimuli 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<.01. Post hoc tests using Greenhouse-Geisser correction showed that mean reaction time differed significantly between exercise conditions, F (3.425, 106.177) = 14.157, p<.01. There were no significant differences between Go-task while walking, fast-paced walking and NoGo-task while fast-paced walking. Participants were assigned to either a maximal aerobic capacity responder group (Responders) who increased V02 max (n=7) or a non-responder group (Non-Responders) that did not increase V02 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.

**3081 Board #127** 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 HRQL 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: 510.08 ± 68.69 m vs. 561.62 ± 94.98 m; p=0.002), CON: 456.86 ± 78.86 m vs. 487.07 ± 76.16 m; p=0.000)) and in STS10 (EXP: 27.94 ± 5.98 s vs. 17.46 ± 4.52 s; p<0.000), CON (31.40 ± 7.80 vs. 26.13 ± 8.85 s; 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 Kt/V score. EXP improved their score from 1.49 to 1.65 (p=0.006) and CON from 1.59 ± 1.11 (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 the 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 intradialytic 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

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(No relevant relationships reported)

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 BTT. 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 V02 max (n=7) or a non-responder group (Non-Responders) that did not increase V02 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.

**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 Vinosky, Jochen Kressler. San Diego State University, San Diego, CA. (Sponsor: Michael J. Buono, FACSM)

Email: Jmoore714@gmail.com

(No relevant relationships reported)

**PURPOSE:** To examine sex differences in postprandial glucose (PGP) during moderate intensity stair climbing of various durations following consumption of a mixed meal. The PGP response is strongly associated with cardiometabolic disease risk and women remain understudied in biomedical science. **METHODS:** Five males (24.0±3.9y) and nine females (23.7±2.7y) consumed a mixed meal containing 675 kcal (33% fat, 53% carbohydrate, 14% protein) and glucose levels were monitored for 1 hour. On three subsequent visits, participants consumed an
identical meal combined with either 1min, 3min, or 10min of stair-climbing, all ending 28 minutes after subjects finished the meal. Fingertip 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 pre-exercise PPG at 30min for any of the trials in men ($\Delta=0.05 \pm 0.12$ to 0.28; $\Delta=23.0\%$; $p=0.69$ to 0.29). In women there was a significant difference in pre-exercise PPG at 30min for the 1min trial ($\Delta=0.57 \pm 0.07$ to 4.54mg/dL/kg; $p<0.001$) but not for the 1min or 3min trials. No difference in pre-exercise PPG was observed in the incremental area under the curve (AUAC) or incremental area under the curve (iAUAC) for any of the trials in men ($\Delta=2.22 \pm 3.90$ to 5.32; $\Delta=58.6\%$; $p=0.46$ to 0.40 and $\Delta=0.56 \pm 0.86$ to 74.90mg/dL/kg/min; $p=0.77$ to 0.38). In women there was a significant difference in AUAC for the and iAUAC for the 1min trial ($\Delta=11.45 \pm 2.22$ to 3.6mg/dL/kg/min; $p=0.001$ and $\Delta=10.51 \pm 2.99$mg/dL/kg/min; $p<0.01$) but not for the 1min or 3min trials. No interaction was seen between trial and sex for post-exercise PPG at 30min ($\Delta=0.65$, $\eta^2_p=0.15$; $p=0.70$, $\eta^2_p=0.13$), or AUAC ($p=0.80$, $\eta^2_p=0.09$).

**CONCLUSIONS:** Men and women showed a similar response in PPG following moderate intensity stairclimbing 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 transition of these habits into 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-served 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/mentor ratio was 1:1 - 1:2. Pre-service teachers alternated leading lessons focused on health and skill-related 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 = 0.0092, Right: p = 0.00319); One Mile Run (p = 2.279E-7); Curl-Ups (p = 0.000261); Push-Ups (p = 0.0003). Paired t-tests were used to assess the pre and post values for all four FitnessGram Performance Standards.

**CONCLUSIONS:** Significant differences were observed for all outcomes between the three exercise sessions, $F (1, 135) = 67.9-277.2$, $p < 0.01$, $\eta^2_p = 0.42-0.79$, except for %ST ($p > 0.05$). In detail, immersive VR resulted in significantly higher steps than non-immersive VR and traditional biking, respectively ($2,033.8 \pm 423.4; 1,412.7 \pm 193.5$). Participants’ percentage of sedentary time (%ST) and steps were tracked using ActiGraph GT3X+ accelerometers, with situational interest examined using the validated Situational Interest Scale. One-way MANOVA examined differences for all outcomes between the three exercise sessions. **RESULTS:** The EG presented improvements in general mobility (SMD= -0.71 [moderate], 95%CI=0.0, 1.37) and in all mobility tests compared to the CG (TS 8UG: SMD=0.62 [moderate], 95%CI=0.06, 1.90; coefficient of variability (CoV) 8UG: SMD=0.14 [trivial], 95%CI=0.1, 1.38; DT 8UG: SMD=1.12 [large], 95%CI=0.73, 1.23; 2.48; cost of DT (CDT) SUG: 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 (3.78 ± 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 ± 0.3; 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 Harweger1, Paige Davis1, Cory Mahan1, Bryan Smith2, Amy Givan3, Bharath Sagar Selvaraj1, Mason Plater3, Cassidy Stout1, Enoko Larumbe-Zabala2, Maria Fernandez-del-Valle1, 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). Trainings consisted of seven exercise strengths performed at an intensity of 80% 1RM until 350 calories have been expended.

**Results**

Analysis of variance (ANOVA) showed significant interaction effects (time x group) in LP (p<0.001) and BP (p=0.001) tests. Further, pairwise comparisons showed significant increases in LP (p<0.001) and BP (p<0.001) total weight lifted in the RT group after the intervention (20.55±12.22 kg and 6.1±4.54 kg respectively), but not in the control group (2.26±1.86 kg and 0.58±0.26 kg respectively). There were no statistically significant changes found for arterial compliance.

**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 group exercised at 80% of their age adjusted heart rate reserve (HRR) for 4 one minute intervals and upper body muscular endurance (50% of 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), IRM 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 = 6.696; 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.

**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. (Reported Relationships: K. Delcastillo: Industry contracted research. The study was funded by an industry grant.)

**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.

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**3091** Board #137 May 31 3:30 PM - 5:00 PM Student Engagement in Classroom Physical Activity Breaks Jeanne Barcelona1, Yen Chen2, Darla Castelli1. Wayne State University, Detroit, MI. 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 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 = -0.4, SE = 0.1, t = -3.09, p < .05). Sedentary behavior had a direct effect on total MVPA (B = -0.45, SE = 0.06, t = -7.69, p < .05). Student perceived classroom climate did not have a significant direct effect on total MVPA (p = .09) but did have significant indirect effect through sedentary behavior (indirect effect = -0.02, 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.
Grade, sex, and PA break type were controlled in the analyses. **Conclusions**: Providing students with classroom PA breaks may not be enough. Student’s PCC shape how they engage in classroom PA breaks. Teachers must develop a positive classroom climate where PA is encouraged and affirmed.

**Purpose**: Lagre 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 Lagre Fitness Megaformer in men and women.

**Methods**: 31 healthy participants began a 6 month, 3x per week, 25 minute group lead, Lagre 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 necessity 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) approximated significance. Change in total leg LM (P = .382) was not significant.

**Conclusion**: In the absence of weight bearing exercise, high-intensity exercise on the Lagre Fitness Megaformer provided significant improvements in total leg space (P = .009), significant, and increases in total body LM (P = .069) approximated significance. Change in total leg LM (P = .382) was not significant. Most college classes require long periods of sedentary behavior and attention demands tasks. College students, as emerging adults, are moving through a key developmental stage, in which it is critical to instill lifelong health behaviors. Physical activity breaks (PABs) in college settings are novel, but have been shown to be potentially beneficial regarding concentration and academic performance (Babkes Stellino, et al., 2017). **PURPOSE**: To explore college students’ barriers to, and reasons for, engagement in PABs intervention. **METHODS**: College students were invited to participate in video-led or live instructor-led PABs consisting of cardio-strength based exercises or yoga during a 6-week summer college course. Students were asked to write out the reason(s) they chose to engage in the PAB, or not, each day a PAB was offered. At the end of the 6-week course, students also completed an open-ended survey intended to understand their overall reasons for engagement, and barriers to participation in PABs. Basic thematic analysis was conducted to explore why students chose to engage in PABs or chose to opt out. **RESULTS**: Common reasons reported for engaging in PABs were enjoyment, needing a break, from lecture, and contributing to the research. Enjoyment levels were higher when various modes of PABs were offered. Students mentioned a greater personal connection, and a desire to put forth more effort when a live instructor led the activity, particularly for yoga PABs. PABs were viewed as a break from class, and considered a valid exercise bout for some students. This was motivating for some students, but reported as a limitation for others who had already exercised or were going to exercise later that day. Not feeling well, being unprepared or just not wanting to participate, were reported as the main barriers to engagement in the PABs. **CONCLUSION**: It is important to understand what motivates college students to engage, or not, in PABs, in order to better tailor future programs that will appeal to a greater majority of students. Findings will contribute to the continued exploration of the benefits that PABs can have for college students in the college classroom.

**Alzheimer’s disease (AD) is the most prevalent dementia in the world. Indeed, the expectation is that this number will triple in the coming decades. Clearly, accessible interventions to prevent and treat the disease have been crucial, as well as, identify preclinical individuals. Despite clinical diagnosis are still focused on episodic memory deficits as the gold standard for AD, some studies suggest that because of the damages caused by the disease in prefrontal and temporal areas, along with, impairment in executive function AD could also have a motor signature that could be access through gait and Dual task (DT) tests. The accuracy of these tests to distinguish healthy from AD elders.**

**PURPOSE**: To verify the sensitivity and specificity of DT and DT cost to distinguish elderly with AD from healthy controls. **METHODS**: We evaluated older adults over sixty years old, DT performance was measured by gait velocity (m/s), DT cost (DTC= [(single task - dual task) / single task] × 100)) and the number of evoked words (DTanimals). We also included Sit to Stand, 8 Foot up and go (STEG) test to measure functional capacity. Cognitive functions were evaluated through MMSE, RAVLT and Trail (A and B). T test and Mann-Whitney test were used to compare the two groups. The sensitivity and specificity of the tests were explored through the ROC curve. **RESULTS**: The final sample consisted of 82 participants, being 39 healthy elderly and 43 diagnosed with AD. There was a significant difference between the Healthy and AD groups in all DT variables and MMSE; DT (p < 0.001), DT cost (p < 0.001), MMSE (p < 0.001). Moreover MMSE (area = 0.974; sensitivity = 82%; specificity = 88.1%; p < 0.001) showed better accuracy than DT (area = 0.901; sensitivity = 80.5%; specificity = 86.8%; p < 0.001) and DTC variables (area = 0.816; sensitivity = 82.7%; specificity = 76.3%; p < 0.001). The cut-off point of DT was 9.55.
CONCLUSIONS: DT analysis was able to differentiate AD from Healthy elderly with great accuracy and a moderate sensitivity and specificity. Performance in dual task should be more investigated as a possible motor biomarker of AD.

