Anterior cruciate ligament injury prevention programs (ACL-IPP) are generally successful at reducing injury rates; however, these ACL-IPP are more effective with women’s soccer (SOC) than basketball (BB) athletes. Purpose: To compare the biomechanical profiles and responses to an ACL-IPP in women’s BB and SOC players. Methods: 87 single-sport athletes (38 BB, 49 SOC) were cluster randomized into intervention (6-week ACL-IPP) and control groups. 3D biomechanical analyses of drop vertical jump (DVJ), double- (SAG-DL) and single-leg (SAG-SL) sagittal, and double- (FRONT-DL) and single-leg (FRONT-SL) frontal plane jump landing tasks were tested before and after the intervention. Baseline peak angles, excursions, and joint moments were analyzed using repeated measures MANOVA, while delta (Δ) scores of the same biomechanical measures were analyzed using two-way MANCOVs controlling for pre-test scores. Results: At baseline, BB players landed with less hip and/or knee excursion during all tasks (p<0.05) except for the SAG-SL task. The FRONT-SL task elicited the most distinct differences, including decreased hip abduction angles (mean difference: 5.0±1.3°, p<0.001), increased hip internal rotation excursion (mean difference: 2.8±0.9°, p<0.001), greater knee abduction (mean difference: 0.9±3.5°), and lower hip adduction angles (mean difference: 5.0±1.3°, p<0.001) in basketball players. After completing the ACL-IPP, the basketball intervention group exhibited a lower reduction in peak knee abduction angles (Δ=0.9±3.5°) compared to the basketball control group (Δ=1.5±4.5°) after training than the control group (Δ=1.8±5.5°, p<0.01). Conclusion: Soccer players exhibit a more protective landing strategy than basketball players, yet women's basketball and soccer players largely exhibit similar ACL injury events limit direct in vivo investigations. Instead, researchers have developed in vitro models such as the mechanical impact simulator to recreate ACL injury events. Purpose: To quantify the biomechanical response of the ACL and meniscal ligament (MCL) in a simulated landing environment capable of producing ACL ruptures consistent with clinical injury presentation. KAM, ATS, and ITR magnitudes corresponded to in vivo recorded kinetics from athlete cohorts exhibiting high, medium, low, and no relative risk for ACL injury. Each kinetic input was independent and randomized and a series of impulses was repeated on each specimen until hard or soft tissue failure occurred. ACL and MCL strains were recorded with implanted sensors, while a 6-axis load cell recorded forces and torques at the knee. Results: 87% of specimens produced ACL failures during simulation, with 92% presented at the femoral insertion or midsubstance and concurrent MCL failures in 31%. Peak strain was greater in the ACL (15.3±8.7%) than the MCL (5.1±6.3%; p<0.01). Overall ACL strain across all external loading conditions was 3.5% greater in females than males (p=0.04), but no sex differences were noted in the MCL (p=0.36). Under identical external loading conditions, female specimens also exhibited larger KAM moments than males (p=0.04). Conclusion: The mechanical impact simulator is the first in vitro model to reliably create ACL ruptures consistent with clinical presentation. Female specimens were more susceptible to ACL injury and KM than males, which supports the established association between sex, KM, and ACL injury risk. Future iterations of this model could be manipulated to investigate efficacy of injury prevention interventions and ACL reconstructions during simulated ACL injury events.
Persistent Vestibular Symptoms and Impairment Following Concussion in Adolescents

Aaron M. Sinnott¹, Valerie L. Reeves², Cyndi L. Holland³, Nicholas A. Blaney⁴, Andrew M. Rosse⁵, Hannah B. Blitzer⁶, R.J. Elbin⁷, Michael W. Collins⁷, Anthony P. Kontos⁸. ¹University of Pittsburgh, Pittsburgh, PA; ²University of Pittsburgh Medical Center, Pittsburgh, PA; ³University of Arkansas, Fayetteville, AR.

(No relevant relationships reported)

Vestibular impairment following concussion is associated with higher symptom burden, worse cognitive performance, and longer recovery. However, the role of persistent vestibular symptoms and impairment on these outcomes among adolescents is unknown. PURPOSE: Determine the role of persistent vestibular symptoms and impairment following concussion on recovery time and clinical outcomes among adolescents. METHODS: 50 (F:22/M:28) adolescents aged 12-20 years completed the Vestibular/Ocular Motor Screening tool (VOMS), Immediate Post-concussion Assessment and Cognitive Testing (ImpACT), and Post-concussion Symptom Scale (PCSS) at 0-10 and 11-21 days after concussion. Participants were categorized into: 1) persistent vestibular (PV), 2) vestibular improvement (VI), and 3) no vestibular (NoV). A 3 (group) X 2 (time) ANOVA with Bonferroni correction was performed for cognitive and symptom scores, and one-way ANOVA was performed for recovery time. RESULTS: Participants included 17 (35%) PV, 12 (25%) VI, and 20 (40%) NoV with one being excluded based on outlier analyses. Results supported group differences on PCSS at 11-21 days (p=0.004), with PV (29.0±24.9) reporting higher symptoms than VI (13.0±15.5; p=0.045) and NoV (5.45±10.0; p=0.005). The PV group took longer to recover (34.9±11.6 days, p<0.05) than the NoV (22.9±14.9 days) group. There were no significant group by time interactions for cognitive scores. However, all groups improved on verbal (p=0.007) and visual (p=0.03) memory, visual motor speed (p=0.02), and reaction time (p=0.03) from 0-10 to 11-20 days. PV group was more likely than males to be in the PV versus NoV group (p=0.02, 95% CI=1.3-24.6). CONCLUSION: Persistent vestibular symptoms and impairment following concussion may play a role in longer symptom burden and prolonged recovery that warrants attention from clinicians. Females may be more likely to experience these persistent vestibular symptoms and impairment.

Funding

This research was supported in part by a grant to the University of Pittsburgh from the National Institute on Deafness and Other Communication Disorders (1K01DC012332-01A1) to Dr Kontos.

PoW: Persistent Vestibular Symptoms and Impairment Following Concussion in Adolescents

488 Board #3 May 30 1:00 PM - 3:00 PM Influence Of Motion Sensitivity On Baseline Symptoms, Cognitive, And Vestibular/oculomotor Scores In Adolescent Athletes

R.J. Elbin¹, Mallory McElroy¹, Katie Stephenson-Brown¹, Anthony Kontos². ¹University of Arkansas, Fayetteville, AR; ²University of Pittsburgh Medical Center, Pittsburgh, PA.

(Sponsor: Dr. Matthew Ganzio, FACSM)

(No relevant relationships reported)

Researchers report that a history of motion sensitivity is associated with vestibular/oculomotor impairment and symptoms in non-concussed collegiate athletes. However, previous research did not include other commonly used baseline concussion assessments (e.g., neurocognitive, symptoms) or adolescent athletes. PURPOSE: To examine the effects of motion sensitivity on baseline neurocognitive, symptom, and vestibular/oculomotor scores in high school athletes (HS). METHODS: A total of 423 HS athletes (15.0±1.24 years; 97 females - 24%) completed the Motion Sickness Sensitivity Questionnaires (MSSQ), the Immediate Post-concussion Assessment and Cognitive Testing (ImpACT), Post-concussion Symptom Scale (PCSS), and Vestibular/Ocular Motor Screening tool (VOMS) at baseline. Athletes were categorized into three groups: 1) NONE - MSSQ score=0 (33%, 142/421), 2) LOW-MSSQ score >0<7.07 (34%, 144/421), and 3) HIGH- MSSQ score >7.07 (33%, 135/421) based on median split of MSSQ scores >0. A series of ANOVAs were performed to examine between group differences on MSSQ items scores, near-point convergence (NPC) distance, cognitive testing, and symptoms. A series of chi-square analyses with odds ratios (ORs) were used to analyze the association of motion sensitivity to clinical cutoffs on VOMS (i.e., >2 on any item) and NPC distance (≥5 cm). RESULTS: A total of 34% (144/423) and 95% (407/423) of athletes had scores greater than 1 VOMS item and NPC distance, respectively. Total PCSS scores were greater for the HIGH compared to the NONE group (p=0.003). There were no differences between motion sensitivity groups on cognitive performance (p >0.05). The HIGH group had higher total VOMS scores than the NONE group for horizontal saccades, horizontal vestibulo-ocular reflex (VOR), vertical VOR, and visual motion sensitivity (p <0.01). The HIGH group was 2.94x (p<0.001) more likely than the NONE group to exceed clinical cutoffs on VOMS. CONCLUSION: Motion sensitivity was associated with scores above clinical cutoffs on VOMS. Sports medicine professionals should assess motion sensitivity in athletes at baseline to inform better SRC care.

Barrier Multimodal Assessment To Quantify Concussion Recovery Trajectory Among Youth Athletes

David R. Howell¹, Gregory D. Myer², Anna N. Brilliant³, Kim Barber Foss², William P. Meehan³, IV; ¹Children's Hospital Colorado, Aurora, CO; ²Cincinnati Children’s Hospital Medical Center, Cincinnati, OH; ³Boston Children's Hospital, Waltham, MA.

(Sponsor: Louis R. Osternig, FACSM)

(No relevant relationships reported)

PURPOSE: Our aim was to evaluate a quantitative and multifaceted approach for determination of concussion recovery among youth athletes across different functional domains. METHODS: Youth athletes 8-18 years of age and diagnosed with a concussion were tested 3 times: within 10 days of injury (T1), approximately 3 weeks post-injury (T2), and after clinical recovery, defined as symptom resolution and return to sport clearance (T3). Control participants completed the protocol in similar temporal increments as concussion participants. All participants completed a multivariate protocol that included a symptom inventory (PCSS), a dual-task gait evaluation, an electroencephalography (EEG)-based auditory oddball task, and objective eye tracking. Repeated measures ANCOVAs were used to evaluate between group differences with sex, age, and prior concussions as covariates. We also examined if the rate of change across time for each outcome variable was different between groups using analysis of response profiles for longitudinal data.

RESULTS: Sixty-three athletes participated: 36 post-concussion (age=14.0±2.6 years; 44% female) and 31 controls (age=14.6±2.2 years; 39% female). Concussion symptom severity was significantly higher for the concussion group compared to controls at T1 (PCSS=31.7±18.8 vs. 19.2±9.2; p<0.001) and T2 (PCSS=10.8±11.2 vs. 1.8±3.6; p<0.001), but resolved by T3 (PCSS=1.7±3.6 vs. 2.0±3.8; p=0.46). The concussion group walked significantly faster than controls at each of the three tests (0.83±0.19 vs. 0.95±0.15 m/s; p=0.049). We found no significant differences between groups for the EEG oddball task or objective eye tracking measures. The EEG auditory oddball connectivity recovery trajectory differed significantly between groups, where the concussion group scores decreased and the control group scores increased across the testing timeline (p<2×10^-4).

CONCLUSIONS: Despite symptom resolution, athletes with concussion displayed altered dual-task gait speeds at their final visit and their auditory oddball connectivity scores worsened throughout the test timeline. A multimodal and objective approach to concussion monitoring may support clinicians in the detection of brain function deficits that are undetectable with standard clinical assessments.

490 Board #5 May 30 1:00 PM - 3:00 PM Association Between Sleep Quality and Symptoms Following a Sports-Related Concussion in the Pediatric Population

Aaron J. Zynda¹, Jane Chung¹, Shane M. Miller¹, Meagan J. Sabatino¹, Chan-Hee Jo¹, Cason Hicks¹, Nyaz Didehbani¹, Kathleen Bell¹, Munro Cullum²; ¹Texas Scottish Rite Hospital for Children, Plano, TX; ²Texas Scottish Rite Hospital for Children, Dallas, TX; ³University of Texas Southwestern Medical Center, Dallas, TX.

(Sponsor: J. Holton, FACSM)

(No relevant relationships reported)

PURPOSE: To determine if there is an association between reported sleep quality and concussion symptoms in pediatric athletes. METHODS: A review of prospectively collected data from subjects diagnosed with a sports-related concussion between October 2015 and June 2017, and enrolled in the North Texas Concussion Network Prospective Registry (Con-Tex), was performed. Subjects were treated at one of four outpatient clinics, in North Texas, specializing in concussions. Records were reviewed for sleep quality, indicated by composite scores on the Pittsburg Sleep Quality Index (PSQI). According to PSQI guidelines, good sleep quality (GOOD SLEEP group) is indicated by a composite score of ≤5 (possible total=21), and poor sleep quality (POOR SLEEP group) by a score of >5. Demographics, symptoms, and total symptom score, as assessed by the Sports Concussion Assessment Tool 3 (SCAT3) at initial visit and 3-month follow-up, were compared between groups. RESULTS: Of 356 eligible subjects, 180 (50.6%) were girls and 176 (49.4%) were boys, with a mean age of 14.58 years (7-18). 261 subjects had a PSQI composite score of ≤5 at their initial visit (GOOD SLEEP group) while 95 had scores of >5 (POOR SLEEP). At initial visit, the POOR SLEEP group had a higher mean PSQI composite score (8.7) and total symptom score on SCAT3 (39.2) compared to the GOOD SLEEP group (2.6 and 20.4, respectively, p=0.001). The POOR SLEEP group also had a higher mean PSQI composite score (5.7) and total symptom score (12.2) at 3 months compared to the GOOD SLEEP group (3.0 and 4.2, respectively, p<0.001), although both groups had resolved.

Additionally, subjects in the POOR SLEEP group reported more fatigue, drowsiness, and trouble falling asleep on the SCAT3 at both the initial visit and 3-month follow-up when compared to the GOOD SLEEP group (p<0.005). Gender was also significantly different between the two sleep groups with more girls included in the POOR SLEEP group.
Participants were divided into groups, based off a previously validated T-Anxiety season, 35 adolescent female athletes ranging from 13-18 years of age (mean age: baseline testing in adolescent female athletes. Concussion test scores. Batteries require clinicians and researchers to examine the effect of anxiety on baseline interaction between anxiety and impaired cognition commonly assessed by concussion Anxiety occurs in approximately 15-20% of adolescent females. The potential for the interaction between anxiety and impaired cognition assessed by concussion batteries require clinicians and researchers to examine the effect of anxiety on baseline concussion test scores. PURPOSE: To determine if functional near infrared spectroscopy (fNIRS), a noninvasive imaging modality detecting oxygenation changes reflective of cognitive workload, distinguishes physiologic differences between concussion subjects and healthy controls during King-Devick (KD) testing, a rapid number naming task. METHODS: We recruited 37 cases, ages 7 to 21 years, 51% female, and 17 controls, ages 10-21 years, 47% female from a subspecialty referral concussion program for this prospective case control study where the subjects performed the KD test while wearing a fNIRS device consisting of a headband which records anterior prefrontal cortex oxygenation changes with 4 optodes at a 4Hz sampling rate. The main outcome measures were KD times, symptom provocation and oxygenation change during KD testing. RESULTS: Concussion subjects demonstrated longer times and greater oxygenation change on fNIRS compared to healthy controls. However, within the group of concussion subjects, KD times did not distinguish between those with and without symptom provocation upon testing. In contrast, fNIRS was able to detect oxygenation change differences between these two subgroups, with the symptomatic group exhibiting greater oxygenation change with testing. CONCLUSIONS: Based on our data, the prolongation of KD times observed following concussion has physiologic correlates with increased cognitive workload. Among subjects with concussion, KD times did not distinguish between those with and those without symptom provocation upon testing. In contrast, fNIRS was able to differentiate between these two subgroups of concussion, with symptomatic subjects exhibiting a pattern of greater cognitive workload compared to asymptomatic. fNIRS has utility in detecting subclinical differences in cognitive workload in concussion. In addition, our data supports the concept that the physiologic basis for symptom provocation in concussion may be related to cognitive overload.

PURPOSE: To determine if functional near infrared spectroscopy (fNIRS), a noninvasive imaging modality detecting oxygenation changes reflective of cognitive workload, distinguishes physiologic differences between concussion subjects and healthy controls during King-Devick (KD) testing, a rapid number naming task. METHODS: We recruited 37 cases, ages 7 to 21 years, 51% female, and 17 controls, ages 10-21 years, 47% female from a subspecialty referral concussion program for this prospective case control study where the subjects performed the KD test while wearing a fNIRS device consisting of a headband which records anterior prefrontal cortex oxygenation changes with 4 optodes at a 4Hz sampling rate. The main outcome measures were KD times, symptom provocation and oxygenation change during KD testing. RESULTS: Concussion subjects demonstrated longer times and greater oxygenation change on fNIRS compared to healthy controls. However, within the group of concussion subjects, KD times did not distinguish between those with and without symptom provocation upon testing. In contrast, fNIRS was able to detect oxygenation change differences between these two subgroups, with the symptomatic group exhibiting greater oxygenation change with testing. CONCLUSIONS: Based on our data, the prolongation of KD times observed following concussion has physiologic correlates with increased cognitive workload. Among subjects with concussion, KD times did not distinguish between those with and those without symptom provocation upon testing. In contrast, fNIRS was able to differentiate between these two subgroups of concussion, with symptomatic subjects exhibiting a pattern of greater cognitive workload compared to asymptomatic. fNIRS has utility in detecting subclinical differences in cognitive workload in concussion. In addition, our data supports the concept that the physiologic basis for symptom provocation in concussion may be related to cognitive overload.

PURPOSE: To determine if functional near infrared spectroscopy (fNIRS), a noninvasive imaging modality detecting oxygenation changes reflective of cognitive workload, distinguishes physiologic differences between concussion subjects and healthy controls during King-Devick (KD) testing, a rapid number naming task. METHODS: We recruited 37 cases, ages 7 to 21 years, 51% female, and 17 controls, ages 10-21 years, 47% female from a subspecialty referral concussion program for this prospective case control study where the subjects performed the KD test while wearing a fNIRS device consisting of a headband which records anterior prefrontal cortex oxygenation changes with 4 optodes at a 4Hz sampling rate. The main outcome measures were KD times, symptom provocation and oxygenation change during KD testing. RESULTS: Concussion subjects demonstrated longer times and greater oxygenation change on fNIRS compared to healthy controls. However, within the group of concussion subjects, KD times did not distinguish between those with and without symptom provocation upon testing. In contrast, fNIRS was able to detect oxygenation change differences between these two subgroups, with the symptomatic group exhibiting greater oxygenation change with testing. CONCLUSIONS: Based on our data, the prolongation of KD times observed following concussion has physiologic correlates with increased cognitive workload. Among subjects with concussion, KD times did not distinguish between those with and those without symptom provocation upon testing. In contrast, fNIRS was able to differentiate between these two subgroups of concussion, with symptomatic subjects exhibiting a pattern of greater cognitive workload compared to asymptomatic. fNIRS has utility in detecting subclinical differences in cognitive workload in concussion. In addition, our data supports the concept that the physiologic basis for symptom provocation in concussion may be related to cognitive overload.

An estimated 500,000 to 800,000 concussions occur annually among U.S. high school athletes. However, the association of sex and race/ethnicity with recovery remains unclear. PURPOSE: The aim of this study was to examine influence of sex and race/ethnicity on the Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) in adolescents. METHODS: This was a retrospective cohort study of adolescents, 13-19 years old, evaluated for an acute concussion (<10 days from injury) at a university-based concussion clinic. General linear models (GLM) were used to examine race and sex interaction on post-concussion ImPACT composite scores on verbal memory, visual memory, visual motor speed, reaction time, and symptoms. RESULTS: A total of 227 charts that met inclusion criteria. There were no differences in the distributions of age and sex. The sample (N = 227) was primarily male (75%), and the median age was 15 years. Minorities (Blacks and Hispanics) constituted 46% of the sample. White females had the longest recovery time (median 27.5 days) and minority males had the shortest recovery time (median 11 days). Univariate tests indicated that the interaction of sex and race was statistically significant for visual memory (F(3,223) = 3.83, p = .011, η^2 = .049), reaction time (F(3,223) = 2.87, p = .037, η^2 = .037), and symptoms (F(3,223) = 9.46, p < .001, η^2 = .113). On these ImPACT subscales, White females had the poorest performance, and minority males had the best performance. Compared to the scores for minority males, ImPACT scores for White females on these subscales were as follows: visual memory (70.67 ± 14.1 vs. 60.95 ± 14.5), reaction time (67.5 ± 17 vs. 76.1 ± 19), and symptom scores (12.30 ± 10.57, Low: 37.31 ± 4.96, Low: 40.31 ± 5.82). Athletes with high trait anxiety reported more symptoms and performed slower on visual motor speed. No statistical differences existed for composite: verbal memory, visual memory, reaction time and impulse control (p > 0.05). CONCLUSION: This study provides preliminary evidence that adolescent females with high trait anxiety during baseline concussion assessment present with higher symptoms and slower visual motor speed. In order to subscribe to a holistic approach of concussion management, anxiety needs to be incorporated into the clinical decision process. Without examining adolescent levels of anxiety the clinician may be vulnerable to making inaccurate interpretations of baseline test scores.

An estimated 500,000 to 800,000 concussions occur annually among U.S. high school athletes. However, the association of sex and race/ethnicity with recovery remains unclear. PURPOSE: The aim of this study was to examine influence of sex and race/ethnicity on the Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) in adolescents. METHODS: This was a retrospective cohort study of adolescents, 13-19 years old, evaluated for an acute concussion (<10 days from injury) at a university-based concussion clinic. General linear models (GLM) were used to examine race and sex interaction on post-concussion ImPACT composite scores on verbal memory, visual memory, visual motor speed, reaction time, and symptoms. RESULTS: A total of 227 charts that met inclusion criteria. There were no differences in the distributions of age and sex. The sample (N = 227) was primarily male (75%), and the median age was 15 years. Minorities (Blacks and Hispanics) constituted 46% of the sample. White females had the longest recovery time (median 27.5 days) and minority males had the shortest recovery time (median 11 days). Univariate tests indicated that the interaction of sex and race was statistically significant for visual memory (F(3,223) = 3.83, p = .011, η^2 = .049), reaction time (F(3,223) = 2.87, p = .037, η^2 = .037), and symptoms (F(3,223) = 9.46, p < .001, η^2 = .113). On these ImPACT subscales, White females had the poorest performance, and minority males had the best performance. Compared to the scores for minority males, ImPACT scores for White females on these subscales were as follows: visual memory (70.67 ± 14.1 vs. 60.95 ± 14.5), reaction time (67.5 ± 17 vs. 76.1 ± 19), and symptom scores (12.30 ± 10.57, Low: 37.31 ± 4.96, Low: 40.31 ± 5.82). Athletes with high trait anxiety reported more symptoms and performed slower on visual motor speed. No statistical differences existed for composite: verbal memory, visual memory, reaction time and impulse control (p > 0.05). CONCLUSION: This study provides preliminary evidence that adolescent females with high trait anxiety during baseline concussion assessment present with higher symptoms and slower visual motor speed. In order to subscribe to a holistic approach of concussion management, anxiety needs to be incorporated into the clinical decision process. Without examining adolescent levels of anxiety the clinician may be vulnerable to making inaccurate interpretations of baseline test scores.
abroad. little is known about multidimensionality of stress factors and their effects among various populations. PURPOSE: The purpose of this study was to examine the influence of multidimensional stressors on the mental health in Chinese adults and identify the impact of physical exercise on mental health. METHODS: Participants for the survey were randomly recruited from Jinan institutions, parks, squares and streets. A total of 1000 questionnaires were distributed, of which 819 questionnaires were returned (response rate 81.9%), 110 invalid excluded. A total of 709 valid questionnaires were used for the data analysis. Using SPSS version 16.0, descriptive statistics, T-test, Multivariate Analysis of Variance (MANOVA) and hierarchical regression analysis were used to analyze the data. RESULTS: Analysis of variance (P = 0.046 < 0.05) indicated that the stress levels of professionals across the ranks are significantly different. Descriptive Statistic Analysis showed that the main sources of stress across different occupational groups are work (35.8%), education (36.1%), and health (18.1%). MANOVA (Wilks Lambda Criterion = 0.86) showed that satisfaction, emotional balance, self-awareness, and interpersonal relationship are significantly different among different occupations (p < 0.01, respectively). T-test indicated that there was a significant differences in life satisfaction, emotional balance, self-awareness, and interpersonal relationships between physical activity and non-physical activity group (all p < 0.05). CONCLUSION: It can be concluded that China has distinct social classes, whose mental health conditions vary; The stress levels of professionals across the ranks are significantly different; Work, education, and healthcare were identified as main sources of stress among working professionals. Respondents who regularly engaged in physical activity far better in terms of mental health compared to the non-exercise group. Supported by the China Scholarship Council; Shandong Soft Science. [2015RKE27016], National science and technology basic work. [2015FY111600].

Despite knowing the factors that increase stress levels in collegiate freshmen, there is limited research that compares the stress levels and coping mechanisms between collegiate, freshmen athletes and freshmen non-athletes. PURPOSE: To investigate differences in perceived stress levels and coping mechanisms in collegiate freshmen athletes and non-athletes. METHODS: One hundred and forty-seven NCAA Division II freshmen (female = 68, male = 69) completed three self-report questionnaires: Perceived Stress Scale (PSS-10), Brief COPE, and demographic information questionnaire. The 10-item PSS-10 was used to measure the degree to which an individual appraises his/her situation as stressful. The 28-item Brief COPE was used to measure frequency of positive, neutral and negative coping mechanisms on fourteen different scales. An alpha level of p ≤ .05 was set for statistical significance. An independent t-test was conducted to compare mean scores of the PSS-10, and Mann-Whitney U tests were used to compare Brief COPE scales. A Spearman’s rho correlation was used to determine relationships between perceived stress and coping mechanisms. RESULTS: Analysis revealed no statistical difference between athletes and non-athletes on perceived stress or coping mechanisms. All participants rated a high level of perceived stress on the PSS-10, (females = 29 (SD = 6) males = 26 (SD = 5)) out of 40 possible points, yielding a statistical difference between genders, t(133) = −3.117, p < .001. Of the 14 coping strategies measured, four were found to be statistically significant for females: emotional support (r = 0.001), instrumental support (r = 0.03), venting (r = 0.001), and self-blame (r = 0.05). A positive correlation exists between increased stress levels and eight coping mechanisms. The two highest correlations were disengagement (r = −.422, p < .001) and self-blame (r = −.523, p < .001). CONCLUSION: No difference was observed in perceived stress levels between collegiate freshmen athletes and non-athletes, all freshmen perceive high levels of stress. Females perceive higher levels of stress than males, and tend to select negative coping mechanisms. The higher levels of perceived stress, the more likely the person would be to use disengagement and self-blame as coping mechanisms.
of psychiatric diseases. Being physically fit has been associated with improved sleep. However, to date, there has been limited investigation of physiological stress responding as a mediating factor in the relationship between physical fitness and improved sleep, and even fewer which have investigated this relationship in women while experimentally controlling for the influence of the ovarian cycle on the physiological stress response. This study aimed to investigate relationships among physical fitness, sleep disturbances, and physiological responses to psychosocial stress in women. METHODS: Following a two-tiered screening process, 30 healthy women (18-45y) who were medication-free and had regular menstrual cycles completed: (1) enrollment visit, (including mood and sleep assessment and assessment of cardiorespiratory fitness via maximal oxygen consumption during exercise); (2) one-week sleep monitoring period (objective and subjective measures of sleep-wake behavior); and (3) psychosocial stressor protocol for the collection of heart rate (HR) and cortisol stress responses. Psychosocial stress testing sessions occurred during the follicular phase of the menstrual cycle to control for hormone fluctuations which have been shown to influence the physiological response to stress. RESULTS: Higher levels of physical fitness were significantly associated with reduced objectively measured wake after sleep onset (WASO) duration (r = -.38, p = .04), higher self-reported sleep quality (higher scores reflect poorer sleep quality; r = -.37, p = .05), and lower HR during the psychosocial stressor (r = -.39, p = .04). Consequently, lower self-reported sleep quality was significantly associated with a higher HR during the psychosocial stressor (r = -.41, p = .02), and increased WASO duration was significantly associated with blunted cortisol responses to the psychosocial stressor (r = -.41, p = .04, n=26). CONCLUSIONS: Results suggest that, in women, physical fitness may be protective against the deleterious effects of stress via improved sleep-wake behavior.

Collegiate student-athletes experience prolonged physical, psychological and academic stressors, putting them at risk for impaired athletic performance and overall well-being. Practical feasibility undermines the use of objective physiological measures of stress, such as serum cortisol, alternatively favoring subjective measures of well-being by using self-reported questionnaires. Purpose: To determine the relationship between serum cortisol and various subjective measures of well-being in NCAA D1 swimmers over a 6-month training period. Methods: Early morning resting serum samples were collected from sixteen NCAA Division 1 swimmers (8 M, 8 F: 19.81 ± 0.65 yrs) at 2 timepoints (early season and immediate post-season), and an additional mid off-season timepoint was collected in a subset of 10 swimmers. Self-reported subjective measures of well-being were collected at each timepoint by using questionnaires for overtraining (DALDA), sleep quality (PSQI) and mood state (AD-ACL). The gold-standard physiological biomarker of stress, serum cortisol, was measured using commercially-available ELISA kits (R&D Systems). Pearson’s correlation coefficients determined linear correlations between serum cortisol concentration and questionnaire responses (r=0.05). Results: At the pre-season timepoint, higher serum cortisol concentrations (113.3 ± 76.7 ng/mL) were negatively correlated with calmness (r= -0.46, p=0.035) and tension (r= -0.45, p=0.041). Surprisingly, however, swimmers reporting greater symptoms of overtraining at the post-season timepoint had reduced cortisol concentration (r= -0.44, p=0.046). Discussion: Subjective questionnaires have been used as a surrogate to objective biomarkers of stress, such as serum cortisol concentration. Although the results obtained from self-reported questionnaires were highly correlated with serum cortisol levels during periods of high academic and athletic stress (post-season), the correlation between cortisol concentration and mood states did not remain consistent throughout the competitive season.

University students report greater symptoms of psychological distress compared to age-matched controls, which plausibly contribute to a greater incidence of anxiety and depressive disorders. Maladaptive responses to, and recovery from, stress may be partially explained by cognitive (e.g., threat bias) and physiological (e.g., poor autonomic balance) correlates of affective dysfunction that may be modifiable through exercise training. Thus, elucidating interactions among psychological and physiological predictors of stress has implications for better understanding the mental health benefits of exercise training.

**PURPOSE**

To quantify the moderating effect of heart rate variability on a relationship between threat bias and perceived stress during exam week in healthy, undergraduate students.

**METHODS**

45 undergraduate students completed a Spielberger Trait Anxiety Inventory, a computerized Dot-Prob Task, and a 5-minute assessment of resting heart rate variability (HHTF). Threat bias was operationalized as a positive bias score (disorder vs. concordant trials), and HHTF was computed as a ratio of power density in the high frequency spectrum (15-40 Hz) to power density in the entire spectrum (0.4-40 Hz). The Perceived Stress Scale was completed online during exam week 4-8 weeks later. Bivariate correlations were computed between trait anxiety and threat bias and HHTF. Moderation was tested using hierarchical linear regression with interaction effects.

**RESULTS**

Trait anxiety was inversely associated with HHTF (r = -.35, p = .01) and positively associated with bias scores (r = -.34, p = .01). The relationship between threat bias and perceived stress during exam week was moderated by HHTF, F(1,26)=26.04, p=.001, AB=-2605. Lower stress was only predicted by a lack of attentional bias among participants who also had the highest resting HHTF, b=6.60, SE= 1.43, p = .001. There was no association between trait anxiety and perceived stress.

**CONCLUSION**

Findings suggest that in young, healthy individuals the protective effects of high parasympathetic tone are only revealed among those who do not exhibit threat biases. Cognitive and physiological correlates of affective dysfunction should be measured when determining the efficacy of exercise training programs designed to improve mental health outcomes.

**Athlete stress appraisals have been associated with athletic performance, which is purported to be mediated by emotions and coping behaviours. However, our understanding of how these psychological mechanisms underpin endurance performance is equivocal. Purpose: To assess the causal psychophysiological and performance impact of past- (e.g., harm/loss and benefit) and future-oriented (e.g., challenge and threat) stress appraisals on performance. Methods: Thirty trained and gender-matched athletes were randomly engaged with one of five stress appraisals (challenge, threat, benefit, harm/loss, or control) and completed three 16.1km cycling time trials on a SRM cycle ergometer. Salivary cortisol concentration was measured via an ELISA to assess neuroendocrine response, whilst psychometrics measuring appraisals, emotions, and coping behaviours were also completed. Results: Penalized Multinomial Logistic Regression analyses of performance change revealed that temporal orientation of appraisal was a causal influence upon performance, with benefit (β = -5.13, 95% CI = -1.90, 10.93, p < 0.001, OR = 169.00) and harm/loss (β = -3.15, 95% CI = -4.6, 8.18, p = 0.019, OR = 23.40) groupings significantly facilitating and inhibiting performance respectively. Threat appraisals lead to a performance dichotomy, with both significant improvement (β = -3.41, 95% CI = -5.2, 8.54, p = 0.018) and significant deterioration (β = -3.08, 95% CI = 0.06, 8.23, p = 0.046) more likely to occur than a non-significant change (OR = 30.33 and 21.67 respectively). Variation across temporal orientation also translated into neuroendocrine response, with cortisol spikes found in threat (g = -0.49), compared to a decrease in harm/loss (g = 0.74). Conclusion: Stress appraisals significantly influence psychophysiological response and performance, with past-oriented appraisals as autonomous and influential as future-oriented appraisals. Spikes in cortisol levels in
the future-oriented stress appraisal threat, compared to a decline in the past-oriented harm/loss, suggest that the fear of defeat may be physiologically more stressful than losing itself. Practitioners are advised to engender benefit stress appraisals in order to facilitate both psychophysiologial well-being and subsequent performance proficiency among their athletes.

502 Board #1 May 30 1:00 PM - 3:00 PM
No Effect Of Hmb Or α-hica On Training-induced Changes In Performance Or Body Composition
Filipe J. Teixeira, Catarina N. Matta, Cristina P. Monteiro, Maria J. Valamatos, Joana F. Reis, Francisco Tavares, Cristophe Domingos, Francisco B. Alves, Ana R. Batista, Luis B. Sardinha, Stuart M. Phillips, FACSMM. Faculty of Human Kinetics, University of Lisbon, Lisbon, Portugal. **CIPER, Faculty of Human Kinetics, University of Lisbon, Lisbon, Portugal. **Universidade Europeia, Laureate International Universities, Lisbon, Portugal. **Wakato University, Hamilton, New Zealand. **McMaster University, Hamilton, ON, Canada.

Some leucine metabolites like β-hydroxy-β-methylbutyrate (calcium: HMB-Ca and free acid: HMB-FA) and α-hydroxy-isocaproic acid (α-HICA or leucic acid) have been suggested to augment training-induced adaptations in body composition and performance. PURPOSE: To compare the effects of commercially available supplements, HMB-Ca, HMB-FA and α-HICA, on resistance training-induced changes in fat mass and fat-free mass (FFM) and performance. METHODS: Forty men were block-randomized (based on handgrip strength, age, and fat-free mass (FFMM)) to one of four groups: HMB-FA (n=11, age 30 ± 2.4 y, FFM 62.7 ± 10.5 kg), HMB-Ca (n=9, age 34 ± 1.5 y, FFM 65.6 ± 10.1 kg), α-HICA group (n=10, age 31 ± 2.7 y FFM 62.0 ± 7.1 kg), and placebo (PLA) group (n=10, age 31 ± 2.1 y FMM 64.2 ± 5.7 kg). The training program consisted of whole body thrcie weekly training for 8wk (7 exercises/session, 3-4 sets per session, 70-80% 1RM). Whole body fat and FFM were assessed by DXA, and performance measures (vertical jump, IRM for bench press, squat and Wingate test) were all assessed at baseline and at the end of weeks 4 and 8. Participants were instructed to consume at least 45 kcal/kg FFM/d and 1.6 g protein/kg body weight/d.

RESULTS: Time-dependent changes were observed for IRM bench press (p = 0.001), IRM Squat (p < 0.001), vertical jump height (p = 0.028) and vertical jump power (p = 0.006). No significant between-group or time-group interactions were observed for body weight, Wingate peak and average power, handgrip, whole body fat or whole body FFM (A changes: HMB-FA 0.1 ± 5.1 kg; PLA 0.6 ± 0.8 kg; α-HICA 0.1 ± 1.0 kg; HMB-Ca 0.6 ± 2.0 kg) CONCLUSION: When consuming sufficient protein while in an estimated positive energy balance, none of the leucine metabolites studied resulted in any ergogenic effects on any outcome variable. We do not recommend leucine metabolites as a supplement strategy to augment training-induced gains in performance or body composition.

503 Board #2 May 30 1:00 PM - 3:00 PM
Human Skeletal Muscle Lipid Mediator Responses to Resistance Exercise and Anti-inflammatory Drugs
Tommy R. Lundberg, Mats Lilja, Mirko Mandić, Krishna Rao Maddipati, Thomas Gustafsson, Eric Rullman, Karolinska Institutet, Stockholm, Sweden. **Wayne State University, Detroit, MI.

Exercise has been found to induce bioactive lipid mediators which possess both pro- and anti-inflammatory activity, yet the role of these mediators in the muscle adaptive response to resistance exercise (RE) remains to be explored. PURPOSE: The present study aimed to characterize the presence of polysaturated fatty acid-related bioactive lipids in human skeletal muscle. Specifically, we hypothesized that high doses of anti-inflammatory drugs (NSAIDs) would hinder the action of both pro-inflammatory and pro-resolving lipid mediators in response to acute RE, thereby providing a mechanistic link to the negative effect of high (compared with low) doses of NSAIDs on the muscle hypertrophic response to RE reported by us. METHODS: Thirty-one men and women (18-35 years old) performed 8 weeks of RE at 80-85% of 1RM with or without consumption of either a high dose of ibuprofen (IBU; 1200 mg) or a low dose of aspirin (ASA; 75 mg). Muscle biopsies were obtained before the training/treatment period and 3 h after an acute RE bout at week 4 of the intervention. We used a targeted lipidomics approach (High-Performance Liquid Chromatography with Tandem Mass Spectrometry) to compare the response of over 140 pro- and anti-inflammatory lipid mediators in IBU and ASA as well as in relation to untreated controls (CON). RESULTS: We could reliably detect 71 lipid metabolites in skeletal muscle, where 12/71 belonged to the cyclooxygenase pathway but the majority of the mediators were from the lipoxygenase and epoxygenase pathways. Overall, both the pro-inflammatory and the pro-resolving lipid mediator signature was decreased in both IBU and ASA, yet remained unchanged with exercise in CON. Pathway analysis revealed significant differences between drug treatments in the lipoxygenase pathway, specifically in mediators derived from the 5-LOX and 15-LOX enzymes, where levels after exercise were significantly lower in ASA compared with IBU. Specific metabolites driving these differences were 5-HETE, 13-OxoODE and 17-HDoHE. CONCLUSIONS: The results show that both high and low doses of NSAIDs markedly affect the skeletal muscle lipid mediator response to RE. We put forth the idea that lipid mediators from the lipoxygenase pathway may have a role in explaining the differential muscle hypertrophic response to RE noted with different doses of NSAID treatment.

504 Board #3 May 30 1:00 PM - 3:00 PM
Hyperbaric-oxygen Reduces Inflammation And Regenerates Rats Skeletal Muscle Via Macrophage And Satellite Cell Activation
Takuya Oyazui, Mitsuhiro Enomoto, Naoki Yamamoto, Masaki Horie, Atsushi Okawa, Kazuyoshi Yagishita. Tokyo Medical and Dental University, Tokyo, Japan.

Muscle contusion injury is the most common sport-related injury. Hyperbaric oxygen treatment (HBO) promotes rapid recovery from soft tissue injuries. PURPOSE: Uncover a potential mechanism of the restorative effect of HBO on injured muscle. METHODS: A muscle contusion injury was performed by the drop-mass method on the rat calf muscle. Rats were divided into non-treated (NT) and HBO-treated (HBO). HBO consisted of 2.5ATA 100% oxygen for 120 minutes once per day. Circulating CD11b, CD68 positive cells were measured with flow cytometry. Injured muscles were homogenized and interleukin-6 (IL-6) and signal transducer and activator of transcription 3 (STAT3) were measured with enzyme-linked immunosorbent assay (ELISA). Calf muscles sections were immunostained with CD68 and CD163 (macrophage markers), Pax7 and MyoD (satellite cell markers). RESULTS: Expression of IL-6 (NT vs. HBO: 995±144 vs. 1964 ± 396 pg/mg, p<0.05) and the ratio of phosphorylated to total STAT3 (0.42± 0.05 vs. 1.17 ± 0.07, p<0.01) are increased at 3 hrs in HBO. The percentages of circulating CD11b-positive cells 6 hrs (NT vs. HBO: 65.5 ± 4.6 vs. 42.2 ± 4.1%, p<0.001) and 24 hrs (45.6 ± 6.1 vs. 21.9 ± 1.1%, p<0.001) were deceased in HBO. In the injured muscle, peak infiltration of CD68-positive cells occurred 2 days earlier in HBO. CD163-positive cells were higher at 3 days (NT vs. HBO: 9.3 ± 0.75 vs. 12.7 ± 0.83/HPF, p<0.05), 5 days (13.3 ± 0.63 vs. 17.2 ± 0.89/HPF, p<0.01) and 7 days (11.9± 0.9 vs. 17.3 ± 1.70/HPF, p<0.05) after injury. In muscle tissue, the number of Pax7+MyoD- cells was higher at 3 days (NT vs. HBO: 8.7 ± 0.75 vs. 17.2 ± 0.99/HPF, p<0.01) and 5 days (14.73 ± 2.24 vs. 24.99 ± 2.22/HPF, p<0.05) after injury. The number of Pax7+MyoD+ cells was higher at 1 day (NT vs. HBO: 9.9 ± 1.4 vs. 15.4 ± 0.48/HPF, p<0.01) and 3 days (12.6 ± 1.5 vs. 21.96 ± 1.4/HPF, p<0.05) and the number of Pax7-MyoD+ cells was higher at 1 day (NT vs. HBO: 4.4 ± 0.21 vs. 8.2 ± 1.0/HPF, p<0.05) and 3 days (6.9 ± 1.1 vs. 15.5 ± 2.6/HPF, p<0.05) and 5 days (13.0 ± 1.4 vs. 23.4 ± 1.4/HPF, p<0.01). CONCLUSIONS: HBO increased levels of a tissue inflammatory cytokine, reduces circulating inflammatory cells and induces a rapid macrophage response. These early-onset inflammatory responses appear to enhance satellite cell proliferation and differentiation, leading to rapid recovery of injured skeletal muscle.

505 Board #4 May 30 1:00 PM - 3:00 PM
Muscle Fiber Type Adaptations To Exercise Differ In Obese And Non-obese Volunteers
Maxime Moreillon, Yannick Morard, Nicholas T. Brokskey, Sonia Conde Alonso, Cyril Besson, Francesca Amati, FACSM. University of Lausanne, Lausanne, Switzerland.

Obese And Non-obese Volunteers
Muscle Fiber Type Adaptations To Exercise Differ In Obese And Non-obese Volunteers

Muscle fiber type adaptations to exercise differ in obese and non-obese volunteers.
METHODS: Twenty-two obese sedentary healthy men and women (O, BMI=30kg/m²) and 15 non-obese (Lean, L, BMI=20kg/m²) volunteers participated in a 4 months supervised endurance exercise intervention. 18 endurance trained volunteers matched by gender and age (60-70) served as controls (C). Tectus lateralis muscle biopsies were analyzed using immunohistochemistry to determine fiber type distribution and CSA. Baseline group comparisons were made using 1-way ANOVA. Pre/post-intervention changes were assessed by paired t tests.

RESULTS: At baseline L and O had less type I fibers than C. No difference in CSA was found in proportion of type Ila, Ibx or hybrid I-IX fibers. The proportion of hybrid type IIX was higher in O than C. Type I CSA was larger in O than L. No difference in CSA was found for type Ila, Ibx or hybrid fibers. With intervention, proportions of type I, Ila, Ibx and hybrid type IIX were not modified. An increase in proportion of hybrid type IIX was seen in L but not in O. Type I CSA increased in O and L, while Ila CSA increased only in L.

CONCLUSION: Different adaptations in proportion of fiber types and CSA were observed in O and L previously sedentary volunteers. The increased proportion of hybrid I-IX fibers with intervention observed in L could be interpreted as a shift of fibers towards a more oxidative muscle such as the profile of C. This transition was not observed in O. As exercise dose was similar in both groups, this unequal shift may be time-dependent, thus not yet apparent here in O. Although fiber CSA was on average 1.5x larger in O than L at baseline, similar CSA increments were observed with endurance exercise in both groups. In previously sedentary seniors, increments of CSA with exercise, even if concurrent to a significant weight loss in the obese subjects, are crucial to prevent age related muscle atrophy.

---

**Board #5**

**May 30 1:00 PM - 3:00 PM**

### 2000 Steps/Day Does Not Prevent Muscle Atrophy or Strength Loss During Bed Rest

**Baseline group comparisons were made using 1-way ANOVA. Pre/post-intervention changes were assessed by paired t tests.**

**RESULTS:** Performing 2000 steps/day during 7 days of bed rest corresponded to 239.6 ± 410.8 m/day, with a peak of 5477 m/day at day 21. At T1, EX muscles secreted less IL-6 (2.7 ± 0.1 vs. CON: 14.6 ± 0.9 pg/ml), but had no effect on muscle strength (Δ STEP: -14.4 ± 3.8 vs. CON: -10.6 ± 3.8 g). CON: -1035 ± 159 g), glucose tolerance; OGTT AUC (Δ STEP: -0.5 ± 6.3 vs. CON: 0.5 ± 6.3 mg/dl).

**CONCLUSIONS:** Performing 2000 steps/day during 7 days of bed rest compromised muscle health in older adults. Physical activity interventions in an inpatient setting often include periods of walking, but are hampered by key knowledge gaps that limit our ability to provide efficient, evidence-based exercise prescription.

---

**B-11 Thematic Poster - Muscle Basic Science Applications**

**Wednesday, May 30, 2018, 1:00 PM - 3:00 PM**

### Aerobic Exercise Training Alters The Lipopolysaccharide-induced Cytokine Secretory Profile Of Skeletal Muscle In Mice

Alex J. Mattingly, Orlando Laitano, Thomas L. Clanton. University of Florida, GAINESVILLE, FL.

Skeletal muscles secrete cytokines in response to engagement of toll-like receptors (TLR) with pathogen associated molecular patterns (PAMPs), such as lipopolysaccharides (LPS). Though acute exercise is a known stimulus for cytokine secretion, it is unknown if chronic exercise training alters the cytokine secretory response to LPS. PURPOSE: To determine if spontaneous free-wheel aerobic exercise training in mice alters the cytokine secretory profile from isolated soleus muscles in response to LPS. METHODS: Age-matched (12 weeks old) C57BL/6 mice (N=4) were given 24-hour access to running wheels for 69 days (EX). Their daily running distance was recorded. Results were compared to matched sedentary controls (CON; N=8). Solei from the mice were excised in Krebs-Ringer and placed in 2 ml, 35°C muscle baths with 1 μg/ml LPS for 2 hours. Bath samples were drawn for hours 1 (T1) and 2 (T2), flash frozen, and analyzed by Luminex multiplex analysis. Cytokine accumulations at T1 and T2 were compared via one-way parametric or nonparametric ANOVA, as appropriate. RESULTS: Mean daily running distance for EX mice was 3406 m/day, with a peak of 5477 m/day at day 21. At T1, EX muscles secreted less IL-12p70 (6.03 ± 0.27 pg/ml; p=0.016) and TNFα (1.89 ± 0.34 pg/ml; p=0.020) than CON. At T2, the concentrations of IL-12p70 (6.03 ± 0.27 pg/ml; p=0.016) and TNFα (1.89 ± 0.34 pg/ml; p=0.020) were greater in CON than EX. All other cytokines (MIP-1β, IL-13, IL-12p70, MIP-1α, IL-6, GCS-F, MCP-1, IL-10, RANTES, GM-CSF, IL-15, IFN-γ) were not significantly different. CONCLUSION: Spontaneous free wheel running in mice alters the cytokine secretory profile of isolated muscle solei in response to LPS. Since endurance exercise training has been shown to reduce mortality in rodent models of septic shock, the results raise the possibility that conditioned muscles may be participating in improvements in host defense associated with aerobic exercise training. Supported by NIGMS R01GM118895-01
Mitochondria are highly dynamic organelles within eukaryotic cells that function primarily to produce energy. Exercise has been known to positively impact mitochondria for over 50 years. Our previous work indicated that one novel factor, dynamin-related protein 1 (Drp1) that is responsible for splitting mitochondria, was impacted by exercise. However, it is not known whether Drp1 is essential for the development of exercise adaptations. **Purpose:** To determine the impact of reduced Drp1 expression in skeletal muscle on muscle strength, exercise performance, and long-term exercise induced adaptations. **Methods:** For each protocol, skeletal muscle specific heterozygous (mDrp1+/−) and littermate control mice were used. Animals were sacrificed and tissues harvested at the times indicated. **Protocol 1:** Treadmill exercise at 15 m/min (5° grade) for 90 minutes for controls and 13 m/min for mDrp1+/− mice. **Protocol 2:** Thirty days of cage voluntary wheel running (VWR) after which wheels were locked. Animals were sacrificed 30 hours later. Exercise effects were statistically assessed with two-way ANOVA or t-tests (P=0.05 established a priori; values presented as mean ± SEM). **Results:** Muscle strength was reduced in mDrp1+/− mice resulting in a reduction in protocol 1 exercise speed but not relative intensity. Following protocol 1, signaling molecules and cellular factors regulating mitochondrial life cycle were not different between mDrp1+/− and control exercised mice. Additional metabolites including plasma lactate and triglyceride and muscle glycogen levels post exercise were not different between groups. In untrained mice, endurance exercise capacity was not different between groups; however, following VWR, mDrp1+/− mice had a reduced increase in exercise capacity when compared to control trained mice. Several cellular factors and signaling molecules regulating mitochondrial life cycle showed similar expression levels in mDrp1+/− mice compared to control exercised animals. **Conclusions:** Our results indicate that Drp1 is particularly important for muscle strength in untrained mice and may play a role in the improvement of exercise capacity.
response was an elevation in TNFRSF12A in the trained twin. CONCLUSIONS: At the mRNA-level, differences in expression of some key markers related to muscle fiber type, muscle growth, and the inflammatory response were observed in the trained vs the untrained twin. These data highlight the adaptability of skeletal muscle at the molecular level with decades of divergent physical activity patterns.

Long stays in space can have deleterious effects on the body homeostasis. Significant adverse effects of long-term weightlessness include loss of skeletal muscle mass, strength and endurance that can lead to fatigue and poor performance of astronauts during space missions and put them at high risk of injury when they return to earth. Bed rest studies have been proven to be a reliable model to study the effect of spaceflight on muscle. PURPOSE: To characterize the vastus lateralis (VL) gene and microRNA (miR) responses to 70-day bed rest with and without countermeasures to mitigate the negative consequences of weightlessness. METHODS: 22 healthy young adults participated in a NASA 70 day bed rest study with and without 2 different modes of exercise interventions (6 participants bed rest only; 8 bed rest + flywheel exercise; 8 bed rest + standard aerobic training). RNA extracted from the VL was hybridized to Agilent Human Gene (V3) and miR (V2) microarrays. Data was analyzed using GeneSpring 14.5 and differential gene and miR expression was determined using ANOVA, (FDR<0.05, Fold Change>2 for GE, >1.1 for miR). Kegg pathway was used to classify the genes into pathways (EASE<0.05). RESULTS: 70 day bed rest significantly altered the levels of 286 VL genes and 83 miRs. 16 oxidative phosphorylation pathway genes (e.g., ATP5G1, ATP5G3, ATP7, NDUFS1, COX7A2, SDHB and UQCR10) and 37/40 metabolic pathway genes (e.g., HMGCS2, NDUF3, ACY1 and FH) that were significantly altered had reduced expression in all 3 conditions. All genes in the oxidative phosphorylation pathway and 31 out of 40 genes in the metabolic pathway had attenuated response when exercise was introduced with no significant difference between the two different modes of exercise. Five let-7 family miRs were significantly upregulated and miR-1 and miR-133a were downregulated (30 and 50% respectively in the bed rest only group), all of which known to be linked to muscle atrophy. Both exercise modes mitigated the miRs response. CONCLUSION: 70-day bed-rest altered the expression of genes and miRs that could affect muscle metabolism and promote muscle atrophy. Introducing exercise as countermeasures mitigated the expression of almost all bed-rest altered genes and miRs, with no significant difference in the 2 modes of exercise. Supported: NSBRI MA02801 & PERC Systems Biology Fund

Obesity is a significant health problem and is associated with numerous changes in skeletal muscle. Obesity increases muscle mass and muscle fiber cross sectional area (FCSA) of type I and II fibers. Resistance exercise (RE) promotes muscle fiber hypertrophy. Activation of the IGF-1/Akt/mTOR pathway is critical for muscle mass maintenance and muscle hypertrophy. PURPOSE: To investigate: 1) if obesity alters basal muscle IGF-1/Akt/mTOR pathway; and 2) if obesity alters the muscle response to acute RE. METHODS: Vastus lateralis biopsies were obtained to investigate mRNA, miRNA, and protein expression between lean (LN) and obese (OB) sedentary subjects at rest, and 15 min and 3 hr post-acute RE. RESULTS: Type II FCSA in OB was larger than FCSA of type I in OB and type I and II in LN (Type I: LN =4804.53 vs. OB =6044.78 µm; Type II: LN =4609.71 vs. OB =8114.34 µm). Skeletal muscle fiber expression was lower in OB for IGF-1 mRNA (Pre: LN =1.00 vs. OB =0.95 AU; 15 min: LN =0.95 vs. OB =1.00 AU; 15 min: LN =0.95 vs. OB =1.00 AU; 15 min: LN =0.95 vs. OB =1.00 AU). A negative relationship was observed between miR-206 and IGF-1 mRNA at rest (r = -0.54) consistent with miR-206 regulating IGF-1 expression. CONCLUSIONS: In spite of greater muscle FCSA, obesity decreases muscle IGF-1 expression suggesting a negative feedback mechanism may be limiting muscle mass expansion in obesity.

Several design features of running shoes such as decreased mass, appropriate midsole cushioning, and increased longitudinal bending stiffness are associated with improved running economy (RE). While increased longitudinal bending stiffness has been achieved through the use of carbon fiber plates inserted into shoe midsoles, there are some concerns associated with this construction method. An alternative way to increase longitudinal bending stiffness in running shoes is to utilize a carbon fiber shoe insole (CFI) tuned for optimal mechanical efficiency of the athlete–footwear system. PURPOSE: To determine if a carbon fiber shoe insole (VK Performance Insole; VKTRY Gear, Milford, CT) can improve running economy in highly-trained distance runners. METHODS: Ten highly-trained male distiners (body mass: 24.7 ± 6.8 years; height: 177.9 ± 5.59 cm, mass: 67.7 ± 5.7 kg) participated in this study. To measure RE, participants ran for 6 min at 16 km hr 

The greatest 4 min were to allow the athlete to reach a steady state and metabolic data from the last 2 min were used to determine submaximal VO2. The shoe insole conditions were presented in random order; each RE test was separated by a period of 6 min to minimize the effects of fatigue. A repeated-measures ANOVA was used to determine the effects of shoe insole condition on RE. RESULTS: The submaximal VO2 for each of the shoe insole conditions were as follows: 1) control footware (no CFI), 2) medium flex CFI (VK Pro 4), and 3) stiff flex CFI (VK Pro 5). Indirect calorimetry was used to measure oxygen consumption (VO2). The first 4 min were to allow the athlete to reach a steady state and metabolic data from the last 2 min were used to determine submaximal VO2. The shoe insole conditions were presented in random order; each RE test was separated by a period of 6 min to minimize the effects of fatigue. A repeated-measures ANOVA was used to determine the effects of shoe insole condition on RE. RESULTS: The submaximal VO2 values for each of the three shoe insole conditions were as follows: 1) control (no CFI): 49.8 ± 3.0 ml·kg⁻¹·min⁻¹; 2) medium flex CFI (VK Pro 5): 50.2 ± 3.5 ml·kg⁻¹·min⁻¹; and, 3) stiff flex CFI (VK Pro 5): 51.3 ± 3.1 ml·kg⁻¹·min⁻¹. Based on these submaximal VO2 values, there was no difference in RE between the three different shoe insole conditions [F[2,8] = 0.97, p < 0.44]. CONCLUSIONS: Previous studies have shown that increased longitudinal bending stiffness achieved through the use of carbon fiber plates inserted into shoe midsoles can significantly improve RE by 1-4%. However, the use of a CFI did not result in similar improvements in RE. Further design work and testing of the CFI is required to determine the optimal longitudinal bending stiffness for improved RE at submaximal velocities.

The purpose of the present investigation was to determine the effect of compression socks on maximal aerobic running performance and heart rate response. METHODS: Moderately fit college aged students (n=28) were recruited for the study. Each subject completed four exhaustive treadmill runs utilizing the McConnell Treadmill Protocol. Each phase included two testing sessions, 24 hours apart. Each phase was separated by a minimum of seven days to ensure proper recovery. The two phases included a control phase, and a compression phase. In the compression phase, subjects wore compression socks during the 24 hours separating each testing trial and two. The assignment of phases was determined by a randomized crossover design. During each treadmill test, time to exhaustion was recorded, as well as maximal heart rate achieved during the run and 20 minutes post run. RESULTS: Time to exhaustion was significantly higher (p = .012) in the compression phase in comparison to the control phase (13.82 min; 13.11 min, respectively). Maximal heart rate achieved during the treadmill run was significantly lower (p = .024) while wearing the compression socks compared to the control phase (189.65 BPM; 192.39 BPM, respectively). Heart rate measurement 20 minutes post run was significantly lower (p = .032) in the compression phase when compared to the control phase (99.89 BPM; 101.46 BPM, respectively). CONCLUSIONS: Time to exhaustion was significantly improved while wearing compression socks, which indicated an improvement in fatigue resistance and enhanced running performance. Moreover, heart rate, both maximal and recovery (20
minute) was significantly lower while wearing compression socks, which indicated a reduction in cardiovascular stress. Compression socks have a positive effect on running performance and heart rate responses associated with maximal aerobic exercise for moderately fit college aged individuals. It is hypothesized that this change is brought about as the compression applied decreases venous pooling in the lower leg, assisting in venous return. The applied compression allows for a more efficient circulation path back to the heart, promoting increased clearance rates of muscle metabolites while also lowering the workload on the heart.

**RESULTS:**

- The mean change from MX1 to MX2 was significantly greater VO₂max values (1.4% and 4.2% mean increase, respectively).
- The mean change from MX1 to MX2 was -2.2%, yet 37.9% of the subjects benefited (+2.9% mean increase) from the booster test with individual increases of +0.2% up to +8.0%.

**CONCLUSION:**

- Mean results (ES=0.91; Table 1) suggest that 2min active recovery may not allow significantly greater VO₂max values to be achieved by fit ultramarathon runners during a max treadmill GXT, yet 37.9% of the subjects increased their VO₂max during the “booster VO₂max test” treadmill protocol. Future research may examine if fitness level, training experience, age, ultramarathon distance specialty, or other variables might affect this exercise testing protocol.

---

**Purpose:** Evaluate the effects of 2-minutes active recovery on running performance in healthy males.

**Methods:** Twenty-nine (19 males and 10 females) ultramarathon runners performed (p=0.002).

**Results:** Athletes who expressed higher than normal salivary amylase levels for a particular week, showed a decline in performance (p=0.006).

**Conclusions:** Periodic measurements of salivary amylase and testosterone could be an important diagnostic marker for monitoring overtraining and predicting performance in collegiate athletes. Funding was provided by the School of Health Science Faculty Grant.

---

**Purpose:** To determine the effects of training load on salivary amylase and testosterone levels and their association with race performance in Female Division I cross-country athletes.

**Methods:** 18 female athletes (18.9 ± 0.86 yrs old) were monitored during the 2015 cross-country season. VO₂ max, and baseline salivary amylase and testosterone levels were assessed during the pre-season. Participants also underwent weekly data collection sessions in which saliva samples were collected. Salivary levels of amylase and testosterone were analyzed using ELISA kits from Salimetrics (State College, PA) according to the manufacturers instructions. Athletes utilized a GPS/HR monitor system daily during training to record training load. Training load was calculated using the Running Training Stress Score (rtSS) according to a commercial website (www.TrainingPeaks.com). Race performance was also monitored during the season. Linear mixed models were used to analyze the effect of cumulative training load on amylase and testosterone levels and race performance during the season.

**Results:** There were no significant effects of training load on salivary amylase levels however, training load was a significant predictor of weekly salivary testosterone levels (p=0.009). Athletes, who had a high weekly training load, expressed lower levels of testosterone for that week. While controlling for race distance and baseline VO₂ max, both salivary amylase and testosterone were predictive of race performance. Athletes who expressed higher than normal salivary amylase levels for a particular week, showed a decline in performance (p=0.006). However, the higher the weekly salivary testosterone level, the better the athletes performed (p=0.002).

**Conclusions:** In this study, higher levels of weekly salivary testosterone were associated with optimal training and improved race performance. While higher levels of salivary amylase, were associated with a decline in race performance. Periodic measurements of salivary amylase and testosterone could be an important diagnostic marker for monitoring and predicting performance in collegiate athletes. Funding was provided by the School of Health Science Faculty Grant.

---

**Purpose:** Evaluate the effects of two-minutes active recovery on a “booster” VO₂max test using ultramarathon runners.

**Methods:** Seven healthy males (age=29±9 yrs; mass=76.6±15.6 kg; height=1.72±0.1 m; BMI=25.6±3.7 kg/m²) were recruited for this study. Participants performed ECT for 8 weeks (2x/week; 5-10.5 min; 20-55% of VO₂max). RE was obtained through metabolic analysis during treadmill running at 3 randomized speeds (2.24m/s, 2.68m/s, and 3.13m/s) for 4 minutes consecutively. PPO (W) and RE (ml/kg/min) were assessed prior to, and following the 8-week ECT intervention. Pre-versus post training changes in RE were analyzed using paired sample t-tests, alpha level was set at 0.05. Cohen’s d effect size (ES) was calculated from all analyses and ES magnitudes of 0.10, 0.30, and 0.50 were interpreted as small, medium, and large, respectively.

**Results:** Post-training VO₂max was significantly improved while running at 2.24m/s (P=0.002, ES=0.91; Table 1). These results demonstrate that 8 weeks of ECT was effective in improving VO₂max in healthy individuals. We speculate that the improvement in VO₂max may be attributed to an increase in leg spring stiffness. To the best of our knowledge, this is the first report of a significant improvement in RE following ECT. Improvement in RE would be beneficial for both coaches and athletes.

---

**Table 1. Pre- versus post-training changes in Running Economy (RE)**

<table>
<thead>
<tr>
<th>Running Speed (m/s)</th>
<th>Running Economy (ml/kg/min)</th>
<th>Pre-training</th>
<th>Post-training</th>
<th>P</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.24</td>
<td>0.71 ± 0.08</td>
<td>0.67 ± 0.08</td>
<td>0.002*</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td>2.68</td>
<td>0.65 ± 0.04</td>
<td>0.63 ± 0.04</td>
<td>0.085</td>
<td>0.64</td>
<td></td>
</tr>
<tr>
<td>3.13</td>
<td>0.66 ± 0.04</td>
<td>0.63 ± 0.04</td>
<td>0.153</td>
<td>0.20</td>
<td></td>
</tr>
</tbody>
</table>

*Significantly different compared to pre-training (P<0.05).

Supported By: 2017 Faculty-Student Research Grant – Central Connecticut State University.

---

**Purpose:** Evaluate the effects of 2-minutes active recovery on running performance in the heat.

**Methods:** 7 healthy males (age=29±9 yrs; mass=76.6±15.6 kg; height=1.72±0.1 m; BMI=25.6±3.7 kg/m²) were recruited for this study. Participants performed ECT for 8 weeks (2x/week; 5-10.5 min; 20-55% of VO₂max). RE was obtained through metabolic analysis during treadmill running at 3 randomized speeds (2.24m/s, 2.68m/s, and 3.13m/s) for 4 minutes consecutively. PPO (W) and RE (ml/kg/min) were assessed prior to, and following the 8-week ECT intervention. Pre-versus post training changes in RE were analyzed using paired sample t-tests, alpha level was set at 0.05. Cohen’s d effect size (ES) was calculated from all analyses and ES magnitudes of 0.10, 0.30, and 0.50 were interpreted as small, medium, and large, respectively.

**Results:** Post-training VO₂max was significantly improved while running at 2.24m/s (P=0.002, ES=0.91; Table 1). These results demonstrate that 8 weeks of ECT was effective in improving VO₂max in healthy individuals. We speculate that the improvement in VO₂max may be attributed to an increase in leg spring stiffness. To the best of our knowledge, this is the first report of a significant improvement in RE following ECT. Improvement in RE would be beneficial for both coaches and athletes.

---

The combination of environmental heat stress and exercise is a potent physiological challenge and is known to impair performance. While pre-cooling might improve performance in the heat, it may prove impractical. PURPOSE: to investigate the impact of a novel wrist cooling device (DhamaSport™), which can be worn during exercise, on exercise performance and physiological responses in the heat. METHODS: In a single-blind, counterbalanced, crossover design, 13 male athletes (33±9 yrs, 15±7 %body fat, and VO₂max 59±5 ml/kg/min, range 50-71) completed three 10km running time trials in the heat (80°F, 60% relative humidity), while wearing two...
The Influence of AlterG Treadmill Training on Lower Extremity Muscle Performance in Cross Country Runners

Tracy A. Dierks1, Vincent C. Nittoli2, Todd W. Arnold2, Jason Pociask1, Jacquelyn Fletcher1. Indiana University, Indianapolis, IN. St. Vincent Sports Performance, Indianapolis, IN.

PURPOSE: This study investigated the effects of easy and hard training days on the nocturnal HRV and the Orthostatic Test. In addition, the aim was to investigate relationships between nocturnal and morning HRV variables.

METHODS: Thirty-four recreational endurance runners performed nocturnal R-R interval recordings and the morning Orthostatic test (5 min supine + 3 min standing) after an easy and a hard training day (moderate- or high-intensity endurance training). Nocturnal HRV was analyzed as four-hour period starting 30 min after going to bed for sleep. Morning HRV was analyzed over 4 min supine (00:30-04:30) and 2 min standing position (06:00-08:00). In addition, peak HR after stand-up and Orthostatic heart rate (HR) (HRstanding - HRsupine) were analyzed. RESULTS: Training load (session RPE) of hard training day (638 ± 638) was significantly (P < 0.001) greater compared to easy training day (50 ± 100). Nocturnal HR was lower in moderate- or high-intensity endurance training (52 ± 6 vs. 57 ± 9, P < 0.001) and all nocturnal HRV variables were higher (Total power: 8.86 ± 0.63 vs. 8.41 ± 0.79, P < 0.001) after easy training day. HR in supine position was lower (53 ± 7 vs. 56 ± 7, P = 0.011) and high frequency power in supine position was higher (8.06 ± 0.89 vs. 7.74 ± 0.93, P = 0.027) after easy day. Other Orthostatic test variables were not different between easy and hard training days. Nocturnal HR and HRV variables showed moderate correlations (r = 0.62 - 0.78, P < 0.001) to the morning supine variables, but trivial and small correlations (0.19 - 0.39) to most standing variables.

CONCLUSIONS: Different training load after easy and hard training days can be observed in both nocturnal HRV and Orthostatic Test. However, the differences are greater in nocturnal HRV recordings compared the morning Orthostatic Test. In addition, it seems that standing variables are not able to evaluate the training load of the previous day. The results suggest that both nocturnal HRV and selected, supine variables of the Orthostatic test can be used in monitoring training load.

Running on an AlterG® Treadmill (AGT) at reduced bodyweight requires speed to be increased if heart rate response is to match overground running. This can be beneficial as one can run at faster speeds for longer durations, without increasing impact forces or heart rate intensity beyond typical training, all while increasing lower extremity muscle demands. However, it is unknown if AGT training influences lower extremity muscle performance. PURPOSE: Investigate the effect of an AGT training program on lower extremity muscle performance. METHODS: As an off-season supplement, 19 uninnured high school boys cross country runners replaced 2 overground running sessions/week with AGT runs for 6 weeks. AGT runs were 80-85% of bodyweight with speed increased to elicit a heart rate intensity and distance/time consistent with each runner’s mile pace for that day. Bilateral isokinetic muscle performance testing was completed at baseline and post program; 10 concentric/eccentric contractions at a speed of 180°/s for sagittal motions at the hip, knee, and ankle. A 2-way ANOVA (side x time) was used to assess pre-post changes (torque, work, power) and side-to-side symmetry (p≤0.05). RESULTS: Significant interactions were found for almost all hip variables for pre-post and side-to-side comparisons, while both the knee and ankle generally showed no differences. At the hip, the right generally improved pre-post for all variables, while the left decreased. This resulted in side-to-side asymmetries at pre, but improved to mostly symmetric at post. CONCLUSION: The AGT program seemed to primarily influence hip musculature, possibly related to pre-existing asymmetry. However, after training in the AGT environment for 6-weeks, both sides were generally symmetric post-program, mostly due to right side improvements. Thus, AGT training appears to be associated with improved symmetry of hip muscle performance, which may be significant when considering the role of the hip in overuse injuries.