3096 Board #142 May 31 3:30 PM - 5:00 PM Effects Of Bingocize® On Quality Of Life, Fall Risk, And Health Knowledge In Community-Dwelling Older Adults Alyssa Kathryn Dispennette1, Brian Focht, FACSMM, Brian Clark2, Mark Schafer2, Matthew Shlake2, Gretchen Macy2, Jason Crandall2. 1The Ohio State University, Columbus, OH. 2Western Kentucky University, Bowling Green, KY. (Sponsor: Brian Focht, FACSMM)

(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-stage balanced, 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 (t (34) = 2.85, p = 0.007, 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.

3097 Board #143 May 31 3:30 PM - 5:00 PM Tailored Domain-Specific Sedentary Behavior Intervention on Reducing Sedentary Time Heontae Kim, Minsoo Kang. FACSMM The University of Mississippi, University, MS.

Email: hkim35@olemiss.edu (No relevant relationships reported)

PURPOSE: To continue the advancement of sedentary behavior intervention, it is important for researchers to design the intervention based on the theoretical model and contextual information of sedentary behavior. Therefore, the purpose of this study is to identify the feasibility of tailored domain-specific sedentary behavior intervention on reducing sedentary behavior time using contextual information of sedentary behavior. METHODS: A total of 43 adults (age ≥ 18) were participated in this study. A randomized controlled trial with a covariate adaptive randomization was used. Participants were randomly assigned to three groups: 1) tailored domain-specific intervention group; 2) standard intervention group; and 3) control group. Statistical analysis: t-test was used to compare the means and standard deviation of the study. RESULTS: There was a significant difference in volume and CSA for all muscles measured for the FS group between T0 and T8 (p<0.05). Muscle volume in the FS group increased by 140.9% and CSA increased by 114.4%. CONCLUSION: The tailored domain-specific sedentary behavior intervention using contextual information of sedentary behavior was effective, reducing sedentary behavior time for adults.

3098 Board #144 May 31 3:30 PM - 5:00 PM Stage Of Behavior Change In Regards Of Physical Activity, Health And Quality Of Life Among Health Professionals From Health Institutions Amauri dos Santos, Carolina Gonzalez Beltran, João Pedro da Silva Junior, Victor Keihan Matsudo. CELAFICS, Brazil.

(Brazil. (No relevant relationships reported)

Purpose: To analyze the factors associated to the stage of behavior change among professionals from health institutions. METHODS: The sample consisted of 1054 professionals (247 male and 807 female). The dependent variable was the irregularly active group of the behavioral stage questionnaire (proposed by Prochaska, 1988). The independent variables were: gender, physical activity, steps number, sleep, negative mood, presence of diseases, health perception, and quality of life. Statistical analysis: Binary Logistic Regression Odds Ratio (OR) and its respective 95% confidence intervals (CI) were used to associate the study variables. Results: Factors associated with irregularly active behavior change were: gender, physical activity, sleep, negative mood, presence of disease, health perception and quality of life. On the other hand, steps number was not associated with the stage of irregularly active behavior change (see table below). Conclusion: The irregularly active group had a positive association with female sex, as well as a higher probability of belonging to groups that did not comply with the recommandation of physical activity, dissatisfaction with sleep, with a higher frequency of negative mood, with diseases, negative health perception and a low quality of life.

3099 Board #145 May 31 3:30 PM - 5:00 PM The Effect of a Foot Exercise Protocol on Intrinsic Muscle Volume Ulisses T. Taddei1, Alessandra B. Matias1, Fernanda IA Ribeiro2, Irene S. Davis, FACSMM, Isabel CN Sacco3, 1Universidade de Sao Paulo - Faculdade de Medicina, Sao Paulo, Brazil. 2Spaulding National Running Center, Cambridge, MA. (Sponsor: Irene S. Davis, FACSMM)

Email: utaddei@gmail.com (No relevant relationships reported)

PURPOSE: Musculoskeletal injuries of the foot may be partially attributed to weakness of the intrinsic muscles, which are crucial to foot stability during dynamic activities. Perhaps because of their small size, the potential for strengthening these muscles is highly under-appreciated. Therefore, treatment of foot problems is often focused on externally supporting the foot rather than strengthening it. The objective of this study was to determine the effect of a foot exercise intervention on the volume of plantar intrinsic foot muscles.

METHODS: 34 recreational runners were randomly assigned to either a Control (CON) or Foot Strengthening (FS) group. The CON group was assigned to a placebo lower limb stretching protocol while the FS group performed a foot exercise protocol for 8 weeks. Running mileage and training pace were controlled weekly throughout the study for both groups. The right foot of all subjects was imaged using MRI at baseline (T0), as well as at week 8 (T8). Cross-sectional areas (CSA) of the whole length of the Abductor Hallucis (AbH), Abductor Digiti Minimi (AbDM), Flexor Hallucis Brevis (FHB), and Flexor Digitsum Brevis (FDB) were measured by a researcher blinded to both group assignment and time (T0 or T8). The Intraclass Correlation values for repeatedly measuring CSA for this tester was ICC = 0.97 (0.96-0.98). RESULTS: There was a significant difference in CSA for all muscles measured for the FS group between T0 and T8 (p<0.05). Muscle volume in the FS group increased...
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 Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001, FAPESP 2015/14810-0.

3101 Board #147 May 31 3:30 PM - 5:00 PM Power and Strength Training Produce Similar Improvements in Performance in Individuals with Parkinson's Disease
(Sponsor: Kevin Jacobs, FACSM)
(No relevant relationships reported)

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; η² = .749; p < .0001) and chest press (MD = 7.33 kg ± 3.46; η² = .518; p < .0001) strength, as well as in leg press (MD = 106.89 W ± 24.73; η² = .358; p < .0001) and chest press power output (MD = 52.12 W ± 15.11; η² = .299; p < .0001) were seen for the entire sample. There was also a significant decrease in Berg scores for the sample (MD = -1.68 ± .55; η² = .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 Financial, and 5% in Overall wellness. Significant improvements were noted in Physical, Emotional, Social, Occupational, Financial, and Overall wellness with effect sizes ranging from medium to large. CONCLUSION: This study demonstrates the effectiveness of an educational wellness intervention on overall well-being in university faculty and staff. Further research is needed to evaluate the long-term effects of this intervention on overall well-being.

The Effect Of Exercise Training And Increasing Non-exercise Physical Activity On Glyca Levels
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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 kcal 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 basal level. All participants had a pre and post intervention. Statistical analysis utilized a paired-t test and Cohen’s d for effect size.

RESULTS: No significant group effect was found. Significant increases in leg press (MD = 54.89 kg ± 7.41; η² = .749; p < .0001) and chest press (MD = 7.33 kg ± 3.46; η² = .518; p < .0001) strength, as well as in leg press (MD = 106.89 W ± 24.73; η² = .358; p < .0001) and chest press power output (MD = 52.12 W ± 15.11; η² = .299; p < .0001) were seen for the entire sample. There was also a significant decrease in Berg scores for the sample (MD = -1.68 ± .55; η² = .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 Impact Of A Workplace Wellness Program On Employees In A University Setting
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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 Financial, and 5% in Overall wellness. Significant improvements were noted in Physical, Emotional, Social, Occupational, Financial, and Overall wellness with effect sizes ranging from medium to large. CONCLUSION: This study demonstrates the effectiveness of an educational wellness intervention on overall well-being in university faculty and staff. Further research is needed to evaluate the long-term effects of this intervention on overall well-being.

Abstracts were prepared by the authors and printed as submitted.
Pregnant women had complete metabolic data. Prenatal exercise exhibited 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=0.31; 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; TC: p=0.41; LDL: p=0.24; TG: p=0.49; LT: p=0.69) or across pregnancy (glucose: p=0.83; TC: p=0.40; TG: p=0.32; LDL: p=0.66; LT: p=0.70), with the exception of HDL at 36 weeks. CT mothers exhibited lower LDL 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 1st trimester=7,108 steps), and 45 have completed the study (follow-ups are ongoing). There were no differences in baseline variables between groups. In the IG, 13 women utilized PA services (prenatal yoga: 8, gym: 2, both: 3). There was no difference between groups in PA (assessed via change in step counts from early to late pregnancy) (p=0.81). However, there was a trend for the IG to accumulate less sedentary time compared to the CG during late pregnancy (p=0.12). There were no differences in knowledge (p=0.8) or beliefs (p=0.3) regarding PA during pregnancy between groups. The IG was at a later stage of the transtheoretical model than women in the CG during late pregnancy (p=0.04). CONCLUSION: The intervention was unsuccessful at significantly increasing PA levels and knowledge/beliefs. Yoga was the most commonly utilized activity among IG women, and while beneficial, is unlikely to alter step counts. Future interventions need more educational materials and access to resources in order to have a substantial impact on PA-related outcomes.