Nocturnal Heart Rate Variability and Morning Orthostatic Test as Tools to Monitor Training Load

Ville Vesterinen, Ari Nummela. KIHU - Research Institute for Olympic Sports, Jyväskylä, Finland.

No relevant relationships reported

Both the nocturnal heart rate variability (HRV) and the morning Orthostatic Test are widely used to monitor training load and recovery status of athletes. Both measurements have been observed to be associated with cardiac autonomic regulation. But less is known whether the measurements show similar responses to training load. PURPOSE: This study investigated the effects of easy and hard training days on the nocturnal HRV and the Orthostatic Test. In addition, the aim was to investigate relationships between nocturnal and morning HRV variables. METHODS: Thirty-four recreational endurance runners performed nocturnal R-R interval recordings and the morning Orthostatic test (5 min supine + 3 min standing) after an easy and a hard training day (moderate- or high-intensity endurance training). Nocturnal HRV was analyzed as four-hour period starting 30 min after going to bed for sleep. Morning HRV was analyzed over 4 min supine (00:30-04:30) and 2 min standing position (06:00-08:00). In addition, peak HR after stand-up and Orthostatic heart rate (HR) (HRstanding - HRsupine) were analyzed. RESULTS: Training load (session RPE) of hard training day (638 ± 638) was significantly (P < 0.001) greater compared to easy training day (50 ± 100). Nocturnal HR was lower in moderate- or high-intensity endurance training (52 ± 6 vs. 57 ± 9, P < 0.001) and all nocturnal HRV variables were higher (Total power: 8.86 ± 0.63 vs. 8.41 ± 0.79, P < 0.001) after easy training day. HR in supine position was lower (53 ± 7 vs. 56 ± 7, P = 0.011) and high frequency power in supine position was higher (8.06 ± 0.89 vs. 7.74 ± 0.93, P = 0.027) after easy day. Other Orthostatic test variables were not different between easy and hard training days. Nocturnal HR and HRV variables showed moderate correlations (r = 0.62 - 0.78, P < 0.001) to the morning supine variables, but trivial and small correlations (0.19 - 0.39) to most standing variables. CONCLUSIONS: Different training load after easy and hard training days can be observed in both nocturnal HRV and Orthostatic Test. However, the differences are greater in nocturnal HRV recordings compared the morning Orthostatic Test. In addition, it seems that standing variables are not able to evaluate the training load of the previous day. The results suggest that both nocturnal HRV and selected, supine variables of the Orthostatic test can be used in monitoring training load.
Cardiovascular drift (CV drift) has been shown to be related to reduced maximal oxygen uptake ($\dot{V}O_{2\text{max}}$) during heat stress. At a given relative metabolic intensity ($\%V_{O_{2\text{max}}}$), individuals with higher fitness levels would be expected to experience greater CV drift, and thereby greater decrements in $V_{O_{2\text{max}}}$ because of a greater metabolic heat production resulting from exercising at a higher absolute intensity. However, this has not been directly investigated.

PURPOSE: To test the hypothesis that individuals with a higher initial $VO_{2\text{max}}$ (i.e., fitness level) will experience a greater magnitude of CV drift and accompanying decrement in $VO_{2\text{max}}$ compared to those with a lower initial $VO_{2\text{max}}$ during prolonged, moderate-intensity exercise in the heat.

METHODS: Data from 7 studies (n = 62) were used to assess the relationships between fitness level and 1) CV drift (change in heart rate and stroke volume) and 2) $VO_{2\text{max}}$. CV drift and $VO_{2\text{max}}$ were assessed between 15 and 45 min or between 15 and 60 min of cycling at 60% $VO_{2\text{max}}$ in 35°C or 30°C.

RESULTS: Initial $VO_{2\text{max}}$ (i.e., fitness level) was not related to change in heart rate (r = 0.17, p = 0.20), change in stroke volume (r = 0.06, p = 0.63), and decrease in $VO_{2\text{max}}$ (r = -0.14, p = 0.28). CONCLUSION: Contrary to our hypothesis, fitness level was unrelated to the magnitude of CV drift or decrement in $VO_{2\text{max}}$ during prolonged submaximal exercise in the heat. However, these findings support the results of previous studies in that the greater the magnitude of CV drift—regardless of fitness level—the greater the decrement in $VO_{2\text{max}}$ during constant-rate, moderate-intensity exercise in the heat.

The heat stress response is associated with several beneficial adaptations to promote cell health and survival. Specifically, in vitro and animal investigations have shown that exposure to a mild heat stress (~40°C) elicits mitochondrial adaptations within skeletal muscle that are similar to those observed with exercise. PURPOSE: To investigate the acute effects of deep tissue heating on the heat shock protein (HSP) expression and signaling pathways associated with mitochondrial adaption.

METHODS: Twenty healthy men (n = 10) and women (n = 10) volunteered for the study (21 ± 2.7 yrs, 172 ± 11 cm, 65 ± 13 kg). From each volunteer, a randomly selected leg underwent a 2-hr heating session via pulsed short-wave diathermy. Intramuscular temperature was measured with the insertion of a temperature probe to the approximate depth at which muscle tissue would be sampled (~3.5 cm). Muscle biopsies were taken immediately after heating from the vastus lateralis muscles of both legs (treatment and control). From the collected tissue, we measured HSP phosphorylation and protein expression. In addition, we explored whether the heating protocol was able to elicit mitochondrial biogenesis. RESULTS: Muscle temperature increased significantly in response to the diathermy treatment (3.96 ± 0.51°C, p < 0.0001). In response to the 2-hr heating session, we found the phosphorylation of HSP27 to be significantly decreased (~28% ± 0.08%, p = 0.0016), with no changes in overall total protein expression of any of the measured HSPs (HSP27, 60, 70, and 90).

CONCLUSIONS: Listening to motivational music greatly reduces the heat-related decrements in exercise performance and cardiovascular strain.
Cardiac dysfunction has been documented after exertional heat stroke (EHS), but little is known about the metabolic (mal)adaptations occurring in the heart after exposure to EHS. 

**PURPOSE:** To identify metabolic biomarkers in a preclinical model of EHS that could indicate long-term cardiometabolic adaptations or complications to EHS.

**METHODS:** 56 male mice ran on an incremental forced running wheel while exposed to 37.5°C/~40% humidity to induce EHS. Mice ran 124.1 ± 7.2 min, reaching a core temperature of 42.2 ± 0.07 °C at the time of collapse. Animals lost 7.5 ± 0.9 % body weight. Plasma and heart ventricle tissue were obtained at 0.5, 3, and 24 h and at 4, 9, and 14 days post-EHS and compared to exercise-matched controls at 4 days post-exercise. Metabolites were extracted from biospecimens and analyzed by mass spectrometry. Ions were matched to a library of standards for identification and quantification. 

**RESULTS:** At 0.5-3 h after EHS, there was a marked loss in carbohydrate availability (1.6-3.9-fold reduction in plasma glucose, pyruvate and lactate). During the immediate post-EHS period there was also evidence for mobilization of a variety of amino acids. Elevations in acetylated amino acids were also observed. Elevated nucleic acid breakdown products were evident until 24 h post EHS, then recovered. By 3 h, 1.4-12.1-fold increases in acyl carnitine and ketone bodies were evident in the plasma. In cardiac muscle, most species of acyl carnitines were 2.2-25.0-fold lower than control at 0.5 h, suggesting rapid intracellular turnover of available free fatty acids (FFA). Interestingly, in the heart, cardiac FFA remained 2.0-16.7-fold lower than control through 14 d. 

**CONCLUSION:** Our results are consistent with an acute “energy crisis” following EHS that resolves within 3-24 hours, involving an acute disturbance in glucose and lipid metabolism.

Heat tolerance testing (HTT) has been used in clinical settings to determine readiness to return to activity after exertional heat stroke. However, published HTT data are mostly limited to a walking protocol (5km h⁻¹ at 2% grade) in a climatic chamber set at 40°C and 40% relative humidity (RH), which may limit application in determining one’s ability to achieve thermoregulatory equilibrium during exercise.

**PURPOSE:** To investigate factors that are associated with differences in temperature response during a modified HTT (mHTT). 

**METHODS:** Thirty-two participants completed mHTT on a treadmill set at 27.3±0.4°C and 51.1±7.1%RH. Within this cohort, we identified three pairs of participants (A, B, C) who ran at the same treadmill speed respectively, with body mass (BM) and body surface area (BSA) difference <5% but exhibited rectal temperature (TREC) difference ≥0.75°C at the end of mHTT. Pooled data of participants with lower end TREC (LOW) and higher end TREC (HIGH) during the first 60 min of the mHTT were compared using a two-way ANOVA. Results: BM and BSA %difference in pairs A, B, C were 3.8%, 4.8%, 1.0% and 3.4%, 3.5%, 1.1%, respectively. Starting TREC difference was largest in pair A (HIGH-LOW; A, 0.72°C; B, 0.06°C, 0.27°C). The ten-minute average of the slope of TREC change was greater at all time points in HIGH than LOW with no statistical significance (p=0.03). However, all LOW exhibited a plateau in slopes during the last 2 h (slope ≤0.01°C·min⁻¹). Greater SR (sweat rate) was observed in HIGH in two pairs (SR %difference: A, 25.1%; C, 16.3%). Overall RR was greater in HIGH in all pairs but the difference observed in pair A was negligible (0.001°C·min⁻¹).

**Conclusions:** Fluid was not replaced during mHTT, which may have served as the limiting factor for high sweaters in pair A and C to sustain thermoregulatory equilibrium and contributed in the greater slope, SR, and overall RR. In designing a mHTT that accounts for physical demands greater than walking, SR should be recorded to understand the influence from dehydration. Starting TREC may have also affected the negligible difference observed in RR in pair A. Future studies should investigate the normative values for TREC response during mHTT under a setting where the treadmill speed, BM, BSA, and body mass loss are controlled.
Experimental Manipulating Mechanical Ventilatory Constraint During Exercise Does Not Influence Dyspnea in Older Men and Women


During exercise at a standardized metabolic work load, the perception of dyspnea is higher in older women than men, which is thought to be related to sex-differences in mechanical ventilatory constraint; however, this hypothesis has yet to be experimentally tested. PURPOSE: To determine the effect of manipulating the magnitude of mechanical ventilatory constraint during submaximal exercise in older women and men. METHODS: Thirteen healthy subjects (60-80 y; n=7 women) completed two days of testing. On Day 1, subjects performed pulmonary functional testing and incremental cycle exercise test with 1-Minutes of rest between stages. On Day 2, subjects performed a cycle exercise test at 75% of predicted maximal power output (W) and all stages were repeated with four conditions of a modified 3-Minutes of rest between stages: 1) Control, 2) Inspiratory Muscle Bracing (IMB), 3) Out of Phase (OP), and 4) End Expiratory Lung Volume (EELV) manipulation. Dyspnea was assessed during all stages of the incremental exercise test with the visual analog scale. RESULTS: There were no significant differences in dyspneic responses during the control condition for males or females. Specifically, there were no differences observed between a 3-Minutes of rest between stages with or without the IMB condition. However, for females, the dyspnea scores were significantly lower during the OP condition compared to the control condition (p=0.017). CONCLUSION: There were no significant differences observed for males or females during the control condition. For females, dyspnea responses were significantly lower during the OP condition compared to the control condition. These findings suggest that dyspnea responses during submaximal exercise are not influenced by mechanical ventilatory constraint and may be more influenced by neural and central factors.
lowering the Wb decreases MSNA during whole-body cycle exercise. METHODS: Healthy active subjects (n=12, female) performed semi-recumbent cycling to exhaustion (VO\textsubscript{2peak} = 45±2 ml kg\textsuperscript{-1} min\textsuperscript{-1} means ± SE). On a subsequent day, three constant load exercise trials at 40, 60, and 80% of peak workload were performed. Each trial was 7 min long and consisted of: 3 min spontaneous breathing, 2 min reduced Wb followed by 2 min spontaneous breathing. MSNA was recorded via microneurography of the right median nerve at the elbow. A proportional assist ventilator (PAV) was used to reduce the Wb. All statistical comparisons were made within each workload between PAV and PAV-RESULTS: The 40, 60 and 80% trials resulted in 57±1.78kPa and 96±2% of VO\textsubscript{2peak}, respectively. At 40%, the PAV resulted in a similar Wb (62.7±7 vs. 67.7±7 kPa; P=0.4), decreased MSNA as (27±2 vs. 30±2 burst min\textsuperscript{-1}; P=0.05) and increased VO\textsubscript{2peak} (67.3±3 vs. 55.2±1 kPa; P=0.05); for PAV and PAV-RESULTS. At 60%, the Wb significantly (P<0.05) reduced Wb (103±2 vs. 144±14 kPa); MSNA (35.3± vs. 42±2 burst min\textsuperscript{-1}); heart rate (151±4 vs. 154±4 burst min\textsuperscript{-1}) and VO\textsubscript{2peak} (2.4±0.2 vs. 2.6±0.11 kPa) without influencing VO\textsubscript{2peak} (86±3 vs. 82±1 kPa; P=0.05); for PAV and PAV-RESULTS. At 80% (n=8) the PAV reduced (P<0.05) Wb (235±39 vs. 361±53.3 kPa), MSNA (48.2±3 vs. 53.4±4 burst min\textsuperscript{-1}), heart rate (173±4 vs. 176±4 burst min\textsuperscript{-1}) and VO\textsubscript{2peak} (2.9±0.2 vs. 3.2±0.2 burst min\textsuperscript{-1}) but not V\textsubscript{E}(1217±7 vs. 1237±7 burst min\textsuperscript{-1}) compared to post-PAV-CONCLUSIONS: During whole-body aerobic exercise above ~57% of VO\textsubscript{2peak}, attenuating the normally occurring Wb has a significant effect on sympathetic vasomotor outflow. Our findings support the theory of a respiratory muscle metaboreflex that influences the integrative response to exercise.

**Supported by American Heart Association 16UFEL27930008**

**Funding:** NSERC, JSPS KAKENHI Grant Number JP16K00201

---

**B-15 Clinical Case Slide - Cardiovascular I**

**Wednesday, May 30, 2018, 1:00 PM - 3:00 PM Room: CC-200E**

**Chair:** Aaron L. Baggish, FACSM. Massachusetts General Hospital, Boston, MA.

No relevant relationships reported

**Discussant:** Sourav Poddar. University of Colorado Health Sciences Center, Denver, CO.

No relevant relationships reported

**Discussant:** Mats Börjesson. Sahlgrenska University Hospital, Gothenburg, Sweden.

No relevant relationships reported

**May 30 1:01 PM - 1:20 PM Exercise Induced Electrocardiogram Abnormalities In Elite Swimmer**

Dalya Navot-Mintzer\textsuperscript{1}, Naama W. Constantini, FACSM\textsuperscript{2}, Wanget Institute and Clalit Health Services, Netanya, Israel. \textsuperscript{3}Shaare Zedek Medical Center, Jerusalem, Israel.

No relevant relationships reported

**HISTORY:** A 17-year-old male national team swimmer came for an intake examination at The Academy for Sports Excellence at Wingate Institute. He reported being a non-symptomatic carrier of familial long QT mutation of the LQT2 type (KCNH2: R744X) which was diagnosed through a family screening examination. He is taking Bisoprolol 2.5 milligrams once daily since he was 10 years old. Three other family members were diagnosed with the same long QT mutation (brother, mother and maternal grandfather). None of the family members have ever developed cardiac symptoms or arrhythmia, except for the grandfather who had one event of Torsade de Pointes at an old age, following acute MI. The whole family was screened following this event.

**PHYSICAL EXAMINATION:** PE revealed no pathological finding, including normal cardiac examination. Resting ECG at supine position was within normal limits (Heart rate (HR) = 49/min, QTc = 415 ms). QT interval became elongated (HR=48/min, QTc=550 ms) at the first minute on the treadmill stress test. During the stress test the swimmer was asymptomatic, had a normal blood pressure response and reached maximal oxygen consumption of 65ml/min/Kg. Exercise ECG showed two patterns of wide premature beats with few bigemins that started at a HR of 95/min.

**DIFFERENTIAL DIAGNOSIS:** 1- Benign ventricular pre-mature hypotension exercise 2- Electrical myocardial instability, due to channelopathy 3- Co-existence of CPVT in the family. **TESTS AND RESULTS:** 1- Repeated resting ECG, normal. 2- Echo-cardiography, normal. 3- Repeated family history and family ECG examination. No evidence of any cardiac symptoms except for the index event of the maternal grandfather. 4- Repeated 24h holter, normal. 5- Expert consultation.

**WINGATE DIAGNOSIS:** Asymptomatic elite swimmer. A carrier of benign familial LQT2 type mutation. No evidence of QT elongation on resting ECG and therefore does not meet QTc elongation criteria. Exercise induced ventricular pre-mature beats should be evaluated separately. Channelopathy expert physicians concluded that there is no justification for disqualification. **TREATMENT AND OUTCOME:** Cleared for swimming with no limitations. Repeated stress test and switching to a non-selective beta-blocker drug was recommended.

---

**544**

**543**

**542**

---
CARDIOVASCULAR DISEASE MANAGEMENT AND POLICY

CARDIAC REHABILITATION: A Gateway to the Senior Olympics
Kirk D. Hendrickson, Beaumont Health, Royal Oak, MI.
(Sponsor: Barry A. Franklin, FACSM)
(No relevant relationships reported)

HISTORY: An 81-year-old male with a history of hypertension in 2012 initially underwent graded exercise testing (GXT) followed by cardiac catheterization that revealed severe multivessel coronary artery disease (CAD). He underwent urgent coronary artery bypass surgery (CABG x 4) and enrolled in an exercise-based cardiac rehabilitation program (CR).

PHYSICAL EXAM: (1/2012): Lipid values: Total cholesterol (TC), HDL-C, LDL-C, and triglycerides (TG) were 118, 25, 56, and 186 mg/dL, respectively. Resting heart rate (HR) and blood pressure (BP): 59 bpm and 102/80 mmHg; body mass index (BMI), 29.2 kg/m².

DIFFERENTIAL DIAGNOSIS: CAD

TEST AND RESULTS:
Baseline GXT with myocardial perfusion imaging (MPI): patient achieved 94% HRmax and 4.8 METs; no symptoms or diagnostic ST segment depression were noted. However, MPI revealed a transient inferotemporal wall and a fixed posterior wall perfusion defect. Peak HR and BP: 136 bpm and 192/110 mmHg. Resting ejection fraction (EF) ~ 55%.

CABG 1/13/2012: Left anterior descending coronary artery (LAD) had 70-80% stenoses in the proximal and distal LAD. There were multiple 80-95% lesions in the left circumflex coronary artery (LCx), obtuse marginal artery (OM), and right coronary artery (RCA). EF ~ 55%.

Most recent GXT 2/18/2015: 8.3 METs; negative for symptoms or ischemic ST segment shifts. MPI showed mild reversible defects in the anterior and lateral wall. Follow-up coronary computed tomography angiography was unremarkable. Lipid values (9/2017) were largely unchanged from his 2012 profile, except for an increased HDL-C, 41 vs 25 mg/dL; formerly, his BMI also decreased, 27.1 vs 29.2 kg/m² at baseline.

FINAL WORKING DIAGNOSIS: CAD; previous CABG

TREATMENT AND OUTCOMES:
Patient initiated CR in 2012, follows a plant-based diet, is currently taking a beta-blocker, ACE inhibitor, aspirin, and statin and has continued lifting. He has no paresthesia, weakness, or radiculopathy. He has no exertional pain. He has a known history of multiple aneurysms diagnosed at the age of 7 with negative genetic testing. PHYSICAL EXAMINATION: There are no overlying skin changes or deformity. There is a tender, non-pulsatile 2 cm mass within the medial distal bicep with firmness of the surrounding soft tissues. Active range of motion at the shoulder and elbow are full and symmetric. Pain cannot be recreated with manual muscle testing. Brachial and radial pulses are symmetric and equal. Right ulnar pulse is difficult to palpate. Allen’s test reveals no perfusion to the distal extremities.

DIFFERENTIAL DIAGNOSIS: Superficial phlebitis

Intramuscular hemorrhage

Biceps or brachioradialis muscle tear

Neoplasms (vascular, sarcoma, nerve sheath)

Brachial artery aneurysm or pseudoneurysm

TEST AND RESULTS:
Bilateral extremity angiogram - Right arm: multiple arterial stenoses: 3 discrete aneurysms. Pseudoaneurysm at the proximal anastomosis of the aorto-bi-iliac graft that measures 4 cm proximally and 2.2 cm on the right iliac limb.

FINAL WORKING DIAGNOSIS:
Multiple aneurysmal disease of unknown origin

TREATMENT AND OUTCOMES:
This case highlights provocative issues of a rare vascular disorder with no literature related to physical activity recommendations. Increased intravascular pressure related to heavy resistance likely accelerates disease progression, and as such, the athlete was advised to refrain from weightlifting. Vascular surgery was consulted for evaluation of abdominal aortic pseudoneurysm and right vertebral artery aneurysm.

CARDIOVASCULAR DISEASE—ICE HOCKEY
Bradley Changstrom¹, Robert Quaife², Matt Sokolowski², Nicholas Edwards¹, Gregory Coe³, William Cornwell².
¹University of Colorado Hospital, Denver, CO. ²Colorado Avalanche Hockey Club, Denver, CO. ³University of Colorado Denver- Anschutz Medical Campus, Denver, CO.
(No relevant relationships reported)

HISTORY: An 18-year-old healthy male semi-professional ice hockey player presented with a chief complaint of dizziness during a graded oxidation and lactate bike test. During the episode, he exhibited fluctuating levels of consciousness, gaging and cough. Following this episode, he mentioned two similar episodes while performing bike fitness tests. During hockey activities, he denied chest pain, dyspnea, dizziness, or syncope. Physical Exam: On examination following the episode, he was responsive to verbal commands but appeared dizzy and confused. He was frequently coughing and appeared dyspneic. Blood pressure 120/70. Heart rate was in the 120s. Pulse oximetry was 93%. Heart was regular rhythm without murmurs, rubs or gallops. Pulmonary exam demonstrated upper respiratory rhonchi. The patient was transferred to the emergency room.

Abstracts were prepared by the authors and printed as submitted.
8. The aim of this case presentation is to review into current literature and practice and to discuss what is advisable versus safe for return to play in this case of abdominal organ injury.

**B-16 Clinical Case Slide - Musculoskeletal: Spine to Ankle**

**Wednesday, May 30, 2018, 1:00 PM - 3:00 PM**

**Room: CC-200F**

**Chair:** Joshua Blomgren, Rush University Medical Center, Chicago, IL.

**Discussant:** Kaleigh Suhs, Advocate Lutheran General, Park Ridge, IL.

**Discussant:** Kyle J. Cassas, FACSM, Greenville Health System, Greenville, SC.

**May 30 1:00 PM - 1:20 PM**

**Ankle Pain—Volleyball Player**

Jacob Reisner¹, Cara Prideaux², Edward Laskowski, FACSM³. ¹Mayo School of Graduate Medical Education, Rochester, MN. ²Mayo Clinic, Rochester, MN. (Sponsor: Edward Laskowski, FACSM)

**May 30 2:40 PM - 3:00 PM**

**Palpitations, Diaphoresis, Left-sided Chest, And Shoulder Pain — Football**

James N. Cornwell, David Wilhelm. LECOM Health Sports Medicine, Erie, PA. (Sponsor: Patrick F. Leary, DO FACSMD, FACSM)

**Test and Outcomes**:

An electrocardiogram was normal. A complete blood count, comprehensive metabolic panel, cardiac troponin and brain natriuretic peptide were normal. A chest radiograph was normal. The patient was discharged with follow up.

The following day, a transthoracic echocardiogram was normal.

A stress echocardiogram on a bike was performed under the same graded exercise protocol as the provoking bike test. At similar sub-maximal effort for heart rate and lactate levels, the patient developed recurrent symptoms. A continuous EKG did not demonstrate arrhythmia; however, the stress echocardiogram demonstrated hyperdynamic left ventricular contractility. At the same time, a cerebral perfusion monitor demonstrated a decrease in cerebral blood flow. No left ventricular outflow tract gradient was noted.

A cardiac magnetic resonance imaging (MRI) was normal.

A dobutamine stress echocardiogram was performed which confirmed an abnormal cardiovascular reflex response.

Final Diagnosis: Bezold-Jarisch (Cardioinhibitory) response to exercise due to a hyperdynamic left ventricle.

**Results**:

1. He was cleared for full athletic participation.
2. He has returned to hockey activities without issues.

**PHYSICAL EXAMINATION**:

Upon evaluation in a local emergency department, the patient had denied trauma to the chest or abdomen during the practice. The athletic training staff immediately arranged for transport of the patient to a local hospital for evaluation.

**TEST AND RESULTS**:

Pneumothorax

1. Blunt force trauma to spleen
2. Pneumothorax
3. Liver laceration
4. Pancreatitis
5. Left Kidney trauma

**Vital Signs**

- 98.4, 112, 24, 108/68, 98% RA
- Labwork – slight anemia
- CXR – wnl, no pneumothorax
- CT of Abdomen and Pelvis
- C-reactive protein were slightly elevated.

The patient did not demonstrate any chest pain, palpitations, diaphoresis, left-sided chest, and shoulder pain.

**DIFFERENTIAL DIAGNOSIS**

1. Septic Arthritis
2. Inflammatory Arthritis/Synovitis
3. Crystalline Mononarthritis
4. Lyme Arthritis
5. Internal Derangement
6. Occult Fracture
7. Pigmented Villonodular Synovitis
8. Synovial Chondromatosis

**ANALYSIS**

An otherwise healthy 24 year old female volleyball player presented to the sports medicine clinic with a two week history of atrumatic severe left ankle pain and swelling. She localized the pain to her tibiotalar area. She described a sensation of “tightness” in the ankle. She denied any numbness or tingling or mechanical features to her pain, and she denied focal weakness. She did not endorse any other swollen or painful joints. She denied any history of autoimmune disease, inflammatory arthritis, or exposure to ticks. She had tried ibuprofen and Tylenol with no significant relief.

**PHYSICAL EXAMINATION**:

Exam revealed a left ankle effusion and tenderness to touch over the anterior tibiotalar joint but not on the medial, lateral or posterior ankle. No laxity was noted with anterior drawer test. External rotation stress test was not painful. No pain was produced with resisted ankle motion in all planes. Neurologic exam did not reveal any focal strength or sensory changes in the lower extremities. Distal pulses and capillary refill were symmetric.

**DIFFERENTIAL DIAGNOSIS**:

1. Cardiac arrhythmia
2. Structural heart disease
3. Seizure disorder
4. Hypoglycemia
5. Exercise induced asthma

**FINAL WORKING DIAGNOSIS**

Differential diagnosis:

1. Cardiac arrhythmia
2. Structural heart disease
3. Seizure disorder
4. Hypoglycemia
5. Exercise induced asthma

**TREATMENT AND OUTCOMES**:

1. Modest improvement of pain with activity reduction
2. Orthopedic Foot and Ankle Surgery consult for planned arthroscopic nodule aspiration showed extensive tibiotalar synovitis but did not produce any fluid for analysis. MRI of the left ankle showed extensive nodular synovial thickening of the anterior compartment consistent with Diffuse PVNS.

**FINAL WORKING DIAGNOSIS**

1. Septic Arthritis
2. Inflammatory Arthritis/Synovitis
3. Crystalline Mononarthritis
4. Lyme Arthritis
5. Internal Derangement
6. Occult Fracture
7. Pigmented Villonodular Synovitis
8. Synovial Chondromatosis

**TEST AND RESULTS**

Laboratory testing showed normal white blood cell count. Sedimentation rate and C-reactive protein were slightly elevated. Lyme disease ELISA, rheumatoid factor, and CCP were all negative.

X-ray showed left ankle effusion but no fractures. Attempted ultrasound guided aspiration showed extensive tibiotalar synovitis but did not produce any fluid for analysis. MRI of the left ankle showed extensive nodular synovial thickening of the anterior compartment consistent with Diffuse PVNS.

**S106 Vol. 49 No. 5 Supplement**
HISTORY: A 68 year-old male with history of right second metatarsal Weil osteotomy, third webspace interdigital neuroma removal and third hammertoe correction presented with non-traumatic, burning pain in his second webspace that radiated into his second and third toes over the last four years. His pain was present at rest and worsened with activity.

PHYSICAL EXAMINATION:
He had full, symmetric, and painless ankle and subtalar joint range of motion. Strength and sensation to light touch were full and normal. There was tenderness to palpation in right second webspace but no tenderness over the second and third MTP joints. No pain or paresthesia was elicited on Mulder’s test. He walked without a limp.

DIFFERENTIAL DIAGNOSIS:
- Interdigital neuroma
- Intermetatarsal bursitis
- Metatarsophalangeal joint instability
- Metatarsalgia
- Metatarsal stress fracture

TEST AND RESULTS:
Foot Radiographs
- Healed osteotomy right 2nd metatarsal neck with screw fixation
- Post-operative changes right 2nd and 3rd PIP joints

Diagnostic Ultrasound
- No neuroma or intermetatarsal bursitis was noted
- Third digit flexor tendons were dislocated medially between the second and third metatarsal heads compressing the adjacent neurovascular structures

Foot MRI
- Confirmed US findings of medial dislocation of the third flexor digitorum longus and brevis tendons in between the second and third metatarsal heads

FINAL/WORKING DIAGNOSIS:
- Medial dislocation of third flexor digitorum longus and brevis tendons between the second and third metatarsal heads likely causing mass effect on the interdigital nerve in the second interspace

TREATMENT AND OUTCOMES:
- It was felt that relocation of the tendons was not a technically feasible surgery
- An ultrasound-guided second webspace corticosteroid injection along the interdigital nerve provided immediate relief of all patient’s symptoms, however the pain and burning returned within one week
- Definitive treatment with an interdigital neuroectomy was planned

Gait: antalgic gait
Palpation -- Tone: [ abnormal ]
Tenderness: [ paraspinal area at level of T10 through S1 ]
Range of Motion: Forward Flexion - [ 90 + ] Deg
Extension - [ 15 ] Deg
Forward bending: [ symmetric / normal ]
Extension: [ exacerbates pain ] [ R ] and [ L ]
Stork test: [ exacerbates pain ] [ R ] and [ L ]
Straight Leg Raise (Laseague) Test: [ negative ]

DIFFERENTIAL DIAGNOSIS:
1. Lumbar
2. Stress Fracture
3. Hamstring/ITB Syndrome
4. Psychosomatic
5. Spondylarthropathy

TEST AND RESULTS:
Lumbar Xray (obtained via fax from PCP visit in New York): There is mild lumbar scoliosis. There is narrowing of all intervertebral disc spaces from T12-L5. Schmorl node endplate deformities and discogenic changes are present. No fracture or subluxation. Facet joints and SI joints are normal.

MRI Lumbar: Degenerative changes greater than expected for age and multiple Schmorl’s nodes. No spondylolisthesis or spondyloysis. Considering thoracic MRI as concern exists for Scheuermann’s disease. There is subchondral sclerosis along the iliac sides of bilateral sacroiliac joints.

MRI Thoracic: Scattered endplate irregularities and small Schmorl’s nodes with disc space narrowing throughout the thoracic spine with associated endplate change.

LABS:
- HLA B-27: negative
- CRP: 7.4
- ESR: 4
- Quantiferon Gold TB: negative
- ANA: positive
- DX-DNA and Anti-Sm: negative

FINAL WORKING DIAGNOSIS:
Scheuermann’s Disease and HLA-B27 seronegative Axial Spondyloarthritis

TREATMENT AND OUTCOMES:
Patient is doing well in medical school and currently being managed on naproxen 500mg twice a day with no gastrointestinal side effects.

History: A 24 year old previously healthy left handed male professional baseball pitcher was warming up on the mound before a game when he suddenly felt a vague pain in his lower left anterior-lateral rib cage region but denied hearing a pop. Pain was a localized deep ache on the lower anterior rib cage. Although he felt discomfort the player was able to complete his warm up regimen and start the game. During the game he was only able to throw four pitches prior to unbearable pain during the acceleration phase of pitching causing him to be pulled from the game and seek medical attention.

Physical Exam: Normal appearance of the chest wall. Point tenderness to palpation and a 1x1cm soft tissue mass on the lower left anterior chest wall on palpation. Any active and passive motion of the torso exacerbated the pain and the mass was vascularly intact. There was no winging of the scapula or crepitus along the rib cage.

Differential Diagnosis:
1. Oblique muscle strain
2. Rib stress fracture
3. Costochondral junction avulsion fracture
4. Serratus anterior avulsion fracture
5. Intercostal muscle strain

Test and Results:
- Thoracic MRI findings suspected either a fracture or stress injury of the costochondral cartilage along the left anterior-inferior aspect of the ribcage. There was extensive edema present along the region that measured 8x10 cm but there was no evidence of rib fractures.
- Chest CT without contrast revealed edema around the costochondral junction of ribs 7 and 8 on the left with anterior prominence of the cartilage but no focal displacement or rib fractures.

Final Working Diagnosis: Based on Imaging, injury most likely to be costochondral junction avulsion fracture of ribs 7 and 8.

TREATMENT AND OUTCOMES:
- Pain management
- Rehabilitation
- Anti-inflammatory medications
- Referral to orthopedic specialist for further evaluation and potential surgery

History: A 22-year-old male presents to MedStar Sports Medicine clinic from Student Health physician with complaint of hamstring and back pain for the last year. Patient describes the pain is worse when he rides his bike to school (5 miles) improved with walking to class and through the day, but worsens when he tries to run at night beyond 4 miles.

PHYSICAL EXAMINATION:
The player was initially treated with 6 weeks of activity restriction and rest. Surgery was not warranted due to lack of significant separation of the fragment. Repeat radiographs were obtained at 6 weeks which revealed proper healing. After 6 weeks he began a graduated pitching regimen. Pain improved throughout his rehabilitation with rest and NSAIDS once he began physical activity. He returned to full activity at 8 weeks.

**PHYSICAL EXAM:**

Full and symmetric strength, sensation, and reflexes. Mild

**DIFFERENTIAL DIAGNOSIS:**

1. Lumbar pain spine X-rays: Normal alignment, normal vertebral body and disc space height. Partial lumbarization of S1 vertebral body. Five degrees of lumbar dextroscoliosis. 2. MRI lumbar spine: Lumbarization of S1 vertebral body. 3. Disc herniation. 4. Muscular strain. 5. Sacroiliac joint dysfunction. 6. Intrabdominal/intrapelvic etiology. 7. Neoplasm.

**TESTS AND RESULTS:**

1. Lumbar spine X-rays: Normal alignment, normal vertebral body and disc space height. Partial lumbarization of S1 vertebral body. Five degrees of lumbar dextroscoliosis. 2. MRI lumbar spine: Lumbarization of S1 vertebral body. 3. Disc herniation. 4. Muscular strain. 5. Sacroiliac joint dysfunction. 6. Intrabdominal/intrapelvic etiology. 7. Neoplasm.

**FINAL WORKING DIAGNOSIS:** Ureteropelvic junction obstruction causing Driet’s crisis.

**TREATMENT AND OUTCOMES:**

1. Referral to urology. 2. Resolution of pain and improvement in renal function after pyeloplasty.
Back and Shoulder Pain in a Female Weight Lifter with Ehlers Danlos

History: The Patient is a 44 yo woman who is a former fitness model, power lifter, and police office. She has a past medical history consisting of, pituitary tumor, Macromastia (C to DDD), right and left temporal aneurysms, bilateral hip subluxation, Chiari Type I herniation – nonoperable and Ehlers Danlos. She is treated for chronic pain and her regimen consists of Tylenol, Tramadol and Oxycodone based on severity. NSAIDs are contraindicated due to the Xarelto use. In her most recent EDS clinic visit, she was referred to the sports medicine clinic for pain in her back and right shoulder. She was swimming and performing rehab exercises and presented with her 9/10 shoulder pain. The pain is worse with motion and is located on her posterior and lateral shoulder.

Physical Exam:
GENERAL: Healthy appearing, Alert and Oriented, no acute distress, mood appropriate, respiratory rate non-labor, hearing intact
THORACIC:
PALPATION: TENDER over Bilateral Trapezius, splenius capitus, rhomboids
ROM: LIMITED in flexion-extension lateral rotation B/L
EXTREMITIES EXAM:
SENSATION: Upper Extremity: intact bilateral, no deficits
Lower Extremity: intact bilateral, no deficits
STRENGTH: Upper extremity: full strength in all major muscle groups
Lower extremity: full strength in all major muscle groups
SPECIAL TESTS
(+) Hawkins right side
(+) Spurling’s away from affected

Differential Diagnosis:
Final Working Diagnosis: Chronic Rotator Cuff tendinosis from chronic subluxation, and bilateral trapezius, rhomboid and splenius capitus strain, likely from overly active rehab and her Macromastia

Treatment: Subacromial shoulder injection with glucocorticoids and dry needling of her splenius capitus, rhomboids, and trapezius muscles

Outcome: Significant reduction in her pain, reduced narcotic use and continuing with her rehab and swimming. Receiving dry needling on a monthly basis.
Left shoulder x-rays (AP/Outlet/Axillary): “Innumerable calcific loose bodies consistent with synovial osteochondromatosis as well as significant osteoarthritis changes at the glenohumeral joint with close to bone-on-bone narrowing seen best on the axillary view. The loose bodies are dispersed throughout the joint capsule and into the bicipital groove.”

**Final/Working Diagnosis:**
Synovial osteochondromatosis

**Treatments and Outcomes:**
- Continued physical therapy
- Over the counter analgesics, ice/heat as needed
- Referral to orthopedic surgeon for loose body removal vs. shoulder joint replacement

**568**

**May 30 2:20 PM - 2:40 PM**

**Shoulder Pain in a Youth Hockey Player**

Brennan J. Boettcher, Jeffrey M. Payne, Jonathan T. Finnoiff, FACSM. Mayo Clinic, Minneapolis, MN. (Sponsor: Jonathan T. Finnoiff, FACSM)

(No relevant relationships reported)

**HISTORY:** A 14-year-old male hockey player presented for right shoulder pain. He checked an opponent with his left shoulder and developed right shoulder pain immediately. There were no associated neurovascular symptoms. The pain was sharp, and radiated down the lateral side of the shoulder to the mid-arm with abduction. Outside shoulder radiographs were normal.

**PHYSICAL EXAMINATION:** Athletic male resting with his right hand on his abdomen. Asymmetric depression of his right acromion with arms unsupported at his side. Right shoulder range of motion was slightly limited due to pain. He had tenderness just posterior to the distal mid-third of the clavicle diaphysis over the trapezius insertion. Neurologic and strength examination were normal.

**DIFFERENTIAL DIAGNOSIS:** - Trapezius strain - Occult clavicle fracture - ACJ separation - Physisal injury - Brachial plexus injury - Rotator cuff injury - Labral tear.

**TEST AND RESULTS:** Diagnostic ultrasound revealed an avulsion of the deep fibers of the trapezius from the clavicle, with ACJ spasm and distal clavicular hypermobility. Repeat radiographs demonstrated subtle periosteal lifting of the inferior clavicle near the avulsion visualized on sonographic evaluation indicative of a clavicular physisal injury.

**FINAL WORKING DIAGNOSIS:** Grade 1 right ACJ separation with trapezius avulsion off of the clavicle and distal clavicular physisal injury.

**TREATMENT AND OUTCOMES:** The patient was placed in a sling for comfort for 2 weeks. At the 3-week follow-up, he was about 95% of normal, repeat ultrasound demonstrated a small amount of distal clavicular callus formation. He was cleared to return to unrestricted activity.

**Physical exam:**
Right shoulder: Tenderness to palpation over AC joint. Limited active and passive range of motion: Forward flexion 160 deg, Abduction 160 deg. External rotation 60 deg.


**Differential Diagnosis:**
1. Impingement Syndrome
2. Fracture
3. Rotator cuff tendinopathy
4. Osteochondral defect of the glenoid fossa
5. Osteochondroma

**Testing and Results:**
MRI Right Shoulder: Large osteochondral defect centered in the posterior superior aspect of the glenoid measuring approximately 1.6 x 1.7 cm. Associated marked irregularity and bone loss of the subchondral plate and subchondral bone, suspicious for an instable osteochondral fragment. Tear of the adjacent posterior superior labrum.

**Final Diagnosis:**
Osteochondral defect of the glenoid fossa

**Treatments/Outcomes:**
1. Hyaluronic acid injection into glenohumeral joint with no change in symptoms
2. PRP injection into glenohumeral joint with excellent reduction in pain and eventual return to baseline range of motion
3. Physical therapy - rotator cuff strengthening, range of motion exercises, joint mobilization, and manual modalities
4. Returned to full sports 8 weeks following PRP injection. After complete resolution of symptoms, she played volleyball in the following season as a setter.

**B-36**

**Thematic Poster - Get Up, Get Moving: New Research in Sedentary Behavior**

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100C

**Chair:** David W. Dunstan, Baker IDI Heart and Diabetes Institute, Melbourne, Australia.

(No relevant relationships reported)

**PurPOSE.** Our goal was to estimate the time-use exchanges associated with exercise, prolonged television viewing, and work days on the amount and type of sedentary and physically active behaviors and physical activity energy expenditure in older adults.

**METHODS.** Participants were 1,020 older adults who completed up to 6 detailed previous-day recalls over 12-months that provided a profile of the use of time in sedentary and physically active pursuits. We predicted time-use and physical activity energy expenditure (PAEE) outcomes for 1) days with and without exercise, 2) days with or without prolonged television (2+ hours/day), and 3) work vs non-work days. To estimate time-use exchanges we used repeated measures and linear mixed models, adjusting for age, sex, season of the year, and day of the week.

**RESULTS.** Exercise days were associated with less sedentary time (-0.37 hrs/d) and light activity (-0.29 hrs/d), and less household, work, and shopping activities. Compared to non-exercise days, the increase in total PAEE on exercise days (2.83 MET-hrs/d) was only about half that expended during exercise (5.98 MET-hrs/d). Prolonged television viewing was associated with an increase in total sedentary time (0.86 hrs/d) and less light (-0.45 hrs/d) and moderate-vigorous intensity activity (-0.41 hrs/d), and thus lower total PAEE (-2.43 MET-hrs/d). Work days were associated with less sleep (-0.91 hrs/d) and an increase in total sedentary time (1.32 hrs/d).

**DISCUSSION.** Exercise was associated with an increase in PAEE, but due to reductions in other activities, only about half of the energy expended during exercise trickled-up to total daily PAEE. Prolonged television viewing was associated less PAEE and less moderate-vigorous activity. These findings provide new insights into possible compensation associated with exercise training, and suggest a strong link between television viewing and physical inactivity.

**569**

**May 30 2:40 PM - 3:00 PM**

**“OCD”: A Zebra In The Glenoid Fossa**

Elizabeth Barchi. New York University, New York, NY.

(No relevant relationships reported)

**History:** A 19-year-old female Division 1 volleyball player presented with 5 months of right shoulder pain and decreased range of motion. The pain was localized to “inside” the shoulder and aggravated by serving and setting (right hand dominant). 2 months after the onset of symptoms, she noticed an acute increase in pain following a collision that resulted in a cervical strain. The symptoms persisted despite 3 months of physical therapy in the training room and 2 months of post-season rest. She denied neurological or instability symptoms.
Prolonged Uninterrupted Sitting Impacts Postprandial Glucose, Insulin and Lipid Responses in Overweight/Obese Adults


Purpose: Prolonged uninterrupted sitting amplifies postprandial glucose, insulin and lipid responses in overweight/obese adults with or without type 2 diabetes; and, impairs lower limb endothelial-mediated vasodilation in healthy adults. It is unknown whether prolonged sitting impairs vascular function or modulates other vascular inflammatory and pro-atherogenic mechanisms in those at heightened risk of cardiometabolic disease. In overweight/obese adults, we examined the potential pro-atherogenic effects of an acute bout of prolonged sitting, compared to sitting interrupted with brief activity breaks.

Methods: In a randomised crossover trial, following a standardised breakfast meal, 19 (11 Male, 8 Female) overweight/obese participants (BMI 30.6±3.4 kg/m², age 57±12 years; mean±SD) either: (i) sat uninterrupted for 5h (SIT); or, (ii) interrupted 5h of sitting with 3min light-intensity simple body-weight resistance activities every 30min (SRA). Brachial and femoral artery endothelial-mediated vasodilation were measured using flow mediated dilation (FMD). Circulating levels of vasoactive and pro-atherosclerotic biomarkers (total nitrate+nitrite, ET-1, ICAM-1 and VCAM-1) were measured. Sympathetic nervous activity was also estimated (peroneal microneurography and circulating catecholamines). Data were analysed using generalised linear mixed models controlling for age, sex, BMI, baseline values and treatment order, and are presented as marginal mean±SEM. Results. Femoral artery FMD was impaired in the SIT condition, compared to SRA (5.1±0.5% vs 9.0±0.5%, respectively, p<0.05). Significantly higher circulating levels of the potent vasoconstrictor and pro-inflammatory mediator ET-1 (1.6±0.1 vs 1.4±0.1 pg/ml) and pro-atherogenic adhesion biomarker VCAM-1 (616±33 vs 564±26 ng/ml) were observed in SIT compared to SRA, respectively (p<0.05). There were no differences between conditions for any other outcomes.

Conclusion. In overweight/obese adults, an acute bout of uninterrupted sitting impaired femoral artery endothelium-mediated vasodilation and increased circulating levels of pro-atherosclerotic biomarkers. Prolonged sitting may have implications for vascular function, leukocyte adhesion and atherogenesis in those at heightened risk of cardiometabolic disease.
an activPAL accelerometer/inclinometer on the thigh continuously across workdays (n = 5.8 ± 1.8 days/person) to assess sedentary time prior to any intervention. Work time was segmented using daily work logs and time of day was temporally aligned based on “work time” (i.e., minutes since starting workday) or “clock time” (i.e., minutes since midnight). Mixed-effects regression models (clustered by time within workdays) were used to account for within person time variations and to examine interept (i.e., main effects) and time trajectory differences by worker characteristics. RESULTS: Based on work (min/hour) 62% of participants had a small negative trajectory for sedentary time (β [SE] = -0.31 [0.12], p=0.010). Women were less sedentary overall (β [SE] = -2.90 [0.62], p<0.001); however, men had greater decreases in sedentary time over the workday (β [SE] = 0.278 [0.10], p=0.002).

Obese individuals were less sedentary than overweight (β [SE] = -4.90 [0.65], p<0.001) and normal weight (β [SE] = 6.61 [0.63], p<0.001) individuals overall; however, overweight individuals (β [SE] = -0.26 [0.10], p=0.006) had greater decreases in sedentary time over the workday relative to obese (whose sedentary time remained stable). These patterns were similar when time was aligned by clock time.

CONCLUSION: Sedentary time was modestly reduced over the work day. This pattern varied by gender and weight status, but not by age or job type. These findings inform potential tailoring strategies by identifying when and for whom to optimally target interventions to reduce sedentary time in the workplace.

PURPOSE: The purpose of this study was to evaluate free exercise apps and the ability of participants to use them. RESULTS: 641 men and women were available for analyses, with mean age (± SD) = 44.5 ± 14.6 years, 65% overweight or obese. Worksite-level energy intake decreased over time by 132 kcal/day (95% CI: 8.256; p < 0.05). There was a trend towards decreased feelings of hunger over time (p = 0.20). While macronutrient and fiber intake appeared to decrease over time, no differences were observed in macronutrients or fiber after adjusting for energy intake.

CONCLUSIONS: Self-reported energy intake decreased among sedentary workers participating in the ‘Stand & Move at Work’ intervention over the first three months. This may be explained by a change in diet quality. Future analysis will incorporate a relative comparison of the intervention arms to explore any differential effects on energy intake, diet composition, and subjective feelings of hunger.

PURPOSE: The purpose of this study was to determine the association between weather condition, ambient temperature and objectively measured sedentary time in Chinese adults.

METHODS: 3,426 Chinese (2,116 men and 1,310 women) users of a brand of smart bracelet from July to October in 2015 were recruited in this study. Witha nol algorithm, the gravity component of the accelerometer signal collected by the activity monitor was extracted from the raw data to identify different types of activities and determine sedentary time. Using the information of GPS and time, the data of ambient temperature and weather condition were collected from the meteorological data released by China Central Meteorological Observatory.

RESULTS: Compared with the days with rain, shower, haze and clouds, Chinese adults spent less time in sedentary behaviors in sunny days. There is no significant difference in sedentary time in rainy days in adults with different weight status. However, obese adults had significant longer sedentary time in non-rainy days than their counterparts with normal weight. Chinese women have shorter daily sedentary time when the mean ambient temperature lower than 20 °C, as compared with 20-24°C, 25-29°C and ≥30°C groups, whereas no difference was found in Chinese men.

CONCLUSIONS: Weather condition and ambient temperature are important factors associated with sedentary behaviors. Sedentary time in Chinese adults is longer in rainy days and high ambient temperature as compared with non-rainy days and cool weather. Long sedentary time especially in non-rainy days could be one of the factors contribute to the development of obesity in Chinese adults.

PURPOSE: The purpose of this study was to evaluate free exercise apps and the potential for promoting physical activity. METHODS: Study investigators identified 153 free exercise apps. Written descriptions posted by the app developers were evaluated by two investigators for enabling and disabling components of the Precede-Proceed Health Promotion Model as a guide. Six factors (three enabling and three reinforcing) were evaluated, with one point recorded for each factor included in an app. RESULTS: Enabling scores ranged from 0 to 3. One hundred and thirty-
four (87.6%) apps included videos or pictures, while 123 apps (80.4%) included written instructions on how to perform exercises. Thirty-eight apps (24.8%) included the ability to track daily and gaming experience and no statistical difference were found by category. RESULTS: Compared to resting values (4.5±0.6ml/kg/min), VO2 was higher during TOF, AS, and HP (30.5±7.1, 19.1±5.8, and 24.8±6.6ml/kg/min, respectively; *p<0.05). Using %VO2R, 95% Confidence Interval (95%CI), TOF was classified as vigorous, HP was moderate, and AS was light intensity depending on gaming experience. Using METs (95%CI), TOF was classified as moderate, leaving a final sample of 9 players and 11 non-players. Participants were examined using a one-way between groups ANCOVA (Male: M=9.00, SD=1.84; Female: M=7.21, SD=2.77) for 7 consecutive days. After 7 days, participants returned the SWA and completed a VR environment. Using METs (95%CI), TOF was classified as vigorous, HP ranged from moderate to vigorous, and AS was moderate intensity. Using RPE (95%CI), TOF was classified as moderate, whereas HP and AS were light intensity. CONCLUSIONS: Our data suggests the three VR games examined can elicit at least a moderate exercise intensity based on ACSM guidelines. Participants perceived the physical exertion to be lower during the games than their measured exertion, which might allow participants to continue playing A VRGs for longer durations before feeling fatigued. Data on metabolic cost for movement specific games may aid consumers and health/fitness specialists in developing exercise programs with A VRGs.

Conclusions: To assess athletes’ interest in VR as an intervention to enhance performance and injury rehabilitation, and to identify preferred components within a VR world. We also explored gender influences on these preferences. We focused on one collegiate sport, soccer, at three levels (NCAA, NAIA, Junior College).

Methods: Sixty-eight collegiate soccer (25 male; 43 female) athletes completed an electronic survey which included demographics, as well as the virtual reality interest survey created to assess VR use, interest and specific factors that athletes may find useful in a VR environment.

Results: Participants’ responses on a 10-point Likert-type scale from not interested (1) to extremely interested (10), indicated strong interest in using VR, both in recovery from injury (M=7.06, SD=2.67), and to improve sport performance (M=7.89, SD=2.59). Additional items asked about interest in specific forms of VR with the same 10-point response scale. Athletes indicated strong interest in viewing sport-specific scenarios (M=7.26, SD=2.66), sport-specific skills (M=6.89, SD=2.73), and physically touching a soccer ball while submerged in a virtual world (M=6.89, SD=2.83). Other items, such as seeing a crowd in the stands, presence of water coolers, or viewing teammates perform a sport skill unsuccessfully, were rated of less interest. In terms of gender, men were more interested than women in using VR both for injury recovery (Male: M=8.24, SD=2.18; Female: M=6.64, SD=2.70) and to enhance performance (Male: M=9.00, SD=1.84; Female: M=7.21, SD=2.77).

Conclusions: VR interest is high among collegiate soccer athletes, both for injury recovery and performance enhancement. The athletes were particularly interested in a VR environment that incorporates specific-sport scenarios and physically touching a soccer ball. Men had stronger interests in VR, but both men and women athletes at all levels indicated interest in engaging in VR to assist in injury recovery and performance enhancement.
on DEE for on-body time \[ F(1, 17) = 4.892, p = 0.041 \]. When weight was included in the model, there was a trend towards a significant effect on DEE \[ F(1, 16) = 4.366, p = 0.053 \]. However, weight was not used for analysis in the main ANCOVA model as it is outside the significance level. **CONCLUSION:** Pokémon Go players exhibited a significantly greater DEE than their non-player counterparts (Players: 2735 ± 474 kcal vs non-players: 2274 ± 474 kcal, \( p = 0.031 \)).

**TABLE 1. Demographic data.**

<table>
<thead>
<tr>
<th></th>
<th>Players</th>
<th>Non-players</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>27.89 +/- 6.62</td>
<td>25.73 +/- 3.85</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>78.99 +/- 16.00</td>
<td>73.02 +/- 12.35</td>
</tr>
<tr>
<td>BMI (Kg/m²)</td>
<td>27.66 +/- 4.20</td>
<td>24.73 +/- 3.69</td>
</tr>
</tbody>
</table>

**Conclusion:** Home-based exergaming may positively impact cognition, fitness, and BFP for some preschoolers, with slight positive effects on EE possible for most preschoolers. Therefore, an exergaming program might be a good option for home-based PA interventions.

### S114 Vol. 49 No. 5 Supplement

**Figure 1. Differences in daily energy expenditure between Players and Non-players. * indicates significant difference \( p \leq 0.05 \).**

**Table 647 Board #7 May 30 3:15 PM - 5:15 PM**

**Effects of Exergaming on College Students’ Mood and Energy Expenditure Compared to Traditional Treadmill Exercise**

Wenxi Liu1, Zachary Pope1, Nan Zeng1, Jung Eun Lee1, Zan Gao, FACSM1.1 University of Minnesota Twin Cities, Minneapolis, MN. 2 University of Minnesota Duluth, Duluth, MN. (Sponsor: Zan Gao, FACSM)

**Purpose:** To date, no known research concerning exergaming on young adults’ affect is available. Thus, this study examined exergaming’s effect on college students’ mood and energy expenditure compared with traditional treadmill exercise.

**Methods:** Sixty college students (30 female; \( M_2 = 23.6 \)) participated in three separate 20-minute exercise sessions: 1) Xbox 360 Kinect Reflex Ridge; 2) Xbox 360 Kinect Just Dance; and 3) moderate-intensity treadmill walking (4.0 mph). Mood was assessed via the Brunel Mood Scale (BRUMS) – a 24-item questionnaire containing six subscales: anger, confusion, depression, fatigue, tension, and vigor. Participants completed the questionnaire following each exercise session.

**Results:** The data indicated participants in treadmill session (M = 174.21) had more energy expenditure (in calories) than Just Dance (M = 91.70) and Reflex Ridge (M = 110.20). Significant differences between the three sessions for mood was only observed for fatigue (F (2, 118) = 12.28, \( p < 0.01 \), \( \eta^2 = 0.172 \)), with post hoc Bonferroni comparisons indicating that participants’ perceived fatigue levels were significantly lower during Just Dance compared to Reflex Ridge (\( p = 0.02 \)) and treadmill walking (\( p < 0.01 \)). However, Reflex Ridge and treadmill walking were not observed to have significantly different levels of fatigue (\( p = 0.07 \)). It is also notable that feelings of vigor and depression approached significance (F (2, 118) = 2.694, \( p = 0.07 \) and F (2, 118) = 3.18, \( p = 0.06 \), respectively), with Reflex Ridge promoting the greatest feelings of vigor and treadmill walking resulting in the greatest feelings of depression.

**Conclusion:** Findings revealed that even though traditional treadmill exercise performed more energy expenditure, however, exergaming may lead to less perceived fatigue and potentially higher vigor among college students compared to traditional exercise. This finding has important implications as college students may be more likely to participate and maintain in PA when less fatigue is perceived and feelings of vigor upon cessation of gameplay are experienced. Future research should examine other exergames to discern what genre of exergaming is most effective in promoting positive affect among young adults.
CONCLUSIONS: Despite extensive user training, several intervention BCS found the Polar M400 difficult to use—possibly decreasing intervention adherence. Future interventions should utilize simpler smartwatches to promote PA among middle-aged clinical/non-clinical populations.

B-38 Thematic Poster - High Intensity Interval Training
Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100H
Chair: Tom Hazell. Wilfrid Laurier University, Waterloo, ON, Canada.

Blood lactate steady-state level, sustained during rest time, in moderate intensity interval training
Juan C. Maaza1, Raúl R. Festa1, Lisandro Ruffo1, Patricia Cosolito1, Sandra L. Prieto1, Alvaro Gurovich, FACSM1. 1Biosystem Institute Sports Sciences, Rosario, Argentina; 1Colombia State University, Bogotá DC, Colombia; 2The University of Texas at El Paso, El Paso, TX, USA.

BACKGROUND: Important isotope studies related to lactate metabolism have pointed out that blood lactate level (BLA) is an expression of the balance between Production (RP), Removal (Ri) and Oxidation (ROx) rates. Also, evidence shows that the relationship between BLA with R and ROx rates, is concentration-dependent, close 4 to 7 mmol/l.

PURPOSE: Analyze BLA in the first sec. (BLA-10s) and last sec. (BLA-50s) of 1-min passive rest, during steady-state moderate intensity interval training (IT), considering that BLA is a balance of RP with R and ROx intracellular process. We want to demonstrate that (BLA-10s) and (BLA-50s) levels are similar, so R and ROx are maintained, in steady-state conditions, during IT workouts.

METHODS: Ten trained swimmers and eight trained track athletes (19.1±2.6 yr) performed a moderate intensity IT session (BLA-50s: 4.5±1.46 vs. 12.80±0.41 mmol/l, respectively (p<0.01) and 182±17 vs. 152±10 bpm, respectively (p<0.01). In addition, LA and HR values are significantly different between IT and EITnT: 3.28±0.86 vs. 1.53±0.55; 4.44±0.91 vs. 1.21±0.33; 4.94±1.31 vs. 1.19±0.32; 5.51±1.64 vs. 1.18±0.34 mmol/l, respectively (p<0.01). And 179±6 vs. 153±9; 183±6 vs. 152±7; 184±7 vs. 153±9 bpm, p<0.01, respectively. Additionally, there was a sudden drop in HR and LA in each test (EITnT: r = 0.26; EIT: r = 0.42).

RESULTS: The present study showed that IT is a more metabolic and cardiovascular stressful stimulus than EITnT. Same volume and intensity, but higher fractioned distance might not produce the same physiological adaptations. In addition, the low correlations between LA and HR might not be a valid and reproducible variable to control metabolic intensity during IT in soccer.

Keyword: Endurance training; Blood Lactate; Soccer.

Blood lactate steady-state level sustained during rest time, in moderate intensity interval training
Juan C. Maaza,1 Raúl R. Festa,1 Lisandro Ruffo,1 Patricia Cosolito,1 Sandra Prieto1 and Alvaro Gurovich, FACSM1.

CONCLUSION: Despite extensive user training, several intervention BCS found the Polar M400 difficult to use—possibly decreasing intervention adherence. Future interventions should utilize simpler smartwatches to promote PA among middle-aged clinical/non-clinical populations.

METHODS: Ten trained swimmers and eight trained track athletes (19.1±2.6 yr) performed a moderate intensity IT session (BLA-10s: 4.5±1.46 vs. 12.80±0.41 mmol/l, respectively (p<0.01) and 182±17 vs. 152±10 bpm, respectively (p<0.01). In addition, LA and HR values are significantly different between IT and EITnT: 3.28±0.86 vs. 1.53±0.55; 4.44±0.91 vs. 1.21±0.33; 4.94±1.31 vs. 1.19±0.32; 5.51±1.64 vs. 1.18±0.34 mmol/l, respectively (p<0.01). And 179±6 vs. 153±9; 183±6 vs. 152±7; 184±7 vs. 153±9 bpm, p<0.01, respectively. Additionally, there was a sudden drop in HR and LA in each test (EITnT: r = 0.26; EIT: r = 0.42).

RESULTS: The present study showed that IT is a more metabolic and cardiovascular stressful stimulus than EITnT. Same volume and intensity, but higher fractioned distance might not produce the same physiological adaptations. In addition, the low correlations between LA and HR might not be a valid and reproducible variable to control metabolic intensity during IT in soccer.

Keyword: Endurance training; Blood Lactate; Soccer.

Blood lactate steady-state level, sustained during rest time, in moderate intensity interval training
Juan C. Maaza1, Raúl R. Festa1, Lisandro Ruffo1, Patricia Cosolito, Sandra Prieto1 and Alvaro Gurovich, FACSM1. 1Biosystem Institute Sports Sciences, Rosario, Argentina; 1Colombia State University, Bogotá DC, Colombia; 2The University of Texas at El Paso, El Paso, TX, USA.

BACKGROUND: Important isotope studies related to lactate metabolism have pointed out that blood lactate level (BLA) is an expression of the balance between Production (RP), Removal (Ri) and Oxidation (ROx) rates. Also, evidence shows that the relationship between BLA with R and ROx rates, is concentration-dependent, close 4 to 7 mmol/l.

PURPOSE: Analyze BLA in the first sec. (BLA-10s) and last sec. (BLA-50s) of 1-min passive rest, during steady-state moderate intensity interval training (IT), considering that BLA is a balance of RP with R and ROx intracellular process. We want to demonstrate that (BLA-10s) and (BLA-50s) levels are similar, so R and ROx are maintained, in steady-state conditions, during IT workouts.

METHODS: Ten trained swimmers and eight trained track athletes (19.1±2.6 yr) performed a moderate intensity IT session (BLA-10s: 4.5±1.46 vs. 12.80±0.41 mmol/l, respectively (p<0.01) and 182±17 vs. 152±10 bpm, respectively (p<0.01). In addition, LA and HR values are significantly different between IT and EITnT: 3.28±0.86 vs. 1.53±0.55; 4.44±0.91 vs. 1.21±0.33; 4.94±1.31 vs. 1.19±0.32; 5.51±1.64 vs. 1.18±0.34 mmol/l, respectively (p<0.01). And 179±6 vs. 153±9; 183±6 vs. 152±7; 184±7 vs. 153±9 bpm, p<0.01, respectively. Additionally, there was a sudden drop in HR and LA in each test (EITnT: r = 0.26; EIT: r = 0.42).

RESULTS: The present study showed that IT is a more metabolic and cardiovascular stressful stimulus than EITnT. Same volume and intensity, but higher fractioned distance might not produce the same physiological adaptations. In addition, the low correlations between LA and HR might not be a valid and reproducible variable to control metabolic intensity during IT in soccer.

Keyword: Endurance training; Blood Lactate; Soccer.

Blood lactate steady-state level, sustained during rest time, in moderate intensity interval training
Juan C. Maaza1, Raúl R. Festa1, Lisandro Ruffo1, Patricia Cosolito, Sandra Prieto1 and Alvaro Gurovich, FACSM1. 1Biosystem Institute Sports Sciences, Rosario, Argentina; 1Colombia State University, Bogotá DC, Colombia; 2The University of Texas at El Paso, El Paso, TX, USA.

BACKGROUND: Important isotope studies related to lactate metabolism have pointed out that blood lactate level (BLA) is an expression of the balance between Production (RP), Removal (Ri) and Oxidation (ROx) rates. Also, evidence shows that the relationship between BLA with R and ROx rates, is concentration-dependent, close 4 to 7 mmol/l.

PURPOSE: Analyze BLA in the first sec. (BLA-10s) and last sec. (BLA-50s) of 1-min passive rest, during steady-state moderate intensity interval training (IT), considering that BLA is a balance of RP with R and ROx intracellular process. We want to demonstrate that (BLA-10s) and (BLA-50s) levels are similar, so R and ROx are maintained, in steady-state conditions, during IT workouts.

METHODS: Ten trained swimmers and eight trained track athletes (19.1±2.6 yr) performed a moderate intensity IT session (BLA-10s: 4.5±1.46 vs. 12.80±0.41 mmol/l, respectively (p<0.01) and 182±17 vs. 152±10 bpm, respectively (p<0.01). In addition, LA and HR values are significantly different between IT and EITnT: 3.28±0.86 vs. 1.53±0.55; 4.44±0.91 vs. 1.21±0.33; 4.94±1.31 vs. 1.19±0.32; 5.51±1.64 vs. 1.18±0.34 mmol/l, respectively (p<0.01). And 179±6 vs. 153±9; 183±6 vs. 152±7; 184±7 vs. 153±9 bpm, p<0.01, respectively. Additionally, there was a sudden drop in HR and LA in each test (EITnT: r = 0.26; EIT: r = 0.42).

RESULTS: The present study showed that IT is a more metabolic and cardiovascular stressful stimulus than EITnT. Same volume and intensity, but higher fractioned distance might not produce the same physiological adaptations. In addition, the low correlations between LA and HR might not be a valid and reproducible variable to control metabolic intensity during IT in soccer.

Keyword: Endurance training; Blood Lactate; Soccer.
Adaptations in physical fitness and health parameters. Future investigations should aim to compare physical fitness adaptations between healthy adults and overweight/obese adults when using a HIIT exercise intervention while monitoring caloric intake.
**B-39  Thematic Poster - Running Injuries**

**Wednesday, May 30, 2018, 3:15 PM - 5:15 PM**
**Room: CC-Lower level L100E**

**657  Chair: Allison H. Gruber. Indiana University Bloomington, Bloomington, IN.**
(No relevant relationships reported)

**658  Board #1 May 30 3:15 PM - 5:15 PM**

**Peak Braking Force as a Risk Factor for Running-Related Injuries**

Christopher Napiér1, Christopher L. MacLean1, Jack E. Taunton, FACSM2, Jessica Maurer1, Michael A. Hunt1. 1University of British Columbia, Vancouver, BC, Canada. 2Fortius Institute, Burnaby, BC, Canada. (Sponsor: Jack Taunton, FACSM)

(No relevant relationships reported)

Kinetic factors have been implicated in the development of several running-related injuries (RRIs). Most research has focused on measures of vertical loading, such as the average vertical loading rate (AVLR), instantaneous vertical loading rate (IVLR), and vertical impact peak (VIP), as they have all been associated with RRIs in retrospective analyses. Less studied has been the horizontal braking force exerted on the body during running.

**PURPOSE:** To prospectively predict the capacity of vertical and horizontal loading variables on RRI risk.

**METHODS:** 74 healthy, female recreational runners ran at their preferred speed on an instrumented treadmill while ground reaction force data and 3D joint kinematics were collected. Main kinetic outcomes were VIP, AVLR, IVLR, active vertical peak, vertical impulse, and peak braking force (PBF). After baseline testing, participants began a 15-week half-marathon training program. Pain and running volume were recorded via a weekly online log. Exposure time (hours of running) was calculated from the start of the training program until onset of injury (INJ) or right-censoring at non-RRI, loss to follow-up, or end of 15-week program (UNINJ). After converting kinetic variables from continuous to ordinal variables based on tertiles, Cox proportional hazard ratios were fit for each kinetic variable independently.

**RESULTS:** 65 participants were included in the final analysis. 22 were diagnosed with an RRI (mean exposure of 17.46±9.81 hours). 33 completed the program without injury (mean exposure of 43.46±10.48 hours). PBF was the only kinetic variable significantly associated with increased injury risk when compared to the middle tertile. INJ participants also had a significantly greater (more negative) PBF than UNINJ (-0.27±0.04 BW vs. -0.24±0.04 BW; p=.002, ES=0.91). Finally, when analysed in a multivariable model, no other kinetic variables made a significant contribution to predicting injury beyond what had already been accounted for by PBF alone.

**CONCLUSIONS:** Findings from this study suggest PBF is associated with a significantly increased risk of RRI in female recreational runners. Future studies should include this variable in their analysis.