3108 Board #154 May 31 2:00 PM - 3:30 PM Strategies And Challenges In Recruiting Overweight/Obese Pregnant Women For A Behavioral Lifestyle Intervention Program

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Pregnancy may serve as a unique window for lifestyle behavioral change because of increased concern for health and well-being in expectant mothers. PURPOSE: To report the recruitment efforts and results undertaken in a behavioral lifestyle intervention administered during and after pregnancy. METHODS: The Health in Pregnancy and Postpartum (HIPP) Study is an ongoing randomized controlled trial that targets excessive weight gain during pregnancy and promotes weight loss after delivery. The target population includes overweight or obese women who are pregnant ≤ 16 weeks, white or African American, aged 18-44 years, and do not have exercise contraindications. Women are recruited through OB/GYN clinics in metropolitan Columbia, SC. Interested women who meet the initial inclusion criteria (i.e., age, race, gestational age, and pre-pregnancy BMI) are screened by phone for medical exclusions or other study exclusions. A script based on principles of motivational interviewing is used to screen women for eligibility, however, in order to not impose an undue condition, and if still interested in participating, they are scheduled for baseline visit. RESULTS: Of the 1,547 women initially eligible and interested, only 822 (53.1%) could be reached by phone for further screening and 161 (19.6%) were found ineligible. Of the 661 eligible women screened by phone, 387 (58.5%) scheduled baseline measurements. Top reasons women were ineligible or not interested included (3.3%), insulin-dependent diabetes (3.0%), and doctor contraindicated exercise during pregnancy (2.7%). After accounting for cancelled or no show (n=126) and in progress (n=4) appointments, 257 (66.2%) women have completed the in-person portion of baseline measurements, resulting in the overall recruitment yield of 16.6% (257/1547). Women who cancelled or did not show up at baseline visits were less likely to have their own cell phone (p=0.02) or a smart phone (p=0.04), receive <20 texts/day (p=0.001), have access to a computer (p<0.007), or have ever downloaded a podcast (p=0.008); women were more likely to miss or cancel appointments in April, July, and December(n=0.001). CONCLUSION: Recruitment of women in early pregnancy for a behavioral lifestyle intervention appears challenging, particularly among women with limited phone access.

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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No relevant relationships reported

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: 25.4 ± 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 Outcomes: A Meta-analysis

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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 incorporating 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=361, OR=1.00 [95% CI=0.95, 1.05], p<0.001) compared to standard care only. No significant effects on gestational age at delivery (8 RCTs, n=135, OR=0.94 [95% CI=0.84, 1.05], p=0.3) and birthweight (8 RCTs, n=1427, OR=-2.32 [95% CI=-16.44, 13.80]) 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.

**3113 Board #159 May 31 2:00 PM - 3:30 PM Exercise Effects On Cognitive Function And Adls In Alzheimer’S Disease: A Meta-analysis**

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**BACKGROUND:** Alzheimer’s Disease (AD) is the worldwide leading cause of senile dementia and affects approximately 5.3 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 these. **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.

**F-58 Free Communication/Poster - Systematic Reviews and Meta-Analyses**

**3114 Board #160 May 31 2:00 PM - 3:30 PM Insulin Resistance AdaptationsTo High-Intensity Interval Versus Moderate-Continuous Training In Health And Disease: A Meta-Analysis**

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(No relevant relationships reported)

Besides the well-known physical fitness benefits of high-intensity interval training (HIIT) over moderate-intensity continuous training (MICT), the effect on other cardiometabolic risk factors, such as insulin resistance, is not yet well defined. **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 using 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 (t2). Effect sizes (ES) were classified as trivial (d < 0.2), small (d = 0.2 - 0.5), medium (d = 0.5 - 0.8), and large (d > 0.8). A sensitivity analysis was performed using the leave-one-out cross-validation method. Positive and negative ES represent a favorable effect for HIIT and MICT, respectively. RESULTS: The overall effect presented a medium ES (d = 0.53, p = 0.035), with a t2 = 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 = 0.8), and MetS (p = 0.7), and small ES for T2D (p = 0.6). The age subgroup had a large ES for 30-50y (d = 0.87, p = 0.09), and trivial ES for < 30 y (p = 0.5) and > 50 y (p = 0.5). The training duration subgroup had a large ES for < 5 wk (d = 0.95, p = 0.035), trivial ES for 5-10 wk (p = 0.6), and small ES for > 10 wk (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 (p = 0.9) and 0.4-0.6 (p = 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.
ES for running (p = 0.5). CONCLUSIONS: despite a medium overall ES, the effects of HIIT and MCT on insulin resistance vary considerably. HIIT may be superior to MCT 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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PURPOSE: Using a traditional random-effects model, a recent meta-analysis by Herron 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 (IVhet), has been shown to provide more robust findings. The purpose of this study was to apply the IVhet 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 IVhet model. In addition, absolute and relative differences between the IVhet 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 IVhet 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 an aggregate of six mean differences in blood pressure were smaller, ranging from -0.82 to 0.19 mmHg (61% to 41.0%) while all six 95% CI 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 IVhet 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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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, FEV1%, 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.)
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 phrases: (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 indistinctly 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 = 0.000, I² = 76.8%). 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, I² = 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 for the experimental group presents values 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 = 3120

Excess caloric intake leads to weight gain which contributes to an increase in 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 caloric 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 weight loss (kg) was lower in the off season (F: 2.60 ± 1.36; S: 1.87 ± 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.
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 unaware 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 (HYD; 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 HYD and 29.3% were EUH, 24.9% were MOD at PRE compared to 82.3% and 4.6% in Season 2, respectively. There was no change in PRE USG from Fri (1.018 ± 0.008) to Sat (1.019 ± 0.007), 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, when combined with proper feedback and education, can be used effectively to optimize athletic readiness.

PURPOSE: To compare the food servings ingested by food groups after a 12-week intervention program to promote physical activity in a university setting. METHODS: 66 (32 men, 34 women) subjects belonging to the university community (teachers, students, administrative staff) of three different University Centers of the University of Guadalajara were evaluated on their food habits. They were asked about their daily food intake employing a food frequency questionnaire by standardized staff during the interview process. Each subject described how many days per week he/she usually ate each food and the usual amount they consumed on those days. A daily average of food group servings was calculated. Servings’ size were determined according to Mexican System for Equivalent Foods. The sample was divided into three groups: Device group (D, participants wore an accelerometer), Device plus counseling group (DC, participants wore an accelerometer and received a series of tips by a website to promote the physical activity and to change health-related behaviors), and Control group (CO, participants received no intervention). Comparisons were considered significant at a p-value <0.05. RESULTS: Subjects’ age, body weight, and stature were: 24 ± 7 y 21 ± 7 years, 69.9 ± 12.9 kg 57.9 ± 13.0 kg, y 172.1 ± 8.4 y 160.1 ± 8.4 cm, for men and women, respectively. Cereals was the food group most consumed and Legumes the less one for all groups. Considering the average, the intake of Fats increased for all groups. However, Seeds group decreased significantly in the D and CO groups only. No other significance was observed. CONCLUSIONS: The addition of non-contact counseling was associated with no change in Seeds group in comparison with the other groups. Maybe this kind of intervention might not be effective to modify food intake in this population.

**Table. Food servings ingested by Food Group in the studied Groups (n=66)**

<table>
<thead>
<tr>
<th>Device (n = 25)</th>
<th>Device plus counseling (n = 25)</th>
<th>Control (n = 16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
</tr>
<tr>
<td>ASF</td>
<td>6.0 ±3.1*</td>
<td>5.4 ±2.7</td>
</tr>
<tr>
<td>Dairy</td>
<td>2.0 (0.0 - 7.0)**</td>
<td>3.0 (0.0 - 11.0)</td>
</tr>
<tr>
<td>Legumes</td>
<td>1.0 (0.0 - 6.0)</td>
<td>1.0 (0.0 - 6.0)</td>
</tr>
<tr>
<td>Cereals</td>
<td>6.0 (3.0 - 18.0)</td>
<td>8.2 ±4.0</td>
</tr>
<tr>
<td>Vegetables</td>
<td>2.0 (0.0 - 5.0)</td>
<td>2.0 (0.0 - 8.0)</td>
</tr>
<tr>
<td>Seeds</td>
<td>2.0 (0.0 - 11.0)</td>
<td>1.0 (0.0 - 7.0)</td>
</tr>
<tr>
<td>Fats</td>
<td>3.0 (0.0 - 16.0)</td>
<td>4.0 (2.0 - 16.0)</td>
</tr>
<tr>
<td>Fruits</td>
<td>3.6 ±2.0</td>
<td>3.0 (1.0 - 10.0)</td>
</tr>
<tr>
<td>Sugars</td>
<td>2.7 (0.0 - 12.0)</td>
<td>2.0 (0.0 - 8.0)</td>
</tr>
</tbody>
</table>

ASF: Animal source foods. * Mean ± standard deviation. ** Median (min - max). * p <0.05 pre vs post.

(No relevant relationships reported)
PURPOSE: To analyze the association between the proportions of athletes with adequate macronutrient intake with one repetition maximum (1RM) on bench press in college athletes.

METHODS: 164 (103 men, 61 women) college athletes from different sports were evaluated. 24-h dietary recalls were administered to estimate the macronutrient intake. Carbohydrate (CHO), protein (PRO) and fat (FAT) intake were calculated and adjusted for body weight (g/kg/day). Consumption was classified as “adequate” if the athlete consumed the recommended minimum amounts for each macronutrient: 5 g/kg/day of CHO, 1.2 g/kg/day of PRO, and 0.5 g/kg/day of FAT. Bench press 1RM test was performed to determine the maximal strength. Then, 1RM was classified into sex-specific quantities: (Men: Q1 < 57.8 kg, Q2 57.8 - 66.8 kg, Q3 66.9 - 80.3 kg, and Q4 > 80.3 kg; Women Q1 < 35.1 kg, Q2 35.2 - 39.6 kg, Q3 39.7 - 48.8 kg, and Q4 > 48.8 kg) of displaced weight (kg). The proportion of athletes with an adequate intake of each macronutrient was compared between 1RM quartiles and analyzed by sex. Similarly, the proportion of subjects with adequate intake were compared between macronutrients within quartiles. Chi-square and multiple Z tests (with Bonferroni adjustment) were used to determine significant differences between groups. Significant differences were deemed at a p-value ≤ 0.05.

RESULTS: No association between adequate macronutrients intake and 1RM bench press strength levels were observed. However, CHO was the macronutrient with the lowest proportion of athletes achieving the minimum recommended intake.

Table. Proportion of participants with adequate macronutrient intake by 1RM strength quartile.

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHO 70%</td>
<td>6 (60%)</td>
<td>6 (37.5%)</td>
<td>6 (42.3%)</td>
<td>6 (16.7%)</td>
<td>0.166</td>
</tr>
<tr>
<td>p-value</td>
<td>0.303</td>
<td>0.001</td>
<td>&lt;0.001</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHO 60%</td>
<td>6 (37.5%)</td>
<td>6 (42.6%)</td>
<td>6 (21.6%)</td>
<td>6 (16.7%)</td>
<td>0.166</td>
</tr>
<tr>
<td>p-value</td>
<td>0.303</td>
<td>0.001</td>
<td>&lt;0.001</td>
<td>0.001</td>
<td></td>
</tr>
</tbody>
</table>

Data expressed as frequencies (%). Different letters denote significant differences between nutrients within quartiles (p<0.05).

CONCLUSIONS: No association between adequate macronutrients intake and 1RM bench press strength levels were observed. However, CHO was the macronutrient with the lowest proportion of athletes achieving the minimum recommended intake.
RESULTS: 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) (p<0.01); however, there was no obvious difference between the marathon group and cross-country group (p>0.05). The calorie of supplement intakes was 756.17±337.80 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 (r=0.63, p<0.01). The difference in vitamin D intake from the HGM was significant (p<0.01).

CONCLUSIONS: The energy expenditure level during daily training was obviously lower than which during competition in amateur runners. 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 for HGM profiling were collected weekly, during three phases of the project: baseline (5 wks; no CVE), intervention (8 wks; CVE 3x wk), and washout (4 wks; no CVE).

METHODS: Weekly microbiota were profiled using 16S rRNA gene sequencing. Microbiome sequence data were analyzed with the QIIME 2 bioinformatics platform. A minimal number of subjects were pre-determined by the subject’s VO2max test. Gut microbiota were profiled using 16s rDNA gene sequencing. Microbiome sequence data were analyzed with the QIIME 2 bioinformatics platform. RESULTS: To track changes in each subject’s HGM, community richness and composition were compared to the week 1 (baseline) values for each subject. One week after the CVE began there was a significant change (p = 0.001) in the HGM composition. This change persisted through 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.

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MINISTRY & SCIENCE IN SPORTS & EXERCISE

MEDICINE & SCIENCE IN SPORTS & EXERCISE

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This was a cross-sectional study, where 198 athletes were measured for total body BMD (TBMDM), lumbar spine BMD (LBMD), and dual femoral neck BMD (FNBSDM) 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): TBMDM r= -0.254, p<0.05; LBMD r=-0.428, p<0.05; FNBSDM 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.

INFLUENCE OF VITAMIN D INTAKE ON BONE MINERAL DENSITY AND ITS RELATION TO COMPOSITION FACTORS

Julia M. Rovera, Joseph R. Rostan, Sinclair A. Smith, Stella L. Volpe, FACSM. Drexel University, Philadelphia, PA. (Sponsor: Stella L. Volpe, FACSM)

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:

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), muscle 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 explore 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 < 0.01; VO2max (r = -0.24), triglycerides (TGs; r = -0.36), and diastolic blood pressure (DBP; r = -0.25), all p < 0.05. No correlations were observed with strength, BMC, 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 accuring 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 Heparin And Interleukin-6 Response In Trained Athletes

Alexandra L. Shill1, Molly Collinson1, Mark Palmer1, William D. Fraser2, Jonathan Tang2, Richard J. Burden1, Nicolette C. Bishop3, Loughborough University, Loughborough, United Kingdom. 1University of East Anglia, Norwich, United Kingdom. 2English Institute of Sport, Loughborough, United Kingdom.

PURPOSE: Iron deficiency and reduced iron status have potential negative performance implications for athletes, particularly endurance runners. Heparin 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 heparin and IL-6 levels hence could improve iron availability and increase performance. Exercise is known to increase both IL-6 and heparin 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; resistance trained n=6; team sports n=8) 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, 2, and 3 h post-exercise. Blood was analysed for serum total 25-hydroxy vitamin D at pre-exercise only; plasma heparin-25, plasma IL-6 and serum iron concentrations were assessed at all time points.

RESULTS: Heparin levels increased significantly after exercise (F(1.1, 18.4)=36.81, p=0.001) with values peaking at 3 h post-exercise (pre 17.13 ± 12.15 ng/mL; 3 h post-exercise 38.44 ± 23.92 ng/mL). Both iron and IL-6 concentration increased significantly in both treatment groups after the second RE. CONCLUSIONS: The heparin levels peaked at two days after the first resistance exercise in both groups, which is consistent with the Delayed Onset Muscle Soreness. The lower overall soreness in HC than LC might suggest that the higher level of dietary cholesterol promoted a more efficient recovery through regulating membrane homeostasis and facilitating cell signaling. PURPOSE: The purpose of this study was to investigate the effects of dietary cholesterol on the exercise-induced soreness levels. METHODS: 16 untrained, healthy young men (n=12) and women (n=4) performed a short-term high-intensity resistance exercise consisting of unilateral leg press and extension with 5 sets and repetitions until failure at 85% 1RM in the Resistance Exercise (RE) sessions and 3 sets/10 repetitions at 50% 1RM in the Light Exercise (LE) sessions. The RE was performed on the starting day (day 0) and day 9 while the LE was performed on day 3 and 6. Participants were randomly assigned to either a Low Cholesterol Intake (LC, n=7) or a High Cholesterol Intake (HC, n=9) group. Soreness levels were recorded with a Soreness Visual Analog Scale. Overall soreness was defined as the average soreness from Day 1 to 12. RESULTS: The overall soreness levels in LC were 91.6±13.6% higher than HC (P=0.044). Two days after the first RE, soreness levels reached to the highest point in both groups and were higher in LC than HC (P=0.028). The soreness in LC on Day 10 was lower than Day 2 (P=0.012). There was no significant difference between control groups after the second RE. CONCLUSIONS: The soreness levels peaked at two days after the first exercise resistance in both groups, which is consistent with the Delayed Onset Muscle Soreness. The lower overall soreness in HC than LC might suggest that the higher level of dietary cholesterol promoted a more efficient recovery via regulating inflammation and thus lowered the soreness levels. However, the levels of the biomarkers such as creatine kinase and C-reactive protein were unknown and should be analyzed in future studies to investigate the effects of cholesterol on the exercise-induced inflammation.

3135 Board #181 May 31 2:00 PM - 3:30 PM Evaluation of Vitamin K Intake and Its Relation to Bone Mineral Density

Julia M. Rovera, Joseph R. Rostan, Sinclair A. Smith, Stella L. Volpe, FACSM. Drexel University, Philadelphia, PA. (Sponsor: Stella L. Volpe, FACSM)

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:
3137  Board #183  May 31 2:00 PM - 3:30 PM
Effects of Fruit and Vegetable Consumption on Physical Activity Levels in Elementary School-Aged Children
Megan Reynolds. University of Central Florida, Orlando, FL.

PURPOSE: This study will examine the association of fruit and vegetable consumption at school on physical activity and academic achievement among children from disadvantaged backgrounds. Concern for this topic arises from the awareness that childhood obesity and the diseases that accompany it such as diabetes and hypertension are continuing to rise, while participation in physical activity is declining. Meals served in school could potentially intervene and help to reverse these statistics, especially for underprivileged children where many rely on this food to satisfy their daily nutritional needs. This project seeks to discover relationships between these factors in order to optimize the success of young students from different backgrounds.

METHODS: This is a cross-sectional, mixed-methods study designed to compare the association of fruit and vegetable consumption on physical activity and academic performance in a sample of underserved grade-school children. The student sample will be drawn from the UCP Beta Downtown campus. There will be 50 student subjects from each grade 3 to 5 that will be selected from each class roster, using systemic random sampling. Teachers and parents of participants will also be asked to participate in focus groups and fill out short multiple-choice questionnaires.

RESULTS: Results showed that children in the 3rd - 5th grades spend over 70% of their day being sedentary, roughly 20% of time throughout the day was spent participating in light physical activity, and less than 10% of daily living was spent participating in moderate-to-vigorous physical activity (MVPA). These same children also did not meet the recommended dietary intake for fruit and vegetable consumption, as on average they consumed less than one fruit or vegetable serving per day. CONCLUSIONS: It is necessary to educate the nation’s children on healthy eating options, as well allow more opportunity for higher intensity physical activity. School-based interventions are critical to reach children of diverse backgrounds. These interventions could help begin the reversal of current trends in the fight against obesity.

3138  Board #184  May 31 2:00 PM - 3:30 PM
Preschool Children in Childcare Settings Do Not Consume Healthy Snacks Despite Menus That Meet Recommended Dietary Standards
Stacie M. Kirk, Erik P. Kirk, FACSM. Southern Illinois University Edwardsville, Edwardsville, IL.

Email: skirk@siue.edu

Pre-school snack menus must meet the Dietary Guidelines for Americans, however, what is actually served and consumed by children is not restricted, potentially affecting consumption of a healthy diet.

PURPOSE: Compare preschool snack menus that meet recommended dietary guidelines to what is served and consumed by children.

METHODS: Fifty-two preschool children (mean±SD age 3y 9m ± 4m) from a university early childhood center participated in a 10-week study. Dietary intake was measured by trained investigators using direct observation for pre and post snack analysis. Energy and nutrient content was completed using Food Processor Nutrition Analysis by ESHA. Food color was determined by observation during analysis to determine if the color of food affected consumption of certain snacks. A food preference survey was administered orally by investigators to children immediately after each snack.

RESULTS: There was a significant (p<0.05) difference for total kilocalories (kcal) between menus (168 ± 48), served (269 ± 129) and consumed (179 ± 137). There was a significant (p<0.05) difference for grams of carbohydrate between menu (5.7 ± 2.0g) and consumed (5.8 ± 4.2 g) compared to served (8.7 ± 4.2 g). The majority of food served was white (47.4%), brown (14.0%), or orange (19.0%) in appearance indicating a larger amount of processed/prepackaged foods consumed. Minimal food was served with the colors of yellow (4.7%), red (9.0%) or green (2.2%); colors normally associated with fruits, vegetables, and lean meats. Children consumed about 23% of meats and 50% of vegetables that were served to them, which was significantly (p<0.05) lower than dairy (75.2%), fruits (72.6%), and grains (77.6%). Children consumed a high amount (84.2%) of the fats/sweets served to them. Children described the snack food as yummy (85.3%), okay (6.4%), or yucky (0.4%).

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.
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 moderately elevated 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 (P30CA023704)

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

Dr. Gregory J. Ledoux, Northern Vermont University - Lyndon, Lyndonville, VT. (Sponsor: Dr. Samuel A. E. Headley, FACSM)
Email: gregory.ledoux@northernvermont.edu

(No relevant relationships reported)

Pathology Classification and Exercise Adherence: a JTA Educational Approach to Providing Community-Based Exercise Programs

PURPOSE: The purpose of this study was to determine if pathology classification is a significant predictor of adherence to a community-based exercise program.