**660  Board #3 May 30 3:15 PM - 5:15 PM**

**Association Of Isometric Hip And Ankle Strength With Frontal Plane Kinetics In Females During Running**

Kathryn Harrison, Bhusan Thakkar, David Pumphrey, Robert Tickes, Gregory Crosswell, D.S. Blaise Williams III, FACSM. Virginia Commonwealth University, Richmond, VA. (Sponsor: D.S. Blaise Williams, FACSM)

(No relevant relationships reported)

Frontal plane mechanics have been associated with running-related injuries such as patellofemoral pain. Strengthening and gait retraining programs aimed at reducing hip adduction during running have been shown to be effective at alleviating symptoms, however evidence of their effect on running kinematics is equivocal. It is possible that such programs exert their benefits through altering kinetics rather than kinematics in the frontal plane during running. Further, the contributions of the ankle to frontal plane mechanics have not been well studied.

**PURPOSE:** To determine if hip and ankle strength are associated with frontal plane kinetics in female runners.

**METHODS:** 64 healthy women running at least 16km per week participated in this study. Isometric hip abduction and ankle inversion strength were measured using a handheld dynamometer. 3D gait analysis was conducted as participants ran on an instrumented treadmill at 2.7 m/s. Participants were ranked in order of isometric strength of both the hip and ankle, and divided into tertiles of high, medium and low strength. 2-way MANOVA was used to determine the relationship between strength and peak moment, positive work and negative work in the frontal plane of the hip and the ankle. Tukey post-hoc tests were conducted where applicable (α<0.05).

**RESULTS:** There was no significant interaction effect, or main effect of hip strength. There was a significant main effect of ankle strength on frontal plane kinetics (p<0.024). Specifically, the strong ankle group compared to the weak ankle group had significantly greater magnitude of peak ankle inversion moment (0.95±0.32 vs 0.68±0.22 Nm/kg, p<0.033), hip abduction moment (-2.78±1.02 vs -1.88±0.24 Nm/kg, p<0.002) and hip frontal plane positive work (0.27±0.19 vs 0.13±0.03 W/kg, p<0.006).

**CONCLUSIONS:** Isometric ankle but not hip strength is associated with kinetics in the frontal plane during running in females. Thus ankle strength should not be overlooked in clinical evaluation and treatment of runners.

---

**666  Board #2 May 30 3:15 PM - 5:15 PM**

**A Comparison Of Ground Reaction Forces And Sagittal Plane Ankle Kinematics Between Runners With Achilles Tendinopathy And Healthy Controls**

Weijie Fu1, Julia Reilly2, Adam Tenforde2, Steve Jamison3, Matthew Ruder1, Irene Davis, FACSM2, Shanghai University of Sport, Shanghai, China. 2Spaulding National Running Center, Cambridge, MA. (Sponsor: Irene Davis, FACSM)

(No relevant relationships reported)

Achilles tendinopathy (AT) is one of the most common injuries in distance running with a rate of 8% to 15% of all running injuries and a 52% lifetime incidence in male runners. The biomechanics of running gait associated with AT has not been well-studied.

**PURPOSE:** To compare the sagittal plane ankle angle kinematics as well as vertical medial, and lateral ground reaction forces and loadrates in runners with and without AT.

**METHODS:** 22 rearfoot strike runners (RFS) runners with AT (15M, 7F) and 22 matched healthy RFS runners (CON) ran on an instrumented treadmill, while sagittal plane video and ground reaction force data were collected. Foot angles (FA) and tibia angles (TA) were measured, and ankle dorsiflexion angles (DF) were calculated. Values were determined at the point of footstrike (FS) and peak, with total excursion also being calculated. Additionally, vertical average and instantaneous loadrates (VALR, VILR) were calculated. Finally, medial and lateral forces (MF, LF) and medio-lateral instantaneous loadrates (MLILR) were extracted. Comparisons between the AT and CON groups were made using independent t-tests (p<0.05).

**RESULTS:** Overall, there were no differences in TA, DF or DF at footstrike or at peak, or in ankle excursions between the AT and CON groups (Table 1). Additionally, no differences were noted in VALR, VILR, MF, LF and MLILR between groups.

**CONCLUSION:** These preliminary data suggest that runners with AT do not exhibit ground reaction force differences or differences in sagittal plane ankle kinematics compared to their healthy counterparts. Future studies need to include other measures such as frontal plane kinematics and ankle joint kinetics, as well as strength and flexibility measures of the ankle.

Supported by NSFC grant (11772201).

Table 1. Ankle kinematics and GFR (mean±SD) in runners with AT and CON

<table>
<thead>
<tr>
<th>Kinematic Variable</th>
<th>AT</th>
<th>CON</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot angle @ FS (°)</td>
<td>12.0±3.8</td>
<td>11.2±3.9</td>
<td>0.496</td>
</tr>
<tr>
<td>Tibia angle @ FS (°)</td>
<td>5.1±2.5</td>
<td>5.1±2.7</td>
<td>0.979</td>
</tr>
<tr>
<td>Ankle angle @ FS (°)</td>
<td>6.9±2.2</td>
<td>6.1±2.6</td>
<td>0.286</td>
</tr>
<tr>
<td>Pk Ankle angle (°)</td>
<td>25.9±2.1</td>
<td>26.6±2.5</td>
<td>0.314</td>
</tr>
<tr>
<td>Ankle excursion (°)</td>
<td>18.9±3.1</td>
<td>20.5±2.8</td>
<td>0.095</td>
</tr>
<tr>
<td>VALR (BW/s)</td>
<td>65.6±18.6</td>
<td>61.2±23.7</td>
<td>0.493</td>
</tr>
<tr>
<td>VILR (BW/s)</td>
<td>75.1±20.9</td>
<td>70.7±25.7</td>
<td>0.543</td>
</tr>
<tr>
<td>VertStiffness (kn/m)</td>
<td>90.4±27.4</td>
<td>82.5±30.4</td>
<td>0.371</td>
</tr>
<tr>
<td>Med IRL (BW/s)</td>
<td>12.3±11.3</td>
<td>9.0±5.0</td>
<td>0.221</td>
</tr>
<tr>
<td>Lat IRL (BW/s)</td>
<td>12.2±8.3</td>
<td>11.1±7.8</td>
<td>0.638</td>
</tr>
<tr>
<td>Pk Med Force (BW)</td>
<td>0.11±0.06</td>
<td>0.12±0.05</td>
<td>0.543</td>
</tr>
<tr>
<td>Pk Lat Force (BW)</td>
<td>0.09±0.07</td>
<td>0.07±0.04</td>
<td>0.312</td>
</tr>
</tbody>
</table>

---
Running-related overuse injuries are endemic among active populations. During the stance phase of running, the ground reaction force vector (GRF) and shank are not always aligned. Thus, some portion of the GRF is directed perpendicular to the shank and causes a bending moment, which may be implicated in the etiology of injury. PURPOSE: To examine the portion of the GRF that is directed perpendicular to the shank in injured and uninjured runners. METHODS: Twenty-seven runners were followed for a minimum of 43 weeks. Fourteen sustained injury. Overground kinetic and kinematic data were collected at 4.0 m/s (normalized to body weight). Using the sagittal plane angle between the shank and the GRF (GRF/SK angle), the sagittal plane GRF was decomposed into two components: one parallel to the shank (on-axis GRF) and one perpendicular to the shank (off-axis GRF). Group differences were assessed with an independent-samples t-test (α = 0.05). RESULTS: While impact peak was a prominent feature of the on-axis GRF, it was mostly absent in the off-axis GRF. Peak off-axis GRF occurred at midstance for all subjects (Figure 1). Off-axis GRF at impact was similar (p = 0.52, Cohen’s d = 0.25) between injured (0.22 ± 0.13 BW) and uninjured groups (0.20 ± 0.10 BW). Peak off-axis GRF was also similar (p = 0.11, d = 0.63) between injured (1.24 ± 0.09 BW) and uninjured (1.31 ± 0.13 BW) groups. GRF/SK angle was highly variable (range 25.0° to 25.3°) during initial contact but means were similar between groups (injured 60.8 ± 13.5°; uninjured 79.7 ± 14.4°; p = 0.73, d = 0.14). CONCLUSION: Concerning running injury, the off-axis GRF may be 1) not a significant contributor to injury, 2) only important when combined with other factors, or 3) related only to specific injuries.

Figure 1. On-axis and off-axis components of GRF relative to the shank during stance in uninjured and injured runners. The impact peak is not a prominent feature of off-axis GRF. Neither off-axis GRF at impact nor peak off-axis GRF differ between groups.
Conclusion: When controlling for sex and running speed, BOG accounts for 40% of the variance in peak hip adduction, while only predicting <1% of the variance in contralateral peak pelvic drop. The increased peak hip adduction that accompanied a more narrow BOG is likely due to femoral adduction, as contralateral pelvic drop was minimally affected by BOG.

**B-40 Thematic Poster - Vascular Function**

**Wednesday, May 30, 2018, 3:15 PM - 5:15 PM**

**Room: CC-Lower level L100F**

**B-40 Board #1**

**May 30, 3:15 PM - 5:15 PM**

**Physical Activity Modulates Blood Pressure Regulation During Controlled Low and High Salt Diets**

Austen T. Robinson1, Kamila U. Migdal1, Matthew C. Babcock1, Joseph C. Watto1, Megan M. Wen1, Sean D. Stocker2, William B. Farquhar, FACSM1, 1University of Delaware, Newark, DE.

2University of Pittsburgh, Pittsburgh, PA. (Sponsor: William B Farquhar, FACSM)

(No relevant relationships reported)

**Purpose:** Increased blood pressure (BP) reactivity and variability are predictive of future cardiovascular events. Excess dietary salt exaggerates neurally-mediated BP reactivity, and BP variability in salt-resistant rodents. Regular physical activity (PA) blunts BP reactivity in rodents. However, the interaction of salt and PA on neurovascular regulation has not been investigated in humans. Therefore, we sought to test the hypothesis that high habitual PA mitigates high dietary salt-induced increases in BP reactivity and BP variability in healthy, young adults.

**Methods:** Nine participants (5F/4M, 27±2 yrs, BMI: 23.3±0.9 kg/m2) completed randomized, controlled 10-day diets of low (2.6 g/day), and high (18 g/day) salt. Beat-to-beat ambulatory BP variability (ΔBP ARV) were correlated against PA. Twenty four-hour urinary sodium excretion was measured.

**Results:** Those with Δ systolic BP ARV (r = -0.74, p < 0.05) and Δ diastolic BP reactivity (r = -0.68, p < 0.05) during hand grip exercise. There was a trend for higher 24-hr systolic BP ARV on the contralateral peak pelvic drop. The increased peak hip adduction that accompanied a more narrow BOG is likely due to femoral adduction, as contralateral pelvic drop was minimally affected by BOG.

**Conclusion:** These preliminary data suggest that high habitual physical activity may offset some of the adverse neurovascular effects of high dietary salt in young, healthy, salt-resistant humans.

**B-40 Board #2**

**May 30, 3:15 PM - 5:15 PM**

**Particulate Matter Air Pollution and Vascular Function in Older Adults:A Natural Experiment**

Jayson R. Gifford1, Tyler Mangum2, Joshua Weavil3, Ashley Nelson1, Joshua F. Lee1, H. Jon Groot2, Ryan Broxterman2, Matthew Rossman1, Russell Richardson1, 1Brigham Young University, Provo, UT. 2University of Utah, Salt Lake City, UT. 3University of Colorado: Boulder, Boulder, CO.

(No relevant relationships reported)

**Purpose:** The risk of cardiovascular complications in the elderly increases with acute elevations in ambient, fine particulate matter air pollution (PM2.5), and may be related to pollution-induced vascular dysfunction. Therefore, the purpose of this study was to utilize the large, episodic swings in ambient PM2.5, typical of the Wasatch Front in Utah, as a natural experiment to determine the extent to which acute exposure to ambient PM2.5 affects vascular function in healthy, older adults.

**METHODS:** Vascular function (flow-mediated dilation, FMD; passive-leg-movement-induced hyperemia, PLM), and pulmonary function were measured in 10 elderly subjects (70.5±2.3 years) during acute episodes of ∼120 hours of low (3.4±0.8 μg/m3) and 24-96 hours of high (50.0±1.2 μg/m3), naturally-occurring ambient PM2.5 (Figures A and B). Markers of systemic inflammation were also assessed in venous blood during each visit.

**RESULTS:** Notably, high ambient PM2.5 exposure was associated with a 34% reduction in vascular function assessed by FMD (Low PM2.5: 8.9±1.0%; High PM2.5: 5.9±1.0%; P=0.05; Figure C), and a 78% reduction in vascular function assessed by PLM (area under the curve: Low PM2.5: 145±38 ml; High PM2.5: 31±25 ml; P=0.05, Figure D). Additionally, acute exposure to high ambient PM2.5 was accompanied by an increase in markers of systemic inflammation (e.g. Plasma C-Reactive Protein, Low PM2.5: 872±143 ml; High PM2.5: 136±220 ml/mg/ml, P=0.05), which may contribute to the decrease in vascular function. Interestingly, natural exposure to high levels of PM2.5 did not significantly affect pulmonary function (FEV/FVC: Low PM2.5: 74±2%; High PM2.5: 72±2%; P=0.05).

**CONCLUSIONS:** Despite a lack of detectable changes in pulmonary function, acute, natural exposure to elevated ambient PM2.5 results in markedly impaired vascular function in older adults, possibly a consequence of pollution-induced systemic inflammation.

**B-40 Board #3**

**May 30, 3:15 PM - 5:15 PM**

**Skeletal Muscle Microvascular Permeability After Eccentric Contraction-Induced Muscle Injury: Novel In Vivo Imaging Using Two-Photon Laser Scanning Microscopy**

Kazuki Hotta1, Brad J. Bahnke1, Kazuto Masamoto2, Rie Shimotsu1, David C. Poole, FACSM3, Yuuta Kano2, 1University of Electro-Communications, Tokyo, Japan. 2University of Electro-Communications, Tokyo, Japan. 3Kansas State University College of Human Ecology, Manhattan, KS. (Sponsor: David C. Poole, FACSM)

(No relevant relationships reported)

Within injured skeletal muscle the capillary bed plays a crucial role in leukocyte invasion through modulations of the endothelial integrity, associated with increased permeability. However, direct observation of altered microvascular permeability and compromised capillary integrity has not been technically feasible. Two-photon laser scanning microscopy (TPLSM) allows three-dimensional in vivo imaging which, given the depth of penetration and high resolution of TPLSM, will facilitate measurement of microvascular leakage. **PURPOSE:** We hypothesized that the regulation of capillary permeability in vivo, as assessed by real-time TPLSM, is temporally related to acute inflammatory and regenerative processes following muscle injury. **METHODS:** Tibialis anterior muscles of anesthetized male Wistar rats (n=57) were subjected to eccentric contractions (ECC) via electrical stimulation. The skeletal muscle microcirculation was imaged by an intravenously infused fluorescent dye (rhodamine b isothiocyanate dextran, molecular weight 70,000 Daltons) to assess microvascular permeability via TPLSM 1, 3 and 7 days after ECC. Immunohistochemistry on serial muscle sections was performed to determine the percentage of VEGF-A positive muscle fibers in the damaged muscle. **RESULTS:** Compared with non-ECC control, the volumetrically-determined interstitial leakage of fluorescent dye had increased significantly on days 1 and 3 post-ECC (5.1±1.4, 5.3±1.2 vs. 0.51±0.14 μm², P<0.05 respectively days 1 and 3 vs. control). However, post-ECC day 7 interstitial leakage had returned to control values. Damaged muscle fibers were evident on days 1 and 3 (% damaged muscle fiber: 11.7±4.7, 48.4±12.4% vs. 0% P=0.05 respectively days 1 and 3 vs. control). Percentage of VEGF-A positive muscle fiber in damaged muscle fibers was significantly higher on days 1 and 3 compared to control (24.9±9.8, 39.3±16.7% vs. 0%, P=0.05 respectively days 1 and 3 vs. control). Regenerated

Abstracts were prepared by the authors and printed as submitted.
skeletal muscle fibers were found only at 7 days post-ECC. CONCLUSION: In vivo TPLSM imaging represents a powerful investigative technique for skeletal muscle microcirculatory research. Microvascular hyperpermeability is associated with ECC-induced muscle damage and increased VEGF expression.

669 Board #4  May 30 3:15 PM - 5:15 PM
Acute Ultraviolet Radiation Exposure Attenuates Nitric Oxide-Mediated Vasodilation in the Cutaneous Microvasculature
S. Tony Wolf, Anna E. Staniewicz, Tyler B. Garner, Nina G. Jablonski, W. Larry Kenney, FACSM, Pennsylvania State University, University Park, PA. (Sponsor: W. Larry Kenney, FACSM)

The bioactive metabolite of folate, 5-methyltetrahydrofolate (5-MTHF), is degraded by ultraviolet radiation (UVR) in vitro, and UVR exposure to the skin may deplete bioavailable 5-MTHF in the exposed area. Adequate 5-MTHF is essential for full expression of nitric oxide (NO)-mediated vasodilation of the cutaneous microvasculature through its indirect role in enzymatic coupling of nitric oxide synthase (NOS). PURPOSE: To determine the acute effects of UVR exposure on NO-mediated vasodilation in the cutaneous microvasculature and the role of 5-MTHF on this response. We hypothesized that acute UVR exposure would attenuate NO-dependent vasodilation and that local delivery of 5-MTHF would augment NO-dependent vasodilation after UVR exposure. METHODS: Two microdialysis fibers were placed in the central skin of both forearms in 11 healthy young adults (23±4 y; 5M/6F) for local delivery of lacted Ringers (control) or 5 mM 5-MTHF. One arm was randomly chosen for exposure to 300 mJ/cm² UVR while the other served as a non-exposed control (CON). Red cell flux was measured at each site by laser-Doppler flowmetry (LDF). Following a baseline period, a standardized local heating (42°C) protocol was used to induce cutaneous vasodilation. Once a stable skin blood flow plateau was achieved, 15mM NG-nitro-L-arginine methyl ester (L-NAME) was perfused at all sites to inhibit NOS. Cutaneous vascular conductance was calculated (CVC = LDF/MAP) and expressed for each phase of the local heating response (initial peak, plateau, NO-mediated vasodilation) as a percentage of maximum (%CVC_max) 28mM sodium nitroprusside + 43°C). RESULTS: No differences were seen for %CVC_max between UVR and CON for the initial peak (p>0.51) or heating plateau (p>0.58) across microdialysis sites. UVR exposure blunted NO-mediated dilatation in the UVR exposed arm compared to CON (16.4±12.1 vs 33.4±17.9, p=0.02). Local delivery of 5-MTHF augmented NO-mediated vasodilation compared to the control site in the UVR exposed arm (36.4±19.9 vs 16.4±12.1, p=0.005). CONCLUSION: NO-mediated vasodilation is attenuated after acute UVR exposure, but is restored with local delivery of 5-MTHF. Acute UVR exposure may impair NO-mediated vasodilation through photodegradation of 5-MTHF.

670 Board #5  May 30 3:15 PM - 5:15 PM
No Sex Differences in Arterial Stiffness and Hemodynamics Response to Resistance Exercise in Older Individuals
Georgios Grigoriadis¹, Alexander J. Rosenberg¹, Sang Ouk Wee¹, Elizabeth C. Schroeder, Alexander J. Rosenberg ¹, Garett Griffith ¹, Bo Fernhall, FACSM ¹, Tracy Buyanov, FACSM ¹, 'University of Illinois at Chicago, Chicago, IL, 'California State University, San Bernardino, CA.

(slight correlations reported)

Arterial stiffness (AS) contributes to high blood pressure and cardiovascular disease in both men and women. However, sex differences do exist in the incidences rates of stroke with aging, with older women having a greater risk. These sex differences in older individuals have not been fully explained and an acute hypertensive stimulus (e.g. resistance exercise (RE)) may provide a viability physiological stressor to elucidate potential differences. PURPOSE: To determine if sex differences exist for arterial stiffness following acute RE among older individuals. METHODS: Ten males (61 ± 6 yrs, 30.9 ± 4.4 kg/m²) and 15 females (59 ± 6 yrs, 29.5 ± 6.3 kg/m²) completed 3 sets of 10 reps of maximal isokinetic knee extension and flexion on a force dynamometer. Central AS was evaluated by pulse wave velocity (PWV), obtained from an automated ambulatory BP monitor at baseline, immediate and 30 min post-RE. Hemodynamic variables (cardiac output (Q), cardiac index (QI), heart rate (HR), stroke volume (SV), mean arterial BP (MAP)), were also acquired from the brachial occlusive Doppler BP waveforms. Local AS was determined by carotid methodologies (brachial stiffness index, pressure-strain elasticity modulus (Ep) and arterial compliance (AC)) using ultrasonography. RESULTS: See Table 1. PWV, Q, HR and MAP increased immediate post-RE similarly in both groups (p=0.05). However, females had an overall lower AC and Q compared to older males (p=0.05). CONCLUSION: No sex differences were observed in arterial stiffness following acute RE. Thus, the AS response to an acute RE bout did not provide insight regarding contributing factors as to why women are at a greater risk of cerebrovascular events.

671 Board #6  May 30 3:15 PM - 5:15 PM
Moderate-to-Severe Sleep Apnea and Total Body Fat are Inversely Associated with Vascular Function Changes Following Exercise Training
Devon A. Dobrosielski¹, Christophe Papandreou², Susheel Patil¹, Hyunjeong Park¹, 'Towson University, Towson, MD. 'Rovira i Virgili University, Reus, Spain. 'Johns Hopkins School of Medicine, Baltimore, MD.

(slight correlations reported)

Obstructive sleep apnea (OSA) is associated with increased cardiovascular morbidity in middle-aged men due, in part, to impaired vascular function. Exercise confers cardioprotection by improving vascular health. Whether this beneficial effect is attenuated in the presence OSA is not known. PURPOSE: Examine the joint association of OSA severity and total body fat % with brachial artery flow mediated dilation (BAFMD) changes following exercise training in overweight men with and without OSA. METHODS: At baseline, all participants underwent overnight polysomnography to determine the presence of OSA, as defined by the apnea-hypopnea index (AHI). Total body fat was measured using dual energy X-ray absorptiometry. BAFMD was assessed using high-resolution ultrasonography before and upon completion of a 6-week (3 sessions/week; 1 hour/session) exercise training program. RESULTS: Five men with moderate to severe OSA (*OSA) and five men with no to mild OSA (**OSA) completed the study. Per study design, the AHI of the *OSA group was higher compared to the **OSA group (34 ± 12 events/hour vs. 8 ± 5 events/hour, p=0.009). While no baseline differences were observed between the groups in age (49 ± 6 years vs. 46 ± 9 years, p=0.528) or BMI (36.1 ± 6.2 kg/ m² vs. 32.6 ± 8.3 kg/m², p=0.250), total body fat % was higher in the *OSA group (41.3 ± 3 % vs. 36 ± 3 %, p=0.009). Stepwise regression analysis revealed that an AHI above 15 events/hour and total body fat % above the median (joint category) [beta coefficient ~ -2.89, (95% CI -3.59 - -0.71), p=0.040] were significant and independent determinants of the changes in BAFMD with exercise, after adjusting for baseline BAFMD, age and BMI. CONCLUSION: A combination of moderate-to-severe OSA and high total body fat % was inversely associated with the level of improvement in vascular function following exercise training.

672 Board #7  May 30 3:15 PM - 5:15 PM
Acute Influence of Caffeine on Arterial Stiffness and Central Blood Pressures Following Aerobic Exercise
Nicholas A. Carlini, Allison H. Steinbeck, Brittany Smith, Brandon Kisler, Bradley S. Fleenor, Matthew P. Harber, FACSM, Ball State University, Muncie, IN.

(slight correlations reported)

Caffeine ingestion alters blood pressure (BP), however, the interactive effect of caffeine and exercise on central BP is unknown. PURPOSE: Examine the acute influence of caffeine and moderate-intensity aerobic exercise on post-exercise
central BP and arterial stiffness. METHODS: Ten males (aged 55±5; range 31-71 years) completed two exercise trials after ingestion of caffeine (400 mg) or placebo. Peripheral (brachial) and central (aortic) BP were assessed via pulse wave analysis (PWA) and arterial stiffness via pulse wave velocity (PWV) before and 30 min post-ingestion. Participants performed 40-min of cycling at 70% of HRmax using identical workloads between trials. PWA and PWV were collected again 10 and 30 min post-exercise. Data were analyzed via two-way ANOVA with repeated measures.

RESULTS: Prior to exercise, compared to placebo, caffeine increased (P<0.05) brachial systolic blood pressure (bSBP) (+12mmHg), central systolic blood pressure (cSBP) (+11mmHg) and central diastolic blood pressure (cDBP) (+7mmHg). PWV was higher (0.75 vs. 0.22m/s) 30 minutes post caffeine ingestion, independent of trial (P<0.05) while there was a trend for an interaction (P=0.074), suggesting an increase in PWV with caffeine. Post-exercise, bSBP (-4.8 vs. -6.1mmHg) and PWV (-0.40 vs. -0.74m/s) were higher in caffeine (P<0.05), likely due to the influence of caffeine prior to exercise. cSBP (-5 vs. -6mmHg) and bDBP (-3.5 vs. -1.8mmHg) were lower after exercise, independent of trial (P<0.05) while cSBP (-4.8 vs. -6.1mmHg) and cDBP (-3.1 vs. -1.5mmHg) trended (P=0.07) to be lower after exercise, independent of trial. PWV (+0.11 vs. -0.06m/s) remained higher (P<0.05) after exercise in caffeine compared to placebo but was not influenced by exercise. Accordingly, AP (-2.7 vs. -1.1mmHg) and AIX (-5.5 vs. -1.2%) were lower (P<0.05) after exercise in placebo only. CONCLUSION: These findings suggest that the stimulatory effects of caffeine ingestion elevates central hemodynamics and arterial stiffness, which persists even after exercise, exerting a greater afterload on the heart.

673 Board #8
May 30 3:15 PM - 5:15 PM
Atered Vascular Function in Chronic Kidney Disease: Evidence from Passive Leg Movement
Elissa K. Katulka, Alexandra E. Hirt, Danielle L. Kirkman, David G. Edwards, Melissa A.H. Witman. University of Delaware, Newark, DE.

(No relevant relationships reported)

Chronic kidney disease (CKD) is an independent risk factor for the development of cardiovascular disease, with both diseases characterized by reduced nitric oxide (NO) bioavailability and vascular dysfunction. Passive leg movement (PLM) has previously been shown to produce NO-mediated hyperemia in the lower extremity, however this technique has not yet been utilized to assess vascular function in patients with CKD. PURPOSE: To assess vascular function in patients with CKD using PLM, in addition to the traditional flow-mediated dilation (FMD) technique.

METHODS: Assessment of vascular function via PLM and FMD was performed on 12 patients (CKD, 67±3 yrs) and 12 healthy controls (CON, 59±2 yrs). Hemodynamics and artery diameters during PLM and FMD were measured utilizing ultrasound Doppler of the femoral and brachial arteries, respectively. RESULTS: Patients with CKD had reduced peak leg blood flow (LBF) (CKD, 38±4 vs. CON, 62±6; 93 mL/min, p<0.05) and a reduced change in LBF from baseline to peak (Peak-LBF) (CKD, 153±27 vs. CON, 274±41 mL/min,p<0.05) during PLM compared to CON. Additionally, Peak-LBF was significantly correlated with kidney function as assessed by estimated glomerular filtration rate for all participants (r=0.53, p<0.05). As anticipated, FMD was also significantly attenuated in CKD patients compared to CON. CONCLUSION: Vascular function as assessed by PLM and FMD is attenuated in patients with CKD compared to controls, supporting a reduction in NO bioavailability in this chronic disease state. Additionally, PLM appears to be a novel and feasible approach to assess NO-mediated vascular function in CKD and is associated with kidney function.

B-41 Free Communication/Slide - Body Composition
Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Mezzanine M100D

674 Chair: Cheryl A. Howe, FACSM. Ohio University, Athens, OH.

(No relevant relationships reported)

Body composition is an established predictor of cardiometabolic risk. Novel body composition variables may also predict risk and therefore, warrant further examination.

PURPOSE: To assess the influence of fat to muscle ratio (FMR), percent body fat (%BF), and body mass index (BMI) on cardiometabolic risk factors in healthy adults.

METHODS: Data were analyzed from 78 women (29.9±13.5 years) and 45 men (25.0±8.5 years). Height, weight, %BF (via dual-energy X-ray absorptiometry), resting blood pressure, and resting heart rate (RHR) were measured. BMI and mean arterial pressure (MAP) were calculated. Fasting total cholesterol (TC), high-density lipoprotein cholesterol (HDL), TC/HDL ratio, low-density lipoprotein cholesterol (LDL), triglycerides (TG), glycosylated hemoglobin (A1c), glucose (GLU), and insulin (INS) were measured. A 2-hour oral glucose tolerance test was conducted, from which 2-hour glucose (2HR-GLU) and 2-hour insulin (2HR-INS) were measured. Intra-e sensitivity index (ISI) and homeostasis model assessment for insulin resistance (HOMA) were calculated. The influence of FMR [visceral fat area (cc) - fat free mass (kg)], BMI (kg·m⁻²) and %BF on markers of cardiometabolic risk was determined.

RESULTS: Regression analysis showed that FMR was the strongest predictor of MAP, TC, TCHDL ratio, LDL, TG, GLU, INS, and HOMA. %BF was the strongest predictor of RHR, 2HR-GLU, 2-HR INS, and ISI. BMI was the strongest predictor of HDL and Alc. One-way MANOVA (above vs. below 75th percentile) showed a significant multivariate (MAP, TG, HOMA) main effect for FMR. Wilks’ Lambda = 0.628, F (4,96) = 14.24, p < 0.001, with univariate main effects for MAP (F = 22.2, p < 0.001), TG (F = 8.39, p < 0.005), and HOMA (F = 16.27, p < 0.001). MANOVA also revealed a multivariate main effect for BMI (Wilks’ Lambda = 0.695, F(4,96) = 10.55, p < 0.001), with univariate main effects for MAP (F = 18.7, p < 0.001) and HOMA (F = 19.5, p < 0.001). MANOVA showed a multivariate main effect for %BF (Wilks’ Lambda = 0.770, F(4,96) = 7.17, p < 0.001), with univariate main effects for MAP (F = 13.8, p < 0.001) and HOMA (F = 10.6, p = 0.002). CONCLUSION: These data show FMR was a better predictor of several risk factors compared to %BF and BMI. This suggests that this method of calculating FMR may be effective for assessing cardiometabolic risk in adults.

675 May 30 3:15 PM - 3:30 PM
Influence of Multiple Indices of Body Composition on Cardiometabolic Risk Factors in Adults
Lyndsey M. Hornbuckle¹, Robert Buresh, FACSM, Yuri Feito, FACSM², Cassie Williamson, Brian Kliuczczewicz³, Ayles Herrington, Corrine Ellis¹, Leah Tsui¹, Anna Schluppi¹, Kelsey Shepard¹, Stella Volpe, FACSM,¹ University of Tennessee, Knoxville, Knoxville, TN. ²Kennesaw State University, Kennesaw, GA. ³Drexel University, Philadelphia, PA.

(No relevant relationships reported)

Purpose: The purpose of this study was to determine the association between changes in weight to changes in total and regional body composition calculated via dual-energy X-ray absorptiometry (DXA). Linear regression was used to measure the association between change in weight and change in total lean (TLM) and total fat mass (TFM) for the entire sample and for each position. Linear regression was also used to analyzed the association between %change in TLM and TFM with %change in regional lean and fat mass. Results: Position did not have a significant effect on the association between change in weight and change in TLM or TFM (p=0.171, p=0.172 respectively). However, change in %BF was weakly associated with %change in TLM and TFM with %change in regional lean and fat mass. Regional regression was used to measure the association between change in weight and change in total lean (TLM) and total fat mass (TFM) for the entire sample and for each position. Linear regression was also used to analyze the association between %change in TLM and TFM with %change in regional lean and fat mass. Results: Position did not have a significant effect on the association between change in weight and change in TLM or TFM (p=0.171, p=0.172 respectively). However, change in weight was strongly associated with change in TFM for the entire group (slope = SE = 0.8 ± 0.06, p <0.001 R²=0.72). Conversely, change in weight was weakly associated with change in TLM for the entire group (slope ± SE = 0.2 ± 0.06, p <0.001 R²=0.14).
Change in TLM was not significantly associated with change in TFM (slope SE = -0.12 ± 0.06, p > 0.125, R² = 0.03). Regionally, the strongest association was between %change in TFM with %change in Android fat mass (1.62 ± 0.08, p < 0.001, R² = 0.84). For lean mass, both %change in Trunk LM and Leg LM had similar associations with %change in TLM (R² = 0.43 & 0.38, p < 0.001 for both). When comparing each position separately, only RB (n=6) had a strong positive association between change in weight and change in TLM (R² = 0.82, p < 0.001), but no association between change in weight and change in TFM (R² = 0.09, p > 0.879).

Conclusion: These data suggest that changes in weight during a competitive football season are largely driven by changes in fat mass, except for potentially RB. The slopes of the relationship suggest that on average from every 1 kg (2.2lbs) of weight increase there is 0.8 kg (1.8lbs) increase in TFM. Additionally, there is a higher proportion of fat increase is distributed to the android or abdominal region. Given the relationship between increased fat mass with both reduced performance and injury risk, teams should focus on closely maintaining athlete weight during the season.

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

May 30 4:15 PM - 4:30 PM
Regional Variations in Physical Fitness and Activity in Ecuadorian Adolescents
Cheryl A. Howe, FACSIM,1 Sharon L. Casapulla,1 Jay Shubrook,2 Pablo Lopez,2 Mario J. Grijalva,1 Darlene Berryman1, L Beneluzar1,2 Ohio University, ATHENS, OH;2 Florida State University, Tallahassee, FL. 1Pontifical Catholic University of Ecuador, Quito, Ecuador.

Purpose: To compare the physical fitness (PF) and physical activity (PA) levels of adolescents from two different regions of Ecuador and their relationship with peer/familial influence on PF and PA. METHODS: Adolescents (N=407) were recruited from 4 schools: 2 from a suburb of Quito (n=217; Northern Sierra region) and 2 from the smaller town of Cariamanga (n=214; Southern Sierra region). Height (cm) and weight (kg) measurements were used to calculate BMI for weight classification. PF was estimated using a post-exercise heart rate following a 3-min step test. A questionnaire was used to assess PA habits (moderate-vigorous PA and sedentary behavior) and perceived peer/familial support for being physically active. T-Tests and ANOVAs assessed differences in outcome variables by sex, weight status and location. Person correlations assessed relationships among PF, PA habits, and perceived peer/familial influence. RESULTS: According to IOTF standards, 12.3% of the adolescents were classified as overweight or obese. Overall, PF level was 43.4±8.9 ml/kg/min, with males significantly higher than females (48.3±9.4 vs. 41.1±7.5 ml/kg/min) and Southern Sierra adolescents significantly higher than Northern Sierra (47.1±9.6 vs. 39.7±6.1 ml/kg/min) adolescents. Overweight adolescents had significantly lower PF levels compared to healthy and underweight adolescents only in Southern Sierra region (42.3±8.5 vs. 46.9±8.6 vs. 50.5±11.1 ml/kg/min, p<0.0001). Most adolescents reported participating in <60 min/day of moderate-vigorous PA (91.6%) and spending >2 hours/day in sedentary behaviors (79.9%). While perceived peer/familial influence did not correlate well with PF or PA levels (r=0.18 vs. 0.20; adj. p>0.05), males perceived greater peer influence for PA participation than females, regardless of weight status or location. CONCLUSIONS: While adolescents of Southern Sierra had higher PF levels, these values were impacted by sex and weight status, but not by PA levels or perceived peer or familial influence.

May 30 4:30 PM - 4:45 PM
Comparison of Ultrashort Versus Short High-Intensity Interval Training for Body Composition, Anaerobic, and Aerobic Performance
Masoud Moghadam, Tyler W.D. Muddle, Carlos A. Estrada, Mitchell A. Magrini, Nathaniel D.M. Jenkins, Bert H. Jacobson, FACSIM. Oklahoma State University, STILLWATER, OK. (Sponsor: Bert H. Jacobson, FACSIM)

Purpose: This study compared the effects of ultrashort (UH) versus short (SH) high intensity interval training (HIIT) in conjunction with functional training on body composition, anaerobic, and aerobic performance. METHODS: Thirty-four recreationally active participants were randomly assigned to SH (8 males and 9 females) and UH (8 males and 9 females) groups and completed 6 cycles of 6 exercises at ~90% of maximal heart rate (i.e. kettle bell snatches; step-up jumps; jumping jacks; front squat; burpees; high knees) 3 days a week for 4 weeks. SH was performed with 20s:10s work-to-rest ratio, and a 2-2-2-2-2-2 minute recovery with 10s. The UH was completed with 10s:5s work-to-rest ratio, and 1-minute recovery. Fat mass (FM), fast free mass (FM), vastus lateralis cross sectional area (VL CSA), Wingate anaerobic capacity (i.e. peak power [PP] and anaerobic power [AP]), and aerobic fitness (i.e. V O2max) were measured before and after the training interventions and analyzed with 2-way mixed factorial ANOVA. RESULTS: FF did not significantly (p>0.05) change, however, both groups significantly (p<0.05) improved FMU: (UH: 68.0 ± 15.0 to 61.5 ± 15.2 kg, SH: 54.3 ± 11.5 to 55.5 ± 11.0 kg), as well as VL CSA (UH: 24.8 ± 6.2 to 27.1 ± 6.3 cm, SH: 25.6 ± 5.1 to 27.9 ± 5.5 cm). Additionally, anaerobic
Correlation between TL and performance decrease per decade was observed for SPT (r = -0.651, p < 0.01), and a negative correlation between TL and body fat for RUN (r = 0.47, p < 0.01), with a large effect size (d = 0.72). It was observed a significant correlation between TL and performance, with U23-WCh vs. Senior-WCh (+3.32%; P = .034). IQR of SH and BM was 178 - 238 cm and 68 - 73 kg.

Differences in BM were not significant (P = .115; η² = 0.02). Significantly higher BMI reached higher career progression level, probably due to a dimensional and partly inherent anthropometric data should not be used exclusively. BMI, BM at higher SH) reached higher career progression level, probably due to a dimensional and partly inherent anthropometric data should not be used exclusively.

Cancer associated muscle wasting (cancer cachexia) negatively affects the prognosis and treatment of cancer. Specifically, 20-40% of cancer deaths are attributable to cancer cachexia, however current treatments for cachexia are ineffective at reducing mortality. More so, it is currently postulated that once cachexia has developed, it may be impossible to halt its progression. Therefore, a better understanding of the early mechanisms contributing to cachexia is necessary to develop effective therapeutics to halt cachexia before significant muscle loss occurs. Mitochondrial function is thought to largely mediate muscle health and may be a key contributor to the development of cachexia. PURPOSE: To examine the initial effects of tumor cell-derived factors on mitochondrial function and subsequent cell proliferation. METHODS: C2C12 cells were treated with either CON media (1:1 ratio of DEMEM to C2C12 conditioned media) or LLC media (1:1 ratio of DEMEM to Lewis Lung Carcinoma conditioned media) for 4-72 hrs. Cells were then measured for mitochondrial polarization, superoxide production, and cell proliferation. Results were analyzed by blocked t-tests (CON v. LLC, blocked by experiment repeat).

RESULTS: After 4 hrs of incubation with LLC media, cells had a ~12% greater mitochondrial polarization compared to CON (p=0.0002, Hedge’s g effect size=1.08), with no difference in mitochondrial superoxide production (p=0.78, Hedge’s g effect size= 0.10). After 24 hrs of incubation, mitochondrial polarization remained elevated by ~10% compared to CON (p=0.008, Hedge’s g effect size=0.69) and mitochondrial superoxide production was increased ~12% compared to CON (p=0.009, Hedge’s g effect size=0.99). However, LLC incubation for 24, 48 and 72 hrs did not alter cell proliferation (p=0.89, 0.13, and 0.45 respectively, Hedge’s g effect size = 0.05, 0.53, and 0.27 respectively). CONCLUSIONS: Tumor-derived factors appear to have dramatic effects on muscle mitochondrial polarization and subsequent superoxide production. Therefore, these alterations do not appear to affect muscle proliferative capacity. This study was supported by The National Institutes of Health R15AR069913.

Regular exercise improves metabolic health in men and women; however, the molecular adaptations critical for delivering health benefit remain unclear. Heat shock protein (HSP72) is one of the most highly induced proteins in muscle during exercise, and we have shown that muscle expression of HSP72 is protective against diet-induced metabolic dysfunction. By contrast, global deletion of HSP72 promoted glucose intolerance and insulin resistance paralleled by impairment in mitochondrial (mt) function and oxidative capacity. All aforementioned studies were conducted in male animals exclusively.

Regular exercise improves metabolic health in men and women; however, the molecular adaptations critical for delivering health benefit remain unclear. Heat shock protein (HSP72) is one of the most highly induced proteins in muscle during exercise, and we have shown that muscle expression of HSP72 is protective against diet-induced metabolic dysfunction. By contrast, global deletion of HSP72 promoted glucose intolerance and insulin resistance paralleled by impairment in mitochondrial (mt) function and oxidative capacity. All aforementioned studies were conducted in male animals exclusively.

Standing height (SH) and body mass (BM) were well established determinants of rowing performance, which therefore typically included in most talent identification programs. However, it remains unclear if anthropometric profiles allow for differentiation between subsequent career progression levels already in junior female rowers. PURPOSE: We aimed to evaluate the relationship between anthropometric profiles of adolescent junior female rowers and their long-term career progression level. We furthermore described their anthropometric profiles and calculated normative requirements associated with a successful career progression on elite level. METHODS: SH, BM and BM-index (BMI) of 399 female rowers (age 17.6 ± 0.58 years) of the German Junior National Team between 1991 and 2014 were retrospectively analyzed using ANOVA with Post-Hoc test. Rowers were grouped exclusively according to their highest long-term career progression level, categorized as participation in U19-, U23-, Senior-World Championships (WCh), or Olympic Games (OG). Normative anthropometric requirements were defined as interquartile range (IQR) of the OG-group. RESULTS: We found significant small effects between career progression level and SH (P = .009; n² = 0.03), BMI (P = .004; n² = 0.04). Rowers, who never competed higher than U23-WCh were significantly smaller than those who competed in Senior-WCh (~1.30%; P = .036) or OG (~1.34%; P = .049). Differences in BM were not significant (P = .115; n² = 0.02). Significantly higher BMI was identified for rowers who remained on U19-level compared to those competing in Senior-WCh (~3.87%; P = .003) or OG (~3.28%; P = .039). The same was found for U23-WCh vs. Senior-WCh (~3.32%; P = .034). IQR of SH and BM was 178 - 184 cm and 68 - 73 kg. CONCLUSIONS: Advanced anthropometric characteristics partly mirror long-term career progression levels in female Junior National Team rowers, underlining the relevance of anthropometric data for talent identification and development. Interestingly, female rowers tending to a more athletic body type (lower BMI, BM at higher SH) reached higher career progression level, probably due to a better power to body mass ratio. As talent identification and development is multi-dimensional and partly inherently, anthropometric data should not be used exclusively.

CONCLUSIONS: In conclusion, TL of studied master athletes was longer than their untrained peers, and seems to be to not only a marker of health status, but also an indicator of sports longevity since both actual performance level, its decrease over years, and body composition were related to TL of studied sample.
S124 Vol. 49 No. 5 Supplement

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**WEDNESDAY, MAY 30, 2018**

**ACSM May 29 – June 2, 2018 Minneapolis, Minnesota**

**PURPOSE:** We studied the effects of HSP72 knockout (KO) on metabolism in female mice to determine whether sex plays a role in phenotypic outcome.

**METHODS:** We conducted a standard metabolic phenotyping evaluation of WT and HSP72-KO female mice fed a normal chow diet (age 3 - 10 months). Additionally, we induced metabolic challenge, WT and HSP72-KO mice performed two exercise protocols. Protocol 1: Chronic voluntary wheel running for 30-days. Protocol 2: Acute treadmill running (90 min, 15 m/min, 5° incline). Comparison of means of differences were by two-way ANOVA or t-test (P<0.05, a priori; values presented as mean ± SEM).

**RESULTS:** In contrast to male HSP72-KO mice, female KO animals were protected against age-induced metabolic dysfunction and insulin resistance. Moreover, we observed no significant difference in grip strength, run time to exhaustion, latency to fall, or maximum running speed, between the genotypes. Although no differences in metabolic homeostasis or physical performance were detected between the genotypes of female mice, we did observe marked differences in expression of compensatory signaling nodes including transcription factors, the mt proteome, and mt fusion-fission-mitophagy dynamics in HSP72-KO compared with WT. Computational modeling and pQCR analysis identified over 100 proteins differentially expressed between the genotypes. We found that ERα is strongly induced in muscle of female HSP72-KOs compared with WT, and we are currently testing whether ERα confers preservation of metabolic function in female vs. male HSP72-KOs.

**CONCLUSIONS:** Our findings show sex differences related to importance of HSP72 expression for the maintenance of metabolic health and exercise performance.

---

**686 May 30 3:45 PM - 4:00 PM**

**Mitochondrial Fusion Is Essential For Regulation Of Adult Skeletal Muscle Mass And Protein Synthesis**

Graham R. McGinnis, Zachary D. Bush, Margaret B. Bell, Glenn C. Rowc. University of Alabama at Birmingham, Birmingham, AL.

(No relevant relationships reported)

**Purpose:** Mitochondrial dynamics and the function and health of skeletal muscle are inextricably linked. To preserve proper function, muscle mitochondria undergo constant remodeling through fusion and fission events. Mitochondrial fusion is regulated by fission 1 (Fis1) and dynamin-related protein 1 (Drp1), while fusion is regulated by three GTPases: mitofusin 1 and 2 (Mfn1, Mfn2) and optic atrophy 1 (Opa1). However, the role of mitochondrial fusion in adult skeletal muscle mass regulation is not fully understood. We hypothesized that genetic disruption of mitochondrial fusion in adult skeletal muscle will impair muscle function and growth.

**Methods:** We therefore developed and characterized adult inducible skeletal muscle specific Mfn1/2 double knockout mice (MFNDKO). Genetic deletion was induced in adult mice and confirmed by qPCR and western blot. Body/muscle size and composition was analyzed gravimetrically and by QMR. Muscle function was assessed by grip test. Interrogation of pathways regulating muscle mass, including atrophy and autophagy were performed by qPCR and western blotting. In vivo and in vitro protein synthesis rates were evaluated using a puromycin incorporation assay. Results: MFNDKO mice exhibited a progressive decrease in body weight (~20% lower than CON, respectively; p < 0.05). This reduction in body weight was associated with a decrease in lean mass, confirmed by QMR, and oxygen consumption (~10% lower in MFNDKO compared with WT, respectively; p < 0.05). Gene profiling of pathways that regulate muscle homeostasis revealed upregulation of FBXO30, FBXO32, MT1 and CTSL (p < 0.05, all) suggesting an activation of muscle atrophy. Furthermore, muscles from MFNDKO mice revealed increased markers of autophagy with increased p62 mRNA and increased LC3II and p62 protein levels. Protein synthesis rates were decreased in vivo and in vitro (14% and 75%; p < 0.05, respectively) in MFNDKO muscle. Conclusions: Taken together, these observations suggest that normal mitochondrial fusion is required for maintaining normal adult skeletal muscle mass.

---

**687 May 30 4:00 PM - 4:15 PM**

**Skeletal Muscle Mitochondrial Fusion is Required for Exercise Performance and Mitochondrial Oxidative Capacity**

Glenn C. Rowe, Zachary D. Bush, Margaret B. Bell, Graham R. McGinnis. University of Alabama at Birmingham, Birmingham, AL.

(No relevant relationships reported)

**PURPOSE:** Endurance exercise has been shown to be a positive regulator of skeletal muscle metabolic function. Changes in mitochondrial dynamics (fusion and fission) have been shown to influence mitochondrial oxidative capacity. We therefore tested whether genetic disruption of mitofusins (Mfn1s) affected exercise performance in adult skeletal muscle.

**METHODS:** We generated adult inducible skeletal muscle-specific Mfn1 (iMS-Mfn1KO), Mfn2 (iMS-Mfn2KO) and Mfn1/2 knockout mice (iMS-MfnDKO). We assessed exercise capacity with a treadmill time to exhaustion stress test pre-deletion and up to 8-weeks post-deletion. We measured individual electron transport chain (ETC) complex activity of both the subsarcolemmal (SS) and intermyofibrillar (IMF) mitochondria by high resolution spectroscopy. We also performed qPCR and western blotting to measure the expression of ETC subunits.

**RESULTS:** Analysis of either the iMS-Mfn1KO or iMS-Mfn2KO did not reveal an effect on exercise capacity, suggesting a possible functional redundancy between the two Mfn1. However, analysis of the iMS-MfnDKO animals revealed a progressive reduction (66% reduction; p <0.05) in time to exhaustion. The decrease in exercise capacity was associated with a reduction in ETC activity in both the SS and IMF mitochondrial fraction for Complex I (70% and 80% respectively; p <0.05) and Complex IV (60% and 80% respectively; p <0.05). Notably only the IMF fraction for Complex II and Complex V exhibited a significant reduction in activity (70% and 67% respectively; p <0.05), while Complex III was completely unaffected. These changes in enzymatic activity was associated with a decrease in protein expression of ETC subunits for Ndufb8 (86%; p <0.05) and Mtoc1 (50%; p <0.05). We did not observe any significant changes in mRNA expression of nuclear encoded ETC subunits, while mitochondrial encoded subunits (ND2, NDS, CytB, COX2 and ATP6) were all downregulated in iMS-MfnDKO (p <0.05). These data suggest that the decrease in exercise activity is the result of impaired ETC complex activity and expression.

**CONCLUSION:** Taken together these results suggest that mitochondrial fusion in adult skeletal muscle is required for normal exercise performance.

**ACKNOWLEDGMENTS:** We are grateful to the UAB DRC BARB Core P30 DK079626. This work supported in part by NIH AR062128 to GCR.

---

**688 May 30 4:15 PM - 4:30 PM**

**Human Muscle Fiber-Specific Responses of Mitochondrial Fusion Proteins to Sprint Interval and Moderate-Intensity Continuous Training**

Lauren E. Skelly, Jenna B. Gillen, Barnaby P. Frankish, Florence E. Godkin, Mark A. Tarnopolsky, Robyn M. Murphy, Martin J. Gibala, McMaster University, Hamilton, ON, Canada. La Trobe University, Melbourne, Australia. (Sponsor: Dr. Stuart Phillips, FACSFM)

(No relevant relationships reported)

Mitochondrial dynamics, a process regulated by mitochondrial fusion and fission, is important for the maintenance of high quality mitochondria and healthy metabolic function. Low-volume sprint interval training (SIT) increases mitochondrial content to a similar extent as moderate-intensity continuous training (MICT); however, limited data are available regarding the effect of these diverse training approaches on mitochondrial dynamics proteins. Research has also relied primarily on whole muscle analyses which may mask fiber-type specific training adaptations.

**PURPOSE:** To examine changes in mixed whole muscle and fiber-type specific mitochondrial fusion protein abundance following 12 weeks of low-volume SIT and MICT.

**METHODS:** Sedentary adults performed 32 sessions of SIT (n=8) or MICT (n=9). SIT involved 3 x 20 sec ’all out’ cycle sprints against 5% body mass (~500 W) interspersed with 2 min rest and MICT involved 45 min of continuous cycling at ~70% of maximal heart rate (~110 W). Biopsies (vastus lateralis) were obtained before training and 96 h after the final session. The protein contents of optic atrophy 1 (OPA1) and mitofusin 2 (MFN2) were measured in mixed muscle homogenates and pooled segments of type I and II fibers using Western blotting, normalized to total protein content within each sample.

**RESULTS:** Training increased the mixed whole muscle protein content of OPA1 (1.0 ± 0.3 to 1.5 ± 0.3 arbitrary units (AU)) and MFN2 (1.0 ± 0.2 to 1.1 ± 0.2 AU), with no differences between treatments (p < 0.05, main effect). OPA1 content increased after training (p <0.05, main effect) in both type I (1.3 ± 0.6 to 1.9 ± 0.8 AU) and type II fibers (1.0 ± 0.4 to 1.4 ± 0.5 AU). MFN2 content increased after training in type I (1.4 ± 1.1 to 2.2 ± 1.5 AU, p = 0.03) but not type II fibers (1.9 ± 1.6 to 2.1 ± 1.1 AU, p = 0.73). Prior to training, OPA1 content was higher in type I versus type II fibers (1.3 ± 0.6 vs. 1.0 ± 0.4 AU, p <0.01) but there were no fiber-type differences in MFN2 content.

**CONCLUSIONS:** Twelve weeks of low-volume SIT and MICT induces similar increases in mixed whole muscle and fiber-type specific mitochondrial fusion proteins. The potential of SIT to induce comparable skeletal muscle adaptations as MICT despite a reduced exercise volume may be related to a higher intensity per se and/or the intermittent contractile pattern.
Sleep-loss is emerging as an important risk factor for the development of impaired glucose tolerance, insulin resistance (IR) and, subsequently, type 2 diabetes mellitus. While the mechanisms underlying these changes remain to be fully elucidated, in some instances their development may be associated with reduced mitochondrial function. This suggests sleep-loss may also impair mitochondrial function, but this has not been investigated. Given the possible relationship between mitochondrial function and IR, exercise could be used as a strategy to counteract the detrimental physiological changes induced by sleep-loss; however, this has not been demonstrated.

**Purpose:** To investigate the effect of sleep-loss, with or without exercise, on skeletal muscle mitochondrial function and glucose tolerance.

**Methods:** Twenty healthy male participants were allocated into one of three experimental groups: a control group (CON, n=7) (8 sleep opportunity for 5 nights), a sleep-restricted group (SR, n=7) (4 sleep opportunity for 5 nights), and a sleep-restricted and exercise group (SR+EX, n=6) (4 sleep opportunity for 5 nights and 3 x high-intensity interval exercise (HIIE) sessions). The HIIE bouts consisted of 10 x 60-s intervals at 90% peak power, interspersed by 75 s of active recovery. Oral glucose tolerance tests (OGTT) and muscle biopsies were performed pre- and post-intervention.

**Results:** Mean sleep duration per night for CON, SR, and SR+EX was 44±25, 230±13 and 237±5 minutes, respectively. There was a significant reduction in mitochondrial respiratory function (O2, flux - pmol/s/mg tissue) from pre- to post-intervention in the SR group (65 ± 24 vs. 65 ± 0.05, p<0.05) but this remained unchanged in the CON (70 ± 5 vs 64 ± 12, p>0.05) and SR+EX (78 ± 20 vs 79 ± 28, p>0.05) group. OGTT total area under the curve increased post-intervention in the SR group (692 ± 89 vs 832 ± 57 units, p<0.05), but remained unchanged in the CON (741 ± 202 vs 677 ± 184, p>0.05) and SR+EX (645 ± 51 vs 702 ± 83, p>0.05) groups.

**Conclusion:** Sleep-loss was associated with a reduction in mitochondrial respiratory function and a decrease in glucose tolerance. However, these changes were mitigated by performing HIIE, demonstrating exercise as a potent and cost-effective strategy to alleviate some of the negative metabolic effects of sleep loss.

**Purpose:** Bariatric weight-loss surgery can resolve or ameliorate type 2 diabetes (T2D). The cellular and molecular adaptations driving this response remain largely unknown, but some evidence points to epigenetic changes in skeletal muscle following surgery. We assessed global skeletal muscle methylation patterns prior to and 1 year after Roux en Y gastric bypass surgery (RYGB) in women with and without T2D to determine if diabetes modifies the response of the skeletal muscle methylome to weight-loss surgery.

**Methods:** Global vastus lateralis methylation profiles were generated via Illumina 450k Arrays pre- and 1 yr post-RYGB in black adult females (N=12) with (D; n = 6, age = 51 ± 6 yr, BMI = 53.0 ± 5.8 kg/m2) and without (ND, n=6, 43 ± 6 yr, 51.0 ± 9.2 kg/m2) T2D. Clinical values for insulin, glucose, and HOMA were measured at each time point. ANCOVA (group*time with age covariate) assessed changes in skeletal muscle methylation profiles in Partek Genomics Suite. Resultant methylation probes were filtered at p<0.001 and uploaded into Ingenuity Pathway Analysis for biological interopersonation. **Results:** RYGB reduced BMI (P = 0.01; -46.2% ± 28.3) and HOMA (P = 0.01; -1.9 ± 2.4) 1 yr following surgery, with no differences between groups. ANCOVA detected interaction effects in 9106 methylation sites in 6059 known genes. Overall, 7541 methylation sites in 4557 genes were altered 1 yr following RYGB in ND as compared to 4056 methylation sites in 3245 genes in diabetics. Biological pathway analysis of genes with differential methylation in diabetics identified key metabolic signaling pathways such as AMPK Signaling (80 genes; p = 9.7 x 10^-6), and P70S6K Signaling (44 genes; 9.82 x 10^-15). Our analysis also identified hypomethylation in the promoter region of key metabolic genes IRS1 (-4.8% hypomethylated following surgery), SLC2A4 (GLUT4; -2.8% to -3.9%), and GSK3 (-3.4%) following surgery.

**Conclusion:** Skeletal muscle DNA methylation 1 year following RYGB suggest epigenetic changes in key metabolic signaling genes that are modified by diabetes. Changes in gene and protein expression of these genes have previously been demonstrated with improved glucose homeostasis. These data identify DNA methylation patterns that may play an important role in diabetes resolution following surgery.

**Abstracts were prepared by the authors and printed as submitted.**
B-43 Clinical Case Slide - Foot and Ankle
Wednesday, May 30, 2018, 3:15 PM - 3:55 PM
Room: CC-200E

Chair: Stephen M. Simons, FACSM. South Bend Notre Dame Sports Medicine Fellowship, Mishawaka, IN.

(no relevant relationships reported)

Discussant: Adam S. Tenforde. Spaulding Rehabilitation Hospital, Milton, MA.

(no relevant relationships reported)

Discussant: David Smith. University of Minnesota, Minneapolis, MN.

(no relevant relationships reported)

HISTORY: A 22-year-old men’s club Division I Rugby-7s winger, injured his right ankle post a simultaneous opposing two-player tackle. Tackle—one locked the ball carriers foot in place wrapping the lower leg, and tackle-two changed the direction of the upper body of the player which overcame ankle mortise stability and strength, inducing an ankle inversion. Post-tackle, injured player complained of pain and inability to bear weight. History noted, no ankle supports/brace or tape used, and no previous ankle injury/surgeries. PHYSICAL EXAMINATION: Sideline emergency services removed injured foot cleat, found ankle deformity, which was secured for transport. ED exam revealed patient with a medially deformed right foot. Exam noted localized pain and tenderness, post palpation on right ankle deformity and lower leg, planter flexed and supinated. Mild swelling, no lacerations or open wounds noted. Patient’s limited exam secondary to pain, however, reflected no decreased right sided lower extremity sensation, reflexes or strength. Patient was able to flex and extend toes despite extreme pain of deformed limb. Injured limb had a noted palpable dorsalis pedis and posterior tibial pulse. DIFFERENTIAL DIAGNOSIS: 1. Subtalar joint subluxation/dislocation 2. Open sub-talar dislocation 3. Tibial-talar dislocation 4. Fractures of the ankle/foot TEST AND RESULTS: Ankle anterior/posterior radiographs: -right posterior column peri-talar dislocation. Ankle lateral radiographs: -navicular dislocation laterally from talus -rotary subluxation of calcaneus medially from the talus -no associated fractures of the tibia/fibula including malleoli. FINAL WORKING DIAGNOSIS: Closed right posteromedial peri-talar dislocation without associated fracture. TREATMENT AND OUTCOMES: 1. Emergency. Clearly seen on radiograph. 2. Immediate ED conscious sedation closed-reduction, entailing injured knee flexion to relax gastrocnemius, with traction to heel/forefoot of injured ankle to reduce joint. 3. Short-leg cast post-reduction, PWB for 4 weeks. Rehabilitation post-cast removal, with ROM and heel/calf stretches, progressing to strengthening. PWB at 7 weeks post-injury and cleared for sport. 4. 3-month follow-up, FWB, 7° dorsiflexion, 32° plantar-flexion, 14° inversion, and 10° eversion with no restrictions.

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

no dorsal subluxation with 1st MTP joint drawer test. 5/5 great toe dorsiflexion & plantarflexion strength with discomfort. Lateral 1st MTP joint tenderness to palpation. Minimal Tibial sesamoid tenderness to palpation. Intact distal sensation & dorsalis pedis pulse. DIFFERENTIAL DIAGNOSIS: 1. 1st MTP lateral capsular tear 2. 1st MTP lateral collateral ligament tear 3. Adductor hallucis brevis tear IMAGING: MRI right foot: Complete lateral collateral ligament tear of the first MTP joint at the metatarsal attachment. No bony avulsion, normal alignment, normal plantar plate. FINAL DIAGNOSIS: Tear of the 1st MTP lateral collateral ligament in a dancer with resultant joint instability.OUTCOME: Walking boot for 5-6 weeks, without dancing, and improvement of symptoms at follow-up in July 2017-Weaned out of boot, started physical therapy, progressed back into dancing with buddy taping-August 2017, noted 60% improvement of pain but continued 1st MTP joint instability-Referral to Orthopedic Surgeon Dr. Lyle Micheli for surgical opinion with consultation from Dr. William Hamilton, dance medicine expert in New York City-Per recommendations, she underwent two series of PRP injections of the LCL in August and October 2017, follow-up is pending.

HISTORY: A 27 year-old minor league baseball player presents to the ER with right ankle pain after sustaining an injury landing on first base. After hitting a ground ball, the player ran to first base and inverted his right ankle after stepping on the first baseman’s foot. He had immediate pain and an obvious deformity in the right ankle. He was not able to ambulate due to pain. He was neurovascularly intact. There was no obvious skin puncture. The patient’s right foot and ankle were immobilized on the field in a SAM splint, and the player was sent to the ER. He denied any previous injury to this ankle.

Physical Exam: Examination of the right foot and ankle revealed an obvious deformity of right ankle without laceration or skin puncture. Patient was able to move all toes but unable to move the ankle due to pain. He was neurovascularly intact. Exam was limited due to pain.


Test and Results: Right ankle and foot x-rays: Closed dislocation of the medial subtalar joint and talonavicular joint without obvious fracture.

Final/Working Diagnosis: Right Medial Subtalar dislocation, Talonavicular Dislocation, Talus Fracture

Discussion: Consent was obtained, and the patient was taken to the OR for reduction under general anesthesia. After reduction of the right ankle, CT was performed which showed a successful reduction of the medial subtalar and talonavicular dislocations. The CT also revealed a nondisplaced fracture of the medial border of the talus. He was placed in a posterior splint and stirrup and made non-weightbearing. It was not determined why this relatively low impact mechanism caused such rare and significant injuries. Proper reduction was critical in this case to avoid future equinovarus deformity, ankylosis, or severe degenerative arthritis warranting further intervention.

Outcome: The patient was unable to play baseball for the remainder of the season. However, due to his successful reduction, he did not require further interventional treatment. He was transitioned to a short leg walking boot after being non-weightbearing for 6 weeks and participated in a physical therapy program to regain strength and function of his right ankle. His roster status was changed from “disabled” to “active” 8 weeks after his injury.

HISTORY: 35 year old female presents with left dorsal foot pain beginning 2 weeks prior to presentation noticed at mile 10 of a half marathon. She is an established barefoot runner with no previous injuries. Denies trauma or mechanism of injury to the foot. The pain is 8/10, sharp, and intermittent. It is exacerbated by weight bearing and relieved by non-steroidal anti-inflammatories (NSAIDS) and ice. The pain returns once the medication or modality wears off. She eats a well balanced diet and takes a multi-vitamin daily. Her last menstrual period was 10 days prior to presentation and states that occurred in February 2017 when she twisted the toe while pivoting then felt a pop and severe pain. X-rays at the ED were negative for fracture. She was able to continue dancing despite pain and had multiple episodes of re-injury. She was first evaluated in the Sports Medicine clinic in April 2017 after a recent episode of re-injury of first toe medial deviation while dancing with a pop sensation and swelling. X-rays were negative for fracture and she was diagnosed with a first MTP joint sprain treated with a walking boot for 1 month, dancing with buddy taping, and intrinsic foot exercises. By the end of May 2017, she reported near-full recovery with progression back into dancing until suffering the same injury while dancing with subsequent 1st MTP pain and instability.EXAM: Right foot: Normal alignment. No edema. Painful passive end-range 1st MTP joint flexion & extension. Significant laxity with 1st MTP joint varus stress, asymmetric compared to contralateral MTP joint. Discomfort but
it is regular. Denies changes to her running technique or mileage. X-rays performed prior to presentation demonstrate no fracture or deformities. She denies back pain, weakness, or paresthesias.

PHYSICAL EXAMINATION: Inspection of foot and ankle demonstrates edema on dorsal aspect of left foot without ecchymosis. No pes planus or pes cavus is observed. Tenderness over the left dorsal proximal 2nd metatarsal head is present. Full active range of motion of the ankle, foot, and toes in all planes with pain at the 2nd metatarsal during toe extension and flexion. Sensation intact to light touch in all dermatomes. Strength is 5/5 in all myotomes. Reflexes are 2/4 at L4 and S1.


TREATMENT AND OUTCOMES: Patient is educated on stress fractures in barefoot runners. Continue ice and NSAID’s for symptomatic pain control and inflammation. Recommend a short leg off loading boot to decrease stress on the forefoot. She should wean out of the boot and progress to a barefoot running program. Physical therapy to work on foot intrinsic, barefoot gait analysis, and ankle stabilizers. DEXA scan ordered for bone density evaluation. Consider ultrasound instead of MRI for future monitoring of stress fractures.

HISTORY: A healthy Caucasian 12-year-old male presents with right ankle pain after slipping and twisting his ankle during a recreational football game at day camp. Hours after injury, he was seen by his PCP, who ordered plain films and referred him to orthopedic surgery for further evaluation.

PHYSICAL EXAMINATION: Examination in-office revealed mild swelling over the right lateral ankle with tenderness over the anterolateral tibia. Active range of motion was significantly decreased in all directions, and he was unable to bear weight on the right lower extremity. There was good peripheral perfusion, no open wounds or lacerations, and no erythema or ecchymoses.

DIFFERENTIAL DIAGNOSIS:
1. Lateral ankle sprain
2. Triplane fracture
3. Pediatric distal tibial fracture
4. Juvenile Tillaux ankle fracture
5. Incisural ankle fracture
6. Adolescent pilon fracture

TEST AND RESULTS:
XR Right Ankle 3+ Views: On AP view, the fracture is vertical through the epiphysis. On lateral view, the fracture extends posteriorly into the metaphysis. CT Right Lower Extremity: Commminuted distal tibia fracture with intra-articular extension through posterior malleolar through metaphysis and 3 mm separation. Multiple fractures involving epiphysis. Approximately 3.5 mm separation anteriorly at fracture site. Nondisplaced fracture extending through medial malleolus. Tiny fracture fragment within tibialotar joint space adjacent to fracture site.

FINAL WORKING DIAGNOSIS:
Triplane fracture of right distal tibia with intra-articular extension

TREATMENT AND OUTCOMES:
1. Open reduction internal fixation of the right distal tibia with intra-articular extension performed by orthopedic surgery under general anesthesia.
2. Intraoperative post-reduction ankle films demonstrated satisfactory alignment and position with postoperative tissue changes of distal tibial metaphyseal and epiphyseal fractures.
3. 2-week post-surgical follow-up with repeat ankle films demonstrated the fracture to be anatomically reduced with hardware in optimal position. Physical exam had appropriate wound healing and excellent range of motion.
4. Toe-touch weight-bearing while in boot for 4 weeks post surgery.
5. Limited range of motion exercises out of boot during weeks 2 through 4 post surgery.
6. Weight-bearing initiated 4 weeks post surgery.

B-44 Clinical Case Slide - Knee I
Wednesday, May 30, 2018, 3:15 PM - 3:15 PM
Room: CC-200F

700 Chair: Holly J. Benjamin, FACSM. University of Chicago, Chicago, IL.
(No relevant relationships reported)

701 Discussant: Scott A. Magnes, FACSM. Fort Belvoir Community Hospital, Fort Belvoir, VA.
(No relevant relationships reported)

702 Discussant: Jason Pothast, MedStar National Rehabilitation Network, Washington, DC.
(No relevant relationships reported)

703 May 30 3:15 PM - 3:35 PM
Knees - Skiing
Anna R. King1, Surein Theivakumar2, Ramin R. Tabaddor2. 1New York University, NY, NY, 2The Warren Alpert School of Medicine at Brown University, East Greenwich, RI.
(No relevant relationships reported)

HISTORY:
A previously healthy 14-year-old female presents with left knee pain, stiffness, and swelling for one year after hearing a “pop” during a dance move. She is a competitive alpine skier and attends boarding school in Maine to pursue this. She was able to finish her skiing season, though continued to experience symptoms. MRI at that time showed effusion without associated ligamentous damage. Two weeks ago, her right knee began having similar symptoms. Her pain and stiffness in both knees are worse in the morning, after sitting for prolonged periods, and with stairs.