METHODS: A cohort study design was implemented, evaluating the Lyndon Health/Fitness Intervention Program (HFIP). Subjects (N = 44) had a mean age of 65.82 (SD = 10.00) years, participated in a 6-week exercise program consisting of 12 physiologist per session, two days per week. Each subject's Primary Healthcare Provider identified the pathology classification and exercise adherence was defined as the number of sessions attended out of 12 possible sessions. Data were analyzed via an independent groups 2-way analysis of variance (2-way ANOVA), simple linear regression, and multiple linear regression. RESULTS: No significant interaction was found. Result in regards to offer data clarifying the P value (p = 0.698). There was no significant difference between exercise adherence for gender (F(1,1) = 0.299, p = 0.588), or for pathology (F(1,4) = 1.823, p = 0.146). Pathology classification was found to be a 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 10.0% 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 follow-up with subjects after program conclusion. Furthermore, the Lyndon HFIP was facilitated in conjunction with a senior-level, undergraduate exercise science course, and served as an applied means to elucidate imbedded ACSM Job Task Analyses (JTA) required of Commission on Accreditation of Allied Health Education Programs (CAAHEP) accredited exercise science programs. The Lyndon HFIP appeared to be a feasible means to promote student learning while expanding community-based exercise opportunities.

3142 Board #188 May 31 2:00 PM - 3:30 PM Program Directors' Perspectives On Coaes-mediated Caahp Accreditation For The Exercise Sciences

Carlton R. Insley, III1, Susan M. Muller1, Sidney R. Schneider1, William Coale1, Salisbury University, Salisbury, MD. 1Committee on Accreditation for the Exercise Sciences, Indianapolis, IN. (Sponsor: Walt Thompson, FACSM, FACS AM)
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(No relevant relationships reported)

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 distributed by an expert committee. Upon IRB approval, an exploratory study was conducted with the corresponding campuses anticipating the survey. Directors’ perspectives, and evaluating CoAES insight to forward a more positive accreditation path. Electronically solicited, 75 individuals from approximately 500 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:

F-62 Free Communication/Poster - Education and Funk

Friday, May 31, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

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CONCLUSION: While pathology classification was a statistically significant predictor of exercise adherence, only 10.0% 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 follow-up with subjects after program conclusion. Furthermore, the Lyndon HFIP was facilitated in conjunction with a senior-level, undergraduate exercise science course, and served as an applied means to elucidate imbedded ACSM Job Task Analyses (JTA) required of Commission on Accreditation of Allied Health Education Programs (CAAHEP) accredited exercise science programs. The Lyndon HFIP appeared to be a feasible means to promote student learning while expanding community-based exercise opportunities.

3142 Board #188 May 31 2:00 PM - 3:30 PM Program Directors' Perspectives On Coaes-mediated Caahp Accreditation For The Exercise Sciences

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(No relevant relationships reported)

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).

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determine if there were any significant differences between the two groups (α = .05). RESULTS: The results demonstrated significant differences between the groups across all three variables of overall classroom community (p < .00), connectedness (p < .02), and learning (p < .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
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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 capturing type and frequency of common PA-related events (e.g., running, biking, fitness classes) hosted over an average month, as well as associated promotions (e.g., discounted beers). 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 breweries. RESULTS: A response rate of 77% was achieved. Participating breweries (N=10) were located in areas that are populated by predominately 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=18.2), 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 were eligible for one or more of the following promotions: $1USD off all 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 group activities 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)=125.4, p=.731; the interaction effect of task type and group was not significant F(1,10)=0.484, p=.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 DevelopAs A Consequence of Chronic Ankle Instability
Michael J. Turner, FACSM, Aregash Theodros, Anyea King, James Joyner, Tricia Hubbard-Turner, FACSM. UXC Charlotte, Charlotte, NC.
Email: miturner@unc.edu  
(No relevant relationships reported)

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 (22.1±2.6yr and 22.2±3.0yr; Mean±SD), height (167±8cm and 168±8cm), and weight (70.5±7.3kg and 66.7±5.7kg), 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 (0-20 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±6.0% and 24.6±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 VEmax (p=0.008) were different between groups. Maximal

Abstracts were prepared by the authors and printed as submitted.
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). FAMSport (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.

**3149 Board #195**
May 31 3:30 PM - 5:00 PM

**Early Brace Progression Following Anterior Cruciate Ligament Reconstructive Surgery Leads to Improved Knee Range of Motion**

Lauren N. Erickson, Kathryn C. Lucas, Caleb A. Jacobs, Darren L. Johnson, Mary L. Ireland, FACSM, Brian Noehren, FACSM. University of Kentucky, Lexington, KY.

Email: Lauren.Erickson@uky.edu

(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 extension; however, the effects of various brace progressions have received little attention. PURPOSE: To quantify 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 week. 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 (p<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 decreased 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 such as 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.

**3150 Board #196**
May 31 3:30 PM - 5:00 PM

**The Detection of Knee Joint Sounds under Different Loading Conditions using Vibroanthography**

Kristin Kal0, Rainer Sus, Daniel Niederer, Volker Gross2, Winfried Banzer, FACSM3, Lutz Vogt4.1. Goethe University Frankfurt, Frankfurt am Main, Germany. 2. University of Applied Sciences, Giessen, Germany.

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(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 defined dynamic loading conditions using vibroanthography. 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. 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 (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 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 tibial 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=20.7, p<0.001) and at the patella (Chi²=27.5, p<0.001) were obtained. The corresponding median difference for the tibial sensor were: stand/sit: 236 %, stairs: 675 %, OKC1: 291 %, OKC2: 384 %; and for the patella sensor: stand/sit: 158 %, stairs: 260 %, OKC1: 75 %, OKC2: 78 %. CONCLUSION: Overall, the larger the supposed knee joint loading was, the louder was the recorded knee crepitus. Consequently, vibroanthrographically 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.

**3151 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 Fahren, Carolyn Killelea, Morgan Skidmore, Robert Zarzour, Timothy Sell, FACSM. Duke University, Durham, NC. (Sponsor: Timothy Sell, FACSM)

(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 < 0.05. RESULTS: Pitchers demonstrated significant correlations between DOM GIR and DOM HIR (Correlation: 0.845, P < 0.017), as well as between DOM GIR and NDOM 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.

**3152 Board #198**
May 31 3:30 PM - 5:00 PM

**Return To Playing Testing In Individuals With ACL-Reconstructed Knees: Does Timing Of The Assessment Matter?**

Stephan G. Bodkin, Margaret H. Rutherford, Stephen F. Brockmeier, David R. Diduch, Joseph M. Hart, FACSM. University of Virginia, Charlottesville, VA. (Sponsor: Joseph Hart, FACSM)

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(No relevant relationships reported)

Context: Traditional return to play assessments following anterior cruciate ligament reconstruction (ACLR) identify large muscular deficits at 6 months post-surgery. This is concerning with majority of patients being cleared for sports on time alone. It is unknown if individuals post-ACLR show improved outcomes if assessed later than 6 months post ACLR. The purpose of this study was to examine patient function in individuals stratified by months post-ACLR.

Methods: A total of 293 individuals with ACLR (23.2±10.1 years, 142 Female, 6.4±6.9 mo post-ACLR) participated in the study. Participants were stratified based on the timing of their evaluation in months since ACLR: 5-6 mo: n=122, 6-7 mo: n=102, 7-8 mo: n=43, 8-9 mo: n=26. Subjective knee function was assessed through the International Knee Documentation Committee (IKDC) Subjective Form. Mass-normalized maximal voluntary isometric contraction (MVIC) and limb symmetry indexes (LSI) were collected on knee extensor and flexor muscle groups. Non-parametric statistics were run due to violation of the assumption of normality. Measures of subjective and muscular function were compared through Kruskal-Wallis with post-hoc partial eta squared values for effect sizes.
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 deficiencies that may be improving.

Table 1: Between Group Differences: Median (IQR)

<table>
<thead>
<tr>
<th>Mu. Post-ACLR</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>81.4* (70.1, 88.5)</td>
<td>83.9* (74.9, 92.0)</td>
<td>79.3* (73.6, 88.8)</td>
<td>89.1* (75.9, 92.3)</td>
<td>.019*</td>
<td>.026*</td>
</tr>
<tr>
<td>MVIC Extension (N/m/kg)</td>
<td>1.46 (1.16, 1.87)</td>
<td>1.60 (1.26, 2.03)</td>
<td>1.59 (1.23, 2.07)</td>
<td>1.65 (1.39, 2.05)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MVIC Flexion (N/kg)</td>
<td>7.77 (5.1, 1.01)</td>
<td>7.6 (5.9, 0.98)</td>
<td>7.7 (5.7, 0.89)</td>
<td>6.6 (5.1, 1.11)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MVIC Extension LSI (%)</td>
<td>60.0% (49.8, 76.2)</td>
<td>67.9% (52.2, 79.1)</td>
<td>67.7% (56.2, 80.9)</td>
<td>76.7% (64.0, 90.5)</td>
<td>.002*</td>
<td>.021*</td>
</tr>
<tr>
<td>MVIC Flexion LSI (%)</td>
<td>89.5% (71.0, 105.0)</td>
<td>84.2% (68.8, 98.1)</td>
<td>88.5% (66.7, 99.2)</td>
<td>84.3% (69.4, 95.8)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Significant difference between 5- and 6-month groups. ** Significant difference between 5- and 8-month groups. *** Significant difference between 6- and 8-month groups.

Purposes: Lacrosse officials come from different backgrounds, ages and training levels, but all function as athletes while refereeing. Anecdotally 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 athletes participated after high school graduation years. Pain sites and severity (0-10 numerical rating) and current impact of pain on officiating duties 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 (t range = 0.035 - 0.186; all p<0.05). Current participation in lacrosse 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 of players at once, and e) engaging the officiating duties than officials with no OA diagnoses. RESULTS: The TP view was 3.96 ± 1.05 cm², and the posterior was 3.76 ± 1.03 cm². The cross-sectional area (CSA) and thickness of the TP was recorded. To measure the TP, the probe was held at a point 30% and 50% between the knee joint line and the inferior tip of the lateral malleolus. Subjects inverted their foot and videos of the contraction cycle were viewed. Ninety percent of the ‘normal’ group had an anterior aspect of the quadriceps for 30 minutes. The ice pack was secured with low compression (plastic wrap) to the 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 elastic compression treatment. 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 17.9 ± 4.4°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 elastic compression 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.
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

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/flexion 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 by ACL-R.