PHYSICAL EXAMINATION:
Patient has an antalgic gait pattern. The left knee has a tense effusion, with no soft tissue swelling, ecchymosis, or skin lesions. She has diffuse tenderness to palpation, especially along the medial femoral condyle. The right knee has a mild effusion and is not quite as tender. Both knees have full ROM, negative Lachman’s and Anterior Drawer, and are stable to varus/varus stress. She has full strength and sensation. Exam is also notable for left elbow fullness, warmth, and decreased extension by 10 degrees, as well as B/L Achilles tendon fullness without associated tenderness.

DIFFERENTIAL DX:
1. Inflammatory arthropathy
2. Synovial chondromatosis
3. Osteochondral defect
4. Lyme disease
5. Autoimmune process

TESTS / RESULTS:
- B/L knee XR’s: no obvious abnormalities or defects.
- MRI left knee: large joint effusion with extensive tiny loose bodies (typical appearance of “rice bodies”). No meniscal, chondral, or ligamentous pathology.
- Lyme negative
- CRP and ESR elevated
- (+) ANA
- RF negative

FINAL / WORKING DX:
Juvenile Rheumatoid Arthritis (JRA)

TREATMENT & OUTCOMES:
- Strict activity modification, anti-inflammatories, ice, elevation, pediatric rheumatology referral, arthroscopic debridement of B/L knees with synovial biopsies.
- Rheumatology performed an intra-articular steroid injection of B/L knee joints, initiated DMARD therapy with Methotrexate, and referred for expedited ophthalmology evaluation.
- On post-op Eu, pathology findings were reviewed, which were consistent with JRA, -At 1 month post-op debridement and 2 months s/p initiation of DMARDs, patient has no swelling or pain and is undergoing progressive return to full activities (including skiing) as tolerated under the guidance of her athletic trainer.

704 May 30 3:35 PM - 3:55 PM
Using Ultrasound To Diagnose Knee Pain
PATRICK CAREY. Martin Army Community Hospital, FORT BENNING, GA.
(No relevant relationships reported)
16 year old male high school athlete was referred to sports medicine clinic with complaint of intermittent right knee pain exacerbated by cutting maneuvers. Pain began after feeling a strain and pop when pushing off a starting block in track season one year ago. Patient’s mother stated that ice, compressions, use of hinged knee brace makes it better and working out without the knee brace makes it worse. The pain usually starts at the medial side of the knee and radiates to the lateral side and is associated with occasional buckling and locking. No change in character of pain after a course of physical therapy and relative rest during the summer. He just completed football season and is currently in middle of basketball season, participation has been limited at times due to pain.

PHYSICAL EXAM:
Right knee exam reveals skin intact with minimal effusion. ROM 0-130 degrees with no pain at extremes. + LIT medially this is more on the condyle then the meniscus. Medial joint line pain with McMurray and Thessaly; however, no palpable click.
1A Lachman. Stable knee to varus and valgus stress at zero and 30 degrees of flexion. Negative Posterior drawer and sag sign. Sensation intact to light touch on all distributions distally. 2+ distal pulses.

DIFFERENTIAL DIAGNOSIS:
1. Osteochondritis dissecans
2. Osteochondral lesion
3. Meniscus tear

TEST AND RESULTS:
The initial diagnostic test available was the ultrasound. There had been no prior imaging.
A limited ultrasound of the RIGHT Knee showed + mild joint effusion and a step off in the lateral portion of the medial femoral condyle.
Impression: + effusion and chondral defect of the lateral portion of the medial femoral condyle.

FINAL/WORKING DIAGNOSIS: 1. osteochondritis dissecans on the lateral portion of the medial femoral condyle
TREATMENT AND OUTCOMES:
He was given instruction to remain non weight bearing using crutches for 8 weeks pending results of imaging to determine stability of lesion.
hypereextended while being contacted by an opponent, producing forced valgus and lateral rotation. He immediately fell to the ground, required on field medical attention, and was unable to bear weight.

PHYSICAL EXAMINATION
Sideline examination occurred within 5 minutes. Left knee examination revealed a moderate effusion, normal patellar tracking, and no bony deformity. Neurovascular examination normal. Able to perform straight leg raise against light resistance. Active ROM limited to 60° flexion and lacked 10° extension. No bony tenderness. Ligamentous examination revealed a positive Lachman and valgus stress in 30 degrees of flexion. Unable to tolerate compression testing. Left hip and ankle examination normal. Contralateral knee normal.

DIFFERENTIAL DIAGNOSIS
1. Acute ACL tear
2. Acute MCL tear
3. Meniscus tear
4. Patellar dislocation
5. Tibial plateau fracture or contusion

INTERVAL COURSE
Office visit 7 days after injury. Arthrocentesis of the left knee returned 35 mL of blood. Initial treatment included use of crutches, ice, hinged-knee brace, and quadriiceps rehab. MRI ordered, however study was delayed about 6 weeks due to gap in parent’s insurance.

TESTS AND RESULTS
o Left Knee Radiographs: Normal
o Left Knee MRI: - Marrow contusion of medial, lateral compartments, fibrular head, nondisplaced posterior tibial plateau fracture, subchondral impaction injury of lateral femoral condyle and lateral tibial plateau-ACL rupture, acute sprain of MCL, IT band, and LCL- Complex lateral meniscus tear, large fragment from posterior horn flipped anteriorly- Complex medial meniscus tear, vertically through posterior horn

FINAL DIAGNOSIS
Left knee acute ACL rupture, MCL sprain, medial and lateral meniscus tears, bone contusion

TREATMENT/COURSE
1. Referred to orthopedics, underwent arthroscopic ACL reconstruction with hamstring autograft, lateral meniscal repair, and partial medial meniscectomy 8 weeks after initial injury.
2. Significant discussion on post-op rehab and long-term activity modification.

6. Patient and surgeon satisfaction were achieved, and patella positioning was maintained throughout the patient’s recovery.

B-45 Clinical Case Slide - Lumbosacral Spine
Wednesday, May 30, 2018, 3:15 PM - 4:55 PM
Room: CC-Mezzanine M100F

709 Chair: Arthur Jason De Luigi, MedStar NRH/Georgetown University Hospital, Olney, MD.
(No relevant relationships reported)

710 Discussant: Joseph Ihm, FACSM. Shirley Ryan AbilityLab, Chicago, IL.
(No relevant relationships reported)

711 Discussant: Aaron Lee. McNeal Hospital, Berwyn, IL.
(No relevant relationships reported)

712 May 30 3:15 PM - 3:35 PM
Unusual Cause of Postpartum Back Pain
Jacob Wessells. Allina Health, St Paul, MN. (Sponsor: Morteza Khodaei, FACSM)
(No relevant relationships reported)

HISTORY: A 27-year-old G5P0131 delivered an 1800g boy precipitously at 35 0/7 weeks. Her medical history was significant for gestational hypertension, hypothyroidism status post ablation, syphilis during pregnancy, and lumbar disc herniation. Twenty hours later she noted severe pain and inability to move her right lower extremity. She did have a fall or recent trauma. She had no numbness or tingling, normal bowel movements and urination. She did not have a fever, chills or any recent use of new medications.

PHYSICAL EXAMINATION:
Vital Signs: afebrile, other vital signs were unremarkable.
Neurological: Normal sensation and strength testing in lower right leg.

DIFFERENTIAL DIAGNOSIS:
1. Piriformis syndrome
2. Disc herniation
3. SI joint dysfunction
4. Gluteal muscle strain
5. Septic SI joint
6. Sciatica

TEST AND RESULTS:
Post Partum Day 4:
CRP 27 mg/dL, ESR 105 mm/hr
CT abdomen and pelvis: No ileus or obstruction; normal postpartum uterus, no endometriosis or retained products; central disc herniation at L4-5 and subtle effacement of left L5 nerve
Post Partum Day 8:
MRI Spine/Pelvis:
L4-5 disc space annular bulge, mild canal compromise and bilateral recess narrowing. Findings compatible with septic arthritis of the right sacroiliac joint with a small adjacent periscapular and intramuscular fluid collection, worrisome for an abscess
Post Partum Day 9:
CT guided aspiration:
Fluid culture positive Group B streptococcus

FINAL/WORKING DIAGNOSIS: right SI joint septic arthritis and iliopsoas abscess due to Group B streptococcus

TREATMENT AND OUTCOMES:
She was initially treated with physical therapy and pain medication. Failing improvement, labs and CT were obtained. CT was unremarkable and patient declined further imaging. After four days, she was agreeable to an MRI that revealed septic arthritis. She was initiated on broad-spectrum intravenous antibiotics and narrowed to ceftriaxone. She continued therapy and antibiotics for five weeks. Her CRP and ESR normalized and she followed up with primary care clinic and infectious disease.
MRI LumboSacral Plexus: 2.8 X 2.5 X 3.0 cm mass along the left sciatic nerve between the gluteus maximus and quadratus femoris with extension into the ischiofemoral space, consistent with cystic schwannoma

FINAL WORKING DIAGNOSIS: Left sciatic nerve tumor, concern for cystic schwannoma

TREATMENT AND OUTCOMES:
Neurosurgery evaluation
Underwent surgical resection of mass
16 weeks after surgery, reported 100% resolution of her symptoms

Results: Bloods were analysed to out rule inflammation or infection. MRI lumbar-sacral spine demonstrated L2-L3 facet joint hypertrophy but no significant thecal sac or nerve root compression and no evidence of periosteitis. X-ray of right hip showed significant acetabular dysplagia with uncovering of the femoral head. MRI right hip revealed oedema and multiple small cysts in the right femoral head with remodelling and fragmentation, features consistent with avascular necrosis. Final/Working Diagnosis: Idiopathic Avascular Necrosis of the Femoral Head.Treatment and Outcomes: The patient was advised to abstain from training and competition. NSAIDs were prescribed for pain and Alendronate 70mg once weekly was initiated to inhibit osteoclastic activity and reduce the risk of femoral head collapse. The patient was referred for an orthopaedic opinion where options included, observation, femoral head core decompaction, non-vascularized bone grafting and hip arthroplasty. The decision was ultimately made to pursue a conservative medical approach as outlined above.

HISTORY: A 37 year old female dance instructor with a history of stable multiple sclerosis presented with a 5 year history of left buttock and posterolateral thigh pain with radiation to the plantar surface of her foot that began during pregnancy. Pain was minimal at rest and aggravated by prolonged sitting and activities such as dancing, bicycling, and hiking. Pain progressed and now markedly limited activity. She reported tingling of the posterolateral calf and plantar surface of the foot. She denied weakness. Chiropractic care provided no relief. Previously obtained lumbar spine MRI was unremarkable and the patient completed 6 months of physical therapy without improvement.

PHYSICAL EXAMINATION: There was no appreciable deformity, malalignment, or rotation of the lumbar spine, hips, or knees. She walked with a non-antalgic gait, including normal heel and toe walking. Palpation of deep left gluteal muscles reproduced pain with radiation down the left lower limb. Range of motion of the lumbar spine and hips was grossly normal. Manual muscle testing of the lower limbs was normal. Passive hip flexion, abduction, and external rotation, as well as flexion, adduction, and internal rotation of the left hip reproduced pain. Remainder of provocative lumbar spine and hip maneuvers, including straight leg raise, were normal. She was neurovascularity intact.

DIFFERENTIAL DIAGNOSIS:
Chronic Piriformis Strain
LumboSacral Radiculopathy
Hip Osteoarthritis
Multiple Sclerosis Flare
Sciatic, Tibial, or Peroneal Neuropathy

TEST AND RESULTS:

HISTORY: A 27 year old, male, high-level, Gaelic Football and Hurling player presented to the Sports Medicine Clinic with a 3-year history of gradually deteriorating lower back pain rated 6/10. The pain was exacerbated by activity and improved by rest. He denied any history of trauma. He denied any radiation or radicular symptoms. Three years prior to presentation MRI had demonstrated a Scheuermann’s kyphosis involving T12 with associated disc space narrowing at the T12-L1 level in addition to a transitional S1 vertebra. Physical Exam: Visual inspection was unremarkable. There was no pain on palpation over lumbar spine or paraspinal musculature. Lumbar flexion, extension and lateral side flexion were pain free and range of motion was within normal limits. Straight Leg Rise, Schobers and the Femoral Nerve Tension Test were normal. Examination of the hips revealed pain free but restricted internal and external rotation on the right but was otherwise normal. Neurovascular exam of lower limbs was normal. Differential Diagnosis: 1) Degenerative disc disease. 2) Lumbar disc prolapse. 3) Spondylolysisis. 4) Fracture of a lumbar vertebral body. 5) Hip pathology. 6) Inflammatory arthritis. 7) Seronegative spondyloarthropathy. 8) Infection. Tests and
B-58 Free Communication/Poster - Body Composition
Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

Challenging The Testing Protocol Of The Bod Pod
Eric Shamus, PhD, DPT, Sarah Bengston, DPT, Sierra Griffin, DPT, Ahmed Eloka, PhD, PT, Liza Malley, BS, Florida Gulf Coast University, Fort Myers, FL. (Sponsor: Mitchell L. Cordova, FACSM)

The Bod Pod uses air displacement plethysmography to determine an individual’s body composition as percentages of fat mass and fat free mass. The Bod Pod presents potential use in a clinical setting, but the feasibility is currently unknown. There were no studies found examining the consumption of fluids and pre-urination prior to body composition testing utilizing the Bod Pod. PURPOSE: The objective was to determine if the Bod Pod protocol, as set forth by Life Measurement, Inc., needs to be followed in its entirety to ensure validity of body composition results, where urination and fluid consumption prior to testing were both independently tested. METHODS: Thirty-two division 1 male (15) and female (17) soccer athletes were recruited for this research study. Male soccer players weighed 162.6 pounds (± 19.03) and female soccer players weighed 133.8 pounds (± 10.38). All athletes were between 18 and 22 years old (Male = 1.37 & Female = 1.17). Four separate measurements of body composition were taken: pre-urination, standard LMI protocol test point, and consumption of water equal to 10% of their body weight in ounces. RESULTS: A Pearson product moment correlation between the second condition (post urination) and the third condition (post urination retest) signified a good to excellent relationship between the standard test and the retest conditions (0.977, p < .001). A MANOVA analysis was performed comparing pre-urination and post-urination test/ retest indicated that not urinating prior to testing had no significant effect on body composition measurements (p > .05). Consumption of water did have a significant effect on the results of the body composition measurements. It was found that post water consumption, male participants’ measurement of fat mass on average had a significant difference of 0.6% and female participants’ fat mass measurements on average had a difference of 1.4%, p < .001. CONCLUSION: Results did not support the need to urinate prior to Bod Pod testing while supporting the need to refrain from water consumption directly prior to testing.

Assessing The Impact Of Body Fat Percentage And Lean Mass On Wingate Performance
Robert T. Sanders1, Andy Bosak2, Matthew L. Sokoloski2, Hannah E. Nelson1, James Kelly1, Jared Feister2. 1Liberty University, Lynchburg, VA. 2Texas Woman’s University, Denton, TX. (Sponsor: Dr. James Schoffstall, FACSM)

The Wingate test is commonly utilized to assess the anaerobic power capabilities of athletes across various sporting disciplines. Although prior studies have assessed the impact that body composition values have on anaerobic performance in above averagely fit populations, it appears that no study has evaluated the relationship between body fat percentage (BF%), lean mass (LMM), and trunk lean mass (TLM) on Wingate performance in no less than averagely fit males. PURPOSE: To investigate the relationship between BF%, LLM, and TLM on Wingate performance in no less than averagely fit college-age males. METHODS: After having descriptive data recorded, 38 no less than averagely fit college-age males had their BF%, LLM, and TLM assessed via a bioelectrical impedance analyzer. BMI was also calculated. Subjects participated in an 8 min dynamic warm-up on a leg cycle ergometer, followed by the completion of a maximal effort 30s sprint. Pearson Correlations were then performed between BF%, LLM, TLM, peak power (PP), and mean power (MP) with significant differences determined at p < .05. RESULTS: High to moderately high positive correlations existed between PP and TLM (r = .834, p = .001), LLM (r = .773, p = .001), BMI (r = .657, p = .001) as well as between MP and TLM (r = .904, p = .001), LLM (r = .880, p = .001), and BMI (r = .619, p = .01). However, no relationship occurred between (r = .064, p = .123) while a low negative relationship occurred between MP (r = -.234, p = .049) and BF%. CONCLUSIONS: TLM, LLM, and BMI appear to have a strong positive relationship with Wingate performance in no less than averagely fit college-age males. Further research may be necessary in order to determine if fitness level, sport specificity, or a different type of body fat percentage measurement technique may play a factor when considering if BMI, BF%, LLM, and TLM has a relationship with Wingate performance.

Comparison Of A-mode And B-mode Ultrasound For Measurement Of Subcutaneous Fat
Dale R. Wagner, Trenton Judd, Joshua Gordon, Casey McPherson, Adrianna Robison. Utah State University, Logan, UT. (Sponsor: Edward Heath, FACSM)

With lower cost devices and technological advancements, ultrasound has been undergoing a resurgence as a method to measure subcutaneous adipose tissue. Amplitude (A-mode) ultrasound produces a spike at the interface between subcutaneous fat and muscle, while brightness (B-mode) ultrasound produces an image of the underlying tissues. PURPOSE: This study aimed to determine if a low-cost, low-resolution A-mode ultrasound designed specifically for body composition assessment could produce subcutaneous fat thickness measurements comparable to an expensive, high-resolution B-mode device. METHODS: Subcutaneous fat thickness was measured on 41 participants (21 female, 20 male) 12.0 ± 1.10 y, BMI 25.3 ± 5.1 kg/m2) at 7 sites (chest, subscapula, mid-axilla, triceps, abdomen, suprailliac, and thigh) with two devices: 2.5 MHz A-mode ultrasound (BodyMetrix BX 2000), and a 12 MHz B-mode ultrasound (GE NextGen LOGIQ e7). RESULTS: Pearson correlation coefficients between the two ultrasound devices exceeded 0.80 (P < .001) at all measurement sites. Mean differences in fat thickness were not significantly different between the devices (P = 0.05) with the exception of the triceps site (P = 0.021); however, the mean difference at this site (0.53 mm) was not clinically relevant. The variability between devices was greatest at the abdomen, the site with the greatest thicknesses. However, Bland-Altman plots revealed no systematic bias between

Official Journal of the American College of Sports Medicine
Vol. 49 No. 5 Supplement S131

WEDNESDAY, MAY 30, 2018

Abstracts were prepared by the authors and printed as submitted.
Previous research has explored the correlation between strength tests and speed-agility tests among athletes with varying results. Much of this can be attributed to differences in reported results based on absolute strength test values versus those normalized to body mass (BM). Purpose: This study was to compare the correlation between absolute strength, speed, and agility test results to those normalized using body mass. Methods: Varsity Division I male football players (n = 327) were tested during several seasons. Tests for strength included one repetition maximum (1RM) back squat (BS), power clean (PC), and push jerk (PJ). Results were recorded as absolute values as well as normalized values, calculated by dividing each 1RM by the athlete’s BM. Tests for speed and agility included 40-yard dash (40YD), 10-yard dash (10YD), 20-yard shuttle run (SR) and standing vertical jump (VJ). A Pearson Product-Moment Correlation analysis was used to determine significant correlations between tests. Results: Results are presented below, with the first table displaying the absolute values of the strength tests and the second table showing the normalized values:  

<table>
<thead>
<tr>
<th></th>
<th>Shuttle Run</th>
<th>10-yd Dash</th>
<th>40-yd Dash</th>
<th>Vertical Jump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push Jerk</td>
<td>.22*</td>
<td>.11*</td>
<td>.25*</td>
<td>-.08</td>
</tr>
<tr>
<td>Power Clean</td>
<td>.09</td>
<td>.02</td>
<td>.12*</td>
<td>.04</td>
</tr>
<tr>
<td>Back Squat</td>
<td>.16*</td>
<td>.05</td>
<td>.13*</td>
<td>.00</td>
</tr>
</tbody>
</table>

There is a high demand for affordable body composition assessments of body fat and fat free mass. Research has demonstrated that skinfold prediction equations recommended by the American College of Sports Medicine (ACSM) underestimate body fat percentage (%BF). Purpose: The purpose of this study was to validate an alternative equation for women created from dual energy x-ray absorptiometry (DXA). The DFA criterion (DC) equation is:  

%BF = -.60665 + 0.49194(S3SF) - 0.00126(S3SF)  

Conclusion: Based upon the results of this study, the LeanScreen app accurately determines WHR, but does not accurately determine %BF on an individual basis.

**Conclusions:** The results suggest that the correlations between 1RM strength test, and speed-agility test results are affected by normalizing to BM. There is a stronger significant correlation between tests when 1RM strength test values are normalized to BM.
Blood concentrations of ovarian hormones, such as estrogen and progesterone, change during each phase of the menstrual cycle. Ovarian hormones can have an effect on fluid retention. Therefore, it has been suggested that the body weight and body composition changes differ among different phases of the menstrual cycle. PURPOSE: The purpose of this study was to compare changes in body weight and intracellular and extracellular fluid levels during the menstrual cycle.

METHODS: The subjects were eight women (age, 21.6 ± 1.1 y) with regular menstrual cycles who volunteered to participate in this study. Subjects performed 30 min of cycling at an intensity of 60% VO_{2peak} at three time points during the menstrual cycle: follicular phase, FP; ovulation phase, OV; luteal phase, LP. Blood samples were collected at rest (0 min), immediately after the exercise (30 min), 30 min after the exercise (60 min), and 60 min after the exercise (90 min). The duration of each menstrual cycle phase was estimated by assessing the levels of ovarian hormones. Blood analyses of ovarian hormones (estradiol and progesterone), renin activity, and aldosterone were conducted. Intracellular fluid and extracellular fluid from each site (upper limb, lower limb, and trunk) were measured before and after exercise.

RESULTS: Blood concentration of estradiol was greater during the OV and LP than during the FP at all time points (FP, 30.4 ± 12.3 pg/mL; OV, 186.6 ± 139.1 pg/mL; LP, 195.5 ± 118.0 pg/mL, p < 0.05). The body weight tended to greater in the LP when compared to the OV (FP, 57.8 ± 2.3 pg/mL; OV, 57.7 ± 2.4 kg; LP, 58.2 ± 2.2 kg, p < 0.06). The extracellular fluid from the trunk was significantly higher in the LP than in the FP and OV (FP, 5.49 ± 0.4 L; OV, 5.50 ± 0.4 L; LP, 5.55 ± 0.3 L, p < 0.05). A significant positive correlation was found between renin activity and progesterone levels (r = 0.632, p < 0.05).

CONCLUSIONS: The increase in body weight during the LP was induced by an increase in body fluid volume. This study was supported by the JSPS KAKENHI Grant Number 26350768 and Ministry of Education, Culture, Sports, Science and Technology-Japan, Female Athlete Development and Support Project.
Regular exercise and a healthy diet are associated with significant changes throughout the body including improved body composition and enhanced cardiovascular health. A local gym recruits individuals to participate in a six-week twenty pound weight loss challenge and provides participants with a structured diet and exercise plan. PURPOSE: The purpose of this study was to determine if a primarily weight loss driven program would also result in an improvement in body composition and enhance cardiovascular health. METHODS: Total weight, body fat, lean muscle mass, waist and hip circumference, resting metabolic rate (RMR), total cholesterol (TC), high-density lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL) cholesterol, fasting plasma glucose (FPG), triglycerides (TG), resting blood pressure (BP), and resting heart rate (RHR) were assessed before and after the six-week program in thirty four sedentary adults (M = 38.34, SD = 9.93). Subjects were required to participate in a vigorous boot camp program a minimum of five days per week for fifty minutes and follow a structured diet plan. RESULTS: There was a significant decrease in different time of day, and after the participant had consumed a meal. Body composition measurements obtained using whole-body plethysmography by the Airmetrix Whole-Body Self-Service Analyzer to those obtained via multifrequency bioelectric impedance analysis (BFA). Inactive men (n = 23) and women (n = 27) served as a control group (CON). Ratio of BMC to LM for arms, legs, and trunk was calculated to indicate regional bone mineral density (BMD). Inactive men (n = 23) and women (n = 27) served as a control group (CON). Ratio of BMC to LM for arms, legs, and trunk was calculated to indicate regional bone mineral density (BMD). Reports (Pre: 4.0 ± 0.1, Post: 2.7 ± 0.2, p < 0.05) after training. Reported total daily physical activity increased by 33%, which was associated with reductions in body weight (r = 0.39, p < 0.05). CONCLUSION: Large exercise-induced weight losses significantly reduced metabolic risk factors for disease and abdominal fat in young obese males. Therefore, large weight losses through exercise may be an effective strategy for maximizing health benefits to obese individuals.

There has been a lack in research on the effects of large exercise-induced weight loss of more than 10 kg on fat distribution and metabolic profile of obese males. PURPOSE: To examine large exercise-induced weight loss on fat distribution and metabolic risk factors, and their improvements associated with coronary heart disease. METHODS: A total of 20 obese males (age: 19.3 ± 1.30 yrs) completed in the institutionalized regimented training (IRT) held over 16 weeks. Anthropometric, dual x-ray absorptiometry scan and resting metabolic rate (RMR) measurements were taken in the laboratory, while computed tomography scan, fasting venous blood samples, and a 2-hour oral glucose tolerance test were completed at a local hospital. Daily activities and dietary habits were self-recorded over 2 weekdays and 1 weekend day. RESULTS: IRT resulted in an average weight loss of 13.4 ± 3.70 kg (p < 0.001), significantly reducing body fat percentage and body mass index (p < 0.001). There were significant reductions in total cholesterol (Pre: 47.9 ± 0.92 mmol.L⁻¹, Post: 41.2 ± 0.82 mmol.L⁻¹, p < 0.001), triglycerides (Pre: 1.19 ± 0.57 mmol.L⁻¹, Post: 0.74 ± 0.30 mmol.L⁻¹, p < 0.001), low density lipoprotein cholesterol (LDL-C) (Pre: 3.04 ± 0.83 mmol.L⁻¹, Post: 2.51 ± 0.74 mmol.L⁻¹, p < 0.001), Plasma Apolipoprotein (Apo) A-1 (Pre: 133.3 ± 13.1 mg.dL⁻¹, Post: 120.4 ± 14.5 mg.dL⁻¹, p < 0.001). Apo B (Pre: 88.1 ± 25.7 mg.dL⁻¹, Post: 70.1 ± 18.2 mg.dL⁻¹, p < 0.001), Total high density lipoprotein cholesterol (HDL-C) (Pre: 4.00 ± 1.01, Post: 3.26 ± 0.81, p < 0.001), and LDL/HDL-C (Pre: 2.54 ± 0.82, Post: 2.00 ± 0.72, p < 0.001). A 45% decrease in the insulin area glucose area ratio was compatible with an increase in insulin sensitivity. Daily RMR decreased by 138.6 ± 164 kcal day⁻¹ (p < 0.05). RMR after exercise decreased by 138.6 ± 164 kcal day⁻¹ (p < 0.05). RMR after exercise decreased by 138.6 ± 164 kcal day⁻¹ (p < 0.05). RMR after exercise decreased by 138.6 ± 164 kcal day⁻¹ (p < 0.05). RMR after exercise decreased by 138.6 ± 164 kcal day⁻¹ (p < 0.05). RMR after exercise decreased by 138.6 ± 164 kcal day⁻¹ (p < 0.05). RMR after exercise decreased by 138.6 ± 164 kcal day⁻¹ (p < 0.05). RMR after exercise decreased by 138.6 ± 164 kcal day⁻¹ (p < 0.05). RMR after exercise decreased by 138.6 ± 164 kcal day⁻¹ (p < 0.05). RMR after exercise decreased by 138.6 ± 164 kcal day⁻¹ (p < 0.05). RMR after exercise decreased by 138.6 ± 164 kcal day⁻¹ (p < 0.05). RMR after exercise decreased by 138.6 ± 164 kcal day⁻¹ (p < 0.05). RMR after exercise decreased by 138.6 ± 164 kcal day⁻¹ (p < 0.05).
CONCLUSIONS: Sports and sport-specific training appears to impact LM and BMC accrual differently. Men and women athletes in sports that required more intense running and perhaps more weight lifting had greater legs BMC/LM than sports that apparently do not place the same degree of stress on bones and/or LM. The degree of stress on bones for the arms does not seem sufficient to differentiate among these sports or inactive individuals, but may be more related to differences in regional LM and specific strength training programs.

Measurement of body fat can be performed using two, three, and four compartment models. Determining which technique to use in different populations is still being debated based on reliability, validity, ease of use, and subject safety. PURPOSE: To determine the differences between percent body fat measured by DEXA and impedance.

RESULTS: With the significant differences noted, care should be used when measuring and interpreting body fat composition.

CONCLUSIONS: FFMI may be an adequate predictor of strength performance across all BMI ranges. LM was also significantly correlated with performance in both normal and overweight BMI cohorts, indicating that height may not be a moderating factor in this population.

There is limited scientific literature on women’s lacrosse players, especially for body composition measurements. Understanding the relationship between body fat percentages and player position can benefit both the team and individual players. PURPOSE: To determine if body composition in female NCAA Division I lacrosse players differs between player position.

RESULTS: Positions differed in mean body composition, with the attack position having the greatest body fat percentage. Body mass was also significantly different by position. It was unexpected that the attack position had a greater body fat percentage, despite having one of the lower mean weights (although only statistically less than goalies). There were few data points for goalies (n=4), which may have limited statistical power. It is a limitation that these data are from one university team across multiple seasons. The style of play for this team influences aerobic demand and may differ from that of other teams. Because there is limited data on body composition in women’s lacrosse, further comparisons across other teams is needed.

There are distinct roles for each playing position in men’s lacrosse, which often results in apparent anthropometric differences between playing positions. However, little research has examined whether body composition, namely body fat percentage, differs by playing position. PURPOSE: To determine whether or not the body composition of collegiate male lacrosse players differs across playing positions.

RESULTS: 58 female NCAA D1 lacrosse players underwent whole body DEXA scans. Height and body mass of each player were measured on a stadiometer before each scan. A linear mixed effects model was used to determine whether body fat percentage differed by player position. Position was entered as a fixed factor, and height and body mass were included as covariates into the full factorial model RESULTS: The final model demonstrated significant main effects for position (p<0.015), body mass (p<0.001), height (p<0.001), and the interaction between position and body mass (p=0.009). Post-hoc analyses revealed attack (30.8 ± 4.2%) had significantly greater body fat than defense (29.8 ± 3.3%, p<0.021) and midfield (28.5 ± 3.9%, p=0.045). There were no other statistically significant differences in body between position categories. Attack (61.8 ± 7.7%) had a statical significantly lower body mass than goalies (76.0 ± 4.1kg, p<0.012). Midfielders (60.4 ± 14.8kg) had significantly lower body mass than defense (67.3 ± 6.2kg, p=0.044) and goalies (p<0.007).

CONCLUSIONS: Positions differed in mean body composition, with the attack position having the greatest body fat percentage. Body mass was also significantly different by position. It is a limitation that these data are from one university team across multiple seasons. The style of play for this team influences aerobic demand and may differ from that of other teams. Because there is limited data on body composition in women’s lacrosse, further comparisons across other teams is needed.

There are distinct roles for each playing position in men’s lacrosse, which often results in apparent anthropometric differences between playing positions. However, little research has examined whether body composition, namely body fat percentage, differs by playing position. PURPOSE: To determine whether or not the body composition of collegiate male lacrosse players differs across playing positions.

RESULTS: 58 female NCAA D1 lacrosse players underwent whole body DEXA scans. Height and body mass of each player were measured on a stadiometer before each scan. A linear mixed effects model was used to determine whether body fat percentage differed by player position. Position was entered as a fixed factor, and height and body mass were included as covariates into the full factorial model RESULTS: The final model demonstrated significant main effects for position (p<0.015), body mass (p<0.001), height (p<0.001), and the interaction between position and body mass (p=0.009). Post-hoc analyses revealed attack (30.8 ± 4.2%) had significantly greater body fat than defense (29.8 ± 3.3%, p<0.021) and midfield (28.5 ± 3.9%, p=0.045). There were no other statistically significant differences in body between position categories. Attack (61.8 ± 7.7%) had a statical significantly lower body mass than goalies (76.0 ± 4.1kg, p<0.012). Midfielders (60.4 ± 14.8kg) had significantly lower body mass than defense (67.3 ± 6.2kg, p=0.044) and goalies (p<0.007).

CONCLUSIONS: Positions differed in mean body composition, with the attack position having the greatest body fat percentage. Body mass was also significantly different by position. It is a limitation that these data are from one university team across multiple seasons. The style of play for this team influences aerobic demand and may differ from that of other teams. Because there is limited data on body composition in women’s lacrosse, further comparisons across other teams is needed.
statistical power to detect position-specific differences between these parameters. This data might be slightly skewed because the sample included more midfielders (n=23) than attackers (n=11), defenders (n=19), or goalkeepers (n=7). Nonetheless, no clear position-specific trends were observed for body fat percentage. However, statistically significant covariates indicate that heavier and shorter players tended to have greater body fat percentages. Further research is needed to determine if body composition differs between lacrosse players across a larger cohort from multiple teams.

Methods:
Dual Energy X-ray Absorptiometry (DXA) scans to assess body composition have become increasingly popular, especially in athletic populations. Acute factors, such as hydration status and food intake have been shown to alter DXA results (Tinsley, MSSE 2016). It is currently not known if prior strength and conditioning bouts may alter fat mass, lean mass, and bone density results.

**Purpose:** To determine if a strength and conditioning (S&C) bout, similar to what athletes regularly engage in, will alter the fat mass, lean mass, and bone content results of a DXA scan. METHODS: Fourteen strength-trained subjects (10 men, 4 women, age 24 ± 2.7 years, height 176.7 ± 8.1 cm, weight 70.2 ± 11.1 kg) were included in an athletic strength and conditioning course volunteered to participate in this study. Each subject underwent two DXA scans on the same day. The first scan was performed prior to the S&C bout. The second scan was completed within 45 minutes after completion of the S&C bout. Participants were instructed to consume their normal, free-living breakfast prior to the scan one. A food and fluid log was distributed during the informed consent process and was maintained by the participants for 24 hours prior to all DXA scans. Nutritional information was analyzed via a commercial nutrition software for macronutrients, micronutrients, and hydration status. All DXA scans were performed and analyzed by the same trained technician. After the first scan, subjects were instructed to avoid all food intake until completion of the second scan. Subjects were encouraged to drink water ad libitum during the S&C bout from individually assigned 1-liter bottles; the volume consumed during the bout was measured by weight. RESULTS: No significant difference was found (correlated t-test α = 0.05) on any of the body composition measures between pre and post DXA body composition measurements after a S&C bout (changes pre to post: fat mass 46.5–46.0 kg, lean mass 64.8–64.9 kg, bone content 3.3–3.3 kg). CONCLUSION: Based on the results of the present study, S&C bouts do not need to be considered to ensure accuracy when performing DXA scans. The physiological changes that occur in response to a single S&C bout do not affect body composition analysis of DXA scans.

RESULTS:
No significant difference was found (correlated t-test α = 0.05) on any of the body composition measures between pre and post DXA body composition measurements after a S&C bout (changes pre to post: fat mass 46.5–46.0 kg, lean mass 64.8–64.9 kg, bone content 3.3–3.3 kg). CONCLUSION: Based on the results of the present study, S&C bouts do not need to be considered to ensure accuracy when performing DXA scans. The physiological changes that occur in response to a single S&C bout do not affect body composition analysis of DXA scans.

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

**5 Of 5 Supplement**

**760 Board #21 May 30 2:00 PM - 3:30 PM**
**The Effect of Pretest Instructions and Between Day Test-Retest Reliability of Air Displacement Plethysmography**

Emily Dunston, Shelby Christe, Sayer Avena, Katrina Taylor, Annika Valke, Eastern Washington University, Cheney, WA. (Sponsor: Wendy Repovich, FACSM) (No relevant relationships reported)

Air displacement plethysmography (ADP) is considered a valid estimate of body composition. However, pretest instructions are often not followed by the general population which is imperative for tracking body composition via multiple testing sessions. **Purpose:** To determine the reliability of ADP measurements with and without pretest instructions both within and on the same day. **Methods:** Participants (n=19; 14 females, 5 males, age 20.8±1.4 years, weight 69.2±12.5 kg) completed four testing sessions across two days. ADP testing on day one (T1) and afternoon (T3) and afternoon (T4) test were completed. For T1, participants were not provided a free living breakfast prior to scan one. A food and water log was distributed during the informed consent process and was maintained by the participants for 24 hours prior to all DXA scans. Nutritional information was analyzed via a commercial nutrition software for macronutrients, micronutrients, and hydration status. All DXA scans were performed and analyzed by the same trained technician. After the first scan, subjects were instructed to avoid all food intake until completion of the second scan. Subjects were encouraged to drink water ad libitum during the S&C bout from individually assigned 1-liter bottles; the volume consumed during the bout was measured by weight. RESULTS: No significant difference was found (correlated t-test α = 0.05) on any of the body composition measures between pre and post DXA body composition measurements after a S&C bout (changes pre to post: fat mass 46.5–46.0 kg, lean mass 64.8–64.9 kg, bone content 3.3–3.3 kg). CONCLUSION: Based on the results of the present study, S&C bouts do not need to be considered to ensure accuracy when performing DXA scans. The physiological changes that occur in response to a single S&C bout do not affect body composition analysis of DXA scans.

RESULTS:
No significant difference was found (correlated t-test α = 0.05) on any of the body composition measures between pre and post DXA body composition measurements after a S&C bout (changes pre to post: fat mass 46.5–46.0 kg, lean mass 64.8–64.9 kg, bone content 3.3–3.3 kg). CONCLUSION: Based on the results of the present study, S&C bouts do not need to be considered to ensure accuracy when performing DXA scans. The physiological changes that occur in response to a single S&C bout do not affect body composition analysis of DXA scans.

**Posters**

**761 Board #22 May 30 2:00 PM - 3:30 PM**
**Relationship Between Sarcopenia Classification Methods, Relative Fat, and Skeletal Muscle Mass**

Kassi Meacham, A. Page Glave, John P. Yakek, Mary L. Williams, Jennifer J. Didier. Sam Houston State University, Huntsville, TX. (No relevant relationships reported)

Sarcopenia has been identified using muscle mass normalized by height squared (SMMH), similar to BMI, and by total mass(SMMm). As there is not a single agreed-upon definition, it is important to examine the relationships between the various methods of defining sarcopenia, body fat percentage (BF), and skeletal muscle mass (SMM).

**Purpose:** The purpose of this study was to examine the relationships between skeletal muscle index (SMI) normalized for BMI, SMM, and BFM, and SMM.

**Methods:** Participants (n = 62, 42 F, 20 M, 26.4 +/- 8.3 y) were tested using bioelectrical impedance analysis (BIA). The BIA provided information on fat mass, fat-free mass, BFM, and SMM. Skeletal muscle mass index (SMI) was calculated by dividing SMM (kg) by height squared (m^2) and by dividing SMM (kg) by total mass (kg) (SMI).

**Results:** There were significant correlations between SMMm and SMI (r = 0.49, p < 0.00), SMMm and BFM (r = 0.93, p < 0.00), SMMm and SMM (r = 0.50, p < 0.00), and SMM and SMI (r = 0.95, p < 0.00). The correlation between SMM and BFM was not significant (r = 0.20, p = 0.11).

**Conclusions:** It is important to look at both muscle mass and body fat. Both methods of identifying sarcopenia should be used as using a single method gives an incomplete picture. Ideally body fat percentage and both methods of determining sarcopenia would be used to account for individuals of differing leanness.

The accurate measurement of percent body fat (%BF) is important in the determination of a wrestler’s minimum wrestling weight (MWW) under the National Collegiate Athletic Association (NCAA) Wrestling Weight Management Program (WMP). Currently, skinfold measurements (SF), air displacement plethysmography (ADP), and hydrostatic weighing are the only approved methods of assessing body composition for the WMP. While dual energy x-ray absorptiometry (DXA) is considered a criterion method and type-A ultrasound (US) may serve as an alternative method, to our knowledge, no previous study has examined DXA or US in the determination of a wrestler’s MWW. **Purpose:** To compare SF and MWW determined using SF, ADP, US, and DXA. METHODS: Twenty-three college-aged men (21.1 ± 0.8 years) participated. As per NCAA WMP guidelines, participants reported to the lab in a euhydrated state (Urine specific gravity/Usg<1.020), %BF was estimated using SF, ADP, DXA, and US and the wrestlers’ MWW was calculated for each assessment method. **Results:** Body mass and Usg values were 83.2 ± 13.2 kg and 1.005 ± 0.004, respectively. There was a significant difference between methods for both %BF (p < 0.001) and MWW (p < 0.001). %BF values (SF=15.7±5.2%; ADP=18.1±6.4%; DXA=21.2±6.2%; US=15.2±5.2%) and MWW (SF=73.3±18.4kg; ADP=71.1±7.5kg; DXA=68.5±8.2kg; US=73.8±8.9kg) were significantly different between all methods except US and SF (p=0.586, respectively). When comparing the MWW determined by DXA to those determined by SF, the use of DXA would have allowed 57% of participants to reach one weight class lower and an additional 30% of participants to reach two weight classes lower. Compared to ADP, DXA would have allowed 48% of participants to reach one weight class lower and an additional 9% of participants to reach two weight classes lower. **Conclusions:** These data indicate that US may provide an alternative to the SF procedure when determining the MWW of a wrestler. However, when compared with two WMP-approved methods of assessment, DXA would permit approximately 57% (ADP) to 87% (SF) of wrestlers the opportunity to certify at a lower weight class. Given these preliminary
findings, future research should further examine if the currently approved methods of assessment during the NCAA WMP put a wrestler at a disadvantage by restricting weight loss.

763 Board #24  May 30 2:00 PM - 3:30 PM Comparison of Methods Assessing Body Composition in Young Adults
Maura L. Jegerski, Baruch Vainshelboim, Gabrielle M. Brennan, Henry Piascik, Sara D. Dieterich, Patricia Fitzgerdl, Stephen LoRusso, Kristofer S. Wisniewski. Saint Francis University, Loretto, PA.

Previous studies have shown that bioelectrical impedance analysis (BIA) is a simple and reliable noninvasive way to measure body composition. However, the results differ in accuracy compared to other methods. **Purpose:** To compare the validity of different BIA devices against the Bod Pod (BP) for estimating percent body fat (%BF) and lean body mass (LBM) in young adults. **Methods:** Eighty-seven subjects (45 males, 42 females) aged 20.3 ± 1.6 years with BMI 25.1 ± 5.2 kg/m² were assessed for %BF and LBM using BodPod, Tanita TBF-300A [both Aquatic (TA) and Standard (TS) modes], and InBody 770 (InB) in counterbalanced order in one session. Subjects followed a sedentary pre-test period, as mentioned in the InBody manual. **Results:** The %BF and LBM by each method are displayed in Table 1. ANOVA showed TA significantly underestimated (p<0.001), and TS significantly overestimated (p<0.001) %BF compared to BP. There was no significant difference between BP and InB (p=0.701). %BF ANOVA showed TA significantly overestimated (p=0.001) LBM, and the LBM from TS (p=0.197) and InB (p=0.825) were not significantly different from BP. **Conclusions:** The results show that each method is strongly correlated with the BP. However, there were significant differences between Tanita scale values and the BP. **Piority:** BIA devices using both hand and feet sensors and multiple frequencies are more accurate.

Table 1. Comparison of Body Composition Methods

<table>
<thead>
<tr>
<th>Method</th>
<th>%BF</th>
<th>LBM (kg)</th>
<th>Correlation with BP (%BF)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP</td>
<td>21.1 ± 11.3</td>
<td>59.8 ± 14.2</td>
<td>-0.993</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TA</td>
<td>18.3 ± 9.9</td>
<td>62.6 ± 14.8</td>
<td>-0.928</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TS</td>
<td>22.5 ± 9.3</td>
<td>59.0 ± 12.9</td>
<td>-0.921</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>InB</td>
<td>21.3 ± 10.9</td>
<td>59.9 ± 14.4</td>
<td>-0.956</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

764 Board #25  May 30 2:00 PM - 3:30 PM Lifestyle Behaviors and Body Composition in Young Adults
Stephen LoRusso, Gabrielle M. Brennan, Henry Piascik Piascik, Sara D. Dieterich, Maura L. Jegerski, Kristofer S. Wisniewski, Baruch Vainshelboim, Patricia I. Fitzgerald. Saint Francis University, Loretto, PA.

**Methods:** Three hundred eighty-four (209 women; 175 men) subjects volunteered to participate in this study (age = 20 ± 2.1 years). %BF was assessed using MFBA (InBody 770, Biospace Co.) and DXA (GE Lunar Prodigy) within the same visit. **Results:** When compared to DXA, MFBA significantly underestimated %BF (men = 16.4 ± 6.5 vs. 19.4 ± 5.0; women = 28.1 ± 7.8 vs. 32.7 ± 5.6). Linear regression analyses revealed significant correlations (men = 0.92, women = 0.93; p<0.001) and standard error of estimate values (men = 3.2%; women = 3.1%) rated as "very good" between methods. However, Bland-Altman plots revealed a weak bias for %BF (r = -0.36, p<0.001) and a large percentage of the subjects (women = 35%, men = 41%) were outside the ±3% minimally acceptable standard for accuracy. **Conclusions:** When compared to DXA, the InBody 770 underestimated %BF by greater than 3.5% in approximately half of the subjects tested in this study. Given this consistent underestimation, we recommend interpreting the %BF values produced by the InBody 770 with caution.

765 Board #26  May 30 2:00 PM - 3:30 PM Validation Of The Inbody 770 For The Assessment Of Percent Body Fat In Young Adults
Joseph L. Andreacci, FACSM1, Vincenzo Nocera1, Chelsea Wenrich1, Andrea J. Fradkin, FACSM1, Curt B. Dixon, FACSM1. Bloomsburg University, Bloomsburg, PA; 2Lock Haven University, Lock Haven, PA.

**Purpose:** To determine the accuracy of a commercially-available MFBA analyzer for the assessment of percent body fat (%BF) in young adults. **Methods:** Three hundred eighty-four (209 women; 175 men) subjects volunteered to participate in this study (age = 20 ± 2.1 years). %BF was assessed using MFBA (InBody 770, Biospace Co.) and DXA (GE Lunar Prodigy) within the same visit. **Results:** When compared to DXA, MFBA significantly underestimated %BF (men = 16.4 ± 6.5 vs. 19.4 ± 5.0; women = 28.1 ± 7.8 vs. 32.7 ± 5.6). Linear regression analyses revealed significant correlations (men = 0.92, women = 0.93; p<0.001) and standard error of estimate values (men = 3.2%; women = 3.1%) rated as "very good" between methods. However, Bland-Altman plots revealed a weak bias for %BF (r = -0.36, p<0.001) and a large percentage of the subjects (women = 35%, men = 41%) were outside the ±3% minimally acceptable standard for accuracy. **Conclusions:** When compared to DXA, the InBody 770 underestimated %BF by greater than 3.5% in approximately half of the subjects tested in this study. Given this consistent underestimation, we recommend interpreting the %BF values produced by the InBody 770 with caution.

766 Board #27  May 30 2:00 PM - 3:30 PM Association between Segmental Lean Body Mass and Muscular Strength
Joshua D. Graham. Saint Francis University, Loretto, PA.

**Purpose:** To determine the correlation between segmental LBM and various measures of muscular strength in young adults. **Methods:** 48 subjects (25 females, 23 males) aged 20.4 ± 1.9 years underwent bioelectrical impedance analysis using the InBody770 to determine total LBM, legs LBM (sum of both legs), right arm LBM, left arm LBM, and arms LBM (sum of both arms). Strength tests included 1RM bench press, 1RM leg press, maximal voluntary contraction (MVC) handgrip, and MVC deadlift. Standard 1RM protocols were used to assess 1RM for bench press and leg press. Maximal handgrip scores were measured for each arm independently and added together for the summed handgrip strength. MVC deadlift was measured using a Baseline Back, Legs, and Chest Dynamometer. **Results:** Correlation analyses showed a moderate correlation between total LBM and MVC deadlift (r = 0.557, p<0.001), legs LBM and 1RM leg press (r = 0.520, p<0.001), right arm LBM and right handgrip strength (r = 0.428, p<0.001), left arm LBM and left arm handgrip strength (r = 0.425, p<0.001), and arms LBM and summed handgrip strength (r = 0.441, p<0.001). A
It is well accepted that body fat increases with aging, and that obesity contributes to a number of negative health concerns. Clinically, body mass index (BMI) and waist circumference (WC) are the preferred measures for a quick estimate of adiposity, but it is not clear if these measures are accurate estimates in aging individuals.

**PURPOSE:** The purpose was to investigate if BMI or waist circumference (WC) are adequate measures of adiposity in those aged 50 and older.

**METHODS:** Participants were 38 men (60.7 ± 7.7 years) and 62 women (57.3 ± 7.3 years) who reported to the laboratory on one occasion. BMI was calculated using height and weight (kg/m²). WC was measured using a Gulick tape at two anatomic points; narrowest waist (WCN) and the umbilicus (WCU). Percent fat that was analyzed was air-displaced plethysmography (ADP), Bod Pod, COMSLOD and bioelectrical impedance (BIA; InBody 230, Biospace Inc.). ADP was used as the criterion measure of body composition. Correlations were calculated to examine relationships between all measures of obesity (weight related health risk and body composition). Sensitivity and specificity analyses were conducted to classify participants into categories (true positive, true negative, false positive, and false negative) to assess if WC and BMI provide correct categorization when compared to body composition by ADP.

**RESULTS:** Correlations indicated moderate to strong relationships between ADP and WC (r = 0.48), WC (r = 0.57), BMI (r = 0.565), and BIA (r = 0.885, p<0.05 for all). For all measures of WC, sensitivity was considerably higher for WCU (All-Wall: W = 86.2%, M = 47.6%) than WCN (All-Men: W = 26.8%, M = 47.6%). For BMI, sensitivity was slightly higher in women (86.2%) than men (81.0%).

**CONCLUSION:** These results suggest, that in addition to being easy to measure in the clinical setting, BMI and WC are also adequate indicators of obesity in adults aged 50 and over. Training and standardization of WC measurement techniques are warranted, since WC was more strongly correlated with ADP than WCN, suggesting that the optimal site for WC measurement is the umbilicus.

Body composition (BC) is a frequently assessed component of health-related fitness. Many different field methods are used to measure BC including bioelectrical impedance analysis and skinfolds (SKF). Recently, a portable computer based ultrasound (US) system has become commercially available for estimating BC.

**PURPOSE:** The purpose of this study was to determine the validity of a portable computer based US system and skinfolds (SKF) for estimating percent body fat (%fat) in male collegiate basketball players. METHODS: Participants’ %fat was estimated using US (3 site) and SKF (3 site), then compared to dual-energy X-ray absorptionmetry (DXA), which served as the criterion measure. Participants were 50 male collegiate basketball players (age = 20.1 (1.3) years, height = 1.86 (0.08) m, body mass = 87.9 (10.9) kg, and BMI = 24.5 (2.3) kg/m²). The ethnicity of the participants was 41 African Americans and 9 Caucasians. All participants were tested in the hydrated state (1.014 ± 0.009, Urine Specific Gravity). The validity of the US and SKF %fat estimates was based on the evaluation of each method versus the criterion value from the DXA by calculating the mean, SD, coefficient of determination (r²), and standard error of estimate (SEE) from linear regression analysis. To assess the average deviation of individual scores from the line of identity, total error (TE) was calculated for each field method. Paired sample t-tests determined pair-wise differences between measurements using an alpha level of <0.05.

**RESULTS:** The mean %fat results were as follows: US = 12.5 (4.0), SKF = 9.2 (4.5) and the DXA = 12.5 (5.1). %fat differences (mean 95% CI)] were observed between DXA and SKF [3.3 (2.5, 4.1), p<0.001] but not between DXA and US (p<0.04 (-1.4, 1.4), p=0.951). The r² values were 0.159 for US and 0.699 for SKF; SEE values for %fat were 4.7 for US and 2.8 for SKF, and total error (TE) values for %fat were 5.03 for US and 4.36 for SKF. CONCLUSIONS: In this study, neither the US nor SKF estimates provided a valid assessment of %fat. When compared to the criterion (DXA), both SKF and US produced TE values outside of the acceptable range of 4%. Relative to the DXA, neither estimate can be recommended for estimating %fat in collegiate basketball players.

**CONCLUSION:** These results suggest that, in addition to being easy to measure in the clinical setting, BMI and WC are also adequate indicators of obesity in adults aged 50 and over. Training and standardization of WC measurement techniques are warranted, since WC was more strongly correlated with ADP than WCN, suggesting that the optimal site for WC measurement is the umbilicus.

Nowadays, ketogenic diet (KD) is widely used in body aesthetics for changing body composition, even though there is a lack of research regarding to the possible benefits on muscle hypertrophy. **PURPOSE:** The purpose of this study was to evaluate the efficacy of an 8-week KD during energy surplus and a resistance training protocol on muscle hypertrophy in trained men. METHODS: 24 healthy men (age = 30 ± 4.7 years; weight=76.7 ± 8.2 kg; height=174.3 ± 19.7 cm; > 2 years of consecutive training experience) performed an 8-week resistance training (RT) program with similar hypertrophy training variables. Participants were randomly assigned to either a KD (10:20:70, n=10, NKD) or a non-ketogenic diet (55:20:25, n=10, NKD), or a control group (n=5, CK) in hypercaloric condition (39 kcal · kg⁻¹ · d⁻¹). Body composition changes were measured by dual energy X-ray absorptiometry (DXA) before and after each nutritional intervention and training t-test. Compliance with the ketosis state was monitored by measuring urinary ketones weekly. Statistical analyses to determine significant differences between groups and substantive significance were performed with paired t-test, where critical t was p<0.05, and Cohen’s d effect size (ES), respectively.

**RESULTS:** There was a significant reduction in fat mass (Δ = −10.4%, p = 0.030, ES = 0.46) and abdominal visceral adiposity in KD (Δ = −16.3%, p = 0.008; ES = 0.84), while no significant changes were observed in the NKD and CK groups. Muscle mass significantly increased after 8 weeks of RT program in the NKD group only (Δ = 2.31%, p<0.01; ES = 0.31). **CONCLUSIONS:** Our results suggest that KD can be helpful for decreasing abdominal visceral adiposity and fat mass, but not to increase muscle mass during positive energy balance in men undergoing RT. This study shows the relevance of macronutrient manipulation in RT programs, in order to improve body composition parameters focusing on training goals (fat reduction and/ or increase of muscle mass) in trained men. Supported by University of Malaga (Campus of International Excellence Andalucia Tech).
Appropriate stature and adequate somatotype is believed to be some of the most important prerequisites for sports participation and success. In baseball, there is scarce evidence on players’ anthropometric profiles, such as body weight (BW), body height (BH), and body fat % (BF%) and their association with baseball performance statistics (PS) which has led to form anecdotally based beliefs. Hence, the purpose of this study was to compare the selected anthropometric variables, only BF% is negatively correlated with both Batting Average (BA) (r=-0.17, p=0.0103). SF% was selected as the independent variable with the highest goodness of fit significantly correlating with BF% (p=0.0007) and BW (p=0.0115). With adjusted R²=0.04. CONCLUSIONS: The results indicate that leaner batters have higher SF%, SF%, SF% and BW appeared to provide the greatest predictive power of SF%. SF% is a measure of the battering productivity of a hitter and only 4% of this productivity can be explained by anthropometric variables, such as BW and BF%. The common anecdotal belief that heavier players are better batters, no matter their motor skill abilities, is not justified from the results of this study. Practitioners want to prevent their batters’ hitting productivity. Therefore, they may need to focus on other factors than anthropometrics, for instance agility, speed, power, and lower-body performance.

Anthropometric and body composition measurements can offer insight into athletes’ health as well as assist in developing training or diet regimens to enhance competitive potential. Valid and reliable assessments of these measures are vital. PURPOSE: The purpose of this analysis was to compare overall and segmental body composition data of collegiate track athletes using bioelectrical impedance analysis (BIA) and dual energy X-ray absorptiometry (DXA). METHODS: Participants visited the Human Performance Laboratory once for measurement of anthropometric data (ht via stadiometer) and body composition assessment by BIA (via InBody 570) and DXA (via GE Healthcare Lunar Prodigy Advance). Contraindications were addressed and thereafter, they followed verbal instructions provided by the InBody 570. Body weight (lbs.) determined by the InBody 570 was converted to kilograms (kg) and used in the DXA analysis, for consistency. Relative body fat (%) and regional lean mass in the arms (ArmsLean), legs (LegsLean), and trunk (TrunkLean) (kg) were compared between methods, by sex, using paired-samples t-tests. RESULTS (females): Twenty-nine females (age: 19.61±1.0 yr, ht: 168.8±7.9 cm, and wt: 65.01±13.7 kg) volunteered for testing. There were no statistical differences (ordered by BIA and DXA) for BF% [19.8±6.4 vs. 25.07±7.9%, p = 0.0001] and TrunkLean [22.1±12.7 vs. 22.1±11.62 kg, p = 0.038]. No statistical differences were found for ArmsLean [5.18±2.12 vs. 5.30±0.92 kg, p = 0.163] or LegsLean [11.75±3.3 vs. 11.73±2.5 kg, p = 0.070]. RESULTS (males): Thirty males (age: 20.5±1 yr, ht: 179.9±7.5 cm, and wt: 80.2±16.6 kg) volunteered for testing. There was a statistical difference (ordered by BIA and DXA) for ArmsLean [8.02±1.5 vs. 8.65±2.17 kg, p = 0.026], which was %BF% (p<0.05). No statistical differences were found for LegsLean [11.75±3.3 vs. 22.31±3.94 kg, p = 0.115] or TrunkLean [30.36±4.42 vs. 29.87±3.65 kg, p = 0.231]. CONCLUSIONS: Differences existed in the estimation of overall and segmental body composition depending on the method utilized. If pre-post or serial evaluations are to occur, switching assessment methods would not be appropriate.

The assessment of skinfold thicknesses is a widespread anthropometric technique to evaluate body composition. However, little is known about the relation between the changes through time in body fat assessed with only skinfolds compared with DXA.

METHODS: We analyzed the data for 66 professional male soccer players. Subjects’ body composition was evaluated two times with a time difference of one to five years between them. Ten skinfold thicknesses (10SKF, triceps, subscapular, biceps, chest, mid-axilla, iliac crest, supra spinos, abdomen, thigh, calf) were evaluated by anthropometry, and body fat (BF) by a DXA scanning (Hologic QDR4500). The changes between evaluation 1 and 2 were calculated for both 10SKF and BF for every subject. Then the determination coefficient (assuming a zero intercept), slope and SEE for the slope were calculated, where the changes in 10SKF predicted the changes in BF. We also calculated the changes in BF related to initial BF (BF%=[BF evaluation 1 - BF evaluation 2]/ BF evaluation 2). The mean ±SD, [min-max] is reported.

RESULTS: The 10SKF (in mm) at evaluations one and two were 84 ± 31 and 89 ± 27 respectively (Δ 5 ± 22 [-57 to 74]). The BF (in kg) at evaluation one and two were 10 ± 3 and 11 ± 3 (Δ 1 ± 2 [6 to 8]). The %BF at evaluation one and two were 14 ± 3 and 15 ± 3 (Δ 1 ± 3 [-7 to 9]). The BF% (expressed as percentage) was 14 ± 25 (40 to 92). There was a strong relationship between the changes in skinfold thicknesses and the changes in absolute and relative BF, but the best estimation was observed with Δ10SKF - %CBF.

CONCLUSIONS: The changes in BF (kg, % and BF%) were well estimated with the changes in 10SKF and %BF through time. The %ΔSKF had a ≥1% of change for every 1% in %BF, which is an easier definition to remember. However these changes had an error estimate threshold to overcome for increasing the chance to assess a significant change.
MEDICINE & SCIENCE IN SPORTS & EXERCISE®

B-59 Free Communication/Poster - Contact Sports

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

775 Board #36 May 30 2:00 PM - 3:30 PM
Injury Monitoring and Player Education, a Survey of Current Practices in Irish Amateur Rugby Union

Caitriona A. Yeomans, Thomas M. Comyns, Roisin Cahalan, Giles D. Warrington, FACSM, Andrew J. Harrison, Kevin Hayes, Mark Lyons, Mark J. Campbell, Ian C. Kenny. University of Limerick, Limerick, Ireland. (Sponsor: Dr. Giles D. Warrington, FACSM)

(No relevant relationships reported)

Rugby Union is one of the most played and watched collision sports worldwide, with high injury incidences widely reported in the literature. Participation rates in Rugby Union are rising with increasing popularity, particularly in Ireland with 224 amateur clubs and approximately 190,400 players currently registered. Internationally, the Irish men’s team is currently ranked in the top five in the world. PURPOSE: To evaluate injury monitoring and player education practices in Irish amateur Rugby Union.

METHODS: A survey was designed and distributed to coaches and medical staff of 58 clubs. These clubs represent the highest level of amateur Rugby Union in Ireland. The survey consisted of 27 questions, with five sections: 1) Club demographics, 2) Monitoring, 3) Education, 4) Staffing and 5) Injuries. RESULTS: Forty-nine clubs responded to the survey. Five surveys were incomplete and excluded from analysis. The overall response rate was 75.9% representing current practices of 4,843 amateur players (mean 110.57 players per club). Injuries were monitored in 91% of clubs, with medical staff recording data in 75% of cases, using paper records (52.5%), Excel spreadsheets (37.5%) or online resources (7.5%). Training load was monitored in 36% of clubs mainly by the strength and conditioning coach (37.5%). All clubs operated return to play protocols, with 64% for all injuries and 36% for concussion only. Twenty-three% conducted pre-season concussion screening and 82% educated players on concussion. Seventy-one% educated players about injury prevention.

CONCLUSIONS: Injury monitoring is crucial in collision sports such as Rugby Union, where injury risk is substantial. While comprehensive monitoring systems are prevalent in professional sport, injury monitoring is often infrequent and inconsistent in amateur settings. In order to minimize injury risk, it is the duty of care of governing bodies to implement monitoring systems in both amateur and professional cohorts. In Ireland, 91% of clubs monitor injuries by various means. The implementation of a centralized monitoring system in Irish amateur Rugby would allow injury trends to be effectively tracked and used to guide evidence-based injury prevention strategies.

Funding: The Irish Rugby Injury Surveillance Project is funded by the Irish Rugby Football Union.

777 Board #38 May 30 2:00 PM - 3:30 PM
Wearable Sensors to Quantify Performance and Fatigue during Tournament Competition among Elite Developmental Ice Hockey Players

Ken Martel, Andrea Workman, Davor Stojanov, Stephen J. McGregor. Eastern Michigan University, Ypsilanti, MI. (Sponsor: Andrew R. Coggan, Ph.D., FACSM, FACSAM)

(No relevant relationships reported)

At the highest performance levels of ice hockey (e.g. senior/professional), rules govern the number of successive competition days and prevent multiple competitions on a single day. Yet, some youth leagues run weekend showcase events that include multiple competitions per day. It is generally assumed that multiple competitions per day and several competitions over multiple days will impart excessive fatigue and impair performance, but there is no evidence directly related to ice hockey.

PURPOSE: Use player-worn sensors (PWS) to compare accelerations (ACC) and heart rate (HR) over 4 games in 3 days among elite youth ice hockey players in order to establish changes in cardiovascular stress and physical exertion associated with fatigue.

METHODS: 33 elite, youth ice hockey players in two age categories (18U: N=17, 18.2 yrs ± 92 ± 16U: N=16, 16.4 yrs ± 1) on two teams in a league showcase consented to procedures approved by the EMU-IRB. Bioharness-3 (Zephyr, MD) recorded HR and ACC at 1 Hz over the 4 games (G1-G4) in the 3-day event. Peak ACC across multiple time frames (10, 15, 20, 30, 90 sec and 2, 2.5, 3, 5, 10, 15, 20, 30 min) were measured and analyzed and HR was quantified and used in conjunction with ACC to determine exertion profiles for each on-ice session. MANOVAs for peak ACC and HR at each time point across G1-G4 with Bonferroni post hoc and multiple games per day (M1, M2) for magnitude and time as main effects were performed using SPSS 23.0 (IBM, NY; n=0.05). RESULTS: HR (bpm) decreased G1 v G4 at 3 (187.5 ± 2.8 v 176.1 ± 2.5), 5 (178.7 ± 3.0 v 165.7 ± 3.0), 10 (170.4 ± 3.1 v 157.6 ± 3.1), 15 (167.1 ± 3.0 v 153.3 ± 2.9) and 20 min (164.3 ± 3.0 v 152.4 ± 2.9)(p<.05), although ACC were not different. Peak ACC (g’s) were lower for M2 vs M1 at 60 (0.632 ± 0.012 v 0.592 ± 0.012), 90 (0.551 ± 0.050 v 0.520 ± 0.012), 120 (0.545 ± 0.009 v 0.496 ± 0.009) and 180 sec (0.412 ± 0.009 v 0.368 ± 0.009)(p<.05).

CONCLUSIONS: The decline in HR, but not ACC across games over 3 days indicates a cardiovascular adaptation as opposed to overfatigue. On the other hand, the reduced ACC from 60 - 180 sec between games 1 and 2 in a day indicate reduced shift capacity and an overall decline in performance indicative of fatigue during the second contest.

778 Board #39 May 30 2:00 PM - 3:30 PM
Movement Deficiencies in Division II Male Football Athletes as it Relates to Class and Position

Taylor A. Taraski, Jenny A. Martinez, Christopher C. Winter, Jeremy E. Glaser, Brandon M. Fjerstad, Jeremy L. Knous, Saginaw Valley State University, University Center, MI. (No relevant relationships reported)

The NCAA Division II Student-Athlete population may be subject to numerous mobility and stability deficiencies as it relates to sport and training requirements. Deficiencies must first be identified prior to prescription of sport performance training modalities. PURPOSE: Identify movement deficiencies in Division II male football athletes and investigate differences among specified groups. METHODS: Forty-three (9.9 kg, height 183 ± 6 cm) football athletes and investigate differences among specified groups. Fourteen (4.6 ± 3, 5, 10, 15, 20, 30 min) were measured. RESULTS: End-trial ACC were 2.0.14°C, R1C: 1.75 ± 0.52°C, EH: 1.70 ± 0.18°C, E1C: 1.23 ± 0.25°C. CONCLUSIONS: Preliminary data indicate that end-trial halftime from 12 to 20 min in Rugby League is effective at reducing thermal strain whereas in-plays cooling breaks of up to 3 minutes may not provide any additional benefit. These findings may also be applicable to all field based team sports (e.g. American football, soccer and Australian football (AFL)). FUNDING: This research was funded by the National Rugby League (NRL), Australia.
Resistance-training loads are commonly assigned as a percentage of an individual’s one-repetition maximum (1-RM). Unfortunately, repetition maximums do not account for an athlete’s current state of readiness (training state). The use of velocity-based training (VBT) provides objective data about training state, and is an effective and reliable method of examining an athlete’s movement efficiency. Currently, there is insufficient evidence regarding velocity profiles of exercises that are body-weight dependent (BWD) such as the free-weight back squat (BS) and deadlift (DL) compared to non-body-weight dependent (NBWD) such as the barbell bench-press (BP). PURPOSE: To determine velocity profiles for the BS, BP and DL in Division III collegiate male hockey players.

METHODS: Fourteen Division III male collegiate hockey players, (age 21.3 ± 1.5 years; height 181.2 ± 50.0 cm; mass 88.6 ± 8.8kg) completed this study. Prior to velocity testing, body composition via air displacement plethysmography (BodPod) and one repetition maximum (1RM) for the BS, BP, and DL were measured. On separate days, subjects performed nine repetitions each of the BS, BP and DL (10, 20, 30, 40, 50, 60, 70, 80, and 90% of their 1RM). Average velocity was measured with a Tendo Power Analyzer (Tendo Sports Machines, Slovak Republic). A repeated measures ANOVA was used to investigate the impact of exercise on mean velocity (alpha level of p ≤ 0.05).

RESULTS: Subject anthropometric measurements included: BMI (26.95 ± 2.0 kg/m²) and percent body fat (17.12 ± 3.4 %). 1-RMs for the BS, BP, and DL were 146.0 ± 13.1 kg, 103.7 ± 15.3 kg, and 156.84 ± 14.9 kg, respectively. A significant exercise x %1-RM interaction was found (p < .05). Mean velocity for the BP was significantly greater at 10%, 20% and 30% of 1-RM compared to the BS and DL and 90% compared to the DL (p < .017). There were no significant differences in mean velocity between the BS and DL.

CONCLUSIONS: The BS and DL, BWD exercises, demonstrated significantly slower average velocities at various levels of %1-RM compared to the BP, a NBWD exercise. While the differences were not seen throughout the entire range of %1-RM, practitioners should account for body-mass when using VBT with BWD exercises.
RESULTS: Descriptive statistics showed that the mean age of the participants was 47.7 ± 13.2 years old with a mean BMI of 29.0 ± 5.0 kg/m². 30.0% of participants were classified as High Risk for CVD, 27.8% Moderate Risk, and 16.7% Low Risk. A significant correlation was found between age and total physical activity (r = -0.505, p = 0.046) and while the correlation between BMI and extrinsic satisfaction (r = -0.493, p = 0.062) was not significant, it did imply a moderate correlation. A one-way ANOVA exhibited a significant difference between ACSM risk classification and the number of significant differences (p = 0.044). A post-hoc Tukey test indicated that individuals who are High Risk orificinate significantly more sports (p = 0.046) than those who are Moderate Risk. However, High Risk was not significantly different from Low Risk and Low Risk was not significantly different from Moderate Risk (p > 0.05).

CONCLUSIONS: Based on the results of the current study, it appears that the data can confirm that as officials get older they tend to drop out of officiating. In addition, a large degree of officials (77.8%) were considered either Moderate or High Risk for CVD, implying that the physiological stress that officiating typically entails could place these individuals at an increased risk of experiencing a cardiovascular event.

783 Board #44 May 30 2:00 PM - 3:30 PM
Hydration Status in Division III Female Hockey Players Prior to Competition
Anthony Clapp, Danielle Heitkamp. Augsburg University, Minneapolis, MN. (Sponsor: John L. Walker, FACSM) (No relevant relationships reported)

Voluminous sweating and collegiate athletes share an association, especially during competition. The accountability is on the athlete to arrive to the venue euhydrous and it is paramount for optimal performance. For the collegiate hockey player it has been reported that improper hydration will most likely cause headaches, dry mouth, sluggishness, malaise, and reduced performance. PURPOSE: To elucidate the hydration status in a group of DIII collegiate female hockey players prior to competition. METHODS: Sixteen intercollegiate athletes from a NCAA Division III Women’s Hockey team (age = 19.9 ± 0.7 yrs, height = 168.7 ± 8.2 cm, mass = 62.6 ± 9.1 kg) participated in this investigation. During an eight week span over two seasons, 16 skaters randomly provided a sample moments before competition. Urine samples were collected in a sterile 4oz specimen container and measured with a pen refractometer (ATAGO model 3749-E40) to determine urine Standard Gravity (SG). Data were analyzed using a one sample t-test against established optimal hydration levels at or below 1.020 SG. RESULTS: Mean(s) SG score was 1.0239 ± 0.0027 (p < 0.05). Three out of sixteen subjects met the criteria of the 1.020 SG or lower group. Thirteen measured between 1.022 and 1.031. CONCLUSION: This reveals a significant difference above the population standards and indicates that the majority of athletes were slightly dehydrated in that, only 16.7% were properly hydrated by SG guidelines. Thus, revealing that the typical DIII female hockey player is not adequately hydrated prior to competition and would benefit from additional guidance and preparation.

Global positioning tracking comparisons of selected NCAA Division I football player positions during conference games
Bert H. Jacobson, FACSM. oklahoma state university, Stillwater, OK. (No relevant relationships reported)

Physical Demands Of Selected Positions
Bert H. Jacobson, FACSM, Garrett E. Bayliff, Masoud Moghaddam, Carlos A. Estrada

A cross-sectional comparison of LVDd and PWT measured in junior high and senior high school athletes who play rugby with echocardiography in an effort to examine how continuous practice of rugby during the growth period affects ventricular volume expansion and ventricular septum thickening. PURPOSE: To examine if FM, BFP, and BM had any relationship with VO2peak among positional groups in collegiate male rugby union players. METHODS: Twenty-nine participants (20.3 ± 2.3 years old) agreed to perform a 20m multi-stage shuttle-run until volitional failure with the aim of estimating their VO2peak. FM, BFP, and BM, were estimated through air-displacement plethysmography via a BODPOD. Players were split into 2 groups based on their general position (forwards, n=16 and backs, n=13). RESULTS: An independent samples t-test comparing FM, BFP, and BM, VO2peak between forwards and backs revealed that the forwards had a significantly higher BM (t(27) = 5.64, p < 0.001), FM (t(27) = 2.69, p < 0.05), and VO2peak (t(27) = 4.9, p < 0.05). A Pearson correlation coefficient was calculated for the relationships between estimated VO2peak and FM, BFP, and BM for each positional group. Strong negative relationships were found between VO2peak and FM (t(14) = -76.7, p < 0.001), BFP (t(14) = -74.0, p < 0.001), and BM (t(14) = -69.9, p < 0.001) in the forwards. As for the backs, no significant relationships were found between VO2peak and FM, BFP, and BM. CONCLUSION: The higher amounts of FM, BFP, and BM in forwards likely benefits them during play as they spend a large amount of time in contact with the opposition. However, the increased amount of FM, BFP, and BM may negatively affect the forwards’ cardiorespiratory fitness as they are required to move a heavier amount of mass.

786 Board #47 May 30 2:00 PM - 3:30 PM
Longitudinal Observation Of Cardiac Adaptation In Junior Rugby Players Using Echocardiography
Kazuo Oguri1, Kosho Kasugai2, Takahiro Nakano3, Tomoaki Sakai1,1Gifu shotoku Gakuen University, Gifu, Japan. 2Gifu University, Gifu, Japan. 3Nagoya Gakuin University, Aichi, Japan. (Sponsor: Kiyoji Tanaka, FACSM) (No relevant relationships reported)

PURPOSE: The purpose of this study is to conduct a 3-year longitudinal study of cardiac adaptation in junior and senior high school athletes who play rugby with echocardiography in an effort to examine how continuous practice of rugby during the growth period affects ventricular volume expansion and ventricular septum thickening. METHODS: Subjects were 34 male junior high and 79 senior high school rugby players with top-level game experience in rugby. Subjects engaged in rugby practices and games approximately 3 hours a day, 6 days a week continuously for 3 years. We measured height, body weight, blood pressure and took electrocardiogram and echocardiography measurements once a year for 3 consecutive years in these subjects. Echocardiography measurements were taken by portable ultrasonic measurement apparatus on B mode to measure left ventricular end-diastolic dimension (LVDd) and posterior left ventricle wall thickness (PWT). As a substitute for the control group, we estimated predicted values for each subject based on their height to make a cross-sectional comparison with the actual measured values.

RESULTS: A cross-sectional comparison of LVDd and PWT measured in junior high schoolers exhibited a significant increase between the 1st and 2nd grade (equivalent of American 7th and 8th grades, respectively) (p=0.01). A cross-sectional comparison of the predicted and actual LVDd values for each year of junior high school revealed a significant difference in 2nd year students (p=0.01). In senior high schoolers, LVDd increased significantly between the 1st and 2nd grade as well as between the 2nd and 3rd grade, and PWT increased significantly between the 1st and 2nd grade (p<0.01). In senior high school, there was a significant difference between actual and predicted values of

ACSM May 29 – June 2, 2018
Minneapolis, Minnesota
Heart rate (HR) monitoring, GPS tracking, and accelerometry are new techniques for evaluating players’ activity levels during competition. Results from live tracking can help the coaches with practice schedules and game strategies. To date, there are few variables of interest in this preliminary investigation included time spent at various percentages of maximum heart rate (HRmax) as assessed by the Cooper Run Test (46.6±10.3; 33.65-4.51 kg/min). The Wingate mean power was (3743±981; 4965-8057 Watts) and total repetitions were (45.7±4.7; 38-53 repetitions). CONCLUSION: These tests present a unique fitness profile for a studied group of athletes. This profile can be useful for coaches, players and trainers within this sport, ACHA Div 1 Women’s Ice Hockey.

Heart rate (HR) monitoring, GPS tracking, and accelerometry are new techniques for evaluating players’ activity levels during competition. Results from live tracking can help the coaches with practice schedules and game strategies. To date, there are few variables of interest in this preliminary investigation included time spent at various percentages of maximum heart rate (HRmax) as assessed by the Cooper Run Test (46.6±10.3; 33.65-4.51 kg/min). The Wingate mean power was (3743±981; 4965-8057 Watts) and total repetitions were (45.7±4.7; 38-53 repetitions). CONCLUSION: These tests present a unique fitness profile for a studied group of athletes. This profile can be useful for coaches, players and trainers within this sport, ACHA Div 1 Women’s Ice Hockey.

Purpose: In ice hockey, the aerobic metabolism is responsible for up to 30% of total energy expenditure and thus, is considered as an important performance factor. Recently, a number of field tests, including the Skating Multistage Aerobic Test (SMAT) have been developed to predict VO2max in hockey players. When it was developed, the SMAT determined energy expenditure using the retro-extrapolation of the O2 recovery curve at time 0 method. With the development of portable metabolic analyzers, it would be relevant to update the VO2 values using this more precise method. In addition, the SMAT, like most field tests, assumes that participants who reach a given stage have the same oxygen cost, which is not usually true. Thus, the objectives of this research are to update the VO2 values during the SMAT using a portable breath-by-breath metabolic analyzer and to propose a simple index of skating economy (ICE) for male elite hockey players. Methods: Twenty-six elite hockey players (age 15.8±1.3 years) participated in this study. The oxygen uptake was assessed using the portable breath-by-breath metabolic analyzer and to propose a simple index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m/s and, for each stage, speed increased by 0.2m/s. In order to develop an index of skating economy (SSI = # Strides ∙ Body Mass $^{2}$), the number of skating strides was collected for each stage of the test.
can vary by up to 5 (ml·kg⁻¹·min⁻¹). Our results suggest that movement economy should be included in the prediction of VO₂max in field tests requiring high technical skills in order to improve prediction accuracy.

 Ability to generate force quickly is a primary evaluation protocol for assessing athletic potential. Jumping indices have become major indicators of potential or judging training improvement. However, there is limited information concerning these indices for college football players. PURPOSE: To compare two forms of reactive strength index (RSI) between college football linemen and backs. METHODS: Linemen (n = 11) and backs (n = 12) from an NCAA D-II program were tested for one-repetition maximum (1RM) squat (SQ), paused squat jump (SJ) and drop-jump vertical jump (DJV) determined from reach height. Flight time during SJ and ground contact time (GCT) were measured using an automated contact mat. Each player performed 3 trials of each jump. Relative 1RM SQ was expressed allometrically (SQ/kg body mass).

CONCLUSIONS: Relative 1RM SQ was positively correlated with 1RM SQ, SJ, and DJV. However, linemen had greater relative 1RM SQ than backs. This finding supports the use of RSI in assessing athletic potential for college athletes.

The combined athletic and academic demands place a significant burden on college hockey players. Numerous cross-sectional studies have been conducted with professional hockey players assessing body composition and skeletal fitness; yet, no research has investigated the longitudinal physiologic changes among elite collegiate athletes. PURPOSE: To examine changes in body composition and physiologic tests across a player’s collegiate hockey career. METHODS: Over three seasons, six elite male Canadian university hockey players (age = 21.35 ± 2.8 years, height = 175.8 ± 6.5 cm, mass = 77.9 ± 8.9 kg, body fat percentage = 11.0 ± 1.4%) participated in the study. All participants underwent physical testing (as outlined in the 2016 NHL combine) and a day after testing, one total body dual energy x-ray absorptiometry (DXA) scan to measure body composition. RESULTS: A repeated measures ANOVA used to track body composition and physiologic performance variables over a three-year period. Total and regional lean tissue mass stayed relatively constant throughout their careers. There were no significant changes in severity scores, of playing abilities, in long jump distance or impulse generated in the vertical jump as all of these assessments stayed relatively consistent throughout the entire season. As players progressed through their careers, they achieved significantly more bench press repetitions, pull-ups, and had higher Wingate peak power scores (p < .05 for all comparisons). CONCLUSIONS: Pilot findings suggest that as players progress through their collegiate hockey careers, they gain weight, total and regional body fat, and are typically stronger in respects to some fitness tests. With this knowledge, strength and conditioning coaches can work in tandem with food scientists.

794 Board #55
May 30 2:00 PM - 3:30 PM
Changes In Elite Canadian Collegiate Hockey Player’s Body Compositions And Physiologic Tests Across Playing Careers

Nathan Chiarlitti, Patrick Delisle-Houde, Ryan RE Reid, Alex Siros, Cory Kennedy, Ross E. Anderson, FACSM, McGill University, Montreal, QC, Canada. (Sponsor: Ross Anderson, FACSM)

795 Board #56
May 30 2:00 PM - 3:30 PM
Validity Of Jumping Indices For Assessing Strength

Tácito Pessoa de Souza Junior, Marcelo Saldanha Aoki, Brad J. Schoenfeld, FACSM, Alan C. Utter, FACSM®, Steven R. McAnulty, FACSM®, Tácito Pessoa de Souza Junior, FACSM®, 1Universidade Federal do Paraná, Curitiba, Brazil. 2Università di Sàpulo, Sàpulo, Brazil. 3CUNY Lehman College Bronx, NY, NY. 4Texas Woman’s University, Denton TX, TX. 5Appalachian State University, Boone, NC, NC. (Sponsor: Steven R. McAnulty, FACSM)

796 Board #57
May 30 2:00 PM - 3:30 PM
Rapid Weight Loss Induced By The Restriction of Fluids at Different Moments on the Manual Grip Strength: A Repeat Measures ANOVA Reveals for Men and Women, Basal Body Weight (Male: 75.5 ± 2.0; Female: 66.1 ± 6.7) Was Significantly Higher Than at the Time of Weighing (Male: 65.2 ± 2.1; Female: 56.9 ± 4.9) and Match Time (Male: 68.5 ± 2.1; Female: 59.6 ± 6.1). Density for Males Was Higher at Baseline (1.039 ± 0.1) Compared to 24 h Later (1.018 ± 0.1). Therefore, Women Presented a Difference in Density for the Three Moments (Baseline: 1.040 ± 0.2 > 1.030 ± 1.0 > 1.017 ± 0.1). In the Handgrip for Men It Was Evidenced Difference Between Baseline (44.2 ± 13.8) and Weighing (40.3 ± 17.7), Whereas for Women Not Found Difference.

CONCLUSIONS: Rapid weight loss showed to significantly reduce manual grip strength. In addition, we observed that this technique leads the athlete to deharden. This would possibly interfere in a negative way in the performance of the athletes. In this way, the subjective criterion of a supposed advantage in the reduction and supercompensation of the weight must be well planned so that there is no deleterious effect on the performance and health of the athlete.

PURPOSE: The aim of this study was to verify the effect of the rapid weight loss (RWL) induced by the restriction of fluids at different moments on the manual grip strength in mixed martial (MMA) athletes.

METHODS: Twenty-seven male amateur MMA athletes (age 24.0 ± 5.3 years, height 175 ± 8.2 cm, body mass 76.0 ± 14.66 kg) and twenty-three women (age 19.0 ± 6.9 years; height 164 ± 0.61 cm, body mass 66.0 ± 6.70 kg) participated in this study. All athletes had BM, handgrip strength, and hydration status assessed at baseline (10 days before the onset of RWL), the official match weigh-in, and again 24 h later (match time).

RESULTS: A repeated measures ANOVA showed for men and women, basal body weight (male: 75.5 ± 2.0; female: 66.1 ± 6.7) was significantly higher than at the time of weighing (male: 65.2 ± 2.1; woman: 56.9 ± 4.9) and match time (male: 68.5 ± 2.1; female: 59.6 ± 6.1). Density for males was higher at baseline (1.039 ± 0.1) compared to 24 h later (1.018 ± 0.1). Therefore, women presented a difference in density for the three moments (baseline: 1.040 ± 0.2 > 1.030 ± 1.0 > 1.017 ± 0.1). In the handgrip for men it was evidenced difference between baseline (44.2 ± 13.8) and weighing (40.3 ± 17.7); however for women not found difference.

CONCLUSIONS: Rapid weight loss showed to significantly reduce manual grip strength. In addition, we observed that this technique leads the athlete to deharden. This would possibly interfere in a negative way in the performance of the athletes. In this way, the subjective criterion of a supposed advantage in the reduction and supercompensation of the weight must be well planned so that there is no deleterious effect on the performance and health of the athlete.
and nutritionists to optimize meal plans in an effort to prevent weight and adipose tissue gain which may enhance on-ice play and player health across their three-year university careers.

**METHODS:** Twenty voluntary Mexican College football players participated in the study. Consented according to procedures approved by the Eastern Michigan University, Ypsilanti, MI. (No relevant relationships reported)

**Conclusions:** Indirect measurements of VO\(_2\text{max}\) can be used reliably to determine Mexican College football player’s aerobic capacity when it is not possible or feasible to measure VO\(_2\text{max}\) direct.

The use of player-worn sensors (PWS) has become increasingly common in team sports. We have previously shown a relationship between PWS metrics during on-ice sessions and laboratory measures in ice hockey. It is not clear, though, if metrics derived from PWS are indicative of player performance in terms of performance results based on measures (e.g. goals, assists, etc.). **PURPOSE:** To determine if on-ice measures obtained from PWS relate to player in-game statistics: plus/minus, goals, assists, or shots on goal.

**METHODS:** 19 members of the US National Team Development Program ice hockey team (17.5± 2.1 y, 82.0± 8.8 m, 83.1± 7.6 kg) consented to procedures approved by the EMU-HSRC. Zephyr Bioharness-3 (Zephyr, MD) PWS measured triaxial accelerations and heart rate for games. Data was downloaded to Omnisense (Zephyr, MD) and exported to database for mean maximal acceleration (MMA) determination. MMA from 10 - 90 sec at 10 sec intervals and from 2 - 60 min were calculated and used to determine relationships to game statistics. Game statistical data for each player for 10 games was obtained from USA Hockey, including plus/minus, goals, assists and shots on net. Pearson product correlations for game statistics and linear stepwise regressions were performed for game statistics vs. MMA using SPSS 22.0 (IBM, NY; v=05).

**RESULTS:** Goals were correlated with shots (r = .35; p<.01), while plus/minus was correlated to goals (r = .24; p<.01) and shots (r = .14; p<.05). Linear regressions showed that goals were significantly related to 3 min MMA (β= .139; p =.02). Assists were related to 2 min (β= .135), 30 min (β= -.37), and 60 min (β= .226) MMA (p<.05). Shots were related to 3 min MMA (β= .135; p<.05). No variables were accepted into the regression for plus/minus vs MMA.

**CONCLUSIONS:** Some metrics derived from PWS during on-ice sessions are related to game performance statistics. In particular, 2 and 3 min MMA would be indicative of a combination of anaerobic and aerobic energy system contributions and appear important for all scoring metrics.

**Keywords:** body composition, hockey, Fitness testing

---

**Introduction**

Various dietary patterns contribute to performance in team sports. Whether these variations are caused by effects of the internal circadian system or daily variations in the environment or behavioral patterns is not known. It is important to determine whether the endogenous circadian system affects RPE as this could influence sports performance when athletes experience prior jetlag.

**METHODS**

10 healthy adults (6 females, aged 52±2years [mean ± SEM]) participated in a protocol in dim light where all behaviors, including exercise, meals and sleep periods were evenly spread across the circadian cycle. After a normal night of sleep and baseline testing, participants underwent ten recuring ‘behavioural cycles’ of 2h-40min sleep opportunities and 2h-40min of standardized waking episodes. Approximately one hour after each sleep episode, participants performed cycling-ergometer exercise for 15-min at 50% predicted maximal heart rate (Karvonen’s formula). The speed and resistance were identical across each cycling bout. Participants rated their exertion

**Keywords:** body composition, hockey, Fitness testing

---

**Conclusion**

SIM of NL (45.96 ± 4.84 mL . kg\(^{-1}\). min\(^{-1}\)) and indirect VO\(_2\text{max}\) were as follows: LM’s FIM= 0.79 (p<0.05), LM’s SIM = 0.63 (p<0.05), NL’s FIM= 0.78 (p<0.05) and NL’s SIM = 0.73 (p<0.05).

**CONCLUSIONS:** Indirect measurements of VO\(_2\text{max}\) can be used reliably to determine Mexican College football player’s aerobic capacity when it is not possible or feasible to measure VO\(_2\text{max}\) direct.
Non-exercise VO\(_{\text{max}}\) prediction equations currently exist, often requiring anthropometrics were assessed and all subjects completed a questionnaire in which perceived exertion was estimated for 15 well known physical activities. VO\(_{\text{max}}\) estimations were derived from each of the activity items by dividing the metabolic equivalent by the percentage of perceived exertion. The USOP prediction of VO\(_{\text{max}}\) used both THR and the Tanaka MHR equation. Data was entered into a statistical software package where five activity items with the highest correlation to GXT VO\(_{\text{max}}\) were used in a linear regression model to create a prediction model (PEQ).

**Conclusion**

The inclusion of exertion perception in VO\(_{\text{max}}\) prediction models may strengthen the validity of non-exercise estimations. Future research should elucidate the most predictive activity items across populations. Given their ability to be self-administered, VO\(_{\text{max}}\) prediction surveys can provide valuable information to large populations where traditional evaluation methods are impractical to perform.

---

### Perceived Exertion as a Monitoring Strategy during CrossFit®: Useful or Useless?

Derek Crawford, Nicholas Drake, Michael Carper. Pittsburgh State University, Pittsburgh, KS. (No relevant relationships reported)

**Purpose**

Facing harsh criticism of potentially causing injury, CrossFit® (CF) may benefit from the inclusion of appropriate monitoring strategies. Rate of perceived exertion (RPE) is a monitoring strategy commonly used for both quantification and modulation of workloads during exercise and sports training. Despite its widespread use in CF investigations, the validity of RPE as a monitoring strategy in CF training remains untested. **PURPOSE:** To assess the utility of RPE as a monitoring strategy during CF training. **METHODS:** Six males (height, 182.8±6.6 cm; weight, 84.3±12.4 kg; and age, 25.0±5.4 years) participated in three weeks (5 days/week) of CF training. Following each training session, RPE, workout duration (Dura), and immediate post-exercise heart rate (THR) were recorded. Dura and THR were used to quantify the workload (WL) for each session. Means for RPE, Dura, THR, and WL were calculated with Tukey post-hoc adjustments were used to assess differences in training session variables between weeks 1 and 3. **Results**

There were increases in mean session THR (%Δ=+17.3%; F=4.55, p=0.066), and WL (%Δ=+23.9%; F=8.14, p=0.036) from week 1 to week 3. In contrast, mean session RPE decreased (%Δ=−4.9%; F=1.42, p=0.183) between these weeks. RPE was a better predictor of WL during week 3 compared to week 1 (week 1: r=0.36, R\(^2\)=13.5%, p=0.048; week 3: r=0.614, R\(^2\)=37.7%, p=0.001; ΔR\(^2\)=22.4%). For POMS outcomes, total mood disturbance (2.69 fold; 87.6% likelihood), tension-anxiety (3.13 fold; 90.7% likelihood), and vigor-activity (3.25 fold; 94.9% likelihood) subscales most likely highlight meaningful negative changes. **CONCLUSION:** RPE has the potential to be a useful monitoring strategy for incorporation into CF training. Questions still remain as to whether or not RPE is sensitive enough to detect early signs of overreaching during CF training.

---

### Establishment of a Non-Exercise Questionnaire Using Physical Activity Exertion Perception to Predict Maximal Oxygen Uptake in Adults

Emily W. Flanagan, Craig P. Flanagan, Graham D. Salmon, Vanessa Lara, Wesley N. Smith. University of Miami, Coral Gables, FL. (Sponsor: Arlette Perry, FACSM) (No relevant relationships reported)

Maximal oxygen uptake (VO\(_{\text{max}}\)) is an important diagnostic variable for health and fitness status. ACSM has published several sub-maximal VO\(_{\text{max}}\) prediction equations. Non-exercise VO\(_{\text{max}}\) prediction equations currently exist, often requiring variables obtained by a fitness professional. The equation published by Uth *et al.* (USOP) is often used to predict VO\(_{\text{max}}\) from age and RHR measures. No validated models incorporate perceived exertion of physical activities. Non-exercise predictions of VO\(_{\text{max}}\) may provide a quick, valuable alternative to sub-maximal assessments for healthcare providers in order to stratify disease risk and prescribe aerobic exercise.

**Purpose**

The purpose of the study was to explore the efficacy of a non-exercise VO\(_{\text{max}}\) assessment using a combination of perception of activities, body mass index (BMI), gender, and age. **Methods:** Twenty-seven subjects (ages 19-49) performed a maximal graded exercise test (GXT) and the Forestry Step Test (FST). Subject demographics were assessed and all subjects completed a questionnaire in which perceived exertion was estimated for 15 well known physical activities. VO\(_{\text{max}}\) estimations were derived from each of the activity items by dividing the metabolic equivalent by the percentage of perceived exertion. The USOP prediction of VO\(_{\text{max}}\) used both THR and the Tanaka MHR equation. Data was entered into a statistical software package where five activity items with the highest correlation to GXT VO\(_{\text{max}}\) were used in a linear regression model to create a prediction model (PEQ).

This was then compared to both the FST and USOP prediction equations. **Results:** Mean GXT VO\(_{\text{max}}\) were 48.50 ± 1.74 ml/kg/min. PEQ offset values for GXT VO\(_{\text{max}}\) were (F\(_{\text{inter}}\)=6.159, p=0.085, p=0.01), followed by FST (F\(_{\text{inter}}\)=28.635, r=0.731, p=0.001) and USOP (F\(_{\text{inter}}\)=8.575, r=0.505, p=0.007). A model using age, gender, and BMI alone yielded a Pearson correlation of 0.791. **Conclusion:** The inclusion of exertion perception in VO\(_{\text{max}}\) prediction models may strengthen the validity of non-exercise estimations. Future research should elucidate the most predictive activity items across populations. Given their ability to be self-administered, VO\(_{\text{max}}\) prediction surveys can provide valuable information to large populations where traditional evaluation methods are impractical to perform.

---

### Effect of Progressive Fatigue on Session RPE

Carl Foster, FACSM, William Sustereck, Keegan Edgerton, Richard P. Mikat, FACSM, Matthew Andre, John P. Porcari, FACSM. University of Wisconsin-La Crosse, La Crosse, WI. (No relevant relationships reported)

**Introduction**

The Session Rating of Perceived Exertion (sRPE) is an accepted surrogate measure of exercise intensity. The purpose of this study was to examine the effect of progressive fatigue from heavier than normal training on sRPE. **Methods:** Twelve moderately fit college age students completed 30-min or 60-min interval
workouts on a cycle ergometer, with the sequence of sessions designed to test the hypothesis that sRPE for a given exercise bout would increase with progressive fatigue, whether from a longer bout, or from successive days of harder than usual bouts. The workouts were Monday through Thursday for two weeks. The first week was three 30-min sessions (e.g. normal training) followed by a 60-min session (30-min session repeated 2x) (e.g. heavier than usual training). The second week was three 60-min sessions followed by a 30-min session. sRPE was measured 30-min post exercise, and RPE and HLa intervals at 10 min post exercise. Results: The 30-min sessions in week 1 had sRPE that was significantly less than the 60-min session (4.3 ± 1.7, 4.3 ± 1.4, 4.5 ± 1.7, 5.3 ± 1.8). During week 2 the 60-min sessions became progressively harder, before the recovery 30-min session on day 4 (5.3 ± 1.4, 5.9 ± 1.6, 6.0 ± 2.1 & 4.5 ± 1.6). The mean RPE/HLa during the exercise bouts, a potential index of glycogen depletion mediated fatigue, followed a relatively constant course in week 1 (0.7 ± 0.2, 0.9 ± 0.4 & 0.9 ± 0.4) and an increasing course in week 2 (0.8 ± 0.4, 0.9 ± 0.4, 1.0 ± 0.4 & 0.9 ± 0.4). Conclusion: The results suggest that in addition to being a surrogate of exercise intensity, sRPE reflects accumulated fatigue during periods of increased training.
Often, rating of perceived exertion (RPE) is assessed during a one-repetition maximum (1RM) strength test to validate that a true 1RM has been reached. Recently, data have indicated variance in reported RPE at 1RM across individuals. However, it is not known what accounts for this variation. Two proposed traits which may affect an individual’s RPEs are self-confidence and acute anxiety. PURPOSE: Therefore, the purpose of this investigation was to examine the relationship between self-confidence, somatic anxiety, and cognitive anxiety with RPE at a 1RM in the back squat. METHODS: Fifty-eight resistance-trained males (n=41) and females (n=17) (age: 23±3yrs; body mass: 80.6±16.49 kg) completed the Revised Competitive State Anxiety Inventory-2 (CSAI-2) questionnaire prior to performing a 1RM back squat. Additionally, participants completed a perceived self-efficacy (PSE) questionnaire in which participants stated what they believed they would be 100%, 75%, and 50% confident they could squat for a 1RM. Next, following a 5-minute dynamic warm-up, subjects completed a validated 1RM back squat protocol. At all 1RM attempts, subjects recorded an RPE value using the repetitions in reserve (RIR)-based RPE scale. Pearson’s product moment correlations were then utilized to determine the relationship between the self-confidence, somatic, and cognitive anxiety subscales of the CSAI-2 with RPE at 1RM. RESULTS: Self-confidence was positively and significantly related to RPE at 1RM (r=0.26, p<0.05). However, neither somatic anxiety (r=0.09, n=0.97) nor cognitive anxiety (r=0.19, p=0.16) were significantly related to RPE at 1RM. CONCLUSIONS: These results indicate that increased self-confidence is associated with higher reported RPE during a 1RM squat test, while heightened anxiety does not alter the perceptual response during a maximal strength test. It is possible that those with high self-confidence chose higher loads and reached a true 1RM accounting for the high RPE.

Performance foam, when used as an adjunct to training, may positively affect thresholds within the muscle allowing for more intense training, longer training sessions, possible muscle recovery, and a decrease in delayed onset muscle soreness symptoms. PURPOSE: To evaluate the effectiveness of a performance foam on perceived exertion and self-reported recovery on performance in adults participating in a high-intensity functional exercise program. METHODS: Thirty adults (age: 31.2±8.1; males: n=12, 176.9±6.2 cm, 89.5±15.1 kg; females: 164.7±7.1 cm, 80.0±16.1 kg) participated in a randomized counter-balanced and double blind trial over a 2-week period. Randomized experimental conditions (ExCon) consisted of performance foam (PF) or placebo (P) foam. Participants completed 5 workouts each week and applied either PF or P to the primary muscles used before and after each daily workout and before going to bed. Rating of perceived exertion (RPE) was assessed after each workout, and self-reported recovery was assessed using the perceived recovery scale (PRS) the following day. Four repeated measure ANOVAs were assessed after each workout, and self-reported recovery was assessed using the perceived recovery scale (PRS) the following day. Four repeated measure ANOVAs were completed with Bonferroni post hoc comparisons to evaluate differences between corresponding intensities (M±SD) and %RPE by time and between minute 2 and 20 for each bout. RESULTS: There were no statistically significant differences (p>0.05) for RPE between M and 60% (2min: 2.3±1.7 and 1.9±1.5; 20min: 4.3±2.8 and 4.8±1.8, respectively) or between V and 80% (2min: 154.1±28.1 and 153.6±28.6; 20min: 179.8±26.9 and 184.7±24.8, respectively). There were no statistically significant differences (p>0.05) for RPE between M and 60% (2min: 2.9±2.7 and 1.9±1.1; 20min: 4.3±2.8 and 4.8±1.8, respectively) or between V and 80% (2min: 4.3±2.1 and 3.5±1.6; 20min: 7.2±1.8 and 7.8±1.5, respectively). HR and RPE increased significantly from minute 2 to 20 during each bout (p<0.0001). CONCLUSION: HR and RPE did not differ between self-selected and calculated exercise bouts, but shifted significantly within all sessions. While subjects showed attitude at selecting proper intensities, caution must be used when prescribing exercise based on HR or RPE.

The ideal performance state is manifested by optimal psychological and physiological efficiency. The effects of anxiety and self-confidence have been shown to alter psychological and physiological efficiency and hence performance. PURPOSE: This study attempted to identify the state anxiety and self-confidence of high school athletes just prior to a one repetition maximum (1-RM) back squat and determine if the number of spotters affects an athlete’s level of state anxiety and/or self-confidence. METHODS: Male high school athletes (10th and 11th grades) were randomly separated into two experimental groups who performed the 1-RM back squat (BSQ) with either 1 spotters (1SG: n=52) or 3 spotters (3SG: n=54). Following a dynamic warm-up protocol, subjects were given several progressive BSQ warm-up sets, and just prior to attempts at a 1-RM BSQ, the participants completed the revised Competitive State Anxiety Inventory-2 (CSAI-2R). The CSAI-2R included the number of spotters (1 or 3) that would be present during the subsequent 1-RM BSQ attempts. The CSAI-2R is a 17-question instrument with three subscales (self-confidence, somatic anxiety, and cognitive anxiety). The subscale scores were compared between the 1SG and 3SG with an independent t-test (alpha=0.05). RESULTS: Competitive State Anxiety Inventory-2 scores were 1SG (self-confidence=30.2±1.6, somatic anxiety=17.0±4.7, and cognitive anxiety=20.1±5.6) and 3SG (self-confidence=28.4±6.8, somatic anxiety=16.5±5.1, and cognitive anxiety=19.0±5.7). None of the subscales (self-confidence, somatic anxiety, and cognitive anxiety) were significantly different between the 1SG and 3SG experimental groups (p>0.05). CONCLUSION: Within the parameters of this study, the number of spotters present during the execution of the 1-RM BSQ had no practical or statistical impact on self-confidence, somatic anxiety, and cognitive anxiety. Coaches and athletes could use this information in the training environment in order to make best use of personnel (assigned to spotting tasks), physical resources (ex. squat racks), and time management.
The ability of athletes and coaches to adapt training in order to improve athletic performance and prevent injuries is the cornerstone of modern sports medicine. Overtraining syndrome occurs when training consistently occurs at or above lactate threshold without appropriate recovery. It is critical that the coach’s perceptions of effort and intensity of training are similar to what the athlete experiences.

**PURPOSE:** The purpose of this study was to evaluate the training regimen fidelity and quantify training load and intensity in female division I collegiate distance runners.

**METHODS:** An observational descriptive longitudinal design was utilized. The duration of the data collection was 14 weeks. The subjects were six collegiate female track and field distance athletes (21±3 years of age) who ran >800 meter events. Baseline pre-training heart rate and blood lactate levels were recorded during a custom six stage treadmill test. Blood lactate, duration, rate of perceived exertion (RPE), average heart rate for each training session and hours slept nightly were recorded. **RESULTS:** Average training intensity (duration x RPE) over the course of the competitive season as prescribed was 159.56. The mean value was 144.5 and results ranged from 126.21 to 156.62. Coach intended training load (duration x blood lactate average) was 170.75 athletes ranged 73.25 to 140.66; mean = 109.36. Hours of sleep averaged 7.8 the day before a meet and 7.3 the day after. Easy training days (intended RPE of 1.5 out of a possible 10) showed a discernible difference with actual RPE higher than the target value (mean 3.4 ±2.2, range 2.7-4.26). Intermediate training days (intended RPE of 4.3) had a lower RPE than target with a mean of 3.9 ±1.6 (range 3.0 - 4.8). Hard training days (intended RPE of 8.16) showed the most marked difference from target with a mean of 6.24 ±1.4 (range 4.94 - 7.25). **CONCLUSIONS:** Similar to male athletes, female athletes perceived easier workouts as more difficult and harder workouts as easier than their coaches intended. Average training intensity and training load (duration x blood lactate average) were measurably less than their coach intended. The combination of poor adherence to their coach’s training regimen and potentially inadequate recovery may be some of the etiologies for increased overuse injuries in female athletes.

**Conclusions**

High-intensity interval training (HIIT) has been shown to be an effective form of training to improve aerobic fitness. Plasma volume shift has the potential to contribute to acute fatigue via temporary reduction of blood volume. There is a lack of data regarding the acute effects of HIIT on plasma volume shifts over the course of an HIIT protocol. **PURPOSE:** The purpose of the study was to determine the effects of a bout of HIIT on changes in plasma volume during and after the protocol.

**METHODS:** Eight participants (1 female, 7 males) completed a preliminary session to collect anthropometric data and determine cardiorespiratory fitness, followed by an experimental session. During the experimental session, a modified Tabata HIIT protocol on a cycle ergometer was completed: six 15-second sprints at maximum effort against a resistance proportional to lean body mass with two minutes of active recovery between sprints. Hematocrit was determined using a microhematocrit method and hemoglobin was determined using a hemoglobin meter. Plasma volume shifts were determined using hematocrit and hemoglobin concentrations. **RESULTS:** A repeated measures ANOVA was used to determine changes in oxygen consumption (VO2), mean arterial pressure (MAP), heart rate (HR), and minute ventilation (Vt); t-tests were used for post-hoc analysis. Additionally, shifts in plasma volume were compared using a paired t-test. A significant (P < 0.05) change from pre- to mid-HIIT occurred for HR (80.62±5.42 to 173.50±3.78 b/min), VE (26.75±2.87 to 69.85±6.95 L/min), VO2 (11.68±1.45 to 29.35±9.64 ml/kg/min), MAP (93.08±1.65 to 122.75±2.96 mmHg), and plasma volume shift (-12.28±2.14%) with significantly (P < 0.05) greater changes in HR from mid- to post-exercise (173.50±3.78 to 181.00±3.15 b/min) but not VE, VO2, MAP or plasma volume shift (-2.69±1.85%). **CONCLUSION:** Findings revealed that 13 min of HIIT increases cardiorespiratory stress and results in large plasma volume reductions from pre- to mid-exercise with smaller reductions from mid- to post-exercise. These acute reductions in plasma volume are similar to reductions that have been reported after running a marathon.

**Conclusions**

**Purpose**

The ability of athletes and coaches to adapt training in order to improve athletic performance and prevent injuries is the cornerstone of modern sports medicine. Overtraining syndrome occurs when training consistently occurs at or above lactate threshold without appropriate recovery. It is critical that the coach’s perceptions of effort and intensity of training are similar to what the athlete experiences.

**Purpose**

The purpose of this study was to evaluate the training regimen fidelity and quantify training load and intensity in female division I collegiate distance runners.

**Methods**

An observational descriptive longitudinal design was utilized. The duration of the data collection was 14 weeks. The subjects were six collegiate female track and field distance athletes (21±3 years of age) who ran >800 meter events. Baseline pre-training heart rate and blood lactate levels were recorded during a custom six stage treadmill test. Blood lactate, duration, rate of perceived exertion (RPE), average heart rate for each training session and hours slept nightly were recorded. Results:

**Results**

Average training intensity (duration x RPE) over the course of the competitive season as prescribed was 159.56. The mean value was 144.5 and results ranged from 126.21 to 156.62. Coach intended training load (duration x blood lactate average) was 170.75; athletes ranged 73.25 to 140.66; mean = 109.36. Hours of sleep averaged 7.8 the day before a meet and 7.3 the day after. Easy training days (intended RPE of 1.5 out of a possible 10) showed a discernible difference with actual RPE higher than the target value (mean 3.4 ±2.2, range 2.7-4.26). Intermediate training days (intended RPE of 4.3) had a lower RPE than target with a mean of 3.9 ±1.6 (range 3.0 - 4.8). Hard training days (intended RPE of 8.16) showed the most marked difference from target with a mean of 6.24 ±1.4 (range 4.94 - 7.25).

**Conclusions**

Similar to male athletes, female athletes perceived easier workouts as more difficult and harder workouts as easier than their coaches intended. Average training intensity and training load (duration x blood lactate average) were measurably less than their coach intended. The combination of poor adherence to their coach’s training regimen and potentially inadequate recovery may be some of the etiologies for increased overuse injuries in female athletes.

**Blood Flow Restriction (BFR) applied as a percentage of arterial occlusion pressure (AOP) combined with low load resistance exercise in the upper body elicits a cardiovascualr response that, compared to high-load resistance exercise, appears dependent upon the load as well as the cuff pressure. The response to very low load resistance exercise (15% AOP) combined with BFR is unknown. **PURPOSE:** To investigate the cardiovascualr and hemodynamic responses to very low load resistance exercise combined with BFR, and compare these to high load resistance exercise in the upper body. **METHODS:** Sixty-six (50% men) participants (18-35 yrs) were recruited and, following 1RM testing, were randomly assigned to either high load (HL) at 70% IRM or very low load at 15% IRM. Very low-load conditions were no restriction (VLL0), 40% AOP (VLL40), or 80% AOP (VLL80) applied using a 5cm cuff. Four sets of unilateral biceps curls were performed to failure or 90 repetitions, whichever occurred first. Blood pressure (SBP/DBP) was taken before and after. Ultrasound measures of blood flow (BF) were taken at rest, following Set 2, and 1 minute after exercise. Repeated measures ANOVA tests were performed to determine whether differences occurred across time and condition. Results presented as mean (SD). **RESULTS:** Participants were 1.72 (0.1) m tall, weighed 72.0 (13.8) kg, with a 1RM of 15.9 (7.4) kg, and AOP of 103 (73) mmHg. There were no interactions for SBP (p = 0.416), DBP (p = 0.414), but an interaction existed for BF (p = 0.0005). Main effects of time found that SBP (change of 10 [95% CI: -22 to 1] mmHg) and DBP (change of 6 [13] mmHg) increased. BF increased following Set 2 in all conditions except for VLL80 (p=0.129), which remained similar to pre until 1 minute post deflation [change of 378 (256) ml·min⁻¹]. Following set 2, BF was similar between VLL0 [547 (244) ml·min⁻¹] and HL [465 (269) ml·min⁻¹]; both were greater than VLL40 [365 (189) ml·min⁻¹].

**Cardiovascular Responses to Blood Flow Restriction and Very Low Load Resistance Exercise in the Upper Body**

J Grant Mouser, Kevin T. Mattocks, Scott J. Dankel, Samuel L. Buckner, Matthew B. Jesse, Zachary W. Bell, Takashi Abe, Jeremy P. Loenneke. The University of Mississippi, University, MS

**No relevant relationships reported**

**Abstracts were prepared by the authors and printed as submitted.**
814 Board #75 May 30 3:30 PM - 5:00 PM
Acute Hemodynamic Response to Very Low Load Resistance Exercise With or Without Blood Flow Restriction
Kevin T. Mattocks, J Grant Mooser, Matthew B. Jesse, Scott J. Dankel, Samuel L. Buckner, Zachary W. Bell, Takashi Abe, Jeremy P. Loenneke. The University of Mississippi, University, MS.
No relevant relationships reported

Although lifting a load at 30% one-repetition maximum (1RM) to failure elicits an increase in muscle size similar to high load resistance exercise, it is unknown if an individual can reach failure when lifting loads <20% 1RM. PURPOSE: To determine changes in blood pressure and blood flow following exercise with and without different levels of BFR (based on arterial occlusion pressure (AOP)) while using a very low load (15% 1RM) and compare those changes with high load resistance exercise with BFR. METHODS: Data from this pilot investigation suggest that intra-subject variation in mean arterial pressure during post-exercise circulatory arrest may associate with SNPs of genes putatively linked to the metabolic component of the exercise pressor reflex. Additional work is warranted to confirm these observations and explore the mechanistic role of TRP channels in exercise pressor reflex responsiveness. Supported in part by the Huck Institutes of the Life Sciences and the College of Health and Human Development.

815 Board #76 May 30 3:30 PM - 5:00 PM
Acute Hemodynamic Response With or Without Blood Flow Restriction
Kevin T. Mattocks, J Grant Mooser, Matthew B. Jesse, Scott J. Dankel, Samuel L. Buckner, Zachary W. Bell, Takashi Abe, Jeremy P. Loenneke. The University of Mississippi, University, MS.
No relevant relationships reported

Although lifting a load at 30% one-repetition maximum (1RM) to failure elicits an increase in muscle size similar to high load resistance exercise, it is unknown if an individual can reach failure when lifting loads <20% 1RM. PURPOSE: To determine changes in blood pressure and blood flow following exercise with and without different levels of BFR (based on arterial occlusion pressure (AOP)) while using a very low load (15% 1RM) and compare those changes with high load resistance exercise with BFR. METHODS: Data from this pilot investigation suggest that intra-subject variation in mean arterial pressure during post-exercise circulatory arrest may associate with SNPs of genes putatively linked to the metabolic component of the exercise pressor reflex. Additional work is warranted to confirm these observations and explore the mechanistic role of TRP channels in exercise pressor reflex responsiveness. Supported in part by the Huck Institutes of the Life Sciences and the College of Health and Human Development.

816 Board #77 May 30 3:30 PM - 5:00 PM
Comparison of Exercise-induce Endothelial Shear Stress Between Poiseuille’S Law and Womersley’S Approximation
Francisco J. Morales¹, Brycen J. Ratcliffe², Caleb D. Harrison³, Evan J. Bockover⁴, Sierra Crowe⁵, Colin R. Carriker⁶, Alvaro N. Gurovich, FACSM¹. ¹The University of Texas at El Paso, El Paso, TX. ²Indiana State University, Terre Haute, IN. ³High Point University, High Point, NC.
No relevant relationships reported

Purpose
Endothelial dysfunction is the first step for the development of atherosclerosis, and one protective regulatory mechanism is exercise-induced endothelial shear stress (ESS). To quantify ESS, most clinical studies employ Poiseuille’s law rather than Womersley’s approximation, although Poiseuille’s law underestimate the dynamic properties of blood flow. The aim of this study is to compare ESS calculated by Poiseuille’s law to ESS estimated by Womersley’s approximation during exercise.

Methodology
Twelve young healthy subjects (age 13-31, 10 males and 2 females) were recruited to perform two exercise tests on a cycle ergometer. The first test was a maximal incremental test to establish the workloads for the next test, according to lactate levels. The second one, performed at least 48 hours after the first exercise test, was a three 5-minute workload steady-state test at lactate levels of 0-2, 2-4, and >4 mmol/L. Blood flow patterns of the brachial artery were recorded via Doppler ultrasound. For Poiseuille’s law ESS was determined among antegrade and retrograde blood flows using ESS=μ*SR and SR=2*K*V/D, where μ is blood viscosity, SR is shear rate, VS is peak systolic or diastolic blood flow velocities, and D is blood diameter. For Womersley’s approximation ESS=μ*SR and SR=2*K*V/D were used, where k is a complex factor dependent on Womersley parameter (α), and α=(π/D²)(ρ/μ)², where ρ is the angular frequency of the flow pulsation (ω=freq)²π, and μ is blood density. Statistical analysis included paired t test to compare ESS from both estimations.

Results
ESS was significantly higher for Womersley’s approximation in comparison to Poiseuille’s law at rest and during all exercise intensities for antegrade flow (basal: 34.7±5.8 vs. 13.1±2.6 dynes/cm²; 0-2 mmol/L: 41.1±17.6 vs. 15.3±4.8 dynes/cm²; >4 mmol/L: 44.2±17.2 vs. 16.5±7.2 dynes/cm²; 0-2 mmol/L: 57.0±21.6 vs. 21.0±8.0 dynes/cm²; all p<0.05) and retrograde flow (basal: 6.9±3.9 vs. 3.9±1.2 dynes/cm²; >4 mmol/L: 11.3±5.6 dynes/cm² vs. 4.3±2.0 dynes/cm²; 0-2 mmol/L: 17.4±9.2 vs. 4.6±1.5 dynes/cm²; >4 mmol/L: 19.6±8.4 vs. 7.2±3.0 dynes/cm², all p<0.05).

Conclusion
Exercise-induced ESS is underestimated by Poiseuille’s law. Womersley’s approximation might be a better approach to estimate ESS in resting conditions and during exercise.

817 Board #78 May 30 3:30 PM - 5:00 PM
Influence of High-Intensity Exercise on Aortic Stiffness and Femoral Artery Shear Patterns
Jacob P. DeBlois¹, Wesley K. Lefferts², Kevin S. Heffernan³, Bo Fernhall, FACSM³. ¹University of Illinois Chicago, Chicago, IL. ²Indiana State University, Terre Haute, IN. ³University of Connecticut, Storrs, CT.
No relevant relationships reported

Influence of High-Intensity Exercise on Aortic Stiffness and Femoral Artery Shear Patterns
Jacob P. DeBlois, Wesley K. Lefferts, Kevin S. Heffernan. Syracuse University, Syracuse, NY.

Aortic stiffness is linked to atherogenic retrograde and oscillatory shear patterns in peripheral arteries. High-intensity exercise may increase aortic stiffness. Whether such acute changes in aortic stiffness negatively influences superficial femoral artery (SFA) shear rates (SR) and stiffness following high-intensity cycling. METHODS: 20 adults (27±5 yrs; 10 women) underwent arterial assessment at baseline (BL), after a 5-min time control period (TC), and following a 30-sec bike sprint against 7% body mass (POST). Aortic stiffness was measured using carotid-femoral pulse wave velocity (cPWV), SFA diameter, blood velocity, and stiffness (f stiffness and Young’s elastic modulus, c) were measured via Doppler ultrasound. Diameters and blood velocities were used to determine SFA antegrade and retrograde SR as well as the oscillatory shear index (OSI). RESULTS:
Hemorrhage is a leading cause of trauma deaths. Many of these deaths could be prevented with early detection and appropriate treatment. Traditional vital signs such as heart rate (HR) and mean arterial pressure (MAP) can remain relatively normal despite the central hypovolemia that occurs during blood loss. Ultrasound measurements of the inferior vena cava diameter (IVCD) have been used clinically as gross indicators of central hypovolemia. However, it is not known if reductions in IVCD occur prior to changes in traditional vital signs during blood loss in humans. PURPOSE: To test the hypothesis that reductions in IVCD occur prior to changes in traditional vital signs during blood loss in humans.

METHODS: Blood loss was stimulated using lower body negative pressure (LBNP) in fourteen healthy men (22±2 years). Pressure within the LBNP chamber was reduced by 10 mmHg every four minutes until the pressure reached -80 mmHg or subjects fainted. Systolic blood pressure (SBP) and MAP were recorded using a BP cuff. Heart rate (HR), time to faint, radial pulse volume (RPV), and central venous pressure (CVP) were measured throughout. SBP and MAP were calculated using a BP cuff and radial pulse volume. HR was calculated using an ActivPal. Change (Δ) in PSR and physical behavior (PB) within groups across measurement time points were evaluated using mixed linear models (p<0.05). The PSR model was adjusted for demographics (age, gender, race, ethnicity) and systolic blood pressure, and PB models were adjusted for demographics, avg. daily monitor wear-time and total wear-days. RESULTS: Between B and M3, both the D and T groups significantly reduced SED time (T: mean ± SD of Δ for daily proportion=-17.0% ± 3.8%, P<0.01; D: mean ± SD for a daily proportion=7.6% ± 3.1%, P<0.01). Neither D nor T groups significantly increased step time. Changes in PB (B to M3) for D and T returned to baseline levels by M6. In conjunction with the PB change (B to M3), population PSR decreased significantly between B and M6 in group D (mean Δ (95% CI)= -307.1 s (-478.0 to -135.7) and T (mean Δ (95% CI), P= -210.0 s (-378.3 to -41.7)). These changes were sustained to M12. Conclusions: A few months of increasing workplace standing using workstatation-based strategies may yield chronic reductions in PSR that extend beyond the duration of the PB change. Given the greater likelihood of atherosclerotic lesions developing in vasculature with low shear stress, increasing workplace standing may have a negative atherogenic effect. Further studies are needed to see if replacing sitting with stepping, rather than standing, increases shear rate.
821 Board #82 May 30 3:30 PM - 5:00 PM
Calf Venous Compliance in College Age Male Smokers and Non-smokers
Juliane P. Wallace, FACSM, Jocelyn Rothschild-Frey, Southern Illinois University, Carbondale, IL.
(No relevant relationships reported)

Smoking causes endothelial damage and autonomic dysfunction which leads to decreases in arterial compliance. Similar to changes in arterial compliance with fitness and aging, calf venous compliance improves with higher fitness and declines with increasing age. While previous studies have compared smokers and non-smokers for changes in arterial wall properties, no research to date has investigated the impact of smoking on limb venous compliance. PURPOSE: To determine the calf venous compliance differences in college age smokers (S) versus non-smokers (NS).

METHODS: 7 S’s (12-19 years of smoking; mean of 4 pack years; age = 22 ± 4 yrs; mass = 83.7 ± 18.4 kg; ht = 181.1 ± 9.5 cm; BMI = 25.4 ± 4.4 kg/m²; calf volume = 2485.4 ± 482.1 ml; VO₂ max = 34.3 ± 7.8 ml/kg/min) and 7 NS’s (age = 23 ± 2 yrs; mass = 76.6 ± 5.8 kg; ht = 172.6 ± 4.7 cm; BMI = 24.7 ± 2.0 kg/m²; calf volume = 2242.1 ± 450.8 ml; VO₂ max = 38.0 ± 4.1 ml/kg/min) volunteered for this project. Participants underwent anthropometric assessment, a graded exercise test, and assessment of calf venous compliance. Utilizing venous occlusion plethysmography, calf pressure-volume relations were determined using the quadratic regression equation [Δ limb volume] = β₁ + β₂ (cuff pressure) + β₃ (cuff pressure)². Calf venous compliance was calculated as the first derivative of the pressure-volume relation during calf pressure reduction [Compliance = β₁ + β₂ (calf pressure)]. Differences in anthropometric, fitness, and compliance variables between S & NS were analyzed with a simple ANOVA.

RESULTS: There were no significant differences between S & NS in anthropometric variables or fitness except the smokers were significantly higher in body fat (%: 19.2 ± 6.5% vs. non-smokers at 12.3 ± 2.7%). There were no significant differences between S & NS in calf volume or compliance [S, Δ volume = 0.8093 ± 1.401 ± 0.006123 * (cuff pressure) - 0.0010 ± 0.0000028 * (cuff pressure)² vs. NS, Δ volume = -0.3874 ± 1.39718 ± 0.1211 ± 0.06413 ± 0.0011 ± 0.000069 (cuff pressure)].

CONCLUSIONS: College age male smokers have similar calf venous compliance to non-smokers. It is likely that the chronic effects of smoking that would alter the vessel wall and subsequently decrease venous compliance have not had enough time to influence venous wall structure in men in their early 20’s.

823 Board #84 May 30 3:30 PM - 5:00 PM
The Effects Of Cuff Width On Hemodynamics In The Legs During Blood Flow Restriction
Scott J. Dankel, J Grant Mouser, Kevin T. Mattocks, Matthew B. Jessic, Samuel L. Buckner, Takashi Abe, Jeremy P. Loenneke, The University of Mississippi, University, MS.
(No relevant relationships reported)

Blood flow restriction allows individuals to exercise with low loads while producing similar increases in muscle size as high load resistance training. It has been suggested that the pressure should be made relative to the individual (as a percentage of their arterial occlusion pressure), but it remains unknown if a given pressure results in a similar reduction in blood flow, and further, whether this differs based on the width of the cuff being applied. PURPOSE: To examine hemodynamic responses to various relative pressures in the supine position using two commonly used cuffs (10 cm and 12 cm).

METHODS: Participants (men=17, women=14) came to the laboratory for two visits. One cuff (10 cm or 12 cm) was randomly applied to the right proximal thigh for each visit and arterial occlusion pressure was measured. Ultrasound measures of blood flow, mean blood velocity, peak blood velocity, and artery diameter were taken from the posterior tibial artery at rest and during the application of 10% increments of the arterial occlusion pressure. A repeated measures ANOVA was used to examine differences across conditions. RESULTS: There was no significant interaction or an overall difference between the 10 cm and 12 cm cuff relating to blood flow [F(1,50) = 7.9, p = 0.028], mean blood velocity [-0.168 (1.7) cm/sec * p = 0.590], peak blood velocity [0.586 (11.7) cm/sec * p = 0.783], or artery diameter [0.003 (0.2) cm, p = 0.476]. There was a main effect of pressure for blood flow (p < 0.05), mean blood velocity (p < 0.05), peak blood velocity (p < 0.05), and artery diameter (p < 0.05), with each decreasing with increasing pressures. Peak blood velocity increased until 60% of arterial occlusion pressure before decreasing with increased pressure. The 80% and 90% arterial occlusion pressures reduced blood flow by 69.4% and 79.3% respectively when collapsed across the 10 cm and 12 cm cuffs. No other pressures differed significantly between the relative applied pressure and amount of blood flow restricted.

CONCLUSIONS: Provided relative pressures are applied, cuff width appears to have little to no effect on the blood flow response at rest. Importantly, relative pressures may not indicate the magnitude of blood flow being reduced (e.g. 80% arterial occlusion may not reduce 80% of blood flow), particularly at higher arterial occlusion pressures.

824 Board #85 May 30 3:30 PM - 5:00 PM
Manipulation of Retrograde Shear in the Superficial Femoral Artery in Recreationally Active & Exercise- Trained Men
Patricia Pagan Lassalle, Adam J. Palamar, Jacob P. DeBlois, Wesley K. Lefferts, Kevin S. Heffernan, Syracuse University, Syracuse, NY (Sponsor: Bo Fennhall, FACSM)
(No relevant relationships reported)

Retrograde shear stress increases with age and contributes to atherosclerosis. Habitual exercise has been shown to ameliorate the effects of age on cardiovascular disease possibly due to favorable vascular remodeling and reductions in retrograde shear. PURPOSE: Examine whether the vascular remodelling from habitual exercise training affects retrograde shear at rest and during a manipulation designed to alter shear (lower limb compression) in young adults. METHODS: Doppler ultrasound was used to measure superficial femoral arterial (SFA) diameter and retrograde shear rate in 11 exercise-trained men (Division I track athletes; 20 ± 3 yrs of age, body mass index 21 ± 2 kg∙m⁻²) and 18 recreationally active controls (23 ± 5 years of age, body mass index 23 ± 2 kg∙m⁻²). Mean arterial pressure was measured at rest and during a shear manipulation: inflation of a pneumatic cuff applied to the calf to 5 mmHg (sham) and 60 mmHg (experimental) in a randomized order. RESULTS: All results are displayed in Table 1. SFA diameter was larger in exercise-trained men versus controls (P < 0.05). Retrograde shear was similar between the exercise-trained men and controls at baseline and during the sham condition (P > 0.05). Exercise-trained men had lower retrograde shear during the experimental condition (P < 0.05). Group differences during the experimental condition remained after co-varying for resting retrograde shear and body mass index (P > 0.05). CONCLUSION: Manipulation of retrograde shear using lower limb compression reveals differences in shear patterns not detected at rest. Exercise-trained men have a more optimal, anti-atherosclerotic shear pattern (i.e. less retrograde shear) in comparison to recreationally active men.

Table 1. SFA diameter and shear at rest and during lower limb compression.
METHODS

Blood flow restricted (BFR) exercise has emerged as an intervention that increases muscle size and strength during low intensity resistance training. Although the cuff pressures prescribed for this intervention are typically based on pressures required to occlude blood flow at rest, the impact on blood flow during and after exercise is unclear. PURPOSE: To determine how various cuff pressures impact blood flow and tissue perfusion during and post exercise. METHODS: Seven healthy male participants completed four sets of a knee extension exercise (30 reps per set at 30% of max torque, 15 minutes recovery between sets). Four different cuff pressures were used during each set (0%, 60%, 80%, and 100% of arterial occlusion pressure). Doppler ultrasound was used to measure superficial femoral blood flow and NIRS was used to measure tissue saturation index, oxygenated and deoxygenated hemoglobin at rest, during and post exercise. EMG was also recorded for the vastus lateralis during exercise. RESULTS: Blood flow during exercise decreased as cuff pressure increased however there was still blood flow during exercise at 100% AOP. Tissue saturation showed greatest decrease during the 100% occlusion trial (62±5, 39±5; p<.001) followed by 80% (62±8, 40±7; p=.002), 60% (63±12, 45±12; p=.012) and the control (66±9, 52±9; p=.019). Deoxygenated hemoglobin increased the most at 100% occlusion (2.0±7, 31±7; p<.001) followed by 80% (1.1±7, 27±7; p=.002), 60% (0.7±14, 15±14; p=.292) and the control (5.0±8, 11±8; p=.02). Oxgenated hemoglobin decreased the most in the 100% condition (5.0±12, 14±12; p=.002) followed by 80% (6.0±14, 12±14; p<.001), 60% (7.0±15, 9.0±15;p=.023) and the control (4.0±11, 7.0±11;p=.014). There was no difference in total hemoglobin during those time points. EMG showed the largest change in the 100% condition (10±9,23±9;p=.002) compared to the control followed by 80% (9±14,19±14;p=.002) and 60% (18±13,23±13;p=.03). CONCLUSION: This data suggests that during dynamic exercise 100% of AOP still allows some blood flow and tissue perfusion during and post exercise but it still results in the greatest fatigue compared to lower cuff pressures.

RESULTS:

- A 2x2x3 repeated measures ANOVA was used to examine the effects of condition (BFR, non-BFR) and group (UB, LB) by time (Rest, R15, R45) on vascular function.
- There were no 3-way interactions for any variable, and no effect of condition. There was a significant (p<.001) group by time interaction for FBF (UB: Rest: 2.8±1.2 ml/min/100 ml/min, R15: 9.3±4.5 ml/min/100 ml/min, R45: 4.2±2.2 ml/min/100 ml/min) such that FBF was elevated at R15 compared to Rest, and was higher after UB than LB at R15. There was also a significant (p<.02) group by time interaction for AUC (UB: Rest: 65.1±21.6 ml/min/100 ml/min, R15: 144.7±50.2 ml/min/100 ml/min, R45: 90.0±27.8 ml/min/100 ml/min, LB: Rest: 81.9±10.5 ml/min/100 ml/min, R15: 113.1±34.4 ml/min/100 ml/min, R45: 85.6±32.6 ml/min/100 ml/min) such that it was augmented at R15 and R45 compared to Rest, with greater augmentation at R15 after UB compared to LB.

CONCLUSIONS: While there were no differences between BFR and non-BFR, our data demonstrate that acute upper-body resistance exercise has a greater effect than acute lower-body resistance exercise on forearm blood flow and vasodilatory capacity.
oxidation rate was significantly elevated in MOD (Mean±SD, 25.6 ± 8.6 mg/kg/ min), with no difference between NORMAL and LOW (10.6 ± 4.8 and 8.7 ± 2.8).

There were no significant differences among three trials for blood glucose and serum growth hormone levels. Blood lactate and serum cortisol levels were significantly higher in MOD than in those in the other two trials. Oxyhemoglobin (oxy-Hb) for vastus lateralis muscle was significantly lower in MOD than in the other two trials. In addition, deoxyhemoglobin (deoxy-Hb) was significantly increased in both MOD and LOW (vs. NORMAL), and MOD showed the highest values of oxy-Hb and deoxy-Hb.

Conclusion: Moderate intensity (40% of VO\textsubscript{max}) exercise with BFR caused profound elevations of deoxy-Hb with lower oxy-Hb and augmented carbohydrate oxidation. Furthermore, carbohydrate oxidation during low-intensity (25% of VO\textsubscript{max}) exercise with BFR was similar moderate intensity exercise without BFR.

B-62 Free Communication/Poster - Cardiac

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

829 Board #90 May 30 3:30 PM - 5:00 PM
Usefulness Of Two-Dimensional Echo Strain In Evaluation of Cardiovascular Function In Elite Athletes
Benedetta Tosi, Beatrice Leone, Loira Toncelli, Giorgio Galantai, FACSM. University of Florence, Florence, Italy.

Purpose: Cardiovascular adaptation to sport training is influenced by many factors, including the intensity and the kind of sport practiced. The “Morganroth hypothesis” asserted that a static exercise characterized by a pressure load and dynamic (isotonic) exercise which involves a volume load to the heart lead to different myocardial adaptation patterns. More recent studies revisited this hypothesis, showing that left ventricular (LV) remodeling observed in both resistance and endurance trained athletes, presented similar aspects. Although morphological modifications secondary to exercise have been largely studied, less is known on myocardial systolic function in LV remodeling pattern in different elite athletes. Two-dimensional strain analysis allows a complete study of the contractile function in different myocardial regions of interest in left and right ventricle. In this study we aim to underline possible differences in contractile myocardial function with strain analysis in two groups of elite athletes, trained with different loads and playing different sports (football and cycling).

Methods: We enrolled 47 male athletes: 23 football players and 24 cyclists, belonging to same football or cycling team (mean age in both groups 18±3 years old). The athletes were evaluated with echocardiography at the beginning of the sports season. We assessed LV contractile function using speckle-tracking echocardiographic global longitudinal strain (GLS) and global circumferential strain (GCS). We also analysed right ventricle (RV) function by strain echocardiography (peak systolic strain in tricuspid annulus). Results: GLS and GCS were significantly higher (p<0.05) in football players compared to cyclists (23.4±0.02 in football players and 20.6±0.18 in cyclists, respectively). GLS and GCS were found to be highest in athletes performing the pressure load (football) compared to the dynamic load (cycling). There were no significant differences in age or other variables among the HR\textsubscript{rest} groups for either sex and resting HR (HR\textsubscript{rest}) when walking at 2.5 mph among university students.

CONCLUSIONS: Sex is closely related to HR\textsubscript{rest}, %HR\textsubscript{max}, %HRR and SPM in walking at 2.5 mph and to HR\textsubscript{rest} as well with males having significant advantage over females. When comparisons are made among the HR\textsubscript{rest} groups, both male and female university students with lower HR\textsubscript{rest} have significantly lower HR and %HR\textsubscript{max} in walking at 2.5 mph than those with higher HR\textsubscript{rest}.

830 Board #91 May 30 3:30 PM - 5:00 PM
HR, %HR\textsubscript{max}, %HRR, SPM In Moderate-Intensity Walking Among University Students By Sex And Resting HR
Wenhao Liu, FACSM, Ivstvan Kovacs, Ethan E. Hull. Slippery Rock University, Slippery Rock, PA.

Purpose: This study was intended to examine how heart rate (HR), maximal HR% (%HR\textsubscript{max}), HR reserve (%HR\textsubscript{r}), and steps per minute (SPM) would be related to sex and resting HR (HR\textsubscript{rest}) when walking at 2.5 mph among university students.

Methods: This study was measured after lying on the floor for five minutes to 186 university students (mean ages: 20.9±7.1; 124 males, 62 females). Results: As for the three HR\textsubscript{rest} groups for males and females separately with one-way MANOVA.

PURPOSE: This study was intended to examine how heart rate (HR), maximal HR% (%HR\textsubscript{max}), HR reserve (%HR\textsubscript{r}), and steps per minute (SPM) would be related to sex and resting HR (HR\textsubscript{rest}) when walking at 2.5 mph among university students. RESULTS: There were no important differences among the three HR\textsubscript{rest} groups for males and females separately with one-way MANOVA.

Alcohol abuse is a risk factor for disease but moderate use may be beneficial. Mechanisms for this contrast remain speculative. Differences may be explained by acute alterations rather than chronic adaptations. PURPOSE: To compare cardiovascular health markers in patients with and without a history of heavy drinking, and patients who are currently intoxicated.

Methods: Health outcomes of patients treated at a U.S. hospital were analyzed; 2032 were sober, 273 tested positive for alcohol, and 131 reported a history of alcohol abuse. Dependent variables were systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), hemoglobin, oximetry, and disease incidence. Independent variables were age, sex, anthropometry, and use of alcohol. Independent-samples t tests and chi-square tests evaluated differences between patients with and without a history of alcohol abuse. Linear and logistic regressions tested the effects of alcohol on dependent variables.

RESULTS:
Among sober patients, each year of age predicted 0.3 mmHg higher SBP (p<0.001) but no change in DBP (p=0.137). Across the total sample, current intoxication of alcohol did not affect the odds of having a myocardial infarction (p=0.805), congestive heart failure (p=0.712), peripheral vascular disease (p=0.997), stroke (p=0.01), diabetes (p=0.97), or dementia (p=0.905). It did associate with a 1.5-fold increase in the odds of having had a myocardial infarction (p=0.001). CONCLUSIONS: Sober patients with a history of alcohol abuse mimic the cardiovascular profile of intoxicated patients. This suggests that both short and long-term alcohol ingestion may confer modest cardiovascular benefits.

Athletes (A) conduct intense physical training to attain peak performance. Intense training is associated with cardiac remodeling and electrical abnormalities. Although certain ECG abnormalities are considered benign, these changes have been linked to sudden cardiac death in A. PURPOSE: to investigate cardiac structure-function and electrocardiographic changes relative to aerobic capacity (Vo2 max). METHODS: A cross-section of individuals consented for this university IRB approved study. The population consisted of controls (C; n=21; high school sports; n=8 women, 9 men) or active, no organized sports (n=5 women, 1 man), college A (CA; completed career <3 years ago; n=5, 5 women, 4 men), and A (presently competing, n=22, 6 women, 16 men). Measurements included anthropometric assessment (DEXA), resting 12-lead ECG, and graded exercise test (GXT) with echocardiography/Doppler ultrasound performed before and following the GXT. An incremental treadmill GXT was conducted (6 mph) to Vo2 max with respiratory gas measurements (open-flow, indirect calorimetry). RESULTS: CA and A had greater fat-free mass, but bone density was greater in A. While resting heart rate was lower in A and CA, blood pressure, stroke volume (A=87±19 ml; CA=83±23 ml; C=77±18 ml) and cardiac output (A=4.8±1.3 L/min; CA=5.1±1.5 L/min; C=4.8±1.3 L/min) were similar among groups. Left ventricular (LV) end-diastolic dimension and posterior wall thickness provided dichotomous measures. Cardiac remodeling ( eccentric hypertrophy-EH, concentric hypertrophy-CH, concentric remodeling-CR) in C (EH n=3, CR n=4), CA (EH n=1, CR n=2), and A (EH n=2, CH n=1, CR n=4). Overall, ECG analysis showed Pvc’s (n=3), LV hypertrophy voltage criteria (n=10), peaked T-waves (n=7), J-waves (n=4), U-waves (n=7), wandering pacemaker (n=4), early repolarization (n=5), short PR (n=1), Woenckebach (n=1), small Q waves (n=13), Vo2 max (C=44±7.8 ml/kg min; CA=44.7±8.2 ml/kg min; A=49.9±9.3 ml/kg min; A=44.9±9.3 ml/kg min) and maximal heart rate (C=187±91 b/min; CA=194±7 b/min; A=187±9 b/min) were not different. CONCLUSION: Given similar, moderate levels of Vo2 max and cardiac function, presence of cardiac remodeling and ECG abnormalities among each group raises questions regarding the genesis of these changes relative to training history.