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 Romeo2, 1MLB, New York, NY; 2Rothman Orthopaedic Institute, Tarrytown, NY. 1University of Utah, Salt Lake City, UT. Email: Brandon.Erickson@rothmanortho.com

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 time to return to the same level of competition for pitchers treated non-operatively was 170.7 +/- 169.7 days while for those treated operatively was 406 +/- 146.83 days. The RTS rate among players treated non-operatively and operatively was identical at 75%. RTS rate among players treated non-operatively and operatively was identical at 75%. Players treated non-operatively had no change in FIP or WAR following injury but had a higher (i.e. worse) WHIP after injury (p=0.039), and performed significantly worse in several secondary performance metrics, including number of games played per year (p=0.001). Players treated operatively had no change in any measured performance metrics following surgery. No difference existed between cases and controls in the primary performance variables. Conclusions: LD/TM tears occur more frequently in professional pitchers than previously recognized and reported. The majority of LD/TM tears are treated non-operatively. RTS rate for professional baseball pitchers following LD/TM tears treated operatively or non-operatively is 75%. Players treated operatively saw a decline in several performance metrics while players treated operatively had no significant difference in performance after surgery.

Characterizing the Prevalence of Cam-Type Hip Impingement in Women’s Professional Ice Hockey Players

Cordelia W. Carter, Darryl Whitney, Matthew Kindery, Samuel Baron, Guillen Gonzalez-Lomas. NYU-Langone Medical Center, New York, NY. Email: cordelia.w.carter@gmail.com

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 moderate her individual risk for cam lesion development.
Initial/Repeat Triamcinolone Acetonide Extended-Release (TA-ER) Reduces Osteoarthritis Knee Pain Regardless of Prior Intra-Articular Corticosteroids (IACS)
Kim M. Huffman1, John Richmond2, Andrew Spitzer1, Andreas Gomoll1, Deryk G. Jones1, Virginia B. Kraus1, Amy Cinar1, Joelle Luftin1, Scott Kelley1. 1Duke University School of Medicine, Durham, NC. 2New England Baptist Hospital, Dedham, MA. 3Cedars-Sinai Orthopaedic Center, Los Angeles, CA. 4Hospital for Special Surgery, New York, NY. Ochsner Sports Medicine Institute, Harahan, LA. 4Flexion Therapeutics, Inc., Burlington, MA. (Sponsor: 7960, FACS/M)
Email: kim.huffman@duke.edu

(Purpose: Repeat IACS are common in the management of knee osteoarthritis (OA), but efficacy may diminish over time, and recurrent use has been associated with articular damage. This post hoc analysis of a Phase 3b, single-arm, open-label study was designed to evaluate repeat injection of TAER in patients with knee OA who had received prior IACS. METHODS: Patients ≥40 y with symptomatic knee OA for ≥6 mo received the 1st TA-ER injection at Day 1 and the 2nd injection at the first visit (wk 12, 16, 20, or 24) at which repeat dose criteria were met (benefit from and tolerated the 1st injection without safety concerns and clinical indication to receive the 2nd injection). Patients who received 2 injections were evaluated every 4 wks up to 52 wks after the 1st injection. Treatment-emergent adverse events (TEAEs) and index knee radiography were evaluated. Exploratory efficacy endpoints included Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) A (pain). RESULTS: Of 208 enrolled patients, 179 received 2 injections. Of these, 95 (53.1%) had prior index knee IACS. Median time to 2nd injection was 16.4 wks (prior IACS) and 16.9 wks (no prior IACS); in both subgroups ~20% did not need the 2nd injection until wk 24. Mean WOMAC-A scores were comparable in both groups and decreased ~50% following each injection (Figure). Incidences of serious and Grade 3/4 TEAEs were low and similar in both groups. There were no indications of chondrolysis, osteonecrosis, subchondral insufficiency fractures, or clinically significant subchondral bone changes in either group. CONCLUSION: TA-ER provided substantial analgesia for 12-24 wks in patients with knee OA who had received prior IACS. Safety profiles were consistent with the overall population and previous reports. TA-ER may be a potential long-term nonoperative management strategy for knee OA pain.

Board #208 May 31 3:30 PM - 5:00 PM Long-Term Characteristics of Injured Shoulders in Overhead Sports: A Gender Comparison
Youngwook Kim1, Adam B. Rosen2. 1Utah State University, Logan, UT. 2University of Nebraska at Omaha, Omaha, NE.
Email: ywkimac@gmail.com

(Purpose: Overhead sports require high levels of mobility and force produced by the shoulder joint. Additionally, gender differences in glenohumeral joint mobility and upper extremity strength are apparent across various athletic populations. Previous studies have found relationships in shoulder range of motion (ROM) and strength in 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=0.03, d=0.88), IR strength (p=0.04, d=0.83), and ER strength (p=0.04, d=0.84) in the injured shoulder group versus the healthy group, whereas there were no group differences in males (p>0.05). Additionally, male overhead athletes had lower IR (p=0.01, d=0.67) and HAD ROM (p=0.01, d=0.85) and greater IR strength (p=0.02, d=0.64) compared to female overhead athletes. CONCLUSION: The results of this study indicate that shoulder injuries may have longer-lasting effects in male 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 Compatibility with 3D Printed Splints And Casts
Diana Hall1, Dean Miller1, Suprit Singh1, Yue Li2, Bill Bentley1, Lex Schultheis2. 1ActivArmor, Pueblo, CO. 2University of Central Florida School of Medicine, Orlando, FL. 3University of Maryland, College Park, MD.
Email: diana.hall@activarmor.com

(Purpose: 3D printed limb orthotics offer hygienic advantages over traditional technology because no padding is needed. We investigated bio compatibility 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 1929 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.
Ligament Laxity in Young Adults.

Methods:
Subjects were recreationally active undergraduate and medical school females (N=15) and males (N=20). Males served as a control group, in which pubertal development timing was assessed as age at achieving adult height (recall). Age at menarche and current menstrual status in females were assessed by recall questionnaire. Telos™ stress radiography was used to assess ACL laxity. Statistical analysis consisted of an independent samples t-test to compare laxity in males and females. Linear regression analysis was used to determine whether laxity was related to pubertal timing within each sex.

Results: The t-test found no significant sex difference in ACL laxity (female mean ± SD = 3.7 ± 1.7 mm; male mean ± SD = 3.0 ± 1.8 mm; p = 0.26). In males, regression analysis demonstrated no relationship between age at achieving adult height and knee laxity: slope = -0.03 (95% CI: -0.38 – 0.31); intercept = 4.34 (95% CI: -1.60 – 10.39); r² = 0.003; P = 0.83. Similarly, females exhibited no relationship between knee laxity and age at menarche: slope = -0.17 (95% CI: -0.95 – 0.61); intercept = 5.15 (95% CI: -4.87 – 15.16); P = 0.02; P = 0.65. The absence of regression relationship persisted after controlling for current menstrual cycle status.

Conclusion: ACL laxity in females appears to be unrelated to age at menarche. Sponsor: DAGMEC

F-64 Free Communication/Poster - Breast Cancer
Friday, May 31, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

Impact of Aerobic and Resistance Exercise on Global Shoulder Function in Breast Cancer Survivors
Frank C. Sweeney1, Wendy Demark-Wahnefried2, Kerry S. Courneyea3, Nathalie Sami4, Kyuwan Lee5, Debu Tripathy6, Thomas A. Buchanan7, Darcy Spicer8, Leslie Bernstein9, Joanne Mortimer10, Christina M. Dieli-Conwright, FACSM11. 1University of Southern California, Los Angeles, CA. 2University of Alabama at Birmingham, Birmingham, AL. 3University of Alberta, Edmonton, AB, Canada. 4The University of Texas, MD Anderson Cancer Center, Houston, TX. 5City of Hope National Medical Center, Duarte, CA. (Sponsor: Christina Dieli-Conwright, FACSM) (No relevant relationships reported)

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 adverse 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 sessions 5 times/week for 16 weeks. Functional mobility was assessed pre- and post-intervention by active ROM, maximal isometric voluntary strength, the Disabilities of Arm, Shoulder and Hand (DASH) questionnaire, and the Penn Shoulder Scale (PSS). Repeated-measures analyses of variance were used to compare pre- and post-intervention data in the two groups and assess between group differences.

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 chemotherapy 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 (pc>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).

S690 Vol. 51 No. 5 Supplement

ACSM May 28 – June 1, 2019
Orlando, Florida

Lisfranc injuries account for 1 in 55,000 injuries yearly and are associated with poor outcomes and high complication rates. Superficially connecting the medial and transverse tarsal joints, the Lisfranc ligament is composed of two primary ligaments: the Lisfranc lateral and medial interspace ligaments. The Lisfranc lateral interspace ligament is the primary stabilizer of the Lisfranc joints and is well visualized using ultrasound imaging.

Stratasys (Surface) m30i DART+  

Stratasys (Internal) m30i DART+

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Purpose: While widely used in breast cancer patients, anthracyclines induce multiple adverse side effects, including weight gain and muscle atrophy. High-intensity interval training (HIIT) is a novel exercise method that improves glucose metabolism, cardiorespiratory fitness and body composition in less exercise time than traditional continuous aerobic exercise in the general population. However, the effects of HIIT on body composition when performed during chemotherapy are unknown. The purpose of this study was to examine the effects of HIIT on body composition in breast cancer patients undergoing anthracycline chemotherapy.

Methods: Thirty sedentary breast cancer patients diagnosed with stage I-III breast cancer were randomized to exercise (HIIT=15) or control (CON=15) groups. HIIT performed 3 exercise sessions per week on stationary bike for 8 weeks during anthracycline chemotherapy. Exercise intensity was individually prescribed based on peak power output (PPO). Each HIIT session included 7 alternating bouts of 90% of PPO peak power output followed by 10% peak power output. CON was asked to maintain current levels of activity. Lean mass and fat mass were obtained at baseline (wk0) and post-treatment (wk9) from the InBody 770 biochemical impedance scale (Biospace, Cerritos, California). Paired t-test and repeated ANOVA were used to determine effects of HIIT on body composition within and between the two groups.