Purposes of this study was to determine the accuracy of a smartphone app (APP) to measure resting HRV versus a commercially available bio-harness (BH). METHODS: Forty-seven females (age = 23.5 ± 4.4 y; height = 1.6 ± 0.5 m; mass = 73.8 ± 18.5 kg) volunteered to participate in the study. After arriving in the laboratory, participants rested in a supine position for 20 minutes. A BH was used to measure indices of HRV during a five-minute interval while the APP was used during the last 3 minutes. Time measurements included R-R interval (NN), standard deviation of the NN intervals (SDNN), root mean square of the successive differences (RMSSD), and percent of NN intervals over 50 ms (pNN50).

RESULTS: There were no significant differences between the BH and APP with respect to NN (883.1 ± 219 vs 894.3 ± 219 ms; p = 0.72), SDNN (72.9 ± 29.9 vs 71.8 ± 29.9 ms; p = 0.77), and pNN50 (38.8 ± 21.9 vs 40.8 ± 20.6 ms; p = 0.24), HRM and APP RMSSD were significantly different (66.8 ± 33.0 vs 74.4 ± 30.1 ms; p = 0.014). Significant correlations were observed between BH and APP for all variables: NN, r = .93, p < .001, SEE = 48.8 ms; SDNN, r = .91, p < .001, SEE = 23.9 ms; RMSSD, r = .79, p < .001, SEE = 18.5 ms; and pNN50, r = .86, p < .001, SEE = 10.6%.

CONCLUSIONS: The APP provided an accurate assessment of HRV when compared to the BH in the supine position. Moderate to strong correlations were observed for all indices of HRV with no statistical differences between the variables with the exception of RMSSD. The APP could provide an economical, valid method of measuring HRV in adult females.

Purposes of this study was to determine the role of AMPKα2 in exercise-induced cardiac hypertrophy by using AMPKα2 knock out mice and treadmill running model. METHODS: AMPKα2 knockout (KO) and wild type (WT) mice were randomly divided into four groups as wild type control (WT+Ctr, n=6), wild type exercise (WT+EX, n=12), AMPKα2 KO control (KO+Ctr, n=6) and AMPKα2 KO exercise (KO+EX, n=12). WT+EX and KO+EX group mice were applied to treadmill running for 7 weeks at 20min for 90 minutes to induce cardiac hypertrophy. Cardiac fibrosis and myocyte size was evaluated by Sirius red staining and WGA staining separately. The protein expression in heart tissue was analyzed by Western blots.

RESULTS: 1. AMPKα2 gene deficiency had no effect on ratio of heart weight to body weight (HW/BW, mg/g, 3.89 ± 0.77 vs 3.87 ± 0.73, p = 0.0) and cardiomyocyte cross section area (CSA, um2, 229.8 ± 23.6 vs 236.2 ± 23.6, p = 0.17). After 7 weeks exercise training, WT+EX and KO+EX group mice had greater HW/BW (4.34 ± 0.19, 4.52 ± 0.21) and cardiomyocyte CSA (306 ± 27, 355 ± 11) as compared to the control mice (p = 0.05), but KO+EX group was significant higher than WT+EX group(p<0.05).2. There were no significant difference on cardiac fibrosis among four groups (p=0.05).3. Seven weeks exercise training significantly increased cardiac tissue...
AMPKα2 and p-ACC protein expression in both WT+EX and KO+EX as compared to their control groups (p<0.05), while AMPKα2 protein expression only significantly increased in WT+EX and KO+EX (p<0.03) with WT+EX. Exercise training significantly increased cardiac tissue p-Akt protein expression in both WT+EX and KO+EX as compared to their control groups (p<0.05), and in KO+EX was significantly decrease as compared with in WT+EX group (p<0.05). CONCLUSIONS: 1. Seven weeks treadmill running could induce cardiac hypertrophy in mice with increased heart weight and myocardial size. 2. AMPKα2 gene deficiency (0.89±0.09) significantly amplified exercise induced cardiac hypertrophy in mice. 3. Seven weeks treadmill running induced cardiac hypertrophy was not founded with cardiac fibrosis. 4. AMPKα2 might play some important role in exercise induced cardiac hypertrophy through Akt signal pathway.

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**Board #98** May 30 3:30 PM - 5:00 PM Validation Of The Non-Invasive Assessment Of Cardiac Output Via The Closed-circuit Acetylene Rebreathing Technique

Dean Palmer, Ashley Hardin, Justin Lawley, Satyam Sharma, Michinari Hieda, Benjamin Levine, FACSM, IIEEM, Dallas, TX. (Sponsor: Benjamin D. Levine, FACSM)

**CONCLUSIONS:**
The acetylene rebreathing method is much more precise than, and as accurate as, the THD method in a variety of patients and under a range of conditions. Therefore, it can be recommended as a non-invasive alternative for measuring cardiac output.

**Purpose:** The subjects were 68.6% male and 31.4% female. The 27.8% of them had a history of cardiac arrhythmias. The main findings are as follows: 1. The prevalence of arrhythmias (91.4%) compared to conduction delays (16.3%) and other blocks in the 3.2%. Ventricular pre-excitation was found in 3.2% cases, whereas conduction delays were the 0.4% cases. 2. Supraventricular arrhythmia was found in the 80% of recordings (<100 ectopic beats in 24h±76.0%), while ventricular arrhythmia in the 69.3% of exams (<100 ectopic beats in 24h±62.5%).

**Board #100** May 30 3:30 PM - 5:00 PM The Effects Of High Intensity Interval Training On Heart Rate Variability In Physically Inactive Adults

Abdullah B. Alansare1, Edward K. Alford, Sukho Lee2, Tommie Church1, Hyun Chul Jung3. 

1The University of Louisiana at Monroe, Monroe, LA. 2Texas A&M University-San Antonio, San Antonio, TX. 3Monroe, Monroe, LA. (No relevant relationships reported)

**CONCLUSIONS:**
High intensity interval training (HIIT) is a type of exercise that involves repeated intense exercise with active or passive recovery. Heart rate variability (HRV) analysis has been widely used to measure cardio-autonomic functions. PURPOSE: The purpose of this study was to examine the effects of HIIT on heart rate variability (HRV) in physically inactive adults. METHODS: This study was conducted with a randomized and controlled design. Thirteen physically inactive male adults (27.5 ± 3.80 years) were randomly assigned to HIIT (N = 7) or moderate intensity continuous training (MICT, N = 6). The MICT program consisted of 20 min of interval training with rest to work ratio (10/50 sec) at 90% HRmax. Both groups completed 8 sessions of cycle training over a period of two weeks. Height, body weight, blood pressure, and body composition were measured. HRV was measured for 20 minutes in sitting position with Actiwave-Carlo (CamNtech, UK). Time-domain (R-R interval, IBI, RMSSD) and frequency-domain (low frequency, high frequency, and LF/HF ratio) variables were analyzed by autonomic activity. A natural logarithmic transformation of all frequency domain variables was performed to meet the assumptions of parametric statistical analysis. Repeated measures ANOVAs were applied to analyze interaction effects on HRV variables and the significant level was set at 0.05. RESULTS: Significant time effects on R-R interval (F = 8.437, p < 0.05) and IBI (F = 9.611, p < 0.05) were observed with both HIIT and MICT groups decreasing over time. In LF/HF ratio was significantly decreased in the HIIT group while the MICT group did not change (F = 4.875, p < 0.05). CONCLUSIONS: The present study suggests that the HIIT program improves sympathovagal (InL/HF ratio) activity following only 8 sessions of HIIT. Health professionals or fitness trainers could consider this time efficient exercise program (HIIT) for improving cardio-autonomic function in adults who are physically inactive.

**Board #99** May 30 3:30 PM - 5:00 PM Holter Ecg In Sports People: 20 Years Of Monitoring

Riccardo Ariani, Alessio Bartolotti, Giorgio Galanti. University of Florence, Florence, Italy. (No relevant relationships reported)

**Purpose:** Arrhythmias are a common finding in the population that practices sports activity and sometimes their clinical interpretation is not easy. Thus, we aimed to analyze and follow up the recordings in a group of subjects who underwent a 24-hour or weekly Holter ECG monitoring to assess the presence of arrhythmias in a large cohort of sportsmen.

**Methods:** Since April 1997 to April 2017, 6172 unselected and consecutive subjects (35±22 years) were enrolled. Revision analysis was performed by Holter Analysis cohort of sportsmen.

**RESULTS:** A total of 3,198 registrations, focusing on the ECG features, such as arrhythmia (origin, number, complexity), conduction delays and channelopathies, were performed in our laboratory that included RB and either direct Fick or THD. Studies included healthy individuals and patients with clinical disease (mostly HFpEF). For accuracy and precision analyses, simultaneously Qc measurements were obtained under normo-, hypo-, and hypervolemic conditions, as well as submaximal and maximal exercise.

**CONCLUSIONS:** The acetylene rebreathing method is much more precise than, and as accurate as, the THD method in a variety of patients and under a range of conditions. This data support the clinical use of RB derived Qc.

**Board #101** May 30 3:30 PM - 5:00 PM Autonomic Modulation in Response to Three Different Autonomic Reflex Tests in Women with Fibromyalgia

J. Derek Kingsley, FACSM, Kathryn Geither, Alaina Glasgow, Erica M. Marshall, Jason C. Parks, Leslie Sensibello, Yu Lun Tai. Kent State University, Kent, OH. (No relevant relationships reported)

**CONCLUSIONS:** In the Holter recordings examined, we found that there was a clear prevalence of arrhythmias (91.4%) compared to conduction delays (16.3%) and other blocks (0.4%). Analysis of the data with WT+EX exercise training significantly increased cardiac tissue p-Akt protein expression in both WT+EX and KO+EX as compared to their control groups (p<0.05), and in KO+EX was significantly decrease as compared with in WT+EX group (p<0.05). Seven weeks of exercise significantly amplified exercise induced cardiac hypertrophy in mice.3. Seven weeks treadmill running induced cardiac hypertrophy was not founded with cardiac fibrosis.4. AMPKα2 might play some important role in exercise induced cardiac hypertrophy through Akt signal pathway.

**Purpose:** To evaluate autonomic modulation in response to three different autonomic stimulators, including isometric handgrip with post-exercise circulatory occlusion (IHG/PECO), the cold pressor test (CPT) and head-up tilt (HUT) in women with Fibromyalgia (FM) compared to healthy controls (HC). METHODS: Participants previously diagnosed with FM (n=37) and HC (n=25) were randomly assigned to an autonomic test. Baseline ECGs were obtained as compared with WT as group 1. All exercise tests were completed (IHG/PECO and CPT) and supine rest (HUT). For IHG/PECO, participants completed 2 minutes of IHG at 30% maximal voluntary contraction followed by 2 minutes of PECO. For the CPT, circulated cold water hand immersion (10°C) lasted for 2 minutes. For HUT, participants completed 5 minutes of 70-degree head-up tilt followed by 5 minutes of supine recovery. Heart rate variability measures included normalized low-frequency (LFnu) and normalized high-frequency (HFnu) components of sympathovagal and parasympathetic modulation, respectively. A 2 x 3 repeated measures ANOVA was used to compare the effects of group (FM and HC) across time for IHG/PECO (rest, IHG, and PECO) and HUT (rest, HUT, and recovery). A separate 2 x 2 repeated measures ANOVA was used to compared of group (FM and HC) across time for the CPT (rest and CPT). Paired t-tests were used for post-hoc testing if the ANOVA was significant. RESULTS: Age, weight and height were similar (p>0.05) between groups. There were no significant differences between groups at rest for any measure of autonomic modulation. There were no changes in autonomic modulation in response to the IHG/PECO in either group. For the CPT, there were significant main
Altitude places a burden on cardiovascular homeostasis, and heart rate variability (HRV) may serve as a biomarker for altitude stress. PURPOSE: HRV was studied at different altitudes in college-aged students of varying fitness levels, treking in NEPAL. METHODS: 10 min resting HRV data and heart rate (HR) were measured in college aged students (n=17,9F age=20±1.7yrs, BMI 23±3kg/m2) at 300m in Ohio, 1900m, and 4500m above sea level in Nepal. 1 min average oxygen saturation (SpO2) was measured at 4500m via fingertip pulse oximetry. Root-mean- squared of the successive differences (RMSD) of all successive RR intervals varying ≥50ms (pN50), and Poincare-plot SDI (ms) and SD2 (ms) describe time variation between adjacent R-wave-to-R-wave intervals. Low-Frequency and High-Frequency Power Spectral Analysis (LFP,HFP), which describe the balance of sympathetic and parasympathetic drive to the heart, were other HRV variables of interest. RESULTS: pN50 and pNN50 were highly correlated (r=0.90). Most HRV variables responded similarly to altitude, decreasing at 1900m and partially returning towards baseline as the trek continued to 4500m. Initial graphical analysis revealed an apparent relationship between log(RMSSD) and heart rate at 1900m and 4500m, though the relationship was less pronounced at 300m. Linear mixed effects modeling of log(RMSSD) provided evidence of a fairly strong interaction between altitude and HR (p<0.005 for 1900m vs. 300m; p<0.002 for 4500m vs. 300m). This model predicts that for lower HR (e.g. 75 bpm) RMSSD increases as a function of altitude, while at median (82.5 bpm) and higher (90 bpm) HR, RMSSD is lower at 1900m than at the other two altitudes. Oxygen saturation mean was 87±3 at 4500m. CONCLUSIONS: Evidence of a substantial altitude by HR interaction on log(RMSSD) suggest that HRV is sensitive to an altitude stressor, but also that subjects with lower resting heart rates at altitude presented with more favorable HRV.

Introduction: Ageing is associated with a progressive stiffening of the pulmonary vasculature that causes an increase in pulmonary vascular resistance and a decrease in compliance. It remains unclear if right ventricular myocardial mechanics adapt to pulmonary vascular (PV) hypertension. The purpose of this study was to investigate if different measures of right ventricular myocardial mechanics change with age in healthy men (YM) and middle-aged men (MAM) during horizontal head-up tilt (HUT).

METHODS: Eighty healthy men (age: YM 27 ± 2 yrs, BMI 23.2 ± 2.4 kg/m2, n = 40; MAM 51 ± 4 yrs, BMI 25.9 ± 3.2 kg/m2, n = 40) participated in 2 experiments: 1) a control visit (CPT) and 2) a head-up tilt (HUT) visit to examine the effect of age on right ventricular (RV) myocardial mechanics. All RV volumes were measured using phase harmonic imaging (PHI) and right ventricular ejection fraction (RVEF) was obtained from an apical 4-chamber view. RV strain and strain rate imaging (SRIM) were used to quantify RV function. RV strain and strain rate images were obtained from apical and 4-chamber views. All RV measurements were obtained from short-axis stack images using a custom-developed software (CLOVER). RV deformation (strain) in a cohort of healthy young and middle-aged men to characterize age-related changes in the pulmonary vasculature are possible explanations for opposing LV and RV functional remodeling in response to ageing.

(p-relevance relationships reported)

PURPOSE: Hypertension as a well-known major independent risk factor for cardiovascular disease and stroke has had great impact on health outcomes. However, few studies focus on the different risk factors of hypertension among various age groups in the Tuji-Nationality settlement of China. The study aimed to investigate the different risk factors of hypertension among different adult groups in this area.

METHODS: Demographics questionnaires and fitness tests were utilized to identify the risk factors of hypertension among different adult groups in the years 2010 and 2014 in China’s southwest province of Hubei.

RESULTS: Of the 5,646 individuals aged 20-69 years (age=42±7.13±7.7 years) people, 1,219 were classified as hypertensive, giving an overall prevalence of hypertension of 21.6%. The prevalence of hypertension was 13.5% in 2010, before doubling to 29.0% by 2014. The prevalence of hypertension increased with increasing age and overweight/obesity were significant factors associated with hypertension. In addition, the risk factors for the young adult group (31.9±7.2 yrs, n = 20397) included age, gender (men/women), lower level of education, and lower cardiospecific function (CRF), with ORs of 1.214 (CI, 1.116-1.320), 0.365 (CI, 0.285-0.466), 0.720 (CI, 0.625-0.829), and 0.603 (CI, 0.498-0.731) respectively, and for the middle-aged group (51.7±3.4 yrs, n = 1795), included Tuji nationality, white collar workers, and lower CRF, with ORs of 1.076 (CI, 1.056-1.095), 1.612 (CI, 1.390-1.871), and 0.780 (0.631-0.963), respectively.

CONCLUSIONS: The prevalence of hypertension increased dramatically in this area during 2010-2014. BMI was the common risk factor of hypertension in all adult groups. For both young and middle-aged adults, low CRF was a common risk factor associated with hypertension.

Cardiovascular disease (CVD) is the most common cause of job-related mortality among firefighters in the United States. Although age, family history, and work environments cannot be controlled, other predictors are modifiable. If solutions to these issues are to be implemented, it is important to know which health parameters are responsible for the elevated CVD risk in this population. PURPOSE: To examine the cardiovascular health of California firefighters. METHODS: We measured physiological CVD risk factors in 35 firefighters from Northern California. Assessments were age, anthropometry, blood lipids, blood pressure, and blood glucose. Risk factors were summed according to the American College of Sports Medicine guidelines. We evaluated the frequency of individual risk factors and used regression analyses (logistic, negative binomial, and linear as appropriate) to test the effect of age on risk. RESULTS: Firefighters were 33.5 ± 11.8 years old, had a body mass index (BMI) of 26.6 ± 3.4, body fat percent (BF%) of 21.2 ± 6.0%, waist circumference (WC) of 90.3 ± 10.4 cm, and waist-hip ratio of 0.873 ± 0.10. Systolic blood pressure (SBP) was 122.5 ± 8.0 mmHg, diastolic pressure (DBP) was 78.1 ± 10.3 mmHg, fasted blood glucose (FBG) was 98.5 ± 14.3 mg/dL, LDLs were 128.9 ± 40.1 mg/dL, HDLs were 31.6 ± 12.5 mg/dL, triglycerides were 116.8 ± 90.3, and the average number of risk factors was 1.8 ± 1.2. There were 32 firefighters (91.4%) with ≥ 1 risk. The proportion of at-risk firefighters for each variable was: lipid profile (77.1%), obesity (65.7%), diabetes (49.8%), blood pressure (34.3%), and age (14.3%). Most of the lipid profile was associated with hypertension.

(p-relevance relationships reported)
Purpose Cardiac adaptation to intense physical training is determined by many factors. Eliminate the fat mass from the indexing of left ventricular parameters seems to better explain some heart modifications, characterizing the so-called “athlete’s heart”. Fat free mass also contains the extracellular mass which does not represent a metabolically active compartment. The aim of this study is to verify a new left ventricular indexing with the metabolically active tissue of the body as body cell mass (BCM). The above indexing was used in order to normalize the differences between the sexes according to body composition. This study reports the reference values for age and gender of the left ventricular parameters indexed for metabolically active mass.

Conclusions Analyzing body composition in three compartments appears a solution that physiologically can explain some aspects of the athlete’s heart. These results could be considered a preliminary data in order to create a new indexation.

**Purpose:** Postural tachycardia syndrome (POTS) is a form of chronic orthostatic intolerance characterized by an excessive increase in heart rate in the absence of orthostatic hypotension. It is known that women are more likely to suffer from this disorder with 5:1 female to male ratio. Previous studies have reported that POTS is characterized by reduced stroke volume (SV) caused by reduced left ventricular (LV) mass due to cardiac atrophy. Moreover, previous studies indicated that exercise training for POTS patients improved their symptoms and increased LV mass and SV. In the clinical setting, magnetic resonance imaging (MRI) is widely accepted as the gold standard to quantify LV mass and SV. However, probably because it is too expensive to perform MRI very frequently, there have been few studies that intermittently evaluate LV mass and SV changes over exercise therapy. Recent development of three-dimensional transthoracic echocardiography (3D-TTE) may enable us to accurately measure LV mass and SV. The primary purpose of this study was to assess LV mass and SV changes in an Asian POTS patient over exercise therapy by using 3D-TTE.

**Methods:** We diagnosed a 27-years-old Asian woman as POTS in Kyorin University Hospital. We prescribed exercise therapy in which she trained 3 times per week for 30 minutes per session by using a recumbent bike with target heart rate equivalent to 60% of maximum (130-140bpm). We performed 3D-TTE (EPIC 7C, Philips, the Netherlands) at baseline, after 3 months, and after 6 months of exercise therapy (Analysis 3.1, TomTec) before and every 3 months after exercise training.

**Results:** Her symptom started to gradually improve 3 months after exercise training. LV mass and SV gradually increased during exercise training; LV mass was 90g, 98g and 114g, and SV was 39.5ml, 48.5ml, and 43.6ml before exercise, 3 and 6 months after exercise training, respectively.

**Conclusions:** We revealed that exercise training for an Asian POTS patient improved her symptom and increases in LV mass and SV were able to be assessed by using 3D-TTE, indicating the effectiveness of 3D-TTE to assess LV mass and SV for POTS patients.
Endurance exercise reduces risk for cardiovascular disease. Excessive endurance exercise may be detrimental to cardiovascular health. Interestingly, these detrimental cardiac adaptations may be more prevalent in male marathoners. Sex differences in the effect of marathon exercise on cardiac function may be related to differences in aortic stiffness and blood pressure (BP). PURPOSE: 1) Examine sex differences in aortic stiffness, BP and cardiac function; 2) Explore associations between aortic stiffness, BP and cardiac function in marathoners. METHODS: Sixteen experienced marathoners had peak aerobic capacity, aortic stiffness, BP and cardiac function measured on 3 separate days. Aortic stiffness was measured as carotid-femoral Pulse-Wave Velocity (cfPWV) obtained using applanation tonometry. An ambulatory oscillometric blood pressure cuff was used to measure 24-h systolic blood pressure (BP). Cardiac function was measured using 3-dimensional deformation echocardiography (3DE). Left ventricular (LV), longitudinal, circumferential, area, and radial strain were used as indices of cardiac function. RESULTS: cfPWV and 24-h aortic BP were higher and 3DE longitudinal and area strain were lower in males compared to females (p<0.05). cfPWV was associated with longitudinal (r=0.58, p=0.04), circumferential (r=0.71, p=0.01), area (r=0.66, p=0.01), and radial strain (r=-0.66, p=0.02). CONCLUSION: Among marathoners, males have higher aortic stiffness, BP and lower cardiac function when compared to females. Higher aortic stiffness may be associated with lower cardiac function in experienced marathoners. Supported by: Sydney Young Student Research Award; Syracuse University School of Education, Creative Grant Competition.

### Table 1

<table>
<thead>
<tr>
<th></th>
<th>Males (n=7)</th>
<th>Females (n=9)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>45±4</td>
<td>43±3</td>
<td>0.53</td>
</tr>
<tr>
<td>VO₂ max (ml/kg/min)</td>
<td>52.8±11.8</td>
<td>47.6±2.2</td>
<td>0.27</td>
</tr>
<tr>
<td>Resting Heart Rate (bpm)</td>
<td>52±7</td>
<td>56±9</td>
<td>0.31</td>
</tr>
<tr>
<td>Body Mass Index (kg/m²)</td>
<td>29±5</td>
<td>22±3</td>
<td>0.00</td>
</tr>
<tr>
<td>Body Fat (%)</td>
<td>20.7±10</td>
<td>23.6±6</td>
<td>0.59</td>
</tr>
<tr>
<td>cfPWV (m/s)</td>
<td>8.1±1.0</td>
<td>6.5±1.2</td>
<td>0.02</td>
</tr>
<tr>
<td>Brachial 24-h Systolic BP (mmHg)</td>
<td>124±14</td>
<td>112±7</td>
<td>0.01</td>
</tr>
<tr>
<td>Aortic 24-hr Systolic BP (mmHg)</td>
<td>113±4</td>
<td>104±8</td>
<td>0.05</td>
</tr>
<tr>
<td>3DE Longitudinal Strain (%)</td>
<td>10±0.5</td>
<td>-16±4</td>
<td>0.04</td>
</tr>
<tr>
<td>3DE Circumferential Strain (%)</td>
<td>11.3±4.2</td>
<td>-15.6±4.3</td>
<td>0.10</td>
</tr>
<tr>
<td>3DE Area Strain (%)</td>
<td>-18.8±7.1</td>
<td>-26.9±6.3</td>
<td>0.05</td>
</tr>
<tr>
<td>3DE Radial Strain (%)</td>
<td>29.2±12.2</td>
<td>46.0±17.1</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Significance level, p<0.05. cfPWV, Carotid-Femoral Pulse Wave Velocity; BP, Blood Pressure; 3DE, 3-dimensional Echocardiography.
Purpose: To examine changes in walking distance and hemodynamic responses (HED) following a 12-week exercise-based CR program in Costa Rican cardiac patients.

Methods: Six-min walking distance (6MWD) and HED variables - systolic blood pressure (SBP), diastolic blood pressure (DBP), post-6MWD heart rate (FHR), post-6MWD recovery heart rate (REC), post-6MWD SBP (PSBP), and post-6MWD DBP (PDBP) were measured before and after CR in three-hundred and eleven (237 males and 74 females) patients (age = 57.7 ± 13 yr.). Using age as a covariate, a two by two (gender x measurement) ANCOVAs determined differences in 6MWD and HED variables. Pre-to-post CR intervention changes (A) in 6MWD and HED variables were correlated to the number of CR exercise sessions attended by age-quartile (Q₁) within genders. Results: Patients underwent 33.0 ± 5.1 CR sessions. Males walked a longer distance than females (males = 493.5 ± 5.6 vs. females = 429.0 ± 9.9 m; p < 0.001) from pre-to-post CR program (males pre = 429.3 ± 6.2 vs. post = 557.6 ± 5.8 m; p < 0.001, females pre = 374.9 ± 11.2 vs. post = 483.2 ± 10.3 m; p < 0.001). Both genders reduced FHR following a 6MWD test after the CR program (males pre = 78.9 ± 0.7 vs. post = 65.6 ± 0.5 mmHg, p = 0.034; females pre = 69.2 ± 1.2 vs. post = 65.0 ± 1.0 mmHg, p = 0.001), and increased FHR following a 6MWD test after the CR program (males pre = 97.7 ± 1.2 vs. post = 112.7 ± 1.4 bpm, p < 0.001; females pre = 100.7 ± 2.1 vs. post = 110.2 ± 2.5 bpm, p < 0.001). Significant correlations were found between CR sessions and Δ6MWD (r = -0.51; p < 0.001) and ΔREC (r = -0.47; p < 0.001). No significant correlations were found between CR sessions and ΔDBP (r = 0.08; p = 0.10), ΔFBP (r = 0.21; p = 0.04), ΔPSBP (r = 0.21; p = 0.04) and ΔPDBP (r = 0.15; p = 0.002). No significant correlations were found between CR sessions on Q₁ (age ≤ 59.1 yr.), Q₂ (age ≤ 59.2 to 59.4 yr.), Q₃ (age ≤ 59.5 to 59.6 yr.), Q₄ (age ≤ 59.9 yr.) and Δ6MWD or any HED variable. Conclusion: Both men and women improved functional capacity as observed in the 6MWD and HED variable adaptations to exercise following a 12-week CR program.

Comparison of Outcomes Related to Dietary Behavioral Changes in Phase II Cardiac Rehabilitation

Jillian N. Turek, 1 Nathan J. Boehlke, 1 Teresa M. Corbiserio, 1 Caitlin M. Stackpool, 1 Allison B. Haverkate, 1 Mary S. Meyers, 2 Cynthia A. Oster, 1 Porter Adventist Hospital/Centura Health, Denver, CO. 1Centura Health, Denver, CO.

Purpose: Study aim was to compare pre and post dietary survey scores and waist circumference measurements of Phase II Cardiac Rehabilitation (CR) participants receiving an individual, one-hour dietary counseling session from a registered dietitian (RD). Methods: A retrospective comparative design was used to compare 104 Phase II CR program participants who completed ≥ 12 sessions between May 2015 and August 2017 at a hospital-based nationally certified CR program. The Rate Your Plate (RYP) (target score >55), a general dietary assessment survey of usual eating habits and two by two (gender x measurement) ANCOVAs determined differences in 6MWD and HED variables. Pre-to-post CR intervention changes (A) in 6MWD and HED variables were correlated to the number of CR exercise sessions attended by age-quartile (Q₁) within genders. Results: Patients underwent 33.0 ± 5.1 CR sessions. Males walked a longer distance than females (males = 493.5 ± 5.6 vs. females = 429.0 ± 9.9 m; p < 0.001) from pre-to-post CR program (males pre = 429.3 ± 6.2 vs. post = 557.6 ± 5.8 m; p < 0.001, females pre = 374.9 ± 11.2 vs. post = 483.2 ± 10.3 m; p < 0.001). Both genders reduced FHR following a 6MWD test after the CR program (males pre = 78.9 ± 0.7 vs. post = 65.6 ± 0.5 mmHg, p = 0.034; females pre = 69.2 ± 1.2 vs. post = 65.0 ± 1.0 mmHg, p = 0.001), and increased FHR following a 6MWD test after the CR program (males pre = 97.7 ± 1.2 vs. post = 112.7 ± 1.4 bpm, p < 0.001; females pre = 100.7 ± 2.1 vs. post = 110.2 ± 2.5 bpm, p < 0.001). Significant correlations were found between CR sessions and Δ6MWD (r = -0.51; p < 0.001) and ΔREC (r = -0.47; p < 0.001). No significant correlations were found between CR sessions and ΔDBP (r = 0.08; p = 0.10), ΔFBP (r = 0.21; p = 0.04), ΔPSBP (r = 0.21; p = 0.04) and ΔPDBP (r = 0.15; p = 0.002). No significant correlations were found between CR sessions on Q₁ (age ≤ 59.1 yr.), Q₂ (age ≤ 59.2 to 59.4 yr.), Q₃ (age ≤ 59.5 to 59.6 yr.), Q₄ (age ≤ 59.9 yr.) and Δ6MWD or any HED variable. Conclusion: Both men and women improved functional capacity as observed in the 6MWD and HED variable adaptations to exercise following a 12-week CR program.
Table 1

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre</th>
<th>Post</th>
<th>Change</th>
<th>P-Value (P) [PRE vs POST]</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>6MWD (m)</td>
<td>272 ± 92</td>
<td>333 ± 86</td>
<td>326 ± 94</td>
<td>384 ± 93</td>
<td>54 ± 48</td>
</tr>
<tr>
<td>CSE</td>
<td>32.2 ± 12.9</td>
<td>33.1 ± 11.8</td>
<td>39.9 ± 10.9</td>
<td>40.7 ± 8.6</td>
<td>8.0 ± 14.4</td>
</tr>
</tbody>
</table>

Table 2

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre</th>
<th>Post</th>
<th>Correlation Coefficient (R)</th>
<th>P</th>
<th>R</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHL 6MWD vs. CSE</td>
<td>0.26</td>
<td>&lt;0.0001</td>
<td>0.34108</td>
<td>0.0009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LHL 6MWD vs. CSE</td>
<td>0.33</td>
<td>0.0001</td>
<td>0.378</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CONCLUSIONS: This work indicates a positive correlation between improvements in functional capacity and CSE over the course of CR for both LHL and HHL groups, highlighting the utility of CR in overcoming some of the risks of diminished functional capacity and CSE associated with LHL. The study also reflects the importance of HL as a criterion of risk and associated management modification.

Table 1

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre</th>
<th>Post</th>
<th>Change</th>
<th>P-Value (P) [PRE vs POST]</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>6MWD (m)</td>
<td>272 ± 92</td>
<td>333 ± 86</td>
<td>326 ± 94</td>
<td>384 ± 93</td>
<td>54 ± 48</td>
</tr>
<tr>
<td>CSE</td>
<td>32.2 ± 12.9</td>
<td>33.1 ± 11.8</td>
<td>39.9 ± 10.9</td>
<td>40.7 ± 8.6</td>
<td>8.0 ± 14.4</td>
</tr>
</tbody>
</table>

Table 2

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre</th>
<th>Post</th>
<th>Correlation Coefficient (R)</th>
<th>P</th>
<th>R</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHL 6MWD vs. CSE</td>
<td>0.26</td>
<td>&lt;0.0001</td>
<td>0.34108</td>
<td>0.0009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LHL 6MWD vs. CSE</td>
<td>0.33</td>
<td>0.0001</td>
<td>0.378</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CONCLUSIONS: This work indicates a positive correlation between improvements in functional capacity and CSE over the course of CR for both LHL and HHL groups, highlighting the utility of CR in overcoming some of the risks of diminished functional capacity and CSE associated with LHL. The study also reflects the importance of HL as a criterion of risk and associated management modification.

B-64 Free Communication/Poster - Metabolism, Mitochondria and Muscle Physiology

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

Seric Muscle is not Increased in Patients with Metabolic Syndrome and Insulin Resistance
Juan C. Calderón1, Yeliana L. Sánchez1, Pablo Tobón Uribe Hospital, Medellín, Colombia. 2 Pablo Tobón Uribe Hospital, Medellín, Colombia. (No relevant relationships reported)

Skeletal muscle has now been recognized as an endocrine tissue, through the production and secretion of myokines. Muscle is a myokine mainly secreted by
fibers type II (FT-II) that induces insulin resistance (IR) in both cellular and murine models. We hypothesize that muscle could be involved in pathophysiology of metabolic syndrome (MS) in humans. PURPOSE: to evaluate the relationships among IR, systemic, and area occupied by FT-II in skeletal muscle cells and body fat mass. Homeostatic model assessment (HOMA-IR) was used as indicator of IR, muscle mass was measured by ELISA, area of skeletal muscle cells were grown in Dulbecco's modified Eagle's medium (DMEM) and differentiated in DMEM with 2% donor bone serum and 1% penicillin/streptomycin (PS), and differentiated in DMEM with 2% donor bone serum and 1% PS. After 5 days the cells were treated with different concentrations (0, 0.1, 0.25, 0.5, or 1 nM) of β-OBH for 24 h. The levels of insulin-dependent anabolism of the body tissue (the body tissue weight) were measured by western blotting. Exp. 2: PPARα ligand-binding domain were incubated with buffer containing either agonists or β-OBH, and then with fluorescein-labeled coactivator peptide and terbium-labeled anti-GST antibodies. The fluorescence intensity was measured using time-resolved fluorescence resonance energy transfer (FRET).

RESULTS: Exp. 1: Treatment of the cells with 0.25 nM, 0.5 nM, and 1 nM β-OBH increased VDAC levels compared with those in the control (3.5, 2.6, 3.7-fold, p < 0.05). Similarly, treatment with 0.025 nM and 0.5 nM β-OBH increased CXD-IV expression compared with that in the control (2.0, 2.0, 2-fold, p < 0.05). Exp. 2: GW7674, an agonist of PPARα (EC50; 0.3±0.3 nM), increased the fluorescence intensity ratio (520/495 nm). Treatment with β-OBH, however, did not increase the 520/495 nm ratio for either PPARα or PPARδ. CONCLUSION: The results indicate that β-OBH induces the expression of mitochondrial proteins in skeletal muscle cells of mice via a pathway different from the one associated with PPARα.

Conclusions: The purpose of this study was to examine whether β-hydroxybutyrate (β-OHB), a ketone body, increases mitochondrial protein levels in the skeletal muscles of non-obese rodents. We also evaluated the binding activity of β-OHB to PPARs and the expression of mitochondrial proteins in skeletal muscle cells. We hypothesized that β-OHB induces the expression of mitochondrial proteins in skeletal muscle cells that associated with PPARs. β-OHB induces the expression of mitochondrial proteins in skeletal muscle cells and body fat mass. A previous study suggested that β-OHB induces the expression of mitochondrial proteins in skeletal muscle cells. However, the mechanism remains unclear. Most MCFA are converted to ketone bodies, which are thereafter released into the blood. PURPOSE: The purpose of this study was to examine whether β-hydroxybutyrate (β-OHB), a ketone body, and their expression of mitochondrial proteins in skeletal muscle cells. EXP. 1: C2C12 mouse skeletal muscle cells were grown in Dulbecco’s modified Eagle’s medium (DMEM) with 10% fetal bovine serum and 1% penicillin/streptomycin (PS), and differentiated in DMEM with 2% donor bone serum and 1% PS. After 5 days the cells were treated with different concentrations (0.05, 0.1, 0.25, 0.5, or 1 nM) of β-OBH for 24 h. The levels of insulin-dependent anabolism of the body tissue (the body tissue weight) were measured by western blotting. Exp. 2: PPARα ligand-binding domain were incubated with buffer containing either agonists or β-OBH, and then with fluorescein-labeled coactivator peptide and terbium-labeled anti-GST antibodies. The fluorescence intensity was measured using time-resolved fluorescence resonance energy transfer (FRET).

RESULTS: Exp. 1: Treatment of the cells with 0.25 nM, 0.5 nM, and 1 nM β-OBH increased VDAC levels compared with those in the control (3.5, 2.6, 3.7-fold, p < 0.05). Similarly, treatment with 0.025 nM and 0.5 nM β-OBH increased CXD-IV expression compared with that in the control (2.0, 2.0, 2-fold, p < 0.05). Exp. 2: GW7674, an agonist of PPARα (EC50; 0.3±0.3 nM), increased the fluorescence intensity ratio (520/495 nm). Treatment with β-OBH, however, did not increase the 520/495 nm ratio for either PPARα or PPARδ. CONCLUSION: The results indicate that β-OBH induces the expression of mitochondrial proteins in skeletal muscle cells of mice via a pathway different from the one associated with PPARα.

Previous studies have shown that a long-chain fatty acid-rich diet as well as endurance exercise induce increase in muscle mitochondrial and enhance endurance capacity in rodents. We previously showed that a medium-chain fatty acid (MCF&A)-rich diet increases mitochondrial protein levels in the skeletal muscles of non-obese rodents. However, it is not clear how β-OHB affects mitochondrial function in skeletal muscle cells. We hypothesized that β-OHB induces the expression of mitochondrial proteins in skeletal muscle cells. The purpose of this study was to examine whether β-hydroxybutyrate (β-OHB), a ketone body, and their expression of mitochondrial proteins in skeletal muscle cells. EXP. 1: C2C12 mouse skeletal muscle cells were grown in Dulbecco’s modified Eagle’s medium (DMEM) with 10% fetal bovine serum and 1% penicillin/streptomycin (PS), and differentiated in DMEM with 2% donor bone serum and 1% PS. After 5 days the cells were treated with different concentrations (0.05, 0.1, 0.25, 0.5, or 1 nM) of β-OBH for 24 h. The levels of insulin-dependent anabolism of the body tissue (the body tissue weight) were measured by western blotting. Exp. 2: PPARα ligand-binding domain were incubated with buffer containing either agonists or β-OBH, and then with fluorescein-labeled coactivator peptide and terbium-labeled anti-GST antibodies. The fluorescence intensity was measured using time-resolved fluorescence resonance energy transfer (FRET).

RESULTS: Exp. 1: Treatment of the cells with 0.25 nM, 0.5 nM, and 1 nM β-OBH increased VDAC levels compared with those in the control (3.5, 2.6, 3.7-fold, p < 0.05). Similarly, treatment with 0.025 nM and 0.5 nM β-OBH increased CXD-IV expression compared with that in the control (2.0, 2.0, 2-fold, p < 0.05). Exp. 2: GW7674, an agonist of PPARα (EC50; 0.3±0.3 nM), increased the fluorescence intensity ratio (520/495 nm). Treatment with β-OBH, however, did not increase the 520/495 nm ratio for either PPARα or PPARδ. CONCLUSION: The results indicate that β-OBH induces the expression of mitochondrial proteins in skeletal muscle cells of mice via a pathway different from the one associated with PPARα.
Expressed in skeletal muscle and is known to regulate trafficking of transporters including GLUT1. Here, we investigated if and how insulin receptor signaling cascade targeting WNK1 regulates cell surface abundance of GLUT4 in skeletal muscle and whether this regulation is altered in T2D.

**METHODS:** Insulin receptor-WNK1 signaling cascade targeting GLUT4 trafficking were examined using in vitro T2D/db/db mice and in vitro C2C12 cell models. 

**RESULTS:** Compared with control mice, T2D/db/db mice exhibited significant insulin resistance; WNK1 knockdown rescued GLUT4 phosphorylation (E12=2.552±0.141) and GLUT4 expression. Insulin increased phosphorylation of the downstream kinase Akt as well as WNK1 in a PI3K-dependent mechanism. A biotinylation assay demonstrated that insulin stimulates GLUT4 surface expression by promoting its exocytosis suggesting that WNK1 is a novel regulator of insulin-stimulated GLUT4 trafficking in the skeletal muscle. 

**CONCLUSIONS:** These results provide a new perspective on WNK1 function beyond regulation of ion homeostasis and offer new insights for pathogenesis of hyperglycemia in T2D. [Supported by NRF-2015R1D1A1A01060454 & 2017R1D1A3B0301760]

Mitochondrial aldehyde dehydrogenase 2 (ALDH2) is highly expressed in heart and skeletal muscles, and is the major enzyme that metabolizes acetaldehyde and toxic aldehydes. The cardioprotective effects of ALDH2 during cardiac ischemia/reperfusion injury have been recognized. However, less is known about the function of ALDH2 in skeletal muscle.

**PURPOSE:** This study was designed to evaluate the effect of ALDH2 on exhaustive exercise-induced skeletal muscle injury.

**METHODS:** We created transgenic mice expressing ALDH2 in skeletal muscles. Male wild-type C57BL/6 (WT) and ALDH2 transgenic mice (ALDH2-Tg), 8-weeks old were challenged with exhaustive exercise for 1 week to induce skeletal muscle injury. Animals were sacrificed 24 h post-exercise and muscle tissue was excised.

**RESULTS:** ALDH2-Tg mice displayed significantly increased treadmill exercise capacity compared to WT mice. Exhaustive exercise caused an increase in mRNA levels of the muscle atrophy markers, Atrogin-1 and MuRF1, and reduced mitochondrial biogenesis and fusion in WT skeletal muscles; these effects were attenuated in ALDH2-Tg mice. Exhaustive exercise also enhanced mitochondrial autophagy pathway activity, including increased conversion of LC3-I to LC3-II and greater expression of Beclin1 and Bnip3, the effects of which were mitigated by ALDH2 overexpression. ALDH2-Tg mice displayed enhanced ROS generation; mitochondrial reactive oxygen species (ROS) production was significantly lower in ALDH2-Tg mice. Mitochondria function was evaluated in permeabilized fibers from the medial gastrocnemius via high-resolution respirometry. A substrate-uncoupler-inhibitor titration protocol was used to evaluate statistical significance.

**RESULTS:** After heavy load exercise, the mitochondrial structure appeared to be abnormal and formed a lot of mitophagosomes; the CS content and Complex II activity significantly decreased, whereas the Complex IV activity and COX I protein level remained unchanged; the expression of Parkin (E12=2.52±0.141), Ub (E24=2.50±0.191) and LC3 (E12=2.62±0.240) significantly increased (E<1.00, P<0.05 or P<0.01).

**CONCLUSION:** A heavy load exercise may activate the PINK1/Parkin pathway and promote the combination of Ub,pc2,LC3 and mitochondria, and result in mitophagy and mitochondrial damage within skeletal muscle.

Supported by Natural Science Foundation of China (31471133).

Dietary ketone-mediated increases in energy expenditure (EE) have been attributed to increased adipose thermogenesis; however, little is known regarding the contribution of skeletal muscle to the hypermetabolic phenotype. **Purpose:** Determine if dietary ketone esters increase mitochondrial respiration in skeletal muscle. **Methods:** Thirty 5-wk old male C57BL/6J mice were placed on an ad libitum high fat diet (HFD) for 10 weeks. Mice were then randomized to one of three groups (n = 10 per group) for an additional 12 weeks: 1) Control (CON, remain on HFD); 2) Ketone Ester (KE, 22% kcal from KE); 3) Pair-fed (PF, pair-fed to KE group). Body composition was measured during the final week of the study by Quantitative Magnetic Resonance (QMR) and EE was examined by indirect calorimetry. Skeletal muscle mitochondrial respiration was measured by high-resolution respirometry in permeabilized muscle fiber bundles. **Results:** Body weight in the KE group was 27% lower and total adiposity 54% lower than the PF group (p < 0.05 for both) despite comparable energy intake. Differences in body weight and adiposity were attributed to higher resting (REE) and total (TEE) energy expenditure in the KE group (p<0.05). Markers of mitochondrial biogenesis and thermogenesis were increased in brown adipose and a browning phenotype was observed in inguinal white adipose. However, there were no differences in skeletal muscle mitochondrial respiratory capacity between groups. **Conclusions:** These results provide further support that dietary ketone esters increase brown and white adipose thermogenesis but do not appear to have effects on skeletal muscle mitochondrial respiration.

Supported by: UAB NORC Pilot and Feasibility Award (P30DK56336).

Cancer cachexia is a life-threatening, paraneoplastic syndrome featuring unintended weight loss and skeletal muscle atrophy. Mitochondria, the major providers of cellular energy, couple oxygen consumption to ATP synthesis (i.e. oxidative phosphorylation, OXPHOS). Impaired mitochondrial bioenergetics (e.g. respiration) is associated with the pathophysiology of multiple diseases. The control of mitochondrial respiration in skeletal muscle during the induction and progression of cancer cachexia is not well understood. **Purpose:** To investigate mitochondrial respiratory capacity and coupling control of skeletal muscle in the colon-26 model of cancer cachexia.

**Methods:** Balb/c males (10 wks) were assigned to control or colon-26 (C26). C26 mice were injected with 1x10<sup>6</sup> tumor cells, and tissue collected on days 7, 14, and 21 post-injection. In addition, C26 mice were injected with 1x10<sup>6</sup> tumors on day 7, and cachexia by day 21. Controls were injected with PBS and tissue collected on day 0. Respiration was measured in permeabilized fibers from the medial gastrocnemius via high-resolution respirometry. A substrate-uncoupler-inhibitor titration protocol was used to evaluate Complex I OXPHOS (Cl<sub>I</sub>), Complex II+III OXPHOS (Cl<sub>I</ii>III), and electron transfer system capacity (ETS). Efficiency of the OXPHOS system was determined from the ratio Cl<sub>I</i>/ETS (P/E).

**Results:** Cl<sub>I</i>/ETS was significantly lower (p<0.05) at day 21 (4.8±1.6 pmol/s/mg) in comparison to day 0 (5.3±1.7, 7.0 (5.7±4.6), and day 14 (60.0±2.9). Cl<sub>I</i>/ETS was significantly lower (p<0.05) at day 21 (22.3±2.3 pmol/s/mg).

Abstracts were prepared by the authors and printed as submitted.
in comparison to day 0 (65.5±7.8), day 7 (69.3±8.5), and day 14 (73.8±4.8). Maximal ETS was significantly lower (p<0.05) at day 21 (24.1 pmol/mg) in comparison to day 0 (83.7±13.8), day 7 (84.4±12.3), and day 14 (105.1±7.3). P<0.05 was significantly different across timepoints (p<0.05). CONCLUSION: Phosphorylating respiration with electron input from Complex I and II, and maximal electron transfer system capacity (i.e. non-coupled respiration) was significantly reduced at day 21 concomitant with cachexia, but not at earlier timepoints, suggesting that changes in oxidative mitochondrial function occurs as a consequence of cachexia rather than having a causative role. Loss of respiratory capacity may compromise whole muscle function and physical independence.

868

**BOARD 129**

**Localisation Of Myoglobin In Mitochondria: Implication On Regulation Of Mitochondrial Respiration In Muscle**

Kazumi Masuda1, Tsubaia Shibaguchi1, Tatsuya Yamada2, Kazuya Okumura2, Claudia Perez Lopez2, Kokoro Yamashita3, Thomas Jou3, Kenzawa University, Kanazawa, Japan. Johns Hopkins University School of Medicine, Baltimore, MD.

**University of California Davis, Davis, CA.**

(NO relevant relationships reported)

**PURPOSE:** Mitochondria play a principal role for metabolism and have a primary role in regulating respiration and energy expenditure. Recently, we showed that the muscle-specific protein myoglobin (Mb) interacted with complex IV to augment mitochondrial respiratory capacity in skeletal muscles. However, the precise mechanism for the Mb-mediated upregulation remains under debate. The present study has focused on localizing Mb within the mitochondria.

**METHODS:** Muscle specimens from deep portion of m. Gastrocnemius in Wistar rat were homogenized. Crude mitochondria were isolated by differential centrifugations and washed with the mitochondrial isolation buffer. The isolated mitochondria were treated with proteinase K (PK), osmic shock (OS), and SDS (or TCA) in order to digest proteins on the outer membrane and in the intramembrane. The final samples were subjected to SDS-PAGE and immunoblotting using antibodies to localize the proteins in the mitochondria.

**RESULTS:** Western blotting analysis revealed that the PK digests Tom20, which localized on the outer membrane of mitochondria. The Tom20 band intensity decreased with the amount of PK used. Other mitochondrial proteins such as cytochrome c (intermembrane space), COX-IV (inner membrane), and PDH (matrix), were not affected by PK treatment. PK treatment did not affect Mb. The results suggested that Mb did not localize on the outer membrane of mitochondria. The combined treatment of PK, OS and SDS (or TCA) allowed immunoblotting detection of the mitochondrial proteins in specific regions of the mitochondria. For example, cytochrome c disappeared with OS treatment. Tom22 disappeared with PK + OS treatment. However, Mb was detected with either PK or OS treatment. But it cannot be detected with a combined PK + OS treatment. The results suggest that Mb associated with the inner membrane (interspace), not matrix (side) of the mitochondria.

**CONCLUSIONS:** We conclude that Mb in muscle cells localizes in the cytosol and in the mitochondrial intermembrane space. Since exercise training increases Mb expressions of skeletal muscle, the increased Mb concentration may play a direct role in modulation skeletal muscle respiration and oxidative phosphorylation capacity.

869

**BOARD 130**

**Effects of PGC-1α Overexpression on Sirtuins, GCN5, and Mitochondrial Protein Acetylation in Aged Mouse Skeletal Muscle**

Li Li Ji, FACSM, Dongwook Yeo. University of Minnesota Twin Cities, Minneapolis, MN.

(NO relevant relationships reported)

Mitochondrial dysfunction in skeletal muscle is well-documented in sarcopenia. Protein hyperacetylation in mitochondria is one of the emerging causes of the mitochondrial dysfunction in aging skeletal muscle. However, Mb was detected with either PK or OS treatment. But it cannot be detected with a combined PK + OS treatment. The results suggest that Mb associated with the inner membrane (interspace), not matrix (side) of the mitochondria.

**PURPOSE:** In aging skeletal muscle, disrupted mitochondrial homeostasis and lower levels of Mb were found to accompany with elevated oxidative stress. Recent research indicates that impaired mitochondrial homeostasis may lead to diminished Irisin biosynthesis during aging. In order to gain some insight into the role of Irisin in mitochondrial homeostasis, we investigated the effect of oxidative stress, induced by exogenous H2O2, on Irisin and its precursor FND5, as well as key markers of mitochondrial biogenesis and dynamics in C2C12 myoblasts. **METHODS:** Myoblasts were treated for 24 hours with prepared dilutions of H2O2 in culture medium resulting in a final concentration of 10, 20, and 80 mM. **RESULTS:** Survival rate of cells was detected by MTT to determine the optimal concentration of H2O2. Flow cytometry was used to assess mitochondrial membrane potential and reactive oxygen species (ROS) generation. Confocal laser scanning microscopy was used to monitor the morphology of the mitochondrial reticulum. **CONCLUSIONS:** Protein content of Mfn1, Mfn2, OPA1, Drp1, FND5, PGC-1α, NF-kB and p38 MAPK were measured with Western blot. Content of Irisin in culture medium was determined by Elisa. **RESULTS:** Treatment of cells with 80mM H2O2 caused decrease in mitochondrial membrane potential (~65%, p<0.01), and Mfn1 (~41%, p<0.01). Mfn2 (~49%, p<0.05), OPA1 (~17%, p<0.05), Drp1 (~25%, p<0.05), FND5 (~36%, p<0.01), PGC-1α (~80%, p<0.01), and p38 MAPK (~22%, p<0.05). H2O2 exposure elevated MDA content (~107%, p<0.01), ROS generation (~71%, p<0.01), and NF-kB activation (~23%, p<0.01). H2O2 induced visible fragmentation of the mitochondrial reticulum. However, Irisin content showed no significant change. **CONCLUSION:** H2O2 induced oxidative stress impaired Irisin biosynthesis, which may be caused by disruption of mitochondrial homeostasis in muscle cells. Unchanged Irisin level in the cell might represent a decreased export under oxidative stress. Supported by NSFC (No. 81370454, 31110103919).

870

**BOARD 131**

**Comparison Between The Slow Components Of HR Kinetics And Of V'O2 Kinetics: Functional Significance**

Lucrezia Zuccarelli1, Letizia Rasica1, Mauro Marzorati1, Simone Porcelli1, Bruno Grassi, FACSM1, Università degli Studi di Udine, Udine, Italy. University of Milan, Milan, Italy. Institute of Bioimaging and Molecular Physiology, CNR, Milan, Italy.

(NO relevant relationships reported)

**PURPOSE:** Aerobic exercise prescription is often based on a linear relationship between pulmonary oxygen consumption (V'O2) and heart rate (HR). The aim of the present study was to test the hypothesis that during constant work rate (CWR) exercises at different intensities the slow component of HR kinetics occurs at lower work rate and is more pronounced that the slow component of V'O2 kinetics, thereby negating the linear relationship mentioned above. **METHODS:** Seventeen male (age: 27±4 yr) subjects performed on a cycle ergometer an incremental exercise to voluntary exhaustion to determine peak O2 uptake [V'O2 peak] and the gas exchange threshold [GET] and several CWR exercises: 1) moderate CWR exercises (MOD), below GET 2) heavy CWR exercise (HEAVY), at 45% of the difference between GET and V'O2 peak (Δ, 3) severe CWR exercise (SEVERE), at 95% of Δ (4) “HR controlled” exercise in which work rate was continuously adjusted to maintain a constant HR slightly higher than that determined at GET. Breath-by-breath V'O2, heart rate and other variables were determined. **RESULTS:** In MOD, no slow component of V'O2 kinetics was observed, whereas a slow component was observed for HR kinetics. During HEAVY, the amplitude of the HR slow component was more pronounced than that for the V'O2 slow component. During the HR-controlled exercise the decrease in work rate needed in order to maintain a constant HR was associated with a decreased V'O2. **CONCLUSION:** The HR slow component was more pronounced than the V'O2 slow component. The absence of a linear relationship between HR and V'O2 during CWR at different exercise intensities has implications on exercise prescription and tolerance.

871

**BOARD 132**

**Oxidative Stress Impaired Irisin Synthesis and Mitochondrial Homeostasis in C2C12 Myoblast**

Ziyi Zhang1, Tianjian Wang3, Hai Bo1, Yong Zhang2, Li Li Ji, FACSM1, Tianjin University of Sport, Tianjin, China. University of Minnesota, Minnesota, MN. (Sponsor: Li Li Ji, FACSM)

(NO relevant relationships reported)

**PURPOSE:** Aerobic exercise prescription is often based on a linear relationship between pulmonary oxygen consumption (V'O2) and heart rate (HR). The aim of the present study was to test the hypothesis that during constant work rate (CWR) exercises at different intensities the slow component of HR kinetics occurs at lower work rate and is more pronounced that the slow component of V'O2 kinetics, thereby negating the linear relationship mentioned above. **METHODS:** Seventeen male (age: 27±4 yr) subjects performed on a cycle ergometer an incremental exercise to voluntary exhaustion to determine peak O2 uptake [V'O2 peak] and the gas exchange threshold [GET] and several CWR exercises: 1) moderate CWR exercises (MOD), below GET 2) heavy CWR exercise (HEAVY), at 45% of the difference between GET and V'O2 peak (Δ, 3) severe CWR exercise (SEVERE), at 95% of Δ (4) “HR controlled” exercise in which work rate was continuously adjusted to maintain a constant HR slightly higher than that determined at GET. Breath-by-breath V'O2, heart rate and other variables were determined. **RESULTS:** In MOD, no slow component of V'O2 kinetics was observed, whereas a slow component was observed for HR kinetics. During HEAVY, the amplitude of the HR slow component was more pronounced than that for the V'O2 slow component. During the HR-controlled exercise the decrease in work rate needed in order to maintain a constant HR was associated with a decreased V'O2. **CONCLUSION:** The HR slow component was more pronounced than the V'O2 slow component. The absence of a linear relationship between HR and V'O2 during CWR at different exercise intensities has implications on exercise prescription and tolerance.
Deleterious actions for IL-6 have been proposed, such as provoking aging-associated low-grade inflammation accompanied with pro-inflammatory cytokine TNF-α and IL-1β. However, anti-inflammatory effect of exercise may to some extent be associated with muscle-derived IL-6 through inducing anti-inflammatory cytokines such as IL-1α and IL-10. It is increasingly clear that mitochondria are directly involved in the activation of anti-inflammatory response. PURPOSE: To determine the relationship between mitochondrial homeostasis and biological effects of muscle-derived IL-6 in aging and exercise intervention. METHODS: Male C57BL/6J mice aged 3 months (young) and 16 months (aged) were randomly divided into four groups: young normal (YN), young exercise training (YT), aged normal (AN) and aged exercise training (AT). Trained animals were exercised on a treadmill for 12 weeks. ROS generation, ATP content, mitochondrial homeostasis protein, anti-inflammatory and pro-inflammatory cytokines were examined in gastrocnemius muscle. RESULTS: Aging elevated ROS generation (+175%, p<0.01) and protein content of IL-6 (+104%, p<0.01), TNF-α (+158%, p<0.01), IL-1β (+85%, p<0.01), and NFκB (+77%, p<0.01), when comparing AN vs. YN. Furthermore, AN mice showed decreased ATP content (-26%, p<0.01), protein levels of COX IV (-29%, p<0.05), Beclin1 (-27%, p<0.05), PINK1 (-23%, p<0.05), IL-1α (-26%, p<0.05) and PGC-1α (-43%, p<0.01). Compared with AN, AT increased ATP content (+30%, p<0.05), COX IV (+35%, p<0.05), Beclin1 (+100%, p<0.01), PINK1 (+90%, p<0.01) and PGC-1α (+41%, p<0.05) levels. Moreover, training decreased ROS generation (-55%, p<0.01), IL-6 (-42%, p<0.01), TNF-α (-49%, p<0.01), IL-1β (-28%, p<0.01), and NFκB (-28%, p<0.05) levels. CONCLUSION: Aging increased inflammatory cytokine expression and deteriorated mitochondrial function in mouse muscle. Exercise training promoted mitochondrial biogenesis and mitophagy, suppressed inflammatory cytokine production, and elevated anti-inflammatory cytokines, possibly due to upregulation of PGC-1α and inhibition of NFκB pathway. Supported by NSFC (No. 31771320, 81370454, 31110103919).

Spinal cord injury (SCI) results in a dramatic loss in lean mass and subsequent increase in fat mass (FM) with concomitant decrease in basal metabolic rate (BMR). These changes expose persons with SCI to lifelong chronic health comorbidities. PURPOSE: To investigate the effects of testosterone replacement therapy (TRT) with evoked resistance training (RT) using neuromuscular electrical stimulation (NMES) on body composition and BMR in men with complete SCI. METHODS: Twenty-two participants were randomly assigned to either TRT+RT (n=11) or TRT only (n=11) for 16 weeks. The TRT+RT group participated in a progressive ankle weight lifting program using NMES twice weekly while sitting in their wheelchairs. The TRT was provided via transdermal testosterone patches (4-6 mg/day) placed on their shoulders. Body composition (lean mass and %FM) using dual energy x-ray absorptiometry and BMR using indirect calorimetry were measured prior to-and post-training. RESULTS: In the TRT+RT group, ankle weights (P<0.001) increased over the 16-week period for the right (19.6±6.5 lbs.) and the left (20.6±6.1 lbs.) legs. Serum testosterone decreased (-34-36%; TRT+RT: 413.5±147 to 265±183 ng/dl and RT: 435±177 to 288±258 mg/dl, P<0.05) following both interventions. Total body (33±11% to 32±11%; P<0.025) and leg (33±11% to 32±9%; P<0.037) %FM decreased by 1% in the TRT+RT group with no changes in the TRT group. Leg lean mass increased by ~1.8 kg (14.5±3.2 to 16.3±2.7 kg, P<0.037) in the TRT+RT group with a concomitant increase in BMR by 218 kcal/day (P<0.03), but no changes in the TRT group. CONCLUSIONS: TRT combined with RT may help to attenuate the decline in lean mass and BMR years after SCI. At this dose or vehicle of delivery, TRT only is ineffective in restoring lean mass or BMR in men with SCI.

Spinal cord injury (SCI) leads to rapid losses in muscle mass due to immobilization and loss of communication with the central nervous system. SCI is also associated with an oxidative-to-glycolytic fiber-type transition which likely results in muscle metabolic dysfunction. How paralysis affects the levels of major muscle metabolites is in not well-described. PURPOSE: The purpose of this study was to identify changes in metabolite levels in muscle paralyzed at 7 and 28 days following a complete SCI. METHODS: Female C57BL6 mice aged 20 weeks underwent sham or complete SCI surgeries. The sham group (Sham) was sacrificed at 7 d and SCI animals were sacrificed at 7 d (7d SCI) or 28 d (28d SCI) post-surgery (n=5/group). Gastrocnemius muscles were removed at sacrifice and flash frozen. Primary metabolomics analysis was performed on the muscle samples using GC-TOF mass spectroscopy (West Coast Metabolomics, NIH). Statistical analyses of mass spectroscopy peaks was completed using Metabonault 3.0 and R Software. Protein expression was determined using Western blotting.

Results: A principle components analysis identified muscle metabolites at 7 d SCI as a distinct cluster when compared to Sham and 28 d SCI. Metabolomic profiling identified 88 known metabolites with 8 being statistically different: lactate, glucose, malate, oxoproline, sorbitol, tryptophan, maltolitate and pyruvate. Because glucose, lactate and pyruvate are key metabolites of glycolysis, the expression of key glycolytic proteins were probed. GLUT4 levels were upregulated in 7 d SCI animals compared to Sham and 28 d SCI animals. There was a strong trend (p=0.07) for reduced pyruvate kinase expression in 7 d SCI animals compared to Sham and 28 d SCI animals while pyruvate dehydrogenase was greatly reduced in 28 d SCI compared to 7 d SCI. The level of lactate dehydrogenase approached statistical reductions (p<0.09) at 28 d. Conclusions: Paralysis following SCI leads to reductions in glucose, lactate and pyruvate at 7 d post-injury with levels recovering by 28 d. Reductions in levels of these are seen despite elevations in the expression of GLUT4 expression at 7 d, suggesting SCI leads to a disruption in glucose handling and glycolytic functioning in paralyzed muscle in the acute timeframe after injury. Funding was provided by a VA RR&D Service Center Award (B9212C) to W.A.B.
Intracellular Ca²⁺ ([Ca²⁺]) homeostasis following muscle contractions is profoundly impaired in diabetic skeletal muscle. Because heat stress activates transient receptor potential vanilloid 1 (TRPV1) and promotes Ca²⁺ influx from the extracellular space in skeletal muscle we questioned whether TRPV1 might play a role in this pathological process. We tested the hypothesis that impaired muscle Ca²⁺ homeostasis in type I diabetic rats is due to attenuated heat stress tolerance (mediated via TRPV1).

METHODS: Male Wistar rats were randomly assigned to 1 of 4 groups: 1. diabetes 40°C (DIA40°C), 2. diabetes 30°C (DIA30°C), 3. control 40°C (CONT40°C), 4. control 30°C (CONT30°C). Heat stress of 40°C was selected because it represents the activation threshold of TRPV1. Spinotrapezius muscles of Wistar rats were exteriorized in vivo and loaded with the fluorescent probe Fura-2 AM. [Ca²⁺] was estimated over 20 min using fluorescence microscopy (340/380 nm ratio) in quiescent muscle held at the required temperature by means of a calibrated heat source applied to the ventral muscle surface. Western blotting was performed to determine the protein expression levels of TRPV1, spinotrapezius muscle. RESULTS: After 20 min heat stress, the CONT40°C condition induced a 20.0 ± 7.7% [Ca²⁺] (P<0.05) elevation that was markedly absent from the DIA40°C or other conditions. Thus there was no significant differences found over the 20 min observation period between DIA40°C, DIA30°C and CONT30°C (P>0.05). The expression of TRPV1 was significantly decreased 40 ± 7% in DIA compared with CONT (P<0.05). CONCLUSION: This study revealed that the diabetic condition actually suppresses the expression of TRPV1 and inhibits Ca²⁺ influx evoked by heat stress. These findings do not support the notion that impairments of Ca²⁺ homeostasis during exercise result from increased Ca²⁺ influx due to thermal stress per se.

Fatigue of the superficial muscles in quadriceps femoris (QF), notably focusing on vastus lateralis (VL), has been evaluated using near infrared spectroscopy (NIRS). Our previous study (Akima & Ando Clin Physiol Func Imaging, in press) showed that muscle oxygenation of deep vastus intermedius (VI) muscle in QF was significantly higher, i.e. less fatigue, than the other superficial muscles after a fatigue inducing voluntary contraction. It is unclear that this higher oxygenation in VI at muscle fatigue was whether specific response induced by voluntary contraction or the other physiological characteristics.

PURPOSE: The purpose of this study was to compare oxygenation level of individual muscles of the QF at fatigue, which was induced by voluntary contraction or femoral nerve electrical stimulation elicited contraction.

METHODS: Eight healthy men (age, 27 ± 8 years; height, 175 ± 7 cm; weight, 73 ± 12 kg) performed isometric knee extension with knee joint angle of 90° at 50% of maximum voluntary contraction (MVC) for 5 sec induced by voluntary or femoral nerve electrical stimulation (frequency, 20 Hz; pulse duration, 200 μs). The 50% of maximum voluntary contraction (MVC) for 50 sec induced by voluntary or femoral nerve electrical stimulation (frequency, 20 Hz; pulse duration, 200 μs). The 50% of maximum voluntary contraction (MVC) for 50 sec induced by voluntary or femoral nerve electrical stimulation (frequency, 20 Hz; pulse duration, 200 μs).

RESULTS: There were several methods to examine the morphological properties of spinal motoneurons, but it is difficult to evaluate their functional properties. In this study, we developed a method to evaluate motoneuron plasticity using real-time RT-PCR for the entire spinal cord in rats.

RESULTS: Muscle oxygenation in VI could be less fatigued during nerve stimulation elicited contraction as well as voluntary contraction, suggesting slower muscle fatigue in VI was the intrinsic characteristics of physiological response.
CONCLUSIONS: We concluded that the PAP mechanism is ineffective after a tri-set method session, not showing plausible benefits that justify the daily routine in a gymnasium.

Financial Support: FAPEMIG—Fundação de Amparo à Pesquisa de Minas Gerais

880 Board #141 May 30 2:00 PM - 3:30 PM

The Effect of Caffeine on Peak Torque, Muscle Fatigue and Prefrontal Cortex Blood Flow

Krishan Bhakta, Makenzie Stade, Joshua A. Cotter. California State University, Long Beach, Long Beach, CA.

(No relevant relationships reported)

Purpose: The purpose of this study was to assess the effect of caffeine consumption on prefrontal cortex (PFC) hemodynamics and muscular fatigue during maximal isokinetic exercise testing.

Methods: Six active (exercise ≥3x/week, >1 hour per bout for >3 months) individuals (age 20.6±2.3yrs, body weight 72.1±7.3kg, height 172.6±1.4cm) participated in a double-blind placebo controlled study. Participants attended three separate exercise sessions on the Hume Norm Isokinetic Dynamometer. Each exercise session included three sets of 30 maximal knee extensions at 180° per second using their dominant leg. Exercise sessions were separated by one week and participants were instructed to refrain from consumption of caffeine 36 hours prior to testing. One hour prior to testing, participants were administered a placebo (NC), low caffeine (LC) (3mg/kg body weight) or high caffeine (HC) (6mg/kg body weight) dose. Time-resolved near-infrared spectrometry monitoring (TRIS-210, Hamamatsu) was utilized throughout testing to measure hemodynamics in the PFC. Peak torque and fatigue index were analyzed. Results: The fatigue index for HC (42.78%) and LC (42.82%) was lower when compared to the NC condition (47.39%; p<0.05). Peak torque per exercise session was found to increase during LC (124.17 N*m) compared to both NC (120.00 N*m) and HC (116.75 N*m). Additionally, LC showed a significant increase in total hemoglobin levels (141.21µM) compared to NC (101.05µM) and HC (97.618µM) in the PFC. Conclusion: The results of the study indicate that both high and low doses of caffeine were found to reduce fatigue across the bout of fatiguing exercise, but only LC resulted in increased peak torque and total hemoglobin to the PFC. Further examination of both PFC and local muscle hemodynamics should be explored to further understand the differential response between LC and HC.

881 Board #142 May 30 2:00 PM - 3:30 PM

Relationships between Motor Unit Behavior during Maximal Effort Contractions and Skeletal Muscle Phenotype

Ryan J. Colquhoun1, Mitchell A. Magrini1, Cody T. Haun2, Tyler W.D. Muddle1, Patrick M. Tomko1, Michael J. Luera1, Cameron S. Mackey1, Christopher G. Vann1, Jeffrey S. Martin1, Kaelin C. Young1, Jason M. DeFreitas2, Michael D. Roberts1, Nathaniel D.M. Jenkins1, Oklahoma State University, Stillwater, OK, 1Auburn University, Auburn, AL.

(No relevant relationships reported)

It has long been hypothesized that the physical properties of the muscle are related to motor unit behavior. Indeed, recent investigations have reported a relationship between skeletal muscle phenotype of the vastus lateralis and motor unit (MU) firing parameters during submaximal contractions. However, the nature of this relationship during maximal contractions in unknown and warrants further investigation.

PURPOSE: The purpose of the current investigation, therefore, was to examine the relationships between motor unit firing behavior during a maximal voluntary contraction and Myosin Heavy Chain (MHC) isofrom content of the vastus lateralis muscle in resistance-trained men.

METHODS: Ten resistance-trained males (mean ± SD, age = 22 ± 2) completed a trapezoidal ramp contraction up to 100% of their maximal voluntary isometric strength (MVIC). During the contraction, surface electromyography was recorded from the VL using a multi-channel electrode array and decomposed to examine the firing characteristics of individual MUs. A skeletal muscle biopsy of the VL was also collected and the mean fiber area for type I and II muscle fibers was calculated for each individual subject. Regression analyses were performed to identify relationships between type II fiber area and the slopes or intercepts of the mean firing rate (FRmean) vs. recruitment threshold (RT), max firing rate (FRmax) vs. RT, and RT vs. MU action potential amplitude (MUAPp) relationships.

RESULTS: The mean type II fiber area was 65.8% (±13.5%). Each subject displayed a significant (p < 0.05) relationship for the FRmean vs. RT (r = -0.96 to -0.81), and FRmax vs. RT (r = -0.96 to -0.81), and RT vs. MUAPp (r = 0.64 to 0.91) relationships. There were significant inverse relationships between type II fiber area and the y-intercept of the FR vs. RT relationship (p < 0.05). Additionally, strong relationships (r = 0.30) were found between type II fiber area and FRmean vs. RT slope and intercept.

CONCLUSION: These data further support the hypothesis that skeletal muscle phenotype is strongly related to MU behavior during isometric contractions. However, our data, in concert with previous investigations, may suggest that these relationships are influenced by the intensity of the contraction.

B-66 Board #143 May 30 3:30 PM - 5:00 PM

Music And Regular Physical Exercise: perception Of Practitioners Regarding Duration And Performance.

Igor Roberto Dias1, Elias de Fraça1, Jeferson O. Santana2, Vinicius Hirt02, Maria Luisa J. Miranda1, Iris C. Sanches1, Erico C. Caperuto1. 1Universidade São Judas Tadeu, São Paulo, Brazil, 2Universidade Estácio de Sá, São Paulo, Brazil. (No relevant relationships reported)

Regular PE practice with music can improve subjective effort perception, motivation, extend the activity time and increase performance. Music is used by practitioners of different modalities and it is considered important by the practitioner, and this can influence the way music can be used in the training plan in order to improve performance, duration, engagement and quality of practice. The objective of this study was (1) to evaluate the use of music during different PE practices and (2) to evaluate how important music is to the practitioner. We used a questionnaire of musical taste and PE practice. The questionnaire assessed the relationship of the regular PE practitioner with music. We asked if the practitioner used music during the exercise and what was his preferred and current practice. The sample consisted of 50 participants, 28 men and 22 women, with a mean age of 36.4±12.7. We used Google Forms to submit an electronic questionnaire, which was strictly forwarded to regular PE practitioners. Among the reported modalities we identified 28.6% resistance training, 18.4% running, 14.3% cycling and 10.2% walking. The level of physical activity of the participants was considered high, since more PE practices occurred either 2-3 times per week (46.9%) or 4 or more times per week (44.9%). The results show that 70% of the participants considered music necessary to perform the preferred PE, this result agrees with 71% of the participants that reported that listened music during their preferred PE. Also, 40% believed that music can change the PE session duration and 72.7% reported that music helps to improve performance during PE practice. Based on these results, we believe that music can stimulate greater engagement in PE practice and it should be included in the training program development (in a more elaborated way with the choice of musical style and rhythm) to improve the proposed training and not only as entertainment to be randomly chosen during PE.

883 Board #144 May 30 3:30 PM - 5:00 PM

Providing Estimates Of Fitness May Influence Subjects' Exercise

neeraj sathnur, james langland, kate picel, andrewolson. university of minnesota, minneapolis, MN. (No relevant relationships reported)

PURPOSE: We investigated if providing measures of cardiorespiratory and muscular fitness would influence subsequent self-reported physical activity.

METHODS: The Exercise Vital Sign and current types of physical activity were obtained from 1315 individuals attending the 2014 and 2015 Minnesota State Fairs. The baseline mean Exercise Vital Sign was 213 min/week. Subjects were randomized in 1:1 fashion to control and intervention groups. The 656 intervention subjects were provided with personal measurements and age appropriate norms of cardiorespiratory fitness using a validated non-maximal step test to estimate VO2max and muscular strength using a hand grip dynamometer. All subjects were provided exercise recommendations based on current standards and follow up surveys conducted to determine subsequent physical activity. Follow up Exercise Vital Sign and physical activity type was obtained from 823 subjects (65%) over the following year. Forms to submit an electronic questionnaire, which was strictly forwarded to regular PE practitioners.

RESULTS: No significant changes in the Exercise Vital Sign were noted in the control group or intervention group at 3 months, 6 months or 1 year of follow-up. At 3 months resistance training activity was reported to increase in the intervention group from 29.1% to 42.8% whereas it declined in the control group from 24.4% to 20.1% (p<0.05). The increase in resistance training was driven by a significant increase in those with grip strengths below normative values. Lifestyle physical activity was also increased in the intervention group at both 3 months (27.7% to 29.1%) and 6 months (25%) whereas it declined in the control group from 24.4% to 20.1% at 3 months and 18.7% at 6 months (p<0.05). Among the subjects who were less active at baseline (Exercise Vital Sign<150) we observed a significant increase in their Exercise Vital Sign from a baseline of 86 to 146 at 6 months (p<0.05).

CONCLUSIONS: Recording the Exercise Vital Sign and providing exercise recommendations appears effective in increasing physical activity in less active participants.
**Purpose:** To determine the utility of the physical activity vital sign (PAVS), and its association with the cardiometabolic disease biomarkers of body mass index (BMI) and blood pressure (BP).

**Methods:** All patients in a high-risk family medicine clinic (>99% Medicare/Medicaid/Uninsured, n = 2710) were assessed via the PAVS (minutes/week), a product of the reported days/week and minutes/day of physical activity. For pediatric patients (5-18 years, n = 255), individuals were categorized into 3 PAVS groups: inactive (PAVS = 0), under-active (1 - 299), and sufficiently active (≥ 300). Pediatric patients were further classified into youth (5-11 years, n = 118) and adolescents (12-18 years, n = 137). Associations were tested between PAVS, BP and BMI utilizing ANOVA. Chi-square-tests were used to compare results to 2015-2016 National Health and Nutritional Examination Survey (NHANES) reported accelerometer data.

**Results:** Among pediatric patients, PAVS decreased with increasing age (p = 1x10^-14). The average level of physical activity reported for youth patients was 384.9 ± 218.1 with 72.9% reporting sufficient PA, 24.6% under-activity and 2.5% inactive. Adolescents were reported a mean PAVS of 278.3 ± 199.6 with 51.8% reporting sufficient PA, 33.6% under-activity and 15.6% inactive. Using the PAVS, only 24.3% of adults reported sufficient PA of ≥150 minutes per week (mean 97.9 ± 149.4). Similar to adults, pediatric males reported a higher PAVS than females (355.1 vs 298.6; p < 0.05). BMI (p = 3.4x10^-7) and systolic BP (p < 0.001) were inversely associated with PAVS in pediatric patients. Similar to adults, patients meeting PA guidelines demonstrated reductions in obesity (p = 0.04) and hypertension (p < 0.05). In comparison to NHANES data, a greater number of children reported meeting PA guidelines through the PAVS (73% vs. 42% for youth, p < 0.00001; 51.8% vs 8% for adolescents, p < 0.00001). PAVS values decline with age and by adulthood the inactivity burden leads to a smaller portion of patients meeting PA guidelines (24% vs 60% in NHANES).

**Conclusion:** The PAVS may under-estimate the burden of physical inactivity in pediatric patients. However, correlations with BMI and BP may suggest a role for the PAVS in identifying youth at risk for obesity and hypertension, which may allow earlier intervention.

**Purpose:** To examine associations between PA VS, BP and BMI utilizing ANOVA. Chi-square-tests were used to compare results to 2015-2016 National Health and Nutritional Examination Survey (NHANES) reported accelerometer data.

**Results:** Among pediatric patients, PAVS decreased with increasing age (p = 1x10^-14). The average level of physical activity reported for youth patients was 384.9 ± 218.1 with 72.9% reporting sufficient PA, 24.6% under-activity and 2.5% inactive. Adolescents were reported a mean PAVS of 278.3 ± 199.6 with 51.8% reporting sufficient PA, 33.6% under-activity and 15.6% inactive. Using the PAVS, only 24.3% of adults reported sufficient PA of ≥150 minutes per week (mean 97.9 ± 149.4). Similar to adults, pediatric males reported a higher PAVS than females (355.1 vs 298.6; p < 0.05). BMI (p = 3.4x10^-7) and systolic BP (p < 0.001) were inversely associated with PAVS in pediatric patients. Similar to adults, patients meeting PA guidelines demonstrated reductions in obesity (p = 0.04) and hypertension (p < 0.05). In comparison to NHANES data, a greater number of children reported meeting PA guidelines through the PAVS (73% vs. 42% for youth, p < 0.00001; 51.8% vs 8% for adolescents, p < 0.00001). PAVS values decline with age and by adulthood the inactivity burden leads to a smaller portion of patients meeting PA guidelines (24% vs 60% in NHANES).

**Conclusion:** The PAVS may under-estimate the burden of physical inactivity in pediatric patients. However, correlations with BMI and BP may suggest a role for the PAVS in identifying youth at risk for obesity and hypertension, which may allow earlier intervention.

**Background:** Hispanic men have the highest prevalence of obesity-related chronic diseases when compared to men in other racial/ethnic groups. Benefits of regular leisure-time physical activity (LTPA) to improve health outcomes are demonstrable. There is limited information on how acculturation status and self-efficacy for exercise influence LTPA for Hispanic men. **Purpose:** To examine associations between acculturation, changes in self-efficacy for exercise behaviors, and changes in LTPA in response to a gender-and culturally-sensitive weight loss intervention (GCSWL). **Methods:** Thirty-five Hispanic men (mean age: 41.5 (SD 11.2) yrs.; mean BMI: 34.8 (5.5) kg/m²) enrolled in a 12-week GCSWL. Participants attended weekly in-person individual sessions guided by a trained bilingual Hispanic male lifestyle coach, were prescribed a daily reduced calorie goal, and 225 minutes of moderate-intensity physical activity per week. A free gym membership was provided to facilitate engagement in LTPA. The Acculturation Rating Scale for Mexican Americans (ARMS-II) measured acculturation related to language, ethnic identity, and ethnicity related to diet. **Results:** Self-efficacy for exercise and LTPA, assessed by the Global Physical Assessment Questionnaire (GPAQ), were measured at baseline and week 12. **Conclusion:** The ARMS-II, 22 (63%) scored Very Mexican or Mexican Oriented, 9 (26%) scored moderately Mexican, and 9 (26%) scored Very American or American Oriented.
Slightly Anglo, and 4 (11%) scored Strongly Anglo. None scored Very Assimilated. At baseline, self-efficacy for exercise was 3.82 (SD 0.86) on a 5-point scale with 1 low and 5 high self-efficacy. After 12 weeks, mean self-efficacy changed slightly by -0.18, (95% CI (-0.46,0.09)), mean LTPA increased by 200.1 (40.1, 396.3) minutes/week with moderate and vigorous LTPA increasing by 90.1 (-23.2, 203.7) and 109.9 (16.1, 203.6) minutes/week, respectively. Change in vigorous LTPA was weakly positively correlated with change in self-efficacy score (Spearman’s r=0.30, p=0.08). We found no significant associations between low ARSMA-II scores and LTPA. **Conclusion:** Significant improvements in LTPA were observed for Hispanic men participating in a GCWSLI. Acculturation and self-efficacy were not associated with this change. Studies examining additional factors that influence LTPA in this health disparate group are needed.

**888 Board #149 May 30 3:30 PM - 5:00 PM Low-Frequency High-Intensity Interval Training (HIIT) Improves Cardiorespiratory Fitness and Body Composition in Overweight Adults**

Parco Siu, FACSM1, Edwin Chiu1, Stephen Wong, FACSM2, Daniel Fong1, Derwin Chan1, Heidi Ngai1, Paul Lee1, Patrick Yung2, 1The University of Hong Kong, Hong Kong, Hong Kong. 2The Chinese University of Hong Kong, Hong Kong, Hong Kong. 1No relevant relationships reported

**PURPOSE:** This study examined the effects of 8 weeks of low-frequency high-intensity interval training (HIIT) on cardiorespiratory fitness and body composition. **METHODS:** Twenty-three overweight/obese young men (mean age 22.7 ± 2.8 years, BMI 25.5 ± 1.8, percent body fat 22.3 ± 2.2%) were randomly assigned to HIIT and no-intervention control (CON) groups. Participants assigned to HIIT group performed 12 bouts of 1-min 30-meter shuttle runs at 90% of heart rate reserve (HRR), interspersed by 1-min of active recovery at 70% of HRR once weekly. Participants in control group were instructed to maintain their daily lifestyle habit for 8 weeks. **RESULTS:** VO_{2max} was measured by beep test and body composition was assessed by bio-impedance segmental body composition analyzer before and after the study period. **RESULTS:** VO_{2max} was significantly increased after 8 weeks of HIIT intervention (HIIT +17.5% vs. CON -0.3%). Total body fat mass, percent body fat and waist circumference were significantly reduced after 8 weeks of HIIT intervention (fat mass: HIIT -7.9% vs. CON +4.7%, percent body fat: HIIT -7.6% vs. CON +2.9%, waist circumference: HIIT -4.5% vs. CON +0.8%). **CONCLUSION:** Our results demonstrate that low-frequency HIIT (i.e., performed once per week) improves cardiorespiratory fitness and body composition in overweight/obese men. Supported by HKU Seed Fund for Basic Research

**889 Board #150 May 30 3:30 PM - 5:00 PM The Influence of Nutritional Intervention Program on the Dietary Habits of High School Students**

Daniel S. Moran, FACSM1, Ran Kanon2, Yoram Epstein, FACSM1, Ariel University, Ariel, Israel. 1Washington College, Yavne, Israel. 2Sheba Medical Center, Tel Hashomer, Israel. 1No relevant relationships reported

The increase in obesity and sedentary lifestyle has caused many educational bodies to develop intervention programs in an attempt to implement healthier lifestyle. **PURPOSE:** To assess the efficiency of an educational program embedded in a high-school curriculum on dietary habits of the students. **METHODS:** Fifty eight 10th grade students (15-16 yrs) participated in this study. 29 students were chosen randomly to attend four lectures on healthy nutrition habits at the end of the intervention (P3). 12 HWC sessions were completed, which were held weekly (1 hour each), and 36 physical activity sessions, which were held 3 times a week (1 hour each). No diet was prescribed during the whole process. **RESULTS:** A diet prescription was associated with reductions in body weight (-5.1 kg), fat mass (-5.2 kg), BMI [from 29.6 (P1) to 27.8 kg/m² (P3)], and waist circumference (-7.1cm). From P1 to P3, we also observed maintenance of the fat free mass (54.1 kg), a decrease in total energy intake (-300 kcal/day) and fat intake (-44%). **CONCLUSIONS:** Significant improvements in LTPA were observed for Hispanic men participating in a GCWSLI. Acculturation and self-efficacy were not associated with this change. Studies examining additional factors that influence LTPA in this health disparate group are needed.

**890 Board #151 May 30 3:30 PM - 5:00 PM Effect of A Neuromotor Intervention on Balance and Strength**

Anna M. Carman, Rachel M. Whorton, Joshua D. Guggenheim. Saint Catherine University, Saint Paul, MN. 1Sponsor: Mark Blegen, FACSM 1No relevant relationships reported

Falls are the most common mechanism of injury and a leading cause of accidental death in the elderly. Therefore, functional independence for the elderly is clearly contingent upon fall prevention. **PURPOSE:** The purpose of this study was to determine the effectiveness of a neuromotor-based exercise intervention on balance, balance confidence, and strength in older adults. **METHODS:** Nine individuals (eight female) with a mean age of 78.3 ± 9.3 years were assessed before and after a 16-session exercise intervention implemented over eight weeks. Balance was assessed using the Berg Balance Scale (BBS); lower-body strength and endurance was assessed using a 30-second sit-to-stand test (30 SSTS); balance confidence was assessed using the Activities Specific Balance Confidence Scale (ABC); finally, a handgrip dynamometer was used to assess grip strength. Participants were instructed in an exercise session two times per week consisting of the following exercises: squats, chair lifts, lunges, band rows, hip flexion and extension, bicep curls, plantarflexion and dorsiflexion with band resistance, and a balance progression series. Two sets of 10 repetitions were completed for each exercise. **RESULTS:** There was a significant difference in balance, as indicated by an improvement in BBS from 44.5 ± 14.5 to 47.6 ± 14.6, (p < 0.05) after the intervention. Although not statistically significant, there was an 18 percent increase in 30 SSTS performance, from 11.0 ± 4.7 to 13.1 ± 3.9 repetitions. Similarly, ABC scores improved practically but not significantly, from 73.6% ± 14.8 to 79.2% ± 15.7. Pre- and post-test scores for grip strength performances were not statistically different. **CONCLUSION:** The findings of this study indicate that a 16-session neuromotor-based exercise intervention has a positive influence on balance in older adults. Moreover, there was a clinically significant improvement in 30 SSTS and ABC measures. It is strongly recommended that the elderly be encouraged to participate in similar neuromotor-based training, as this type of intervention may reduce falls and enhance independent living.

**891 Board #152 May 30 3:30 PM - 5:00 PM Health And Wellness Coaching Improves Body Composition and Quality Of Life With No Diet Prescription**

Paula Helena Dayan1, Luciana Oquendo Pereira-Lancha2, Antonio Herbert Lancha Junior1, 1Physical Education and Sport School, University of São Paulo, São Paulo, Brazil. 2Instituto de Bem Estar e Saúde, São Paulo, Brazil. 1No relevant relationships reported

Global obesity rates have reached epidemic proportions. However, it is estimated that 95% of the dieters find difficulty in maintaining weight loss and return to gain it for up to 2 years. The desire for long lasting behavioral and weight changes motivated health professionals to seek for new approaches to stop the obesity growing rates. Health and wellness coaching (HWC) comes up as a behavioral change approach, based on a client-centered process, without a diet prescription, and seems to be more likely to promote long lasting changes. The subject of this study had previously tried different diets, all of which failed to achieve lasting weight loss. **PURPOSE:** the aim of this case report is to present and evaluate HWC in promoting sustainable lifestyle changes especially in body composition, eating pattern and self-assessment of quality of life. **METHODS:** body composition, quality of life (WHOQOL-bref) and nutritional intake were assessed at baseline (P1), after 12 weeks of HWC (P2) and 14 weeks after the end of the intervention (P3). 12 HWC sessions were completed, which were held weekly (1 hour each), and 36 physical activity sessions, which were held 3 times a week (1 hour each). No diet was prescribed during the whole process. **RESULTS:** In P3, HWC and physical activity sessions were associated with reductions in body weight (-5.1 kg), fat mass (-5.2 kg), BMI [from 29.6 (P1) to 27.8 kg/m² (P3)], and waist circumference (-7.1cm). From P1 to P3, we also observed maintenance of the fat free mass (54.1 kg), a decrease in total energy intake (-300 kcal/day) and fat intake (-44%). **CONCLUSIONS:** Significant improvements in LTPA were observed for Hispanic men participating in a GCWSLI. Acculturation and self-efficacy were not associated with this change. Studies examining additional factors that influence LTPA in this health disparate group are needed.
BACKGROUND: The prevalence of physical inactivity in Latin America was one of the highest reported worldwide. The purpose of this study was to compare the differences in the prevalence of physical activity (PA) across different countries in Latin America. METHODS: Data from the Latin American Study of Nutrition and Health (ELANS) were included in the analysis. The sample included 9,218 adolescents and adults aged 15-65 years. PA was assessed using the International Physical Activity Questionnaire. PA was compared among countries, gender, age group, socioeconomic, educational level and different PA domains. In addition to using the MET-minutes/week rank, we also used the rating in active or insufficiently active based in minutes/week. Individuals were categorized as active (mean ≥150 min/week) or insufficiently active (mean ≤150 min/week). RESULTS: The prevalence of physically active individuals was 25.2% and men were more active than women in all countries. Only 13.4% of the population had high PA level and 27.4% showed moderate PA level. More than half (59.3%) of subjects exhibited low levels of PA. The prevalence of physically active individuals slightly increased from low to high socioeconomic level. Regarding the educational levels, the prevalence of physically active individuals was similar among those who have a lower educational levels, high school studies, and university degrees (52.4, 52.0, and 52.3%). The largest fraction of transportation was explained by walking (87%). Vigorous-intensity PA was the one that contributes the most for the total leisure time (52%). Recreation/sport time contributes with 25% to total leisure time. The total of minutes of PA is explained in 55% by leisure time and 45% by transportation time. Most of the countries more than 80% of total MET-minutes/week were explained by walking (44%) and vigorous-intensity PA (39%). The only exceptions were Ecuador and Chile, the two countries with the highest levels of PA. CONCLUSIONS: The high percentage of Latin American subjects insufficiently active people and with low levels of PA should be of concern. Measures are needed to promote the practice of PA. If assessment methods are used consistently over time within this world region, trend data will inform countries about the success of their efforts to promote PA.

CONCLUSION: Our data demonstrated that the staff of a hemodialysis clinic improved BMI values in response to WOW; it is a pilot study that demonstrates the potential to improve health indices of the staff of a hemodialysis clinic and may positively impact the health behaviors in the hemodialysis patients under their care.

Purpose: The purpose of this study was to investigate the effects on physical activity with the utilization of motivational interviewing (MI) on sedentary law enforcement officers (LEOs). In addition, this study considered the reasons why LEOs choose to be participate in physical activity or to stay sedentary. The incidence of cardiovascular disease and early mortality are prevalent in LEO, additional behavior change technique research may have a potential impact in their long term health and wellness. METHODS: The LEOS in this study represent veteran officers from the Midwest region of the United States, over the age of 35 years, who were not getting greater than 150 minutes a week of exercise. The five officers involved in the study received four MI sessions in 6 weeks. Data collection procedures for this included transcripts from MI sessions, pre/post results from the Self-Efficacy for Exercise (SEE) scale and (Bandura, 2006), the Stages of Exercise Behavior Change-scale (SEBC) (Marcus, 1992), and 6 weeks of accelerometer data. A descriptive case study of five law enforcement officers was presented with examples drawn from data, followed by a cross-case comparison of the five officers.

Purpose: The purpose of this study was to investigate the effects on physical activity with the utilization of motivational interviewing (MI) on sedentary law enforcement officers (LEOs). In addition, this study considered the reasons why LEOs choose to be participate in physical activity or to stay sedentary. The incidence of cardiovascular disease and early mortality are prevalent in LEO, additional behavior change technique research may have a potential impact in their long term health and wellness. METHODS: The LEOS in this study represent veteran officers from the Midwest region of the United States, over the age of 35 years, who were not getting greater than 150 minutes a week of exercise. The five officers involved in the study received four MI sessions in 6 weeks. Data collection procedures for this included transcripts from MI sessions, pre/post results from the Self-Efficacy for Exercise (SEE) scale and (Bandura, 2006), the Stages of Exercise Behavior Change-scale (SEBC) (Marcus, 1992), and 6 weeks of accelerometer data. A descriptive case study of five law enforcement officers was presented with examples drawn from data, followed by a cross-case comparison of the five officers.

CONCLUSIONS: Based on this study, sedentary LEOs can increase physical activity, increase SE and help individuals to move closer to making behavior changes. Motivational interviewing can used an effective behavior change technique in LEOs. It can also be noted that officers have distinct barriers that keep them from participating in physical activity. Allied health care professionals and worksite wellness could benefit from information gained from this study.

CONCLUSION: Based on this study, sedentary LEOs can increase physical activity, increase SE and help individuals to move closer to making behavior changes. Motivational interviewing can used an effective behavior change technique in LEOs. It can also be noted that officers have distinct barriers that keep them from participating in physical activity. Allied health care professionals and worksite wellness could benefit from information gained from this study.

Diabetes mellitus (DM) is a pandemic disease. In 2015, 422 million people around the world were living with DM, 80% in developing countries, and 60.5 million people were expected to have DM by 2040; North America and the Caribbean will contribute with 60.5 million. Since long time ago it has been claimed that DM’s treatment for diabetes educators have a positive impact on the lifestyle of their DM2 patients. CONCLUSION: Training health professionals as diabetes educators have a positive impact on the lifestyle of their DM2 patients.
For behavioral change, having strong goal intentions does not guarantee goal achievement. Implementation intentions (II) are specific plans of action concerning when, how, and where an intended behavior will be enacted. This self-regulatory skill combined with self-monitoring from daily pedometer use may influence goal achievement. 

PURPOSE: To examine physical activity (PA) goal achievement between participants that used both II and a pedometer and those that just used a pedometer. 

METHODS: Sedentary employees (<150 minutes of moderate to vigorous PA/week) (N = 54) at a mid-sized public university were recruited to participate in an 8-week intervention. A 2-A randomized trial was used to compare the effectiveness of: 1) only pedometers (PED) (n = 26) and 2) pedometers and II (PED + II) (n = 28) on goal achievement. All participants were asked to track steps daily. Participants in the PED + II group were asked to write three II for each perceived barrier to meeting their step goals in Weeks 1 and 4. Daily step goals for Weeks 1-3 were based on baseline data, increasing daily goals each week 10% (Time 1). At Week 4, participants were able to individually revise or keep their daily step goals for the remainder of the study to promote autonomy (Time 2: Weeks 4-8). Goal achievement was evaluated as whether the participant met their daily step goal each day that week (YES) or not (NO).

RESULTS: For Time 1, at least one day/week goal achievement was higher in the PED group (97.4%; 25 ± 1) compared to the PED-II group (83.3%; 23 ± 3), as well as for Time 2 (57.1%; 16 ± 4) compared to the PED-II group (42.3%; 11 ± 3) and (35.5%; 10 ± 5.4); respectively. 

CONCLUSIONS: The PED group had higher goal achievement at both time points compared to the participants in the PED-II. Implementation Intentions have been promoted as a behavioral strategy to bridge the gap between intention and behavior, with specific emphasis on improving goal achievement (Gollwitzer & Sheeran, 2006). These results question the utility of II to enhance goal achievement. Further research is needed to examine if this contradictory finding is unique to worksite pedometer-based II.

PURPOSE: The purpose of this study was to evaluate the influence of the installation of bike fix-it stations on active transportation (AT) awareness and behaviors among middle school students. Self-reported barriers to active transportation (AT) were also recorded. 

METHODS: Three suburban middle schools in Colorado (USA) installed bike fix-it stations on school property that were available for students to use to perform minor repairs to their bikes. A questionnaire was developed by the school district that included the addition of Fitbits to help set goals and track progress. The approaches of each investigation were compared using the average changes from baseline in an independent t-test. 

RESULTS: The SGB study participants significantly increased daily steps from 457.88 ± 388.83 to 8,400 ± 0.01, as well as mental health (p < 0.03) and physical function (p = 0.04) as measured by the SF-36. A decreasing trend in weight and perceived stress was also observed. All participants were asked to track steps daily. Participants in the PED + II group were asked to write three II for each perceived barrier to meeting their step goals in Weeks 1 and 4. Daily step goals for Weeks 1-3 were based on baseline data, increasing daily goals each week 10% (Time 1). At Week 4, participants were able to individually revise or keep their daily step goals for the remainder of the study to promote autonomy (Time 2: Weeks 4-8). Goal achievement was evaluated as whether the participant met their daily step goal each day that week (YES) or not (NO).

RESULTS: For Time 1, at least one day/week goal achievement was higher in the PED group (97.4%; 25 ± 1) compared to the PED-II group (83.3%; 23 ± 3), as well as for Time 2 (57.1%; 16 ± 4) compared to the PED-II group (42.3%; 11 ± 3) and (35.5%; 10 ± 5.4); respectively. 

CONCLUSIONS: The PED group had higher goal achievement at both time points compared to the participants in the PED-II. Implementation Intentions have been promoted as a behavioral strategy to bridge the gap between intention and behavior, with specific emphasis on improving goal achievement (Gollwitzer & Sheeran, 2006). These results question the utility of II to enhance goal achievement. Further research is needed to examine if this contradictory finding is unique to worksite pedometer-based II.

PURPOSE: The purpose of this study was to examine differences in college students’ situational motivation, physiological responses and PA levels during single player and double player exergaming conditions.

METHODS: Twenty Chinese elite athletes (18 females; X̄_age = 27.3 ± 4.3 years, X̄_body mass = 63.5 ± 9.9 kg) completed two separate exergaming conditions: 1) Xbox 360 Reflex Ridge-single player; and 2) Xbox 360 Reflex Ridge-double player. Participants completed a single motivation (intrinsic motivation [IM], identified regulation [IR], extrinsic motivation [ER], amotivation [AM]) was examined following each exergaming condition using an established questionnaire. Blood Pressure (BP) response to each exergaming condition was measured using an Omron HEM-705CP digital BP cuff, with light PA (LPA), moderate-to-vigorous PA (MVPA), and energy expenditure (EE) assessed using ActiGraph GT3X+ accelerometers.

RESULTS: One-way ANOVAs suggested that no significant differences were observed for any outcome between the two exergaming conditions, F(1, 38) = 0.002-0.05. However, it is noteworthy that participants demonstrated higher levels of IM and IR (5.5; 4.7, respectively) compared to ER and AM (3.4; 2.2, respectively) during both exergaming conditions. Further, participants engaged in slightly greater MVP among the single player condition (8.8 minutes) compared to the double player condition (7.8 minutes)—resulting in greater EE being observed during the single player condition (63.7 kcalories) compared to the double-player condition (52.8 kcalories).

DISCUSSION: Findings suggest both single player and double player exergaming conditions may promote motivational states which are more predictive of long-term PA participation (i.e., IM and IR) and that a single player exergaming condition might be more physically demanding than a double player condition. The non-significance between conditions may due to small sample size, and thus future research with larger samples is warranted.

The transition of HIV infection from a terminal illness to a chronic disease requires a focus on lifestyle interventions to address health challenges in this vulnerable population. Social, mental and physical barriers to recruitment/retention of participants can create challenges to acquiring accurate measurements during studies. 

PURPOSE: The purpose of this investigation is to compare the methodologies and results of two approaches to community-based health interventions for people living with HIV (PLWH).

METHODS: Data from an ongoing support group-based (SGB) intervention designed to improve health-related quality of life (HRQOL) through classes that teach and reinforce healthy lifestyle habits, like increasing physical activity (PA), for disease and symptom management was compared to that of a previously published home-based (HB) intervention by the investigators. The same accelerometer brand and psychometric questionnaires were used in each study. The SGB approach included the addition of Fitbits to help set goals and track progress. The approaches of each investigation were compared using the average changes from baseline in an independent t-test.

RESULTS: The SGB study participants significantly increased daily steps from 457.88 ± 388.83 to 8,400 ± 0.01, as well as mental health (p < 0.03) and physical function (p = 0.04) as measured by the SF-36. A decreasing trend in weight and perceived stress was also observed. All participants were asked to track steps daily. Participants in the PED + II group were asked to write three II for each perceived barrier to meeting their step goals in Weeks 1 and 4. Daily step goals for Weeks 1-3 were based on baseline data, increasing daily goals each week 10% (Time 1). At Week 4, participants were able to individually revise or keep their daily step goals for the remainder of the study to promote autonomy (Time 2: Weeks 4-8). Goal achievement was evaluated as whether the participant met their daily step goal each day that week (YES) or not (NO).

RESULTS: For Time 1, at least one day/week goal achievement was higher in the PED group (97.4%; 25 ± 1) compared to the PED-II group (83.3%; 23 ± 3), as well as for Time 2 (57.1%; 16 ± 4) compared to the PED-II group (42.3%; 11 ± 3) and (35.5%; 10 ± 5.4); respectively. 

CONCLUSIONS: The PED group had higher goal achievement at both time points compared to the participants in the PED-II. Implementation Intentions have been promoted as a behavioral strategy to bridge the gap between intention and behavior, with specific emphasis on improving goal achievement (Gollwitzer & Sheeran, 2006). These results question the utility of II to enhance goal achievement. Further research is needed to examine if this contradictory finding is unique to worksite pedometer-based II.

PURPOSE: College students’ psychological and physiological outcomes during single and double player exergaming conditions remain largely unexplored. The purpose of this study was to examine differences in college students’ situational motivation, physiological responses and PA levels during single player and double player exergaming conditions.

METHODS: Twenty Chinese elite athletes (18 females; X̄_age = 27.3 ± 4.3 years, X̄_body mass = 63.5 ± 9.9 kg) completed two separate exergaming conditions: 1) Xbox 360 Reflex Ridge-single player; and 2) Xbox 360 Reflex Ridge-double player. Participants completed a single motivation (intrinsic motivation [IM], identified regulation [IR], extrinsic motivation [ER], amotivation [AM]) was examined following each exergaming condition using an established questionnaire. Blood Pressure (BP) response to each exergaming condition was measured using an Omron HEM-705CP digital BP cuff, with light PA (LPA), moderate-to-vigorous PA (MVPA), and energy expenditure (EE) assessed using ActiGraph GT3X+ accelerometers.

RESULTS: One-way ANOVAs suggested that no significant differences were observed for any outcome between the two exergaming conditions, F(1, 38) = 0.002-0.05. However, it is noteworthy that participants demonstrated higher levels of IM and IR (5.5; 4.7, respectively) compared to ER and AM (3.4; 2.2, respectively) during both exergaming conditions. Further, participants engaged in slightly greater MVP among the single player condition (8.8 minutes) compared to the double player condition (7.8 minutes)—resulting in greater EE being observed during the single player condition (63.7 kcalories) compared to the double-player condition (52.8 kcalories).

DISCUSSION: Findings suggest both single player and double player exergaming conditions may promote motivational states which are more predictive of long-term PA participation (i.e., IM and IR) and that a single player exergaming condition might be more physically demanding than a double player condition. The non-significance between conditions may due to small sample size, and thus future research with larger samples is warranted.
CONCLUSIONS: P-PFx is improved in older overweight and obese women after a weight loss intervention irrespective of whether it included exercise. Perceived ability to accomplish physical roles improved to a greater extent with exercise inclusion in the weight loss intervention in this older adult cohort. Funded in part by The Beef Checkoff

### MEDICINE & SCIENCE IN SPORTS & EXERCISE®

#### 900 Board #161 May 30 3:30 PM - 5:00 PM

**Comparison of Caloric Expenditure in a Smart Watch and Portable Metabolic Cart**

Andrew Rioveros, Evan Glashen, Antoinette Domingo, Taylor Pennafl, Brian Panaligan, Jochen Kressler. *San Diego State University, San Diego, CA.*

No relevant relationships reported

**Purpose:** To validate a Smart Watch (SW) for wheelchair users by comparing caloric energy expenditure (EE) against expired gas analysis. Valid activity tracking will be helpful for clinicians, patients and consumers and may help increase physical activity levels among wheelchair users.

**Methods:** Five wheelchair users (age=50.0(5.6)) and three able-bodied (age=25.3(3.2)) participants completed series of exercises including wheelchair treadmill propulsion at 30, 45, and 60 strokes per minute (spm) and arm cycle ergometry at 45, 60, and 80rpm. They were equipped with a SW on their dominant hand, heart rate monitor, and a portable metabolic tracking cart. The bundled workout app was used for each task. Caloric expenditure data was extracted from both devices and compared by Bland-Altman analysis.

**Results:** For treadmill tasks, the SW reported the average EE at 30, 45, and 60rpm frequencies were 72.0(2.9), 82.3(2.9) and 92.0(2.9) kcs, respectively. At the same frequencies, the metabolic cart expenditures read 103.9(12.5), and 15.7(6.7). Bland-Altman analysis showed relatively poor agreement between the cart and watch at 30mpm (mean difference 3 with limits of agreement (LoA) -4 – 9). Mean absolute percent error (MAPE) was 21.56%. Agreement worsened at higher stroke frequencies, 45rpm (4,12 – 12) and 60rpm (6,4 – 10). MAPE was 29.11% and 35.88%, respectively. For arm ergometry, the average EE reported by the watch at 45, 60, and 80rpm were 71.0(1), 91.5(1), and 111.4(1). Metabolic cart expenditures were 63.0(2), 72.4(2), and 82.8(2) at the same frequencies. Bland-Altman analysis showed good agreement at 45rpm (4,0.3 – 6.5) with a MAPE of 32.69%. Agreement worsened at higher frequencies, 60rpm (3,6 – 15) and 80rpm (2,7 – 21). MAPE was 58.57% and 48.54%, respectively. Conclusion: While performing a treadmill task, the SW underestimated caloric expenditure, but overestimated for arm ergometry. The activity tracker records EE with good validity only at lower frequency tasks.

### B-67 Free Communication/Poster - Older Adults and Aging

#### 901 Board #162 May 30 3:30 PM - 5:00 PM

**Weight Loss Involving Exercise Increases Older Women’s Perceived Ability To Accomplish Their Physical Roles**

R.E. Salyer¹, G.M. Frederick¹, R.A. Reed¹, A.C. Berg¹, C.R. Straught², M.A. Johnson¹, P.J. O’Connor, FACS¹M, E.M. Evans, FACS¹M. *1University of Georgia, Athens, GA. 2University of Massachusetts, Amherst, MA.* (Sponsor: Ellen Evans, FACS) (No relevant relationships reported)

**Purpose:** Older women are known to be at higher risk for both obesity and physical disability compared to their male counterparts. Reductions in perceived physical function (P-PFx) contribute to a decreased health-related quality of life (HRQoL). Weight loss can improve HRQoL in the domain of P-PFx, but the weight loss method that elicits the greatest improvements in both P-PFx and physical role limitations (PRL), such as difficulties or limitations in habitual daily physical activities, is less clear. Women (n=53; 64-77 & 69.3±2 years) were randomized to either diet only (D; n=19) or diet+exercise (D+EX; n=34) treatment groups for 6 months. Outcomes of interest were related to physical domains and were assessed using SF-36 subscales that matched the P-PFx and PRL. Changes in physical role limitations following a 12-month physical activity intervention in older adults

**Methods:** Participants (N=14; 63.5±2 years) completed 2 training sessions per week across 8 weeks, with session duration ≤ 10 minutes. Pre- and post-assessments included a 30-second repeated chair stand (RCS), the timed-up-and-go (TUG), and maximal eccentric strength (MES). Pre-test values for the sample were compared to population averages for the RCS and the TUG, to characterize the sample. Percent change was calculated using: [(Pre-test - Post-test)/ Pre-test] x 100 and paired sample t-tests were conducted to compare changes on RCS, TUG, and MES. **Results:** All participants met or exceeded the population average on both the TUG and, overall, the sample began at a higher level on the TUG relative to this average (p= .031). In contrast, the sample for RCS began training below the population average (p= .041) and only 4 of 14 initiated training at or exceeding the population average. There was a significantly smaller percent improvement for RCS vs the other domains (p< .001 and RCS vs. MES). Older women are known to be at higher risk for both obesity and physical disability compared to their male counterparts. Reductions in perceived physical function (P-PFx) contribute to a decreased health-related quality of life (HRQoL). Weight loss can improve HRQoL in the domain of P-PFx, but the weight loss method that elicits the greatest improvements in both P-PFx and physical role limitations (PRL), such as difficulties or limitations in habitual daily physical activities, is less clear. Women (n=53; 64-77 & 69.3±2 years) were randomized to either diet only (D; n=19) or diet+exercise (D+EX; n=34) treatment groups for 6 months. Outcomes of interest were related to physical domains and were assessed using SF-36 subscales that matched the P-PFx and PRL. Changes in physical role limitations following a 12-month physical activity intervention in older adults

**Results:** Mean absolute percent error (MAPE) was 21.56%. Agreement worsened at higher stroke frequencies, 45rpm (4,0.3 – 6.5) with a MAPE of 32.69%. Agreement worsened at higher frequencies, 60rpm (3,6 – 15) and 80rpm (2,7 – 21). MAPE was 58.57% and 48.54%, respectively. Conclusion: While performing a treadmill task, the SW underestimated caloric expenditure, but overestimated for arm ergometry. The activity tracker records EE with good validity only at lower frequency tasks.
By 2050, 20% of the older population in the US will be comprised of Latinos. However, Latino health is often poorer than that of non-Latinos whites, with a higher prevalence of chronic diseases and Alzheimer’s disease. In addition, Latinos engage in low leisure-time physical activity (LTPA) levels. PURPOSE: Test the impact of the BAILAMOS® dance program on lifestyle PA at 4 months and BAILAMOS® maintenance activities on lifestyle PA at 8 months. METHODS: Older Latino adults (N = 333; M_age = 64.89±7.08) were randomized into the dance (n=167) or health education (HE) (n=166) groups. Inclusion criteria were: (1) aged ≥55 years old; (2) self-identification as Latino/Hispanic; (3) Spanish speaker; (4) participation in ≤2 days/week of aerobic exercise; (5) at risk for disability; (6) Mini-Mental State Examination >14; (7) Danced <2 times/month over past year. The dance group participated in 4 months of Latin dancing, two times per week, plus a 4-month maintenance program. The HE group participated in health education classes once per week for 4 months. The Community Healthy Activities Model Program for Seniors (CHAMPS) Physical Activity Questionnaire was administered. A random-intercept mixed model with data imputation was performed, adjusting for baseline covariates of age, sex, education, income, and health status. RESULTS: Total PA significantly increased at 4 months in both dance (M=899.3 ± 53.8) and HE groups (M=870.4 ± 55.5). Compared to baseline (Dance, M=718.2 ± 529.4; HE, M=702.2 ± 437.9; Estimate=137.08, SE=57.52, p=0.017). It was also observed that total LTPA increased in the dance (M=578 ± 43.2) and HE groups (M=464 ± 39.6) at 4 months compared to baseline (Dance, M=385 ± 416.9; HE, M=364.8 ± 332.7; Estimate=89.9, SE=43.81, p=0.04); and from baseline to 8 months (Dance, M=536 ± 470.6; HE, M=436.3 ± 336.5; Estimate=104.09, SE=47.36, p=0.028). The mean change in LTPA between dance and HE at 4-months was statistically significant (M=114.24, SE=48.84, p=0.019). However, there was no group*time interaction (p > 0.05). CONCLUSION: The results demonstrated that both study groups increased their self-reported total and leisure-time PA after 4 and 8 months, suggesting a positive impact of both dance and the HE program on PA levels in older Latinos. Supported by NIH Grant 1R01NR013151-01.

Weakness in the lower-leg, particularly the tibialis anterior, can negatively impact balance and mobility, and thus exacerbate the risk for falls. Although a variety of interventions have been shown to improve strength and balance, such programs often require extensive time and trained professionals. Furthermore, targeting the muscles of the lower-leg is difficult using traditional resistance exercises. The advent of CLX elastic bands with their continuous-loop design has made it easier to perform such exercises. However, the efficacy of such training is unknown. PURPOSE: The purpose of this study was to determine if performing two lower-leg exercises using CLX bands for short periods of time (10 min) each in a home-based setting improves strength, balance, and mobility in older women. METHODS: Eleven women (age=78.8±8.4 yr) participated in exercise training and 10 women (age=77.7±4.5 yr) served as controls. All participants were sedentary retirement community residents. Training consisted of chair-based dorsiflexion and plantar flexion exercises using CLX bands performed in the residents’ apartments for 3 sets of 10 repetitions on 5 d/wk for 8 wk. Performance was assessed before and after the intervention. Isometric dorsiflexion and plantar flexion strength was assessed using a hand-held dynamometer. The Limits of Stability (LoS) test, performed on a force platform, was used to assess dynamic balance. Mobility was assessed by the Timed Up-and-Go (TUG) test. RESULTS: Compared to controls, CLX band training improved (p<0.05) both dorsiflexion and plantar flexion by approximately 20%. LoS improved in the forward and backward (but not other) directions by 7% and 9%, respectively. TUG performance did not change in either group. CONCLUSIONS: Lower-leg training with CLX bands appears to improve dorsiflexion and plantar flexion strength as well as LoS in the forward and backward directions, but not mobility, in older women. These improvements may reduce the risk of falls.

PURPOSE: Prescribing aerobic and resistance training in conjunction is proposed as an optimum strategy to target cardiovascular as well as musculoskeletal functions in the elderly. However, few studies have examined the effects of intra-session exercise order on arterial stiffness in the elderly. This study investigated the effects of aerobic exercise before and after resistance training on arterial stiffness, body composition, and muscle strength in older men. METHODS: Forty-five older men (70.5±3.5 years) were randomly assigned to one of three groups that performed aerobic exercise first (AR: 16), performed resistance training first (RA: 16), and did not perform any training (CON: 13). The AR and RT groups performed aerobic exercise consisted of cycling at 60% heart rate reserve (HRR) and resistance training consisted of 5 types of exercises (leg curl, leg press, chest press, seated row, shoulder press) at 70-80% one repetition maximum (1RM). Body composition was evaluated by height, weight, body fat percentage, lean body mass and waist circumference. Muscle strength was measured by 1RM and arterial stiffness was evaluated by carotid-femoral pulse wave velocity (cPWV). Pre- and post-intervention group comparisons were analyzed using a two-way ANOVA with repeated measures. RESULTS: A significant group difference was observed in cPWV (F=3.464, P=0.042); cPWV significantly reduced in the RA group (9.3±2.1 m/s to 8.2±1.9 m/s, P<0.05), while did not change in the AR group (8.4±2.1 m/s to 8.7±1.5 m/s, P=0.413). Significant group differences were observed in all exercise types (leg press: F=9.814, P=0.001; leg curl: F=26.667, P<0.001; chest press: F=17.223, P<0.001; seated row: F=15.648, P=0.001; shoulder press: F=13.244, P<0.001), and waist circumference (F=10.516, P=0.001). However, there were no significant differences between AR and RA. CONCLUSION: Based on our results, aerobic exercise after resistance training reduced arterial stiffness and a difference of intra-session exercise order was observed.
Muscle quality has been determined the fat tissue content within a skeletal muscle (i.e. intramuscular fat content). Muscle quality become worse with aging and disuse as a result of increasing of intramuscular fat and/or decreasing of muscle tissue. Intramuscular fat content is known as a negative contributor to force production and physical functions. We have reported the unique change of muscle quality by the 12 months resistance and endurance training in elderly; however, it is not well understood how the muscle quality, quantity and physical functions change by further 12 months (totally 24 months) trainings. PURPOSE: The purpose of this study was to assess the effects of 24 months training on muscle quality, quantity and physical functions in elderly who need long term care. METHODS: Ten elderly men and women (6 women and 4 men, age, 77 ± 6 years; height, 154 ± 7 cm; weight, 54 ± 9 kg) participated in this study, and they needed long-term care while they could do almost all activities of daily living. They performed physical training consisting of resistive exercises, stretching, and aerobic exercises as a part of rehabilitation program once or twice a week for 24 months. B-mode transverse ultrasonographic images were taken from rectus femoris (RF) and biceps femoris (BF). Echo intensity (EI) as an index of muscle quality and muscle thickness as an index of muscle quantity was calculated from these muscles. We measured their physical performance tests, i.e. isometric knee extension peak torque (PT), one-leg stand, chair (20 cm) stand, grip strength, 5-m normal/maximal walk, and timed up and go before and after the training. RESULTS: EI in RF and BF did not change through the intervention, but BF thickness was significantly increased after the training. PT, 5-m normal/maximal walk, and timed up and go were improved after the 24 months training. Percent change of PT was the only independent variable to explain the percent change of EI in RF (regression coefficient = 1.24, R = 0.91, adjusted R² = 0.82, P < 0.001), implying that improvement of PT could be induced increasing EI in RF. CONCLUSIONS: Twenty-four months concurrent training induced muscle hypertrophy with the improvement of physical functions. Furthermore, in this type of long-term training, the increase of EI RF could be a key to improve PT.

Advanced age is often accompanied by deterioration of body composition and physical function. These alterations can lead to reduced performance of daily living and autonomy. It has been purported that regular aerobic exercise may enhance physical function in older adults. PURPOSE: To determine the effects of habitual physical activity on physical function (5 m gait time, 5 m gait speed, and total gait time), cardiorespiratory fitness (VO₂ max), and body composition (body fat percentage, total lean mass, and bone mineral density) outcomes in older adults. METHODS: 27 active and 35 inactive older adults (70 ± 5 yrs, 73.4 ± 15.0 kg, 170 ± 8.0 cm, 30.7 ± 7.5% body fat) were recruited for this study. The perceptually-regulated treadmill exercise test was used to estimate VO₂ max. Body composition was determined by a whole body DXA scan. Gait variables were assessed via the 400 m walking test. The Yale Physical Activity Survey (YPAS) was used to determine self-reported activity. RESULTS: Active individuals had better 5 m gait time (2.78 ± 0.24 vs 3.02 ± 0.48 seconds, p < 0.05), gait speed (1.81 ± 0.15 vs 1.68 ± 0.24 m/s, p < 0.05), total gait time (273.3 ± 21.6 vs 297.4 ± 43.0 seconds, p < 0.05), VO₂ max (41.3 ± 9.1 vs 26.0 ± 4.1 ml/kg/min, p < 0.01), and reduced body fat (25.8 ± 6.6 vs 34.1 ± 6.2%, p < 0.01) compared to sedentary individuals. Age was positively correlated with 5 m gait time (r = 0.39 p < 0.01) and negatively correlated with gait speed (r = -0.40, p < 0.01), but was not a determining variable for any other physical function or body composition outcome. Exercise time (7.9 ± 5.8 hrs/week) was positively correlated with gait speed (r = 0.27, p < 0.05) and negatively correlated with 5 m gait time (r = -0.30, p < 0.05), total gait time (r = -0.30, p < 0.05), and body fat percentage (r = -0.33, p < 0.01). VO₂ max was negatively correlated with gait time (r = -0.28, p < 0.05) and body fat percentage (r = -0.58, p < 0.01).

CONCLUSION: While aging is considered a main determinant for decrements in physical function, these data suggest that habitual exercise, low body fat percentage, and increased cardiorespiratory fitness are better determinants of improved physical performance in active older men and women.

Substantial evidence suggest that the prevention and improvement were a crucial factor of the early stage of dementia. Although the exercise programs were found to improve positive effects of cognitive function, there is a lack of research on the impacts of their use in multidimensional exercise program design on functional fitness on mild cognitive impairment for older adults. PURPOSE: To examine the impacts of multidimensional functional fitness program design on mild cognitive impairment for older adults. METHODS: A pre -post one group experimental design for this study. The pool of available participants in this study were 25 volunteer with mild cognitive impairment elder (on age 65 or above) enrolled in a multi-exercise prescription program. For random reasons were not available for 10 subjects. The final analysis was performed on a sample of 15 volunteer participants (age: 78.76±7.06 yr; Height: 150.9±9.2 cm; Weight: 56.4±7.24 kg). The material as measurement on cognitive function for participants was a Mini Mental State Examination, MMSE. The study was implemented during ten- weeks period. Each week was performed 90 min. on a multi-exercise prescription program. A multidimensional functional physical and mental fitness platform designed were performed on the program. Data analysis were applied to each of the dependent variables. A-t-test was use for pre -post one group experimental design. After participants completed 10 weeks of training program, a post-test was delivered. Calculations were made using the Statistical Package for the Social Sciences(SPSS). All tests of significance adopted an alpha level of .05. RESULTS: The participants demonstrated positive increased cognitive function in three dimensions: total score of MMSE (17.07±3.127 vs 21.93±3.845), reaching a significant difference (p<0.01, p < .05). The average score increased from 17.07 before the intervention to 21.93 after the intervention. The results also revealed that two variables among MMSE score were significantly different for cognitive function performance including short-term memory (p<0.001, p < .05) and understanding (p<0.002, p < .05). CONCLUSIONS: The multidimensional functional fitness program intervention on mild cognitive impairment may result in older adults processing cognitive function more effective.

Objective: to examine the association between light intensity physical activity (LIPA) and sedentary behavior (SB) among active older women. METHODS: Physical activity intensity was based on the accelerometer scale sedentary, light, moderate, total moderate vigorous physical activity (MVPA), vigorous and very vigorous. Sample consisted of 75 women, with mean age 69.2 ±8.6 years old, BMI 20.2 ±1.4 kg/m². They were involved in a exercise program of 2 times sessions per week, 50 min duration each in a Municipal Elderly Center. All off them taken part in the Longitudinal Project on Aging and Physical Activity and Sedentary Behavior in Active Older Women. RESULTS: The multidimensional functional fitness program intervention on mild cognitive impairment may result in older adults processing cognitive function more effective.

Conclusion: Subjectively measured of light-intensity physical activity time was significantly associated with sitting time,sedentary behavior time, modarate activity time, MVPA time and vigorous time among active older women.
Aging is associated with greater fatigueability and reduced participation in physical activity. Exercise training in older adults has been associated with a number of health benefits; however, less is known about the effects of self-managed exercise on fatigueability. PURPOSE: To examine older Latinos’ views on the use of wearables in PA interventions targeting older Latinos. METHODS: 28 older adults participated in a self-managed exercise program (15 men and 13 women; age 71.3 ± 4.2 years). The program consisted of educational lectures on aerobic (AT), resistance (RT), and balance (BT) training methods as described by the National Institute of Aging. 17 adults completed the 12-week program in three exercise groups: AT only (n=8), AT/RT (n=5), and AT/RT/BT (n=4). Fatigueability was assessed following a standardized 10-minute walk test at a self-selected speed at baseline (PRE) and at the conclusion of the 12-week exercise program (POST). PERF was calculated at the completion of walking by dividing participant-perceived changes in fatigue by the total distance walked in meters. PERF was calculated as the change in walking velocity (at 2.5 and 10 minutes), divided by the total distance walked. Within-group data were analyzed with a paired t-test and between-group effects using one-way ANOVA. RESULTS: Within the AT and AT/RT groups, significantly lower PERF was observed at POST (p ≤ 0.03) compared to PRE (respectively no differences found in AT/RT/BT group (p = 0.47)). PERF was unchanged in all groups (AT, p = 0.50, AT/RT, p = 0.65, AT/RT/BT, p = 0.70). No difference was observed between groups for PERF AT (F (2,14) = 0.443, p = 0.65) or PERF AT/RT/BT (F (2,14) = 0.528, p = 0.601). Further, Cohen’s effect size for changes in fatigueability was moderate for AT (d = 0.48), AT/RT (d = 0.38), and AT/RT/BT (d = 0.38). CONCLUSIONS: Participation in a 12-week self-managed exercise program reduced fatigueability in unimpaired older adults. However, our results did not reveal specific exercise recommendations for older adults to improve both performance and perceived fatigueability. Future studies are needed to investigate the influence of exercise training on measures of fatigueability to optimize exercise interventions.
Efficacy Of Bingocize®: A Game-centered Mobile Application To Improve Physical And Cognitive Performance In Older Adults

K. Jason Crandall, Matthew Shake, Rilee P. Mathews, Kathryn Dispennette. Western Kentucky University, Bowling Green, KY. (Sponsor: Scott Lyons, FACSM)

Reported Relationships: K. Crandall: Intellectual Property; Western Kentucky University.

PURPOSE: Adherence to health-promoting programs is a significant barrier to improving the health and well-being of older adults. The present study examined whether Bingocize®, a game-centered mobile app that combines exercise, health education, and bingo, could improve community-dwelling older adults’ physical and cognitive performance. METHODS: Participants (N=85) used the app for approximately one hour, twice per week, for 10 weeks. Each using a tablet, they played the game in small social groups, and were randomly assigned to either an Experimental (Bingo + Health Education + Exercise; n=47) or Control (Bingo + Health Education; n=38) group. Pre and Post-intervention assessments of (a) functional performance, (b) fluid cognition, and (c) knowledge of two health topics (osteoarthritis and fall risks) were identified. RESULTS: A total of 44 related policies were identified. It was found that the Chinese government took an active role in environmental related policies (58%), followed by demand (14%) and supply (28%) related policies as figure 1. Specifically, the government focused more on launching strategies, developing infrastructure, and setting objectives for implementation. While the government still plays a key role in facilitating PA promotion for older adults, it also started to increase efforts to promote organizational participation. However, PA policies support to older adults’ individual needs and PA in more scientific way in different settings, such as communities, workplace, and senior centers, were overlooked as figure 2. CONCLUSION: Presently, the policy for promoting PA among older adults by the Chinese government has been focused on environmental aspects. Future policy should recognize the diversity of older adults by taking into consideration of their health conditions so as to promote PA at a variety of ability levels. Finally, more scientific evidence-based health promotion programs should be developed and promoted through multi-sector and collaborative partnerships along with all related governmental offices.

Sedentary behavior, increased total body weight, elevated blood glucose levels and hyperlipidemia increase the risk of prediabetes. Individuals diagnosed with prediabetes (fasting blood glucose (FBG) between 100-125mg/dL) are recommended to perform a minimum of 150 minutes of physical activity (PA) per week and decrease total body weight by 7% to reduce the likelihood of developing type 2 diabetes. However, there is little known about the role of pedometers with regards to a Diabetes Prevention Program (DPP) PURPOSE: To determine if pedometer use could aid in the reduction of total body weight, cholesterol, and blood glucose levels as a part of the Centers for Disease Control National DPP. METHODS: Body weight, FBG and lipids (total cholesterol, high-density lipoproteins (HDL) and low-density lipoproteins (LDL)) were measured prior to the start of the DPP and 16 weeks following the intervention. All participants were either diagnosed as prediabetic or at risk for prediabetes based on the CDC screening tool. The pedometer group (PG) (n=9) received pedometers and the control group (CG) (n=8) did not. All participants received the same educational sessions that explained dietary changes and strategies to increase PA. The PG was asked to wear a pedometer on their belt for all waking hours of the day, seven days a week, for sixteen weeks. At each weekly DPP meeting, step counts from pedometers were recorded and pedometers were reset and returned to the participants. A 2x2 ANOVA was performed to examine differences. RESULTS: The PG experienced significant (p<0.05) weight loss from pre to post-test (186.2lbs ± 9.7 to 180.7lbs ± 8.9) while the control group did not (191.3lbs ± 16.8lbs to 190.1lbs ± 17.0lbs). Interestingly, HDL significantly decreased from pre to post-test (p<0.05) in the PG group (58.1mg/dL ± 4.0 to 54.9mg/dL ± 3.6) while the CG remained unchanged (59.0mg/dL ± 5.1 to 50.5mg/dL ± 4.8). There were no differences between any other variables. CONCLUSION: It appears that the addition of pedometers into the DPP can contribute positively to weight loss. It is possible participants experienced a sense of greater accountability due to the added tracking tool. Further research and a larger participation population is needed to elucidate the mechanisms that contribute to the changes in body weight and lipid profile.

B-68 Free Communication/Poster - Chronic Disease

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

MVPA And DXA-derived Adiposity In Adolescents With And Without Down Syndrome

E. Andrew Pitchford, Chelsea Adkins, Joseph E. Hornyak, Rebecca E. Hassan, FACSM. Iowa State University, Ames, IA. "Michigan State University, East Lansing, MI. "University of Michigan, Ann Arbor, MI.

No relevant relationships reported

PURPOSE: Obesity is a highly prevalent secondary health condition among adolescents with Down syndrome (DS). It is thought that low levels of physical activity may promote excess adiposity in this population. However, reported associations between body mass index (BMI) and moderate-to-vigorous physical activity (MVPA) have been small and non-significant. The purpose of this study was to compare group differences in adiposity derived from dual-energy x-ray absorptiometry (DXA) and accelerometer-measured physical activity between adolescents with and without DS and then examine associations within each group. METHODS: Thirty-nine adolescents (22 with DS and 17 typically developing (TD) controls), aged 12-18 years participated in the study. Groups had similar distributions of age, sex, and Tanner pubertal stage. Body composition was assessed by DXA, BMI, and BMI percentile. MVPA was measured with Actigraph GT3X+ accelerometers over 7 days. Group differences were analyzed with multivariate analysis of covariance (MANCOVA) while controlling for age, sex, Tanner pubertal stage, and accelerometer wear-time. Pearson product-moment correlation coefficients and linear regression were used to examine the associations between MVPA and adiposity among adolescents with DS and TD.

RESULTS: Adolescents with DS had significantly higher BMI, BMI percentile, and DXA-derived percent body fat (%BF), as well as lower minutes of MVPA compared to TD controls (p<.05). Associations between MVPA and %BF in adolescents with DS were moderate (r = -.39, p = .07), but substantially stronger than BMI (r = -.19, p = .40). However, linear regression analyses identified Tanner stage (β = -.77, p < .05) as the best predictor of %BF and MVPA.
Official Journal of the American College of Sports Medicine
Vol. 49 No. 5 Supplement $177

920 Board #181 May 30 2:00 PM - 3:30 PM Cancer Cachexia: Metabolic Changes In Carbohydrate Metabolism Of The Liver
Sarah Ramey,1 Megan E. Rosa-Caldwell,1 Jacob L. Brown1, Richard A. Perry2, Wesley L. Haynie2, Aaron R. Caldwell1, Tyrone A. Washington1, Michael P. Wiggs3, Nicholas P. Greene4. 1University of Arkansas, Fayetteville, AR; 2University of Texas at Tyler, Tyler, TX. (Sponsor: Dr. Stephen Crouse, FACSMM) (No relevant relationships reported)

One negative side effect of cancer that dramatically affects cancer prognosis is the development of cancer cachexia. Cancer cachexia is defined as cancer-associated muscle wasting. This is thought to be at least partially mediated by increased energy expenditure and is responsible for the death of 20-40% of all cancer patients. Although the liver is known to be the predominant regulator of whole body metabolism, there is little known about its relationship to the development of cancer cachexia. PURPOSE: The purpose of this exploratory study was to investigate alterations in liver metabolism by examining measures of glycogen storage throughout the progression of Lewis Lung Carcinoma (LLC) induced cancer cachexia. METHODS: C57BL/6J mice were injected with 1X10^6 LLC Cells in the left posterior leg, and the control group with phosphate buffered saline (PBS). The experimental groups included PBS, 1wk, 2wk, 3wk, and 4wk of cancer progression with 10-16 in each group. Sections of liver (n=~8/group) were cut and periodic acid-Schiff (PAS) stain for glycogen was completed. Images were analyzed for total area of stain as well as intensity of stain (r = 0.16 respectively). In comparison to day 0 liver (78±15 pmol/s/mg), CI was lower at day 14 (26±6, p=0.08) and day 21 (8±4, p<0.05). CI was also lower in day 21 liver vs. day 7 (p=0.05) and day 14 (p=0.06). In comparison to day 0 liver (157±26 pmol/mg), CI+II was lower at day 14 (49±5 pmol/s/mg, p<0.05) and day 21 (34±11, p<0.05). CI+II was also lower at p<0.05 in day 14 and day 21 livers when compared to day 7 (176±14). Respiration of EAW was not different across time points (p<0.05). CONCLUSION: Coupled respiration with electron supply from Complex I and II, and non-coupled respiration (i.e. ETS) decreased during the progression of cachexia, suggesting that changes in liver oxidative capacity are associated with the development of this comorbidity.

922 Board #183 May 30 2:00 PM - 3:30 PM Dietary Fat Intake Predicts Aortic Stiffness Independent of Physical Activity
Jessica J. Gradberry1, Nicholas A. Carlini2, Summer L. Burke1, Marilyn S. Campbell1, Bradley S. Fleenor3. 1University of Kentucky, Lexington, KY; 2Ball State University, Muncie, IN. (No relevant relationships reported)

PURPOSE: To determine if increased dietary fat consumption predicts aortic stiffness independent of physical activity. METHODS: Men and women 18-60 years of age were recruited for this cross-sectional study. Body mass index (BMI), body fat percentage (BFP, 4-peninsula impedance analysis), aortic stiffness (carotid-femoral Pulse Wave Velocity; cPWV), habitual dietary intake (NIH’s validated Dietary History Questionnaire-II; DHQ-II), and physical activity (International Physical Activity Questionnaire; IPAQ) were assessed for all subjects. Univariate linear regression analyses were implemented to determine dietary correlations with cPWV, and partial correlations were employed to adjust for traditional risk factors using SAS 9.4. RESULTS: The study population consisted of predominately young men and women (23.5 ± 7.9 years, 70.0% female) with a normal body mass index (BMI = 23.6 ± 4.3 kg/m^2) and mean cPWV of 5.8 ± 0.9 meters/second. Weekly physical activity was estimated at 5,547.6 ± 5,478.2 MET-minutes per week. Habitual daily caloric intake was 1,921.0 ± 798.9 calories, consisting of 46.0 ± 0.1% carbohydrate, 36.8 ± 0.1% fat, and 16.3 ± 0.0% protein. Greater consumption of total discretionary solid fat was associated with increased cPWV (R^2 = 0.155, p = 0.031). However, total calories from dietary fat (R^2 = 0.093, P = 0.101), total grams of fat (R^2 = 0.047, P = 0.248), and discretionary oil fat (R^2 = 0.008, P = 0.650) were not associated with cPWV. The correlation between discretionary solid fat and cPWV remained after adjustment for age, body fat percentage, BMI, and physical activity (R^2 = 0.160, P = 0.043). Among food choices contributing to the increased discretionary calories from solid fat, cheese intake was positively correlated with cPWV (R^2 = 0.134, P = 0.047). Additionally, specific fatty acids that predicted cPWV included trans fatty acid, trans-hexadecenoic acid (R^2 = 0.179, P = 0.020), and monounsaturated fatty acids, hexadecenoic acid (R^2 = 0.148, P = 0.036) and myristoleic acid (R^2 = 0.206, P = 0.012). CONCLUSIONS: Increased dietary discretionary fat consumption within the habitual diet predicts aortic stiffness independent of physical activity. Cheese consumption and specific fatty acids may be novel contributors to increased aortic stiffness independent of regular physical activity.

924 Board #185 May 30 2:00 PM - 3:30 PM High Intensity Circuit Training Versus Moderate Strength Training On Body Composition In Obese Adults
Neil McMillan1, Gary Miller1, Sandy Combs, Jr1, Tiffany Gibson1, Jamy Ard2,1 Wake Forest University, Winston-Salem, NC. 2Wake Forest Baptist Health, Winston-Salem, NC. (Sponsor: Michael J. Berry, FACSMM) (No relevant relationships reported)

Weight loss has been shown to adversely affect body composition due to the loss of fat free mass that accompanies fat mass loss during negative energy balance. Exercise has been recommended as a therapy to ameliorate fat free mass loss during weight loss interventions. PURPOSE: The primary purpose of this study was to compare the effectiveness of high-intensity circuit training (HICT) versus moderate strength training (ST) on body composition in obese adults. METHODS: Obese adults (women and men) completing a medically supervised weight loss program were randomized into one of two 12-week exercise training groups: HICT (n=5) or ST (n=6). Baseline (BL) testing included height, weight, and DEXA scans to assess total and regional body composition. Each group underwent a supervised exercise training program of upper and lower body exercises (30 minute sessions; 3 times per week for 12 weeks); follow-up (FU) testing was performed after 12 weeks. The HICT consisted of 8-12 exercises of 2-3 sets, with rest periods of approximately 30 seconds. Exercise intensity corresponded to 80-95% of their VO2peak. The ST group completed progressive resistance training which included 2-3 sets of 10-12 repetitions

Abstracts were prepared by the authors and printed as submitted.
of each exercise. RESULTS: When examining changes in body mass index (BMI), total fat mass (FM), total fat free mass (FFM), trunk fat mass (TFM), and estimated visceral fat mass (VAT) using a non-linear model ANCOVA, there was no significant within-time interaction (p>0.05) nor a main group effect (p>0.05) for the variables. However, there was significant time (BL vs FU) main effect for BMI (38.7 ± 1.5 vs. 33.1 ± 1.7, respectively, p<0.001); FFM (48.4 ± 4.0 vs. 38.7 ± 3.8 kg, respectively, p<0.001); TFM (26.1 ± 2.1 vs. 19.6 ± 1.8 kg, respectively, p<0.001); and VFM (15.1 ± 19 ± 0.10 ± 13 kg, respectively, p<0.001). CONCLUSION: The 12-week HICT and ST program in conjunction with the medical weight loss program produced successful weight loss and FM changes. Furthermore, FFM was retained in both groups, suggesting both programs are viable options to improve or maintain body composition through substantial weight loss. 