Results: At baseline, HIIT and CON groups did not differ by age (46.6±9.0y) or BMI (31.0±7.5 kg/m²). Following 8 weeks, body composition did not significantly change in either group (p>0.05). Fat mass slightly decreased in the HIIT group (wk0: 37.8±13.8 kg to wk9: 35.4±13.4 kg, p<0.05) and CON group (wk0: 30.2±12.6 kg to wk9: 29.4±13.7 kg, p=0.05) groups. Lean mass slightly increased in the HIIT group (HIIT: wk0: 44.0±6.4 kg to wk9: 44.7±6.4 kg, p<0.05) and did not change in the CON group (wk0: 44.3±8.8 kg to wk9: 44.2±8.8 kg, p>0.05).

Conclusions: An 8-week HIIT intervention did not improve body composition in obese breast cancer patients undergoing anthracycline therapy. Longer duration interventions with a larger sample must be explored to elucidate the benefits of HIIT on body composition in this population.
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 breast cancer. The 16-week exercise program included in-clinic tests and completed the self-report questionnaires, respectively. We assessed CRF, QoL, symptoms, muscle strength, estimated cardiorespiratory 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), cognitive 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 -1.60, -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 cognitive 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.

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 = 0.020); borderline superior to HIGH for lower body muscular strength (5.1 kg; p = 0.05); and borderline superior to STAN for upper body muscular endurance (6.4 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.
METHODS: Thirteen PMW (Age: 59.2±3.11; BMI 29.99±4.55) participated in the study. Each participant completed 3 experimental conditions in a randomly assigned order. The low-load condition involved 3 sets of 12-15 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 the athletes presented with hemodynamic abnormalities commonly associated with morbid obesity and mortality within the general population. PURPOSE: To quantify blood pressure (BP) abnormalities among NCAA Division I and II collegiate athletes.

RESULTS: Following written informed consent, 217 (131 male, 86 female) athletes (mean ± SEM; age = 20.0 ± 0.11 yr; ht = 178.7 ± 1.1 cm; wt = 86.9 ± 1.8 kg) underwent supine, hyperventilation, and standing BPs using a manual, hand-held sphygmomanometer as part of a preexercise evaluation prior to CPT. 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 (F(1, 215) = 14.987; P < 0.0001), but not race (F(1, 215) = 2.259; P = 0.101). Post hoc analyses revealed that, overall, males exhibited a higher incidence of elevated BP (BPsys = 121.0±0.9 vs. 113.8±1.1; BPdias = 76.9±1.2 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 = 124.0±0.7; BPdias = 77.8±0.7) as compared to 25.3% of cases documented among females (BPsys = 122.0±1.2; BPdias = 76.9±1.2). Of equal concern, was the hypertension indicated in 7.6% of male athletes (BPsys = 142.8±1.9; 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 I or II hypertension (BPsys > 129 mm Hg, and BPdias > 80 mm Hg). These findings support the need for early detection, follow-up screening, and non-drug treatment of athletes to include identifying risk factors (i.e., stress) and knowledge assessment. Ongoing studies are underway to assess the breadth and long-term implications of elevated BP on the athletes’ health, particularly with respect to potential cardiovascular risk.

3176 Board #222
May 31 3:30 PM - 5:00 PM
Cardiac Etiology of Exercise Induced Hypoxemia within Elite Athletes
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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 to confirm anatomical or functional shunts.

METHODS: Eight consecutive national level endurance athletes (cycling, running and rowing) with severe EIH (SpO2 reproducibly below 92%) has been examined with stress transthoracic echocardiography with injection of agitated saline. The saline was administered via cubital vein during the last two steps of the stress echo and the presence of the hypoxemia. Differential diagnoses was based on previously published reports for evaluation of cardiac shunts - number of microbubbles and latency (number of cardiac cycles) between the injection and appearance of the microbubbles in the left heart. Trans-esophageal echo has been performed in the follow up procedure to evaluate the anatomical etiology of the shunt.

RESULTS: Four athletes presented pulmonary etiology of the hypoxemia. Four athletes have presented cardiac origin with right to left shunt causing EIH. Concurrent transesophageal echocardiography discovered one atrial septal defect and three patent foramen ovale (PFO). One athlete with present PFO/ASD underwent successful catheterization closure due to anatomical challenges.

CONCLUSIONS: Exercise induced hypoxemia is generally thought to be caused by anatomical or functional shunts within the pulmonary circulation. Our findings suggest possibly higher prevalence than originally thought of cardiac etiology. Successful treatment by catheter-based closure device improves performance and eliminates other clinical signs of the right to left cardiac shunt. Further evaluation of larger group of elite athletes with EIH is warranted to understand better the real prevalence and possible treatment of the cardiac origin of the EIH.

3177 Board #223
May 31 3:30 PM - 5:00 PM
Metabolic And Cardiovascular Effects Of Body Weight Support Treadmill Walking In Healthy Older Adults.
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Purpose: Body weight supported treadmill training (BWSTT) has been proven to be effective for gait re-education for patients experiencing neuroplogic 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, 58.2±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±6.6 mmHg. Mean walking speed was 67.1 m/min. All tested parameters for all exercise trials were significantly (p<0.05) different from rest. Among exercise trials, VO2 and tidal volume at 30% BWS was significantly less than 0% BWS. 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.

3178 Board #224
May 31 3:30 PM - 5:00 PM
The Combined Effects of Whey Protein and Aerobic Exercise on Glycemic Responses
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Email: t.castleberry@tcu.edu (No relevant relationships reported)

Background: 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 also suggests that consuming whey protein prior to a single glucose challenge may decrease postprandial glucose response. To the authors’ knowledge, no studies have examined 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), glaucagon like peptide-1 (GLP-1), and glucagon 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 enzymatic-electrode technology. All variables are represented as incremental area under the curve (iAUC).

RESULTS: Glucose and insulin responses are represented in Table 1. GIP, GLP-1, and glucagon increased for both W and EXW compared to R (p < .01) and EX (p < .03).

<table>
<thead>
<tr>
<th>Table 1. Participant glucose and insulin iAUC between trials</th>
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<tr>
<td><strong>Glucose (mmol x 120 min)</strong></td>
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<td>R</td>
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<td>116.8 ± 105.3</td>
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* 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.

3179 Board #225 May 31 3:30 PM - 5:00 PM

Associations Among Objectively and Subjectively Measured Physical Activity in Older Adults

Gabrielle Volk. Miami University, Oxford, OH. (No relevant relationships reported)

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/conditions such as hypertension, type II diabetes, coronary heart disease, depression, and cancer—highlighting its importance 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 Healthy Activities 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 (100-1999 counts/min); moderate-activity (>2000 counts/min); vigorous activity (≥ 3999 counts/min). MVPA for CHAMPS included activities with MET values ≥ 3.0 METs.

RESULTS: Mean values for these subjects included: age= 69.0±6.3y; BMI= 27.4±7.3 kg/m2; body fat percentage (32.8±11.6%); CHAMPS MVPA= 1843.5±1477.2 kcal/wk. Participants glucose and insulin iAUC between trials

Board #226 May 31 3:30 PM - 5:00 PM

The Effects of Fatigue on Peak Torque During Dorisfination Between Limbs in Multiple Sclerosis Patients

David J. Lantis1, Gregg S. Cantrell1, John P. Hinta1, Cameron D. Owens1, Debra A. Bemben, FACSM1, Christopher D. Black, FACSM1, Daniel J. Larson1, Rebecca D. Larson1. St. Ambrose University, Davenport, IA. 1Northern State University, Aberdeen, SD. 2University of Oklahoma, Norman, OK. (No relevant relationships reported)

Multiple Sclerosis (MS) is a progressive immune-mediated disease that causes demyelination of the central nervous system. One of the most common symptoms in MS patients is fatigue. While strength asymmetries (SA) have been previously identified in MS patients, less is known of the impact fatigue has on SA. Fatigue of ankle dorsiflexion (AD) has the potential to limit walking function and activities of daily living (ADL) in MS patients. PURPOSE: To investigate the impact AD fatigue has on peak torque (PT) between limbs in MS patients compared to healthy individuals (Non-MS). METHODS: 26 individuals participated in the current study (MS: n = 13, Age = 50.3±9.1 yrs, Expanded Disability Status Scale = 3.5±2.8; Non-MS: n = 13, Age = 50.8±8.5 yrs). Visit 1 & 2 consisted of test familiarization procedures. Visit 3 consisted of pre-exercise (PRE) maximal isometric contractions (MVC) of AD followed by fatigue-inducing isometric exercise (FE) at 30% MVC until exhaustion. Immediately (POST) and 2 minutes (REC) after exercise subsequent MVCs were performed. Both limbs were tested with 15 minutes of rest between FE. Limbs were separated for analysis based on MVC PT (strong vs. weak). RESULTS: There was no group or limb difference in FE duration. When both limbs were collapsed for analysis,
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 CP were recruited. Seven CP patients completed post-exercise experiments after performing resistance training twice a week for three months. Muscle strength (torque, work, and power) at 90, 150, and 180°/sec were assessed in the leg using the Humac Norm Isokinetic Dynamometer. Functional 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 (75.5±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), or balance [e.g. overall score (25.2±16.1 pre vs. 24.3±11.4 post P>0.05)] on limit of stability test, total score (18.0±19.5 pre vs. 24.4±21.6 post 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 could contribute for higher leg muscular strength in adults with CP. Supported by Central RSCA and Undergraduate Research Grant, SINU.

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 Lastinis2, Gregory Cantrell2, Debra Bemben, FACSM3, Christopher Black, FACSM3, Daniel Larson1, Rachel Larson1. 1University of Oklahoma, Norman, OK. 2St. Ambrose University, Davenport, IA. 3Northern State University, Aberdeen, SD. Email: cdowens@ou.edu (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/flexor 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 ≥2.0 were divided into 23 Non-MS (9 Female, F, 14 Male, M, Age = 50.8 ± 8.5 yrs.) who 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% RTS. 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). Although MVC VCT and MVC PT between groups was not significantly different, notable effect sizes (ES) were shown between groups during MVC for VCT (ES=0.67, MS vs. Non-MS= 0.12 ± 0.09 vs. 0.07 ± 0.06 sec, p= 0.12), and MVC for PT (ES=0.8, MS vs. Non-MS= 3.03 ± 2.67 vs. 1.35 ± 1.23 Nm, p=0.06). CONCLUSION: The moderate/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 Strengthening Training In Patients With Duchenne Muscular Dystrophy Donovan J. Lott1, Tanja Taivassalo2, Hyun J. Park2, Korey D. Cooke2, Zahra Moslemi, Abhinandan Batra2, Sean C. Forbes1, Barry J. Byrne1, Glenn A. Walter1, Krista Vandenborne2. 1University of Florida, Newberry, FL. 2University of Florida, Gainesville, FL. Email: djlotttp@phhp.ufl.edu (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 knee flexor (KF) exercise in DMD.

**METHODS:** Eight ambulatory boys with DMD [9.3 (0.8) yrs, BMI 19.0 (4.6) kg/m²] on 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 12 weeks. Peak strength of 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 a compliance of 84.9 (9.0%) for the exercise sessions. The safety measures did not indicate signs of muscle damage [non-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 (13.25% p<0.05) and descend (27.7% p<0.05) 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.

3188 Board #234 May 31 3:30 PM - 5:00 PM The Characteristics of Muscle Tone and Stiffness in Young Adults with Chronic Low Back Pain Minjia Wang1, Bin Yang2, Guohan Wang1, Pejie Liu1, Yaozheng Wang1, Jie Jing1, Chengdu Sport Institute, Chengdu, China. Email: minjiaw@163.com (No relevant relationships reported)

**PURPOSE:** To determine the effect of resistance training on BMD, skeletal strength and muscular strength in boys with DMD. 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:** 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-Frequency, D-Logarithmic Decrement and S-Stiffness) of three muscle groups (para-spinal, 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-spinal 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-spinal 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-spinal 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-spinal muscle and tensor fascia lata than female patients; The more painful, the higher of the MTS in young CLBP patients.

3189 Board #235 May 31 3:30 PM - 5:00 PM Differential Effect of Resistance Training on Musculoskeletal Architecture and Strength in Adults with Cerebral Palsy Ramon C. Ronquillo1, Mac G. Damoulous, Cory E. Low, Alan L. De Vera, Areum K. Jensen. 1San Jose State University, San Jose, CA. (No relevant relationships reported)

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 causes CP population to be more prone to fractures and further immobility. Bone mineral density (BMD) improves in the general population via resistance training. However, it is still uncertain whether resistance training alters skeletal strength in the CP population and whether it influences musculoskeletal architecture and strength. **PURPOSE:** To determine the effect of resistance training on BMD, skeletal architecture, and muscular strength in adults with CP. **METHODS:** We studied 14 adults with and without CP. CP participants went through 3 months of resistance training twice per week. Dual-energy X-ray absorptiometry was used to measure local BMD at the lumbar spine (L1-1.4), proximal femur, and radial/ulnar regions. Architectural differences were identified by measuring various angles and lengths on the proximal femur. Leg muscular strength was measured during knee extension and flexion using the Humac Norm Isokinetic Dynamometer. **RESULTS:** There was a significant increase in BMD at femur in CP group after 3 month exercise (0.6±0.1 vs. 0.9±0.1; p<0.05). BMD at lumbar and forearm regions in CP group was similar to control group even though BMD in CP group seemed to improve after training (p<0.05). Skeletal architecture and muscular strength were significantly lower in CP compared to control, but it did not change after resistance.
training (architectural angle: 64±5° CPtre vs. 70±2° CPpost degree; P<0.05). While control group showed a strong linear relationship between femoral neck BMD and knee extensor peak torque (R²=0.83). CPtre 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.

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 (ECC; n = 13), or eccentric training combined with neuromuscular electrical stimulation groups (ECC+NMES; n = 13). The control group received conventional rehabilitation training (CRT), involving strength and balance training. The ECC group performed isokinetic concentric and eccentric training of the peroneal muscles based on CRT. The ECC+NMES group received NMES simultaneous to the isokinetic training. Both groups trained 3 days/week for eight 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 groups before training (P = 0.295, P > 0.05). Compared with pre-training, the EMD-P was significantly shorter in the ECC group (133 ± 8 vs. 127 ± 8 ms, P < 0.05) and ECC+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 ECC 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 ECC+NMES compared with ECC (119 ± 9 vs. 127 ± 8 ms, P = 0.03). CONCLUSION: Eccentric training effectively shortened the EMD-P in individuals with FAI compared with conventional treatment. However, ECC combined with NMES further enhanced the reduction in EMD-P. Therefore, ECC+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 Bruening1, Kathryn Brewerton1, Jayson Gifford1, Daniel Hoopes2.1 Brigham Young University. Provo, UT. 2Revere Health Orthopaedic Surgery, Provo, UT. (Sponsor: Pat Vehrs, FACSIM)

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 inside a narrow shoe, may put passive tension on the adductor hallucis, consequently compressing the lateral plantar artery (LPA) into the calcaneus and restrict BF. This may negatively affect the health of tissues within the foot such as the plantar fascia and may contribute to plantar fasciopathy. The purpose of this study was to compare BF within the LPA before and after passive halluc adduction (PHA).

METHODS: Forty-five healthy volunteers (20 female, 25 male; age = 24.8 ± 6.8 years; 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 adductor 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. Overall, in all volunteers, BF was 22% lower compared to before PHA (2.50 ± 0.063 mL/min, P < 0.001), with an initial decrease of 60%. As AHI decreased, there was a greater negative AFB. As baseline BF increased, there was also a greater negative AFB.

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.

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
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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-Akle Society (AOFAS) hindfoot score, as well as the Visual Analogue 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 (physical 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=0.491, emotional limitations p=0.935, mental health p=0.770). The differences in AOFAS and VAS at 3-month follow-up were not statistically significant (p=0.222 for AOFAS, p=0.329 for VAS).

There was also no significant difference in SF 36 score after 6 months (physical functioning p=0.814, physical limitations p=0.481, body pain p=0.091, general health p=0.427, vitality p=0.839, social functioning p=0.680, emotional limitations p=0.299, mental health p=0.416). 6-month post-intervention AOFAS VAS and SF 36 were not significantly different (p=0.978 for AOFAS, p=0.372 for VAS).

Conclusion: Our study showed no significant differences in SF 36 score, AOFAS, and VAS after a 6-month period between participants who underwent physiotherapy alone as compared with those who received ESWT in addition to physiotherapy. No serious adverse events were noted at the 6-month follow-up visit. Further studies need to be undertaken with a larger sample size, and a longer follow-up period.

3193 Board #239 May 31 3:30 PM - 5:00 PM
Effect Of A Virtual-exercise Program On Physical Function And Activity: Findings From The VERITAS Trial
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PURPOSE: To determine the effect of a virtual exercise program versus usual care on physical function and activity 6 and 12 weeks after total knee arthroplasty (TKA). METHODS: We conducted a multicenter, randomized controlled trial with adults undergoing unilateral TKA. At least 10 days before surgery, participants were randomized 1:1 to the virtual exercise program with an avatar coach, in-home 3D biometrics and weekly telehealth clinician support versus usual care (referral to home health or outpatient physical therapy as determined by the surgeon and clinical team). Intention-to-treat analysis was used for the following 6- and 12-week secondary patient-reported outcomes: physical function (in five domains of the Knee injury and Osteoarthritis Outcome Score [KOOS], higher score is better function) and minutes per week of moderate-to-vigorous physical activity (MVPA). Patient satisfaction with the virtual exercise program was assessed of intervention group patients 12-weeks after surgery. RESULTS: From November 2016-December 2017, 306 patients were randomized (mean age, 65 years; 62.5% women); 287 completed the trial (143 virtual, 144 usual care). At 6 weeks, there was no difference between groups in pain, symptoms, quality of life, difficulty with daily activities, and with function needed for sports and recreation (p=0.05). Patients in the virtual exercise group reported a mean of 119.9 (SD 197.4) min/week of MVPA at 6 weeks compared with 68.9 (SD 112.0) min/week for usual care patients (p=0.089). At 12 weeks, physical activity, pain, symptoms, quality of life and daily activities were not significantly different between groups but...
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 [30.3]; 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

Friday, May 31, 2019 - 1:00 PM - 6:00 PM
Room: CC-Hall WA2

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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

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(no relevant relationships reported)

3195
Board #241
May 31 3:30 PM - 5:00 PM
Effects Of Bariatric Surgery On Cardiac Autonomic Parameters During Sleep

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(no relevant relationships reported)

PURPOSE: To analyze the effects of bariatric surgery on cardiac autonomic modulation in morbid obese patients. METHODS: The study included 14 morbid obese patients that were submitted to bariatric surgery. Before and after surgery subjects were submitted to body mass index (BMI) assessment, answered, and were submitted to polysomnography. During polysomnography, AHI and cardiac autonomic modulation were assessed during sleep. RESULTS: After surgery BMI and AHI reduced significantly (p=0.05) from 48.7 ± 5.6 kg/m² to 41.9 ± 5.7 kg/m² and from 34 ± 29 events/h to 18 ± 16 events/h, respectively. Standard deviation were used as a measure of variability in pre and postoperative period and values were calculated with post 829.20 ± 82.84 and post 972.24 ± 146.20 with p=0.001 demonstrating gains in HRV in all patients. [1] Additional information with the application of the spectral wavelet analysis in the frequency decomposition provided values pre 2.8775x10^6 and post 2.3440x10^6 (p=0.05).

CONCLUSIONS: Morbid obese submitted to bariatric surgery presents improvement in cardiac autonomic modulation during sleep.

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Board #242
May 31 3:30 PM - 5:00 PM
Oxygen Desaturation in Sleep Apnea is Inversely Associated with Vascular Changes Following Exercise Training

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(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. Tertile-based cut-off points were used to categorize meanSpO₂ and apnea hypopnea index (AHI). Body fat was analyzed using dual energy X-ray absorptiometry. Vasoreactivity 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. RESULTS: Thirty (age: 40±9 years; BMI: 32.0±3.8 kg/m², 18 men: 12 women) adults without and with OSA completed the study. At baseline, adults in the highest tertile of meanSpO₂ were younger than those in the lowest tertile (43.29 vs 53.72 y, 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 (13.63±1.5898 A.U. vs.-186±10879 A.U.; p=0.041). Forward stepwise linear regression revealed that the highest tertile of meanSpO₂ was a significant (F=5.15, p=0.036) determinant 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±8.4 years) 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=0.0012), 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.
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.