925 Board #186 May 30 2:00 PM - 3:30 PM Continuous Exercise Training Reduces Arterial Stiffness In An Exercise Dose Dependent Manner in Adults With Prediabetes

Mahnoor Kharushid, Natalie Z.M. Eichner, Julian M. Gaitan, Nicole M. Gilbertson, Eugene J. Barrett, Arthur Weltman, FACSM, Steve K. Malin, FACSM. University of Virginia, Charlottesville, VA.

(No relevant relationships reported)

PURPOSE: Although prior work highlights an exercise dose-response relationship for glucose regulation, no study has assessed if exercise energy expenditure is related to reductions in arterial stiffness in an intensity based manner. We tested the hypothesis that increased exercise dose would correlate with reduced arterial stiffness in obese adults with prediabetes. METHODS: In this randomized trial, 26 adults (Age: 61.4±2.5 y, BMI: 32.1±1.0 kg/m²) were screened for prediabetes using American Diabetes Association criteria (75g OGTT and/or HbA1c). Aerobic fitness (VO2peak) was measured on a cycle ergometer by indirect calorimetry. Subjects performed either supervised continuous exercise (CONT; n=13) at 70% of HRpeak or underwent interval training (INT; n=13) for 3 min at 50% HRpeak and 3 min at 90% HRpeak for 60min/d over 2-weeks. Arterial stiffness (augmentation index; AI) and glucose tolerance were determined during a 75g OGTT and analyzed by total area under the curve (tAUC) before and after training. Exercise dose was assessed using VO2 heart rate derived linear regression equations. RESULTS: Mean energy expenditure during CONT and INT training was 312.5±12.0 and 399.9±16.9 kcal/session, respectively (p<0.001). Exercise training had no effect on body weight, but it did significantly improve VO2peak (P=0.001), independent of intensity. Both CONT and INT intervention also reduced glucose AUCmax (P<0.01) and AI AUCmax (P<0.03). However, this reduced arterial stiffness tended to correlate with increased exercise energy expenditure from CONT (r=-0.53, P<0.001) but not INT (r=-0.005, P=0.98) training. Improved VO2peak was also related to reduced AI AUCmax (r=-0.63, P<0.002) only after CONT exercise. CONCLUSIONS: Short-term exercise training reduces arterial stiffness independent of intensity. However, only CONT training improves arterial stiffness in an energy dose-dependent manner. These findings suggest that intensity of exercise may exert different mechanisms for enhancing vascular function in adults with prediabetes to lower diabetes and cardiovascular risk.

926 Board #187 May 30 2:00 PM - 3:30 PM Influence Of Sex On The Relationship Between Two Estimates Of Visceral Adipose Tissue

Gregory L. Nuckols, Kara C. Anderson, Austin M. Peterjohn, Katie R. Hirsch, Malia N.M. Blue, Alexis A. Piñoler, Eric T. Trexler, Abbie E. Smith-Ryan, FACSM. UNC Chapel Hill, Chapel Hill, NC.

(Sponsor: Abbie E., Smith-Ryan, FACSM)

(No relevant relationships reported)

Magnetic resonance imaging (MRI) is the gold standard for estimating visceral adipose tissue (VAT) area. However, MRI machines are not available to all laboratories, and other methods of estimating VAT, including dual-energy X-ray absorptiometry (DXA) and B-mode ultrasound (US), are often more readily available, cost effective, and less time consuming. US scans of the abdomen were often performed in conjunction with the medical weight loss program produced successful weight loss and FM changes. Furthermore, FFM was retained in both groups, suggesting both programs are viable options to improve or maintain body composition through substantial weight loss. 

MEDICINE & SCIENCE IN SPORTS & EXERCISE®
Board #190 May 30 2:00 PM - 3:30 PM
Changes In Liver And Skeletal Muscle Sensitivity In Response To Acute And Chronic Calorie Restriction On A Low Carbohydrate Diet
Erik Kirk, FACSM1, Dominic Reeds1, Samuel Klein†, ‘Southern Illinois University Edwardsville, Edwardsville, IL. 2Washington University in St. Louis School of Medicine, St. Louis, MO. 3Washington University in St. Louis School of Medicine, Saint Louis, MO.

(No relevant relationships reported)

PURPOSE: We determined the effects of acute and chronic calorie restriction with a low-carbohydrate diet on hepatic and skeletal muscle insulin sensitivity.

METHODS: Twelve obese subjects (body-mass index, 36.1±1.0kg/m²) followed a low-carbohydrate (>60g/d) energy-deficit diet (1,200kcals/day). Magnetic resonance spectroscopy, muscle biopsies, and a euglycemic-hyperinsulinemic clamp were used to determine insulin action, cellular insulin signaling and intrahepatic triglyceride content before, after 48 h, and after 12 wks (7% weight loss) of diet therapy.

RESULTS: Intrahepatic triglyceride content significantly decreased at both 48 h (28.6±3.8% vs. p<0.05) and 7% weight loss (-38.0 ± 4.5%; p<0.05) compared to baseline. Basal glucose production rate significantly decreased at 48 h (21.8±3.2% vs. p<0.05) and after 7% weight loss (20.8±3.4%; p<0.001). Insulin-stimulated glucose uptake did not significantly increase at 48 h (4.4±12.7% vs. p<0.05) but did significantly increase at 7% weight loss (35.2 ± 8.4%, p<0.05). Insulin-stimulated phosphorylation of Jun N-terminal kinase decreased by (-15.4 ± 18.1%, p<0.05) and -41.3 ± 19.5%, p<0.05) and phosphorylation of Akt increased by 19.2 ± 26.9% (p<0.05) and 36.1 ± 12.4% (p<0.05), after 48 h- and 7% weight loss respectively. CONCLUSIONS: A low carbohydrate diet acutely reduced intrahepatic triglyceride content and improved hepatic insulin sensitivity whereas moderate weight loss is necessary to improve insulin sensitivity in the skeletal muscle.

Board #191 May 30 2:00 PM - 3:30 PM
Exercise Training Attenuates Non-Alcoholic Fatty Liver Disease in rats with Diabetes Via Endoplasmic Reticulum Stress
Junhan Li1, Deroo Gao1, Junzhi Sun1, Kai Zou1, Quansheng Su1, 2Chengdu Sport University, Chengdu, China. ‘University of Massachusetts, Boston, MA. (Sponsor: Tongjian You, FACSM)

(No relevant relationships reported)

Non-alcoholic fatty liver disease (NAFLD) is highly prevalent in type 2 diabetes (T2D). Recent evidence suggests that endoplasmic reticulum (ER) stress plays a critical role in the development of NAFLD. Although exercise training has been commonly prescribed for the treatment of NAFLD, the effects of different types of exercise on ER stress in NAFLD under type 2 diabetic condition are largely unknown.

PURPOSE: The purpose of this study was to determine the effects of aerobic and resistance exercises on hepatic ER stress response and NAFLD in rats with T2D.

METHODS: Male Sprague-Dawley rats were randomly assigned to four groups (n=10/group): Control (CON), T2D, T2D with aerobic exercise (T2D+AE) and T2D with resistance exercise (T2D+RE), treadmill walking at 30 m/min, 0° incline, 60 mins/day, 5 days/week, for 8 weeks) and T2D with resistance exercise (T2D+RE; climbing a 80° incline vertical ladder with weights walking at 30 m/min, 0° incline, 60 mins/day, 5 day/week, for 8 weeks) and T2D with resistance exercise (T2D+RE; climbing a 80° incline vertical ladder with weights)

RESULTS: The differences between individuals usually are of wide range, for that reason the results are shown like differences between final and initial evaluations. All the treatments showed statistical differences compared with the control in body weight (kg) (ES= -2.36 ± 0.84, E= -0.08 ± 0.68, S= -0.91 ± 0.73, C= 0.04 ± 0.28), BMI (kg.m²) (ES= -0.72 ± 0.41, E= -0.26 ± 0.29, S= -0.31 ± 0.48, C= 0.01 ± 0.44), and BFP (%) (ES= -1.15 ± 0.20, E= -0.49 ± 0.21 S= -0.14 ± 0.46, C= -0.04 ± 0.15).

CONCLUSION: Spirulina maxima intake alone a HIT have an individual and a synergistic effect on body composition (decrease of body weight, BMI and BFP) in overweight and obese adults.

Board #192 May 30 2:00 PM - 3:30 PM
Effect of Exercise and/or Spirulina maxima On Body Composition In Overweight/Obese Humans

(No relevant relationships reported)

Overweight and obesity are the main risk factors for cardiovascular diseases, which are the leading causes of death worldwide. As a consequence of this, it is indispensable to apply a nutritional intervention involving both a healthy diet adjustment and to promote an active lifestyle, since they are effective in preventing and reducing weight gain and excessive accumulation of body fat.

PURPOSE: To determine the independent and synergistic effect of a systematic physical exercise program and/or Spirulina maxima supplementation on body composition in overweight and obese subjects.

METHODS: Through a randomized, double-blind, placebo-controlled, counterbalanced crossover study design, overweight and obese adults (N= 52, 25.12 ± 4.88 y, 1.71 ± 0.11 m, 88.14 ± 16.99 kg) were evaluated during a 12 wk of 4.5 g a day of supplementation (6 wk Spirulina maxima and 6 wk placebo) and/or a systematic physical exercise program (three days a week 20 to 30 min of aerobic exercise with intensities between 50% and 80% of maximum heart rate (HR max) and two days 20 to 30 min between 80% and 90% of HR max using high-intensity interval training (HIT) intervention); the participants were divided in four groups: exercise and Spirulina maxima supplementation (ES), exercise and placebo supplementation (E), Spirulina maxima supplementation without exercise (S), and the control one, placebo without exercise (CPD).

RESULTS: Changes in liver and skeletal muscle sensitivity in rats with diabetes via endoplasmic reticulum stress.
 Board #194  May 30 2:00 PM - 3:30 PM
Normal Grip Strength Thresholds for the Detection of Metabolic Syndrome in Colombian Collegiate Students
Katherine González-Ruíz,1 Antonio García-Hernosio,2 Alejandra Torredcilla-Sanders,1 Jorge E. Correa-Bautista,1 Aura Cristina Quino-Avila1, Carolina Sandoval-Cuellar,3 Mónica Liliana Ojeda-Pardo1, Andrea del Pilar Quintero1, Robinson Ramírez-Vélez1,2 Universidad Manuela Beltrán, Bogotá D.C, Colombia.1 Universidad de Santiago de Chile, USA.2. Universidad de Santiago de Chile, Chile.3 Universidad del Rosario, Bogotá D.C, Colombia.4 Universidad de Boyacá, Tunja, Colombia. (No relevant relationships reported)

PURPOSE: Evidence shows an association between grip strength and health; however, grip strength cut-offs for the detection of metabolic syndrome (MetS) risk in Latin-American populations are scarce. The purpose of this study was to determine cut-offs of normalized grip strength (NGS) in a large collegiate student population from Colombia (2014-2017). METHODS: A total of 1,795 volunteers (61.4% female, mean age = 20.68 (2.9) years old), ranging between the ages of 18 and 30 years participated in the study. Strength was estimated using a hand-held dynamometer and normalized to body mass (handgrip strength [kg]/body mass [kg]). Anthropometrics, serum lipids indices, blood pressure, and fasting plasma glucose were measured. Body composition was measured by bioelectrical impedance analysis (BIA). MetS was defined as including ≥3 of the metabolic abnormalities according to the International Diabetes Federation definition. A metabolic risk score was computed from the following components: waist circumference, triglycerides, high-density lipoprotein cholesterol, glucose, and systolic and diastolic blood pressure. Receiver operating curve (ROC) analysis showed a significant discriminatory accuracy of NGS in identifying the thresholds and risk categories. RESULTS: Lower strength was associated with increased prevalence of MetS. In males, weak, intermediate, and strong NGS values at these points were <0.47, >0.47 to 0.62, and >0.62, respectively. In females, these cut-off points were <0.33, ≥0.33 to 0.44, and >0.44, respectively. CONCLUSIONS: In summary, our sex-specific cut-off points of NGS could be incorporated into a clinical setting for identifying college students at cardiometabolic disease risk.

Board #195  May 30 2:00 PM - 3:30 PM
Effect Of 12-weeks Of Moderate Versus High-intensity Interval Exercise Training On Postprandial Lipemia, Vascular Function And Arterial Stiffness After High-fat Meal Ingestion In Active Adults
Jorge E. Correa-Bautista, Alejandra Torredcilla-Sanders, Viviana Aya-Aldana, Luis Andres Téllez-T., Jhonatan Peña-Ibarguen, Robinson Ramírez-Vélez, Universidad del Rosario, Bogotá D.C, Colombia. (No relevant relationships reported)

PURPOSE: The aim of this study was to determine the effect of 12-weeks of moderate continuous training (MCT) and high-intensity training (HIT) on postprandial lipemia, vascular function and arterial stiffness after high-fat meal (HFM) ingestion in active adults. METHODS: A randomized clinical trial was conducted in 20 healthy, inactive aged adults (31.6 ±7.1 years). Participants completed two exercise protocols, namely, HIT and MCT, for 12 weeks. To induce a state of postprandial lipemia (PPL), all subjects received an HFM containing 1049 kcal, 31 g of protein, 79 g of fat (31 g of saturated fat), 666 mg of cholesterol and 69 g of carbohydrates. Endothelial function was measured using flow-mediated vasodilation (FMD), normalized brachial artery FMD (nFMD), aortic pulse wave velocity (PWV) and augmentation index (AIx). Plasma total cholesterol, High-density lipoprotein cholesterol (HDL-c), triglycerides and insulin was still elevated and BHB decreased. At 3 and 4 hours post-meal, glucose levels compared to the control (12±3 to 35±30mg/dL, p≤0.001). At the 45min time point, there were significant reductions compared to the control for the 3 and 10min trials (436±1126and 896±1108mg/dL, p≤0.036 and p≤0.001 but not for the 1min (272±112mg/dL, p=177). For AIx, there were significant differences compared to the control for the 3 min and 10 min trials (424±1124 and 901±930mg/dL, p≤0.038 and ≤0.001 but not for the 1 min (107±918mg/dL, p=0.59).

CONCLUSIONS: Moderate intensity stair-climbing bouts as short as one minute in duration are effective at attenuating peak postprandial blood glucose with longer bouts producing more substantial benefits.

Board #196  May 30 2:00 PM - 3:30 PM
The Acute Effect of Moderate Intensity Stair-Climbing on Postprandial Blood Glucose
Jeff Moore, Eric Bartholomae, Kathryn Ward, Zach Johnson, Jochen Kressler, San Diego State University, San Diego, CA. (No relevant relationships reported)

PURPOSE: To investigate the effects of moderate intensity stair-climbing of various durations on postprandial glucose response in healthy men and women. The postprandial glucose response is strongly associated with cardiometabolic disease risk. METHODS: Twenty males (26.8±6.0y) and fourteen females (24.8±4.5y) completed a 75g oral glucose tolerance test (OGTT). On three subsequent visits, participants completed an OGTT combined with either 1min, 3min, or 10min of stair-climbing, amounting 28 min after subjects finished the drink. Fingerstick blood glucose measurements were taken at baseline and every fifteen minutes thereafter for one hour. RESULTS: All stair-climbing trials reduced peak (30 min) postprandial blood glucose levels compared to the control (12±3 to 35±30mg/dL, p≤0.001). At the 45min time point, there were significant reductions compared to the control for the 3 and 10min trials (436±1126and 896±1108mg/dL, p≤0.036 and p≤0.001) but not between 1min and control (272±112mg/dL, p=177). For AIx, there were significant differences compared to the control for the 3 min and 10 min trials (424±1124 and 901±930mg/dL, p≤0.038 and ≤0.001 but not for the 1 min (107±918mg/dL, p=0.59).

CONCLUSIONS: Moderate intensity stair-climbing bouts as short as one minute in duration are effective at attenuating peak postprandial blood glucose with longer bouts producing more substantial benefits.

Board #197  May 30 2:00 PM - 3:30 PM
Increase In Beta-hydroxybutyrate After High-fat Meal In Metabolically Healthy Overweight/Obese Adults
Ryan Davies, Stephanie Wilson, Sarah Bronsky, Seth Walk, Carl Yeoman, Mary P. Miles, FACSM. Montana State University, Bozeman, MT. (No relevant relationships reported)

Ketone synthesis is of interest for several clinical purposes including obesity, weight loss and diabetes. Beta-hydroxybutyrate (BHB) is the predominant ketone found in the blood and an indicator of ketone synthesis, which is elevated when carbohydrate availability is low. However, little is known about ketone synthesis in metabolically healthy overweight/obese (MHO) adults with mixed diets.

PURPOSE: To investigate BHB concentrations and responses to a high-fat meal in MHO adults.

METHODS: Adults (n=23), 23-54 y of age with BMI 27.3±5 kg m^-2 were assessed for body composition, self-reported physical activity level, and VO_{max}. After Fasting blood collection, a high-fat meal (50g fat, 54g carbohydrate, and 12g protein) was consumed and blood was collected hourly for 4 hours for measurement of glucose, insulin, triglycerides, and BHB.

RESULTS: Ketone availability is low. However, little is known about ketone synthesis in metabolically healthy overweight/obese (MHO) adults with mixed diets.
Trimesthylamine (TMA) is a bioactive amine made by gut microbes that is converted to trimethylamine-N-oxide (TMAO) in the liver. The conversion of TMA to TMAO is downregulated by insulin. TMAO is pro-inflammatory and has been linked with the development of atherosclerosis. It is hypothesized that TMAO may act as a factor differentiating metabolically healthy overweight or obese (MHO) individuals with low (LO) versus high (HI) systemic inflammation.

**PURPOSE:** To compare serum TMAO concentrations and metabolic responses to a high fat meal challenge between LO and HI MHO individuals.

**METHODS:** Adults (n=25), 28-54 years old with BMI 23.8±5.1 kg m² were measured for interleukin (IL)-1β, IL-6, IL-17, 23, tumor necrosis factor-α (TNF-α), and granulocyte-macrophage colony-stimulating factor (GM-CSF) measured after an overnight fast. A subsample of individuals was grouped to LO (n≥5; above median in ≤ 1 of 6 cytoines) and HI (n=4; above the median in ≥ 5 of 6 cytoines). Blood samples were collected immediately before ingestion of a high-fat meal (50g FAT, 54g CHO, 12g PRO) and hourly for 4 hours postprandial for measurement of TMAO, glucose (GLU), insulin (INS), and triglycerides (TG). TMAO concentrations were determined through ultra-high performance liquid chromatography-tandem mass spectrometry. **RESULTS:** Fasting TMAO concentrations were similar in HI compared to LO (11.0 ± 5.5 vs. 11.1 ± 3.9 µmol l⁻¹). After correction for fasting insulin concentrations and removal of one outlier participant, TMAO decreased from fasting (9.6 ± 2.2 µmol l⁻¹) to 1 h (p<0.061; 6.2 ± 1.1 µmol l⁻¹) and 3 h (p=0.041; 3.7 ± 0.9 µmol l⁻¹). Postprandial increases (p<0.05) were measured for glucose at 1 h, insulin and 1-2 h, and TG at 1-4 h. **CONCLUSION:** Our preliminary analysis indicates that TMAO concentrations were not higher in MHO individuals with higher inflammation. However, TMAO decreased in the postprandial period after insulin was elevated. Thus, TMAO concentrations fluctuate postprandially and its influence on inflammation warrants further investigation, particularly to determine if TMAO synthesis increases with insulin resistance.

Funding acknowledgement: Montana State University Research Initiative 51040-MUSR2015-03 and USDA-NIFA 2017-67018-26367.
Risk of metabolic and intestinal inflammatory disorder development increases significantly with age. In contrast, exercise has shown to reduce disease risk and promote longevity. Interestingly, adenyl cyclase 5 knockout (AC5KO) mice demonstrate an enhanced exercise capacity and improved longevity. PURPOSE: We aimed to examine the inflammatory status along the gastrointestinal tract of AC5KO mice compared to Wild type (WT) mice. METHODS: 21 C57BL WT and AC5KO male mice were randomly assigned to one of 2 groups: (1) sedentary and (2) exercise for 12 weeks. Mice had ad libitum access to food and water. Exercised mice were trained for 4 weeks at 60-70% max speed for 1 hr each session, 5 days/week. WT sedentary and exercised groups were given antibiotics via oral gavage during the last 7 days of the exercise protocol. At the end of 4 weeks, mice were sacrificed and intestinal tissues were fixed for histological analysis and immunohistochemistry for cytokoxygeanse-2 (COX-2), a marker of inflammation. Group means of staining score were analyzed using a one-way ANOVA and LSD post hoc tests. A difference of mean with a p value of ≤ 0.05 was considered statistically significant. RESULTS: In the duodenum, COX-2 expression was isolated in the lamina propria and staining occurred predominately within macrophages. COX-2 expression in the duodenum was less in sedentary animals given antibiotics (p ≤ 0.015). In the ileum, COX-2 expression was localized to both the crypts and lamina propria. Expression in ileal crypts was less in sedentary animals given antibiotics compared to WT exercised animals (p = 0.02) while expression in the ileal lamina propria was increased in WT exercised animals (0.001 ≤ p ≤ 0.009). CONCLUSIONS: Antibiotics reduce small intestinal inflammation. COX-2 expression localizes differently in the mucosa along the small intestine. Forced-exercise increases inflammation to a greater degree in the lamina propria of the distal small intestine.

Undernourishment in early life has been shown to impair cardiovascular function, which could potentially influence maximum exercise capacity in adulthood. PURPOSE: To determine the effects of early life undernutrition on maximum exercise capacity in adulthood. METHODS: Using a cross fostering model, pups were undernourished either during gestation (GUN) or lactation (PUN; PN1-21) by feeding the dam a low-protein diet (8%) protein) to decrease milk production. Control pups were born and suckled to dams fed an isocaloric diet with 20% protein content. At postnatal day 21 (PN21), all mice were weaned and switched to a control diet. To assess exercise capacity, mice began a 5-day treadmill acclimation protocol at PN61. postnatal day 21 (PN21), all mice were weaned and switched to a control diet. To assess exercise capacity, mice began a 5-day treadmill acclimation protocol at PN61. At PN67, mice underwent a maximum work test, which began at 10 meters/minute with a 10% grade. Speed was increased every two minutes until exhaustion. The amount of work completed by each mouse was calculated as: Maximum Work=(J) 9.8 × Maximum Speed (m/min) × grade (radians) × Time (min) × Weight (kg). A two-way ANOVA was used to determine differences in maximal work and cardiac parameters between groups with the effects of gender and diet. RESULTS: GUN (0.3312±0.037 J) mice performed higher than PUN (0.2527±0.050 J) and CON (0.2674±0.030 J) mice on a maximum work test (p<0.05). There was no gender effect. CONCLUSION: Undernourishment during lactation leads to lower work capacity, indicating that developmental programming during the first 21 days of life impacts work capacity during adulthood.

CONCLUSIONS: Taken together, diogenin suppressed neuronal Fas-dependent and mitochondria-dependent apoptotic pathways and enhanced the Bcl-2 family associated pro-survival and IGF-1-p38/p-AKT survival pathways, which might provide neuroprotective effects of diogenin for prevention of D-galactose-induced aging brain.

Healthy aging has been observed in our adenyl cyclase type 5 knockout (AC5KO) model. Aging is also associated with alterations in composition and diversity of the gut microbiota. The extent to which the microbiota contributes to the healthy aging phenotype is unknown. PURPOSE: To examine the role of the microbiota in diabetes and exercise tolerance in AC5KO mice compared to wild type (WT). METHODS: 17 (n=6/group) 6-week old C57BL/6j male WT and AC5KO mice were randomly assigned to one of the following four groups: (1) wild type-exercise (WT-EX), (2) wild type-sedentary (WT-CON), (3) AC5-exercise (AC5-EX) and (4) AC5-sedentary (AC5-CON). Mice underwent a treadmill test to determine maximal oxygen uptake (VO2max) and max exercise performance (i.e. running distance). Mice were exercised via forced treadmill running at 60-70% VO2max for 60-minutes 5 days/week. Four weeks following exercise training, mice were given oral antibiotics for five days to eliminate gut microbiota. Measurements were taken: 1- prior to exercise, 2- post training/pre-antibiotic and 3- post antibiotic. Fecal samples underwent phenol-chloroform extraction and ribosomal operons were amplified with 10 ng of genomic DNA using the universal 16S rRNA-27Forward primer, 23S rRNA-2241Reverse primer and a High Fidelity/Proofreading Taq polymerase. The MinION was used for library preparation and we used Forentools and Geneious sequence analysis software for sequencing. Finally, fasted glucose tolerance (i.p; 2 ul/kg [BW]) and insulin tolerance (i.p; 1 ul/kg [BW]) were measured. RESULTS: AC5KO mice have a unique microbiota compared to WT mice and their insulin/glucose control phenotype may be dependent on the microbiota.

PURPOSE: The purpose of this study was to evaluate the effects of diogenin on the D-galactose-induced cerebral cortical widely dispersed apoptosis. METHODS: Male Wistar rats at 12-week-old were divided into four groups: Control (1 mg/kg/day of saline, i.p.), DDD (50 mg/kg/day of D-galactose) and DD0 (D-galactose+10 or 50 mg/kg/day of diogenin orally). After eight weeks, histopathological analysis, positive TUNEL and Western blotting assays were performed on the excised cerebral cortex from all four groups. RESULTS: TUNEL-positive apoptotic cells, the components of Fas pathway (Fas, FADD, active caspase-8 and active caspase-3) and mitochondria pathway (Bax, cytochrome c, active caspase-9 and active caspase-3) were increased in the DD0 group compared with the Control group whereas they were decreased in the DDD group (p<0.05). The components of survival pathway (Bcl-2, Bcl-2L, IGF-1, p-PI3K and p-AKT) were increased in the DDD group compared to the Control group, whereas the levels of Bcl-2L, p-PI3K and p-AKT were also compensatorily increased in the DD0 group compared to the Control group (p<0.05). CONCLUSIONS: Taken together, diogenin suppressed neuronal Fas-dependent and mitochondria-dependent apoptotic pathways and enhanced the Bcl-2 family associated pro-survival and IGF-1-p38/p-AKT survival pathways, which might provide neuroprotective effects of diogenin for prevention of D-galactose-induced aging brain.
While normal weight obesity (NWO) has become an important health topic, to date no data exist describing physiological characteristics among this group. PURPOSE: The primary aim was to characterize NWO in college-age males and females through body composition and cardiometabolic measures. The secondary aim was to observe the relationship between waist to hip ratio (WHR) and body mass index (BMI) with body fat percentage (BF%). METHODS: Ninety-two college students (Mean ± SD; Age: 19.5 ± 1.4 yrs.; Height: 171.9 ± 9.4 cm; Weight: 67.9 ± 8.2 kg; BF%: 26.0 ± 6.2%; males:n=29; females:n=63) participated in this study. NWO was defined being above NHANES body fat 25th percentile based on age and sex. Body composition variables including BF%, lean mass (LM), and visceral adipose tissue (VAT) were assessed by dual energy x-ray absorptiometry. The same technician measured waist and hip circumferences. Mean arterial pressure (MAP) and metabolic biomarkers [total cholesterol (TC), high density lipoproteins (HDL), non-high density lipoproteins (NHDL), and glucose (GLU)] were evaluated for cardiometabolic health. Blood pressure was measured in a seated position with an automated cuff; biomarkers were assessed by a fasted blood draw. RESULTS: Forty percent of the sample (n=37) was identified as NWO, with 31% of the females (n=19) being NWO, whereas 62% of males (n=18) were. NWO individuals had significantly higher BF% (28.4 ± 6.7% vs. 24.4 ± 5.2%, p<0.001), VAT (0.20 ± 0.15 kg vs. 0.27 ± 0.10 kg, p<0.002), and larger WHR (0.76 ± 0.40 cm vs. 0.72 ± 0.41 cm, p<0.001) compared to normal weight lean (NWL). Although not significant, NWO had higher LM (46.2 ± 8.5 kg; NWL: 41.7 ± 10.3 kg, p<0.05) and MAP (NWO: 84.4 ± 8.6 mmHg; NWL: 82.5 ± 7.0 mmHg, p<0.05) compared to NWL. NWO also had higher levels of GLU, and lower levels of TC, HDL, and NHDL; however, biomarkers were not significantly different between groups (p>0.05). While WHR was significantly correlated with BP% (R=0.293, p<0.005), BMI was not (p>0.05). CONCLUSION: The occurrence of NWO among otherwise healthy college students is high. Identification of these individuals may be an effective approach to obesity prevention and treatment. Determining effective methods to measure both body fat and abdominal obesity in this population is essential, as BMI may mask obesity in a young adult population.

946 Board #207 May 30 2:00 PM - 3:30 PM
Effects of Acute Exercise and Green Tea Supplementation on Glucose Homeostasis in Overweight/Obese Postmenopausal Women
Shannon L. Jordan1, Sarah E. Deemer2, Vic BenEzra2, David Nichols, FACSM1, Lamar University, Beaumont, TX.1 The University of Alabama at Birmingham, Birmingham, AL. Texas Woman’s University, Denton, TX. (Sponsor: David Nichols, FACSM)
(No relevant relationships reported)

Menopause is associated with decreased estrogen levels, increased adiposity, negative changes in adiponectin and TNF-α, and increased insulin resistance. Decreased adiponectin and increased TNF-α are associated with impaired glucose uptake. Exercise enhances glucose uptake several hours post-exercise. Polyphenols in green tea extract (GTE) increase insulin sensitivity and adiponectin while decreasing TNF-α. Orzechowski (2003) proposed using antioxidants as a “preconditioning” method to prevent development of Type 2 Diabetes (T2D). PURPOSE: To investigate independent and combined effects of acute exercise or GTE on glucose homeostasis and adipokines in overweight to obese postmenopausal sedentary women. METHODS: Eight women (52 ± 7 yrs, BMI 32.04 ± 4.95 kg/m²) were randomly assigned to complete four trials (Control [C], green tea [GT], exercise [EX], green tea + exercise [GTEX]). For each trial the participant consumed 400 mg of placebo (rice flour, C and EX) or green tea extract (GT and GTEX) with lunch and dinner the day prior and the morning of (1 hr prior) an oral glucose tolerance test (OGTT). Exercise trials (EX and GTEX) consisted of walking exercise at 65% heart rate reserve (400 Kcal) and were completed 12-14 hours prior to the OGTT. RESULTS: Fasting glucose (C 5.7 ± 8.1, GT 6.1 ± 1.7, EX 5.6 ± 8.8, GTEX 5.4 ± 8.3 mmol) and insulin (C 11.93 ± 4.75, GT 11.66 ± 6.17, EX 11.31 ± 4.12, GTEX 12.23 ± 6.05μU/ml) were not different between trials as well as no differences in area under the curve for both glucose and insulin. There were also no differences between trials for TNF-α (C 5.45 ± 3.68, GT 4.73 ± 1.38, EX 3.55 ± 1.46, GTEX 3.87 ± 1.81 pg/ml) or total adiponectin (C 7443 ± 2941, GT 4947 ± 3070, EX 10060 ± 7393, GTEX 5335 ± 3193 ng/ml). Discussion: An acute bout of exercise or green tea supplementation may not be sufficient to see a favorable impact in glucose homeostasis or adipokines within this population. Elevated TNF-α (> 1.36 pg/ml) and low adiponectin levels observed in all trials may reflect an inflammatory state that could be associated with menopause. Inflammation is known to alter glucose metabolism. Postmenopausal woman present a unique challenge with prevention of T2D, as increased adiposity and decreased estrogen levels negatively affect adipokines, which negatively impacts glucose homeostasis.

947 Board #208 May 30 2:00 PM - 3:30 PM
Family History of Diabetes Does Not Affect Exercise-Induced Improvements in Insulin Sensitivity and Metabolic Flexibility
Manuel Amarod1, Cesar Meza2, Mario Garcia1, Christopher Figueroa1, George King, FACSM3, Andrew McAinich2, Sudip Bajpey1.1 University of Texas at El Paso, El Paso, TX. 2Victoria University, St. Albans Campus, Melbourne, Australia. (Sponsor: George King, FACSM)
(No relevant relationships reported)

A family history of diabetes (FH+) is considered a risk factor to develop insulin resistance and type 2 diabetes. However, it is not known whether exercise induced improvement in insulin sensitivity (IS) and metabolic flexibility (MF) are impacted by a FH+. PURPOSE: To determine if a FH+ limits exercise induced improvements in IS, MF, body composition, and strength following an 8-week combined aerobic and resistance training intervention. METHODS: 19 sedentary, normoglycemic, Mexican-American males underwent 8 weeks of combined exercise training 3 times/week (35-min aerobic & 45-min resistance training/session). A controlled diet was provided 5 days before pre/post intervention tests. IS was assessed by hyperinsulinemic euglycemic clamp. MF was assessed by change in respiratory quotient (ARQ) at the insulin stimulated state of the clamp compared to the fasted state. Body composition was measured using DXA. Upper/lower body strength were measured by 1 repetition maximum bench press and leg strength dynamometer.

RESULTS: IS significantly improved in both groups (FH+: 2.95±31 to 3.84±31.31 μU/mL estimated mean body size (EMBS), p<0.03; FH-: 3.6±5.0 to 4.8±5.0 μU/mL EMBS; p<0.002). MF significantly improved in both groups (FH+: 0.72±0.09 to 0.78±0.008, p<0.001; FH-: 0.70±0.01 to 0.80±0.02, p<0.0001). Fat free mass significantly improved in both groups (FH+: 56.6±2.1 to 58.5±2.1kg, p<0.01; FH-: 51.8±1.95 to 53.4±1.79kg, p<0.01). Upper body strength (FH+: 172.75±20.95 to 200.5±20.74lbs, p<0.0001; FH-: 136.5±14.06 to 168.3±15.29lbs, p<0.0001) and lower body strength (FH+: 368.89±3.02 to 431.11±22.58lbs, p<0.007; FH-: 341.03±2.03 to 412.78±16.22lbs, p<0.0001) significantly increased in both groups. Degrees of improvement in IS was not different between groups (FH+: 28.3±13.6% vs. FH-: 41.66±11.9%; p<0.005).

CONCLUSION: FH+ is not a limiting factor for exercise induced improvements in IS, MF, body composition, and strength in normoglycemic Mexican Americans.

948 Board #209 May 30 2:00 PM - 3:30 PM
Physical Activity and Glycemic Control in Low Versus High Inflammation Phenotypes in Metabolically Healthy Adults
Morgan Chamberlin, Jamie Ritter, Adam Maes, Stephanie Wilson, Sarah Bronsky, Seth Walk, Carl Yeoman, Mary P Miles, FACSM. Montana State University, Bozeman, MT. (No relevant relationships reported)

Metabolically healthy overweight or obese (MHO) individuals may be studied to better understand the relationship of low-level inflammation to physical activity (PA) and fitness, metabolic syndrome, glycemic control, and postprandial responses. It was hypothesized that individuals with lower inflammation would have greater volume of PA, cardiorespiratory fitness (VO2max), and metabolic health. PURPOSE: To compare PA, VO2max, glycosylated hemoglobin (HbA1c), metabolic syndrome criteria, and metabolic responses to a high-fat meal between low (LO) and high (HI) inflammation phenotypes within a group of MHO adults. METHODS: Adults (n=25), 23-54 y of age with BMI from 27-35 kg·m² were assessed for body composition, self-reported PA, VO2max, and fasting/resting concentrations of interleukin (IL)-1β, IL-6, IL-17, IL-23, tumor necrosis factor-α (TNF-α), and granulocyte/macrophage colony stimulating factor (GM-CSF). LO (n=11) were below the group median for ≥ 4 of the cytokines; HI (n=14) above for ≥ 4. Two participants were between phenotypes. After fasting blood collection, a high fat meal (50 g fat, 54 g carbohydrate, and 12 g protein) was consumed and 4 hourly, postprandial blood samples were collected for measurement of glucose, insulin, and triglycerides (TG).

RESULTS: Mean cytokine concentrations were 1.8 to 4.3-fold higher (p<0.05) in HI compared to LO for IL-1β, IL-6, IL-17, IL-23, TNF-α, but not (p=0.12) GM-CSF. The frequency of aerobic activity was higher (p<0.05; mean ± SEM: 5.2 ± 0.5 vs 3.1 ± 0.4

Abstracts were prepared by the authors and printed as submitted.
Reduced Insulin Sensitivity in Young, Normoglycemic Subjects, Alters Tissue Oxygenation During Post Occlusive Reactive Hyperemia

Esther E. Wu, Thomas J. Barstow, FACSM, Dana K. Townsend, 1 Wheaton College, Wheaton, IL. Kansas State University, Manhattan, KS. (Sponsor: Thomas J. Barstow, FACSM)

No relevant relationships reported

INTRODUCTION: Near-infrared spectroscopy (NIRS) measures of the tissue oxygen saturation ([SIo2]) reperfusion rate during post occlusive reactive hyperemia (PORH) has recently been correlated with flow mediated dilation (%FMD) of the popliteal artery (Melnyk et al. 2016). Cardiovascular disease is associated with impairments in %FMD. Reduced insulin sensitivity may negatively affect the vascular system for many years prior to a pre-diabetic/diabetic diagnosis. PURPOSE: To determine if static and dynamic, [SIo2] parameters during PORH are correlated with metabolic markers in healthy, young, normoglycemic subjects. METHODS: Glucose (G) and insulin (I), both in fasting (F) conditions and during an oral glucose tolerance test (OGTT), were measured in twenty-three, young (18-26y), healthy subjects (12M/11F). Each subject underwent upper arm, PORH with oxy- ([HbO2]) and deoxy- ([Hb]) measured in the skeletal muscle of the antebraconial by NIRS. [SIo2] was calculated ([HbO2]/[Hb]) at rest, during the cuff, and during PORH. Parameters describing the amplitude and time course of the response were measured. Hepatic insulin sensitivity ([ISI_h]), a measure of hepatic insulin sensitivity (Matsuda Index, area under the curve for I and GLU, FI and G and 2-HR GLU were measured. RESULTS: FI (range 2.3-12.1 ± 1μl/mL) was significantly negatively correlated (r=0.43, P=0.02) with the amount of change of [SIo2] during reperfusion (Δ [SIo2]) (range 13.94 - 38.66%) and significantly positively correlated (r=0.52, P<0.005) with the minimum [SIo2], a measure of extraction, during the cuff (Min [SIo2]) (range 35.97 - 61.87%). [ISI_h] (range 0-2.37-2.7) was significantly positively correlated (r=0.57, P=0.002) with [SIo2] and significantly negatively correlated (r=0.56, P=0.006) with Min [SIo2]. There was no significant correlation between any metabolic parameter and [SIo2] upstroke (initial slope of [SIo2]), following cuff release. CONCLUSIONS: Δ [SIo2], a measure of the amount of reperfusion, and Min [SIo2], a measure of extraction during the cuff, were correlated with FI and [ISI_h], two of the longest used markers of metabolic function. NIRS-derived [SIo2] may be a useful tool for assessing levels of reduced insulin sensitivity in normoglycemic, young adults.

Lower Glucose Tolerance in Normoglycemic, Healthy Hispanics with a Family History of Type 2 Diabetes

Cesar Meza1, Manuel Amador1, Mario Garcia1, Christopher Figueroa1, Andrew McAinch1, Sudip Bajpeyi1. 1University of Texas at El Paso, El Paso, TX. 2Victoria University, St Albas, Australia.

No relevant relationships reported

Obesity and type 2 diabetes are associated with impaired glucose homeostasis and blood lipid profiles. Further, a family history of diabetes (FH) increases the risk for development of insulin resistance. However, it is unclear whether differences in glucose tolerance, blood glucose, lipid profiles exist between individuals with/ without a FH. PURPOSE: To investigate whether a FH impairs glucose tolerance and blood lipid profile in healthy, sedentary Hispanic males.

METHODS: 22 sedentary, normoglycemic, Mexican American males (mean±SEM: age:23±0.56 yrs; BMI: 26.9±1.09 kg/m2) with/without FH participated in the study. Glucose tolerance was assessed by calculating glucose area under the curve (AUC) following an oral glucose tolerance test. Participants were fed a 5-day standardized diet (55:15:30 Carbohydrate:Protein:Fat) before testing. Serum was collected for analysis of blood glucose and lipid panels by a diagnostic lab corp. (Lab Corp, Burlington, NC).

RESULTS: AUC was significantly greater in individuals with a FH compared to controls without FH (FH: vs FH+: 311.9±7.30 vs 355.35±11.91 AU; p=0.008).

Fasting glucose (75±2±7.20 vs 79±1.82 mg·dl−1; p=0.40) and HOMA-IR (2.64±0.35 vs 1.81±0.19 AU; p=0.26) were not different between groups. There was no difference in fasting insulin between groups. Lastly, no differences in total cholesterol (p=0.18), triglycerides (p=0.28) or LDL cholesterol (p=0.24) were detected regardless of FH.

CONCLUSION: Fasting glucose, insulin, insulin resistance measure by HOMA-IR, and lipid profiles were not different between individuals with and without a FH. However, glucose AUC may be an early indicator of risk for developing insulin resistance in young adults with a family history of type 2 diabetes, despite an otherwise normal clinical health status.

Restricted Carbohydrate Diet and Exercise Improves Metabolic and Inflammatory Profiles in Metabolic Syndrome

Lauren Muatz1, Alex Eason1, Mark Baker2, Deborah Lown1, Amy M. Gyorkos2. 1University of Calgary, Calgary, AB, Canada. 2Grand Valley State University, Allendale, MI. (Sponsor: Timothy J. Michael, FACSM)

No relevant relationships reported

One approach to slow the pandemic of obesity and chronic disease is to look to our evolutionary past, for clues of the changing behaviors contributing to the emergence of ‘diseases of civilization’. Diet and exercise that resemble our ancestral behaviors independently reduce risk factors for the development of chronic disease. To date, little research has examined the effects of combining a Paleolithic diet with high intensity exercise.

PURPOSE: The purpose of this study was to investigate the effects of diet and exercise resembling those of our evolutionary past on inflammatory and metabolic profiles in individuals characterized as having Metabolic Syndrome (MetS).

METHODS: Eleven subjects with MetS followed a crossover design with two 4-wk interventions, including a restricted carbohydrate Paleolithic-based diet (RCPD; ≤50gCHO) with high intensity interval training (RCPD-Ex) and a RCPD diet with sedentary activity (RCPD-Sed), separated by a 4-wk washout period. A two-way analysis of variance with repeated measures was performed with post-hoc analysis using simple effects analysis with a Bonferroni adjustment. The level of statistical significance was established a priori as P<0.05. Values are reported as means ± SD.

RESULTS: Compared to baseline, RCPD-Sed and RCPD-Ex improves VO2max by 22.61 ± 1.9% and 28% (25.5 ± 2.6 ml·kg·min-1), respectively and improves metabolic markers including waist adiposity (-15.1%, -18%), weight loss (-3%, -5%), body fat % (BF%; -7%, -12%), fasting plasma glucose (GLU; -20%, -27%), triglycerides (TG; -47%, -52%), HDL-C (+22%, +36%), mean arterial pressure (MAP; -28%, -34%), fasting insulin (-34%, -39%), HOMA-IR (-37%, -41%), adiponectin (+33.7%, +38%), and leptin (+33.7%, +38%), levels, respectively when compared to baseline. RCPD-Sed and RCPD-Ex also improves inflammatory markers reducing hCRP by -32% and -36% (2.18 ± 1.4, 2.5 ± 1.4 pg/ml), TNF-alpha by -35% and -41% (2.3 ± 0.6, 1.9 ± 0.4 pg/ml), and IL-6 by -29% and -40% (2.7 ± 0.8, 2.1 ± 0.6 pg/ml), respectively, when compared to baseline. CONCLUSION: Adopting behaviors from our evolutionary past, including diet and exercise, shows favorable metabolic and inflammatory profiles in those that characterize as having MetS.
26.9±1.2 kg/m², age= 29.9±1.0 y), and 14 obese women (pre-pregnancy BMI= 35.9± 5.3 kg/m², age= 29.0± 1.6 y). Fasted lipid oxidation values were higher among obese women (0.09±0.03/min) compared to lean women (0.07±0.04/min) (p=0.05), and were positively correlated to GWG among all participants (r=0.38, p<0.01). Obese pregnant women were less able to upregulate fat metabolism in response to the high-fat meal (i.e. metabolically inflexible) compared to lean women (fold change in lipid oxidation-lean: 59.6± 50.6% vs. obese: 36.5± 49.9%, P=0.06). There was a trend (r=0.34) in the relationship between metabolic inflexibility and insulin resistance (r=0.43, P=0.07). Data collection and analysis are ongoing. CONCLUSIONS: Obese pregnant women failed to upregulate lipid metabolism to the same extent as lean pregnant women in response to a high-fat meal. This “metabolic inflexibility” may contribute to unfavorable maternal and neonatal outcomes.  

Purpose: On the recommended 45 to 65% high-carbohydrate, low-fat diets, evening meals, but not morning meals, produce glucose intolerance (GLU-INT). We have recently tested the hypothesis that the high carbohydrate (CHO) content of the diet contributed to evening postprandial GLU-INT and found a 30% reduction in evening postprandial insulin and in HOMA-IR measure of insulin resistance after one day of low (30%), relative to 60% CHO diet (Lin & Boré, PLoS ONE 2016). Two hours of exercise before the two daily meals did not alter this dietary effect but increased GLU-INT after both diets. The purpose of the present study was to test the hypothesis that (1) one day of low-CHO diet will reduce postprandial insulin and glucose at both extremes of the circadian period, and (2) that exercise after the meals will lower or eliminate evening GLU-INT.

METHODS: Subjects were 8 postmenopausal women who for 24 h ate a 25%-CHO diet with the final meal at 7 am or 7 pm. Meal was followed by 10-minute blood collection over 4.5 hours for measurement of glucose and insulin. Two trials were sedentary and in two others 1 h of moderate-intensity exercise started 40 minutes after the test meals. Glucose oxidase was used to measure glucose and radioimmunoassay for insulin.

RESULTS: Circadian time had no effect on postprandial insulin in either sedentary or exercise trials. However, postprandial GLU-INT was observed after evening compared to morning meals. Post-meal exercise attenuated by almost 50%, but did not abolish, evening GLU-INT.

CONCLUSIONS: Evening postprandial GLU-INT persists even on 25%-CHO diet. Higher postprandial insulin resistance after evening meal relative to morning meal reflects higher plasma glucose but unchanged insulin response in the evening compared to morning. One h of exercise after the meals attenuated, but did not eliminate, evening postprandial GLU-INT. Therefore, a combination of low-CHO diet and post-meal, but not pre-meal, exercise reduces evening GLU-INT.

Purposse: Metabolic flexibility has been implicated in the regulation of insulin sensitivity and glucose homeostasis. Although low-carbohydrate diets (LCD) and interval exercise (INT) have been independently shown to improve metabolic flexibility and insulin sensitivity, the combined effect of these therapies is unknown in obese adults. We hypothesized that LCD+INT would enhance fuel selection to a greater extent than a LCD alone, and this would correlate with insulin sensitivity.

METHODS: Twenty-four lean women (Age: 48.2±2.2 years, BMI: 37.7±1.3 kg/m²) were randomly assigned to a LCD (n=12; mixed meals of ~1200kcal/d) or LCD+INT (n=12; 60min of supervised INT at 90% and 50% HRpeak for 3 min each, respectively). LCD+INT subjects received an additional 350kcal post-exercise to equate energy availability between groups. Fitness (VO2peak), percent body fat (BodPod), and insulin sensitivity (Matoua Index), 180min OGGT were assessed pre- and post-intervention. Respiratory exchange ratio (RER; indirect calorimetry) was measured at 0, 60, 120, and 180 min of the OGGT to determine metabolic flexibility, which was defined as the slope of fasting to post-prandial (PP; average of 60-180 min) RER.

RESULTS: LCD and LCD+INT had similar reductions in caloric intake (P=0.001), percent body fat (P=0.001), fasting plasma glucose (P=0.04), fasting RER (P=0.001) and increment in insulin sensitivity (P=0.010). However, LCD+INT improved VO2peak (P=0.04), insulin IAUCoMin (P=0.08), and metabolic flexibility (P=0.007) as well as maintained PP RER (P=0.01) compared with LCD. Maintenance of PP RER (P=0.50, P=0.01) and reductions in percent body fat (P=0.45, P=0.02) were significantly associated with improved insulin sensitivity. Further, increased metabolic flexibility was directly associated with improved VO2peak (r=0.48, P=0.01).

CONCLUSIONS: Adding INT to a LCD accentuates metabolic flexibility in relation to insulin sensitivity in obese women. These findings highlight that INT-induced adaptations may be additive for glucose regulation during a weight-loss intervention.

Purpose: The purpose of this study was to determine the effects of age and sex on body composition, energy expenditure, physical activity, and glucose tolerance in C57Bl/6J mice. METHODS: Young (YG, 23-25 weeks old) and aged (AG, 72-76 weeks old) mice were housed in metabolic cages to measure energy expenditure (EE) and physical activity (PA), and body composition by dual energy X-ray absorptiometry and magnetic resonance imaging, and were subjected to an intrapertralonal glucose tolerance test (ITT) to assess insulin action. RESULTS: Body composition analysis revealed that AG male mice had a significantly greater body mass (42.2±1.9 vs 30.0±0.4 g, P<0.0001), fat mass (18.7±2.0 vs 3.3±0.4 g, P<0.0001), and percent body fat (43.0±3.0 vs 11±0.1%, P<0.0001) compared with YG male mice. In AG female mice, body mass was significantly higher (32.8±1.6 vs 26.3±0.9 g, P<0.002), but fat mass (13.3±2.0 vs 9.5±1.3 g, P<0.024) and percent body fat (37.4±8.4 vs 35±13.8%, P=0.67) were similar when compared to YG female mice. Interestingly, lean body mass was higher in AG female mice (16.9±0.6 vs 14.7±0.6, P<0.008) but lower in AG male mice (18.4±0.4 vs 22±0.6, P<0.001) when compared to YG mice. In AG male mice, body mass was significantly higher (32.2±1.9 vs 32.8±1.6 g, P=0.01) and fat mass (15.9±2.0 vs 13.3±2.0 g, P=0.04) compared to AG females, however, percent body fat (43.3±0.5 vs 37.8±14.8%, P=0.28) was similar between AG male and female mice. Surprisingly, EE was higher in both AG male (24±0.0 vs 19±0.0 kcal/hr, P=0.004) and female mice (26.2±2 vs 20.7±0.4 kcal/hr, P=0.001) compared to respective YG mice; however, EE does not appear to explain the sex-dependent differences in body composition. Physical activity tended to be higher in AG female mice compared to AG male mice, but this effect was not significant (P=0.12).
EXERCISE DECREASES TISSUE BLOOD FLOW IN THE GASTROINTESTINAL (GI) SYSTEM. THE HYPOTHALAMIC-PITUITARY-ADRENAL (HPA) AXIS REGULATES INTESTINAL BARRIER FUNCTION AFTER STRENUOUS SWIMMING

Die Wu1, Beiwei Luo1, Dao Xiang2, Peijie Chen1, 1Shanghai University of Sport, Shanghai, China. 2Naval Medical Research Institute, Shanghai, China.

(No relevant relationships reported)

PURPOSE: Exercise decreases tissue blood flow in the gastrointestinal (GI) system. The hypothalamic-pituitary-adrenal (HPA) axis regulates intestinal barrier function after strenuous swimming.

METHODS: Ten male swimmers were used in this study (male, 8-week, n=6/group).

RESULTS: Exercise significantly decreased tissue blood flow in layers of the colon.

CONCLUSION: The HPA axis plays an important role in the regulation of intestinal barrier function.

Funding: The Natural Science Foundation of China (31471135, 31701040)

959 Board #220 May 30 3:30 PM - 5:00 PM Effects Of Diet Before Endurance Exercise On Hecipdin Response In Young Females

Nanako Hayashi, Kazushige Goto. Ritsumeikan University, Kusatsu, Japan. (Sponsor: Robert R Kraemer, FACSM) (No relevant relationships reported)

PURPOSE: The purpose of the present study was to examine the effects of diet before prolonged exercise on hepcidin response in young female subjects.

METHODS: Ten young, untrained-female subjects [age 20.6 ± 0.8 years; height 1.57 ± 0.1 cm; weight 54.4 ± 1.5 kg; peak oxygen uptake (VO2max) 35.9 ± 1.1 ml/kg/min] participated in the present study. Subjects completed a 60-min bout of cycling at 65% of VO2max after consuming (FED) or not consuming (CON) a meal before the exercise. The two experimental sessions were conducted with a crossover design, and these sessions were separated by about a month (each trial was performed during the follicular phase). Blood samples were collected before exercise, immediately after exercise and 3-h after exercise.

RESULTS: Blood glucose levels were significantly elevated immediately after exercise in the FED (from 91 ± 2 mg/dL to 114 ± 4 mg/dL, P < 0.05). Serum iron level was significantly elevated after exercise in both FED (from 82 ± 14 µg/dL to 99 ± 16 µg/dL, P < 0.05) and CON (from 70 ± 14 µg/dL to 83 ± 15 µg/dL, P < 0.05). However, plasma interleukin-6 and hepcidin levels were not altered significantly during 3-h of post-exercise period in either condition (interaction, main effects for trials and time, P > 0.05).

CONCLUSIONS: Diet before endurance exercise did not affect exercise-induced hepcidin elevation in young females.

960 Board #221 May 30 3:30 PM - 5:00 PM Aerobic Training Status Enhances the Pentraxin 3-Mediated Innate Immune Response Following Maximal Exercise

Aaron L. Slusher, Tiffany M. Zühiga, Edmund O. Acevedo, FACSM. Virginia Commonwealth University, Richmond, VA. (Sponsor: Edmund O. Acevedo, FACSM) (No relevant relationships reported)

PURPOSE: Pentraxin 3 (PTX3) is a vital regulator of innate immune function. Although plasma PTX3 concentrations are enhanced by aerobic exercise, the capacity of aerobic exercise to alter PTX3 functioning at the cellular level in aerobically trained (TR) and untrained (UTR) subjects remains unknown.

EXPERIMENTAL DESIGN AND METHODS: We compared plasma PTX3 concentrations (Baseline, Post-Exercise) with myD88-dependent and independent CD14 receptors in peripheral blood mononuclear cells (PBMCs) of trained (TR), untrained (UTR) males, and sedentary (SE) females after repeated bouts of exercise (Baseline, Post-Exercise).

RESULTS: Plasma PTX3 concentrations were higher in TR compared to UTR females after exercise (P < 0.05).

CONCLUSIONS: These results suggest that aerobic exercise augments PTX3-mediated innate immune responses.

S186 Vol. 49 No. 5 Supplement
METHODS: Fifteen Tr and 15 UTr participated in an acute bout of maximal exercise to examine
ex vivo PTX3 production from whole blood (WB) and isolated peripheral blood mononuclear cells (PBMCs) exposed to LPS or palmitate. The capacity of PTX3 to regulate the ex vivo production of inflammatory cytokines was also examined in isolated PBMCs.

RESULTS: Elevated plasma PTX3 concentrations prior to exercise were positively associated with the percent change (pre to post exercise) in plasma PTX3 concentrations following acute exercise (r = 0.428, p = 0.018), independent of training status and cardiovascular fitness (VO\textsubscript{2}max). In response to acute exercise, while ex vivo PTX3 production from LPS stimulated WB was unaltered following acute exercise in all subjects, the production of PTX3 from LPS stimulated PBMCs tended to be lower in Tr compared to UTr subjects (p = 0.098). Likewise, PTX3 production from palmitate stimulated PBMCs was reduced in Tr compared to UTr subjects (p = 0.017). Although PTX3 concentrations in Tr but not UTr subjects were positively associated with the LPS- and palmitate-mediated production of PTX3 from PBMCs at rest and in response to acute exercise (p ≤ 0.050). Next, isolated PBMCs were stimulated with PTX3. As a result, PTX3-mediated production of the anti-inflammatory cytokines IL-10 and TGF-β1 decreased following acute exercise in both Tr and UTr subjects (p = 0.004, p ≤ 0.001, respectively). To the contrary, although PTX3-mediated IL-6 production was unaltered following acute exercise, the percent change in IL-6 production was positively associated with elevated plasma PTX3 concentrations at rest and in response to acute exercise in Tr subjects only (p ≤ 0.050).

CONCLUSIONS: Aerobic exercise training may enhance the utility of plasma PTX3 concentrations to serve as a biomarker of the PTX3-mediated innate immune response to acute exercise.

963 Board #224 May 30 3:30 PM - 5:00 PM Adding Short-Term Interval Exercise to a Low-Calorie Diet Favorably Influences Appetite in Obese Adults

Heidi Jacob A. Siedlik. Alexander K. Holbrook, Michael A. Belshan, Eric C. Bredahl, Jacob A. Siedlik. Creighton University, Omaha, NE. (Sponsor: Joan Eckerson, FACSM) (No relevant relationships reported)

HIV-1 can efficiently infect and replicate in activated CD4+ cells, including T cells and macrophages. Quiescent CD4+ T cells are susceptible to virus binding and entry, but infect poorly due to a lack of transcriptional and metabolic factors. We previously showed that circulating T cell populations undergo significant functional changes after short episodes of intense exercise. We hypothesize these changes can prime T cells for HIV-1 infection, and possibly facilitate the development of latent infection.

PURPOSE: To identify if exercise-induced changes in CD4+ T cell physiology alter susceptibility to HIV-1 infection. METHODS: Subjects participated in both a control (no exercise) and exercise session. Venous blood samples were obtained at baseline (Pre) and immediately after each session (Post) in sodium heparin vacutainers. Blood samples were immediately processed and CD4+ T cells isolated with a human CD4+ T cell enrichment kit. A subset of cells was activated by stimulation with anti-CD3 and -CD28 antibodies. Unstimulated cells were immediately inoculated with NXL HIV-1 at a multiplicity of infection (MOI) of 0.1 for 4 h, washed, and cultured in XF T Cell media supplemented with 50 U/ml IL-2. After 3 d of stimulation, the activated cells were similarly infected and cultured. Cultures were incubated for 17 d and supernatants collected, clarified by centrifugation, and stored at -20°C every 3–4 d for measurement of virus replication. At 14 d post infection, the resting cells were activated for 3 days with human CD3/CD28/CD2 T cell activator beads to test for latent infection (activated cell group was not restimulated). Viral replication was quantified by HIV reverse transcription assay. RESULTS: Preliminary data from the initial subjects suggests there is not a statistically significant change in viral replication levels between baseline and post exercise cells. In one subject however, a 1702% increase was observed in viral replication after reactivation of control resting cells compared to a 55% increase in reactivated exercise cells. CONCLUSIONS: While evidence suggests acute exercise alters the phenotypic state of T cells, it may not alter compared to a 55% increase in reactivated exercise cells.

WEDNESDAY, MAY 30, 2018

964 Board #225 May 30 3:30 PM - 5:00 PM Effects Of Obesity And Exercise On Bone Marrow And Leukemia Cells Following Radiation

Matthew Ngu1, Russell Emmens2, Diego Hernandez-Saavedra2, Hong Chen3, Michael De Lisio4,1.1 University of Ottawa, Ottawa, ON, Canada. 1University of Illinois at Urbana-Champaign, Urbana, IL. (No relevant relationships reported)

Radiotherapy-induced leukemia is a serious late effect of radiation therapy partially due to long-term alterations in the bone marrow (BM) environment. Obesity and sedentary lifestyles, two host factors that remodel the bone marrow, are common amongst cancer survivors and linked to increased leukemia risk. Whether alterations to the bone marrow environment induced by obesity and physical activity alter leukemia risk following ionizing radiation (IR) exposure remains unknown. PURPOSE: Determine how exercise training and obesity modulate the BM environment and leukemia blast viability following sub-lethal IR exposure. METHODS: 4 week old CBA mice were fed a control (CON; n=20) or 45% high fat diet (HF; n=20). At 9 weeks old, CON and HF mice were divided into sedentary (SED, n=10) or exercise groups (EX, n=10). CON and HF mice were exercised on a treadmill for 50 minutes at varying race paces followed by an outdoor 5-km time trial. Overnight fasting serum samples were collected at pre- and 24-hour post-exercise to examine the effects of PTX3 on inflammatory markers in trained middle-aged men. It is highly recommended that the future studies focus on examining the effects of a long-term high-fat diet on inflammatory markers in a variety of subject populations.

Purpose: Appetite is influenced by gut-derived hormones and behavioral factors. Caloric restriction is suggested to reduce satiety and increase hunger, thereby contributing to challenges in long-term weight loss. Although intense exercise is suggested to attenuate appetite, no data exist testing the effects of interval exercise (INT) during a low-calorie diet (LCD) on appetite regulation. We hypothesized that LCD+INT would favorably influence satiety when compared with LCD in obese adults.

METHODS: Seventeen obese adults (50.5 ± 3.0 years; 35.9 ± 1.4 kg/m²) were randomized to either LCD (n=8; mixed meals of ~1200 kcal/d) or LCD+INT (n=9; 60 min/d of supervised interval exercise at 90% HR\textsubscript{max} for 3 min and 50% HR\textsubscript{max} for 3 min). An additional 350kcal (shake) was provided to LCD+INT individuals post-exercise to equate energy availability between groups. Total PYY, acyl ghrelin (AG) and des-acyl ghrelin (dAG) were measured at 0, 30 and 60 min of a 75g OGTT. PYY and AG concentrations to serve as a biomarker of the PTX3-mediated innate immune response to acute exercise.

964 Board #225 May 30 3:30 PM - 5:00 PM Effects Of Obesity And Exercise On Bone Marrow And Leukemia Cells Following Radiation

Matthew Ngu1, Russell Emmens2, Diego Hernandez-Saavedra2, Hong Chen3, Michael De Lisio4,1.1 University of Ottawa, Ottawa, ON, Canada. 1University of Illinois at Urbana-Champaign, Urbana, IL. (No relevant relationships reported)

Abstracts were prepared by the authors and printed as submitted.
Obesity-induced inflammation promotes type 2 diabetes and cardiovascular disease (CVD). A causative link between adaptive immunity and pathogenesis of obesity-associated diseases has been established.

**PURPOSE** To examine the effects of exercise on circulating T-helper (Th) 17 lymphocytes in overweight-obese post-menopausal women.

**METHODS** Twenty-seven overweight-obese women (BMI 32.7 ± 5.1 kg·m⁻², 55-75 yr) were randomly assigned to the exercise (EX, n=14) or education (ED, n=13) groups. EX performed 2 sets of 8 resistance exercises and a 25-min treadmill walk at 70-80% HRR. ED performed pre-exercise (PR), post-(PO), and 1-hour and 2 hours post-exercise (1HR and 2HR). Blood samples were obtained at the same time points in CON at all timepoints.

**RESULTS** A main effect for time revealed an increase in total PMC number at PO (p=0.036). This increase appears to have been driven by EX (EX = 61.5%; CON = 33.8% increase). Mon1 and Mon2 PMC responses were similar. A significant time x group interaction for Mon3 PMC (p=0.002) indicated an increase from PR to PO (CON: +5218±1170 cells·ml⁻¹; PO: +8155±1152 cells·ml⁻¹), and a decrease from PO to 1HR (1HR = -736±820 cells·ml⁻¹) and 2HR (2HR = -3818±184 cells·ml⁻¹). PMC number remained constant for CON at all timepoints.

**CONCLUSIONS** Aerobic fitness appears to reduce platelet activation indicated by the negative relationship between VO2max and CD42a (p<0.03). Sytolic blood pressure (SBP) positively correlated with percent PMC (p=0.03). Inflammatory cytokines were also increased in the CM of HF-SED compared (p<0.05). Inflammatory cytokines were also increased in the CM of HF-SED compared. Inflammatory cytokines were also increased in the CM of HF-SED compared. Inflammatory cytokines were also increased in the CM of HF-SED compared.
King-Devick (KD) Test, Clinical Reaction Time (CRT), a computerized neurocognitive assessment (CNT), and tandem gait (TG). A 2 (group) x 2 (time) repeated measures ANOVA was performed for each dependent variable.

RESULTS: There were no statistically significant interactions for any of the dependent variables. There were significant main effects of time with improved performance during the second year for SAC (Baseline 1: 26.5 ± 1.9 and Baseline 2: 27.3 ± 1.8, p < .001), KD Test (Baseline 1: 38.4 ± 6.4 sec and Baseline 2: 37.1 ± 6.3 sec, p = .025), and CRT (Baseline 1: 2.43 sec and Baseline 2: 1.95 ± 2.46 sec, p = .013), but no differences in BESS, CNT, and TG. There were no significant group effects for all tests.

CONCLUSION: Sustaining a MSI did not adversely affect performance on the concussion baseline tests. This suggests that a student-athlete’s initial concussion baseline assessment performance is valid to compare with post-injury performance, even if a lower body MSI was sustained after the initial assessment. As expected, improvements on certain tests were observed with repeat administration. These results suggest that a rebaseline concussion assessment for collegiate student-athletes is unnecessary.

In recent years, there has been a unified call to end fighting in the NHL to reduce concussive injury. However, no published data to prove fighting leads to more concussions has been produced, only anecdotal cases. Purpose: To analyze a consecutive NHL Fights from 2010–11 to 2014–15 seasons, recording all resulting injuries and number of games that the player missed. Methods: Public domain ‘Hockeyfights’ web sites were used to identify and view all fights and injuries were confirmed through two independent sources, the NHL and/or the team or independent press sources. The study received IRB waiver for use of public data. Stat Analysis was performed using available software. Results: The NHL had 992 fights in 1,950 games over 2 seasons with a fight/game rate of: 50.9% (range 38.6–65% annually in NHL over past decade). 30 injuries resulted to the 1,984 combatants (n=992 fights) for an injury rate of 1.5/100 per fighters. Specifically looking at concussions, 6 mTBI resulted (20% of injuries) for a rate: 0.2/100 mTBI/fight which is ten-fold less than the reported concussion rates in standard NHL play (3.0 mTBI per 100 player games). The 10 players with most fights in NHL annually, for the past 5 seasons, tallied 1,012 fights from 50 players (fights/season range 17-33) with: all injury rate of 3/100 fights and mTBI rate of .15/100 fights. Discussion: Although fighting may appear a direct causative factor to concussions the data does not prove it. The difference of punching compared to hits that lead to actually offering protection on any significant forces being generated and may explain the greater ‘safety’ of fighting in the NHL without injury. Currently, we are compiling similar data from the 2015–16 and 2016–2017 to compare changes in injury rates following NHL rule changes intended to reduce concussive injuries in comparison to males. Additionally, we investigated if athletes with acute cervical injury were more likely referred to a neurosurgeon in the post-SRC period compared to those without neck injury.

METHODS: This retrospective study assessed male and female youth, high school, and collegiate athletes (n=431; ages 12–21 years old) for post-SRC symptoms. We analyzed whether females who suffer a SRC are more prone to having an accompanying neck injury in comparison to males. Additionally, we assessed whether athletes who suffer an SRC with a neck injury display longer post-SRC recovery times, leading to increased referrals to a neurosurgeon; Statistical analyses were conducted using chi-square tests.

RESULTS: Of the 431 SRC cases, 92 reported concomitant acute neck strain. When comparing recovery time between male and female athletes, a significant difference was seen with males requiring more time to recover (p<0.001). However, when comparing recovery time in males and females with SRC and acute cervical strain, no significant differences were found (p=0.416). Additionally, when comparing the initial symptom burden using the post-concussion symptom scale in athletes with acute neck injury, females have a non-significant increased number of symptoms compared to males (p=0.157). Athletes with an SRC and neck injury are more likely to need a neuropsychology referral compared to those without a neck injury (p<0.027).

CONCLUSION: Evidence has been established that females have an extended recovery time following SRC when compared to males. A sex-based difference in regards to neck injury altering the recovery time were not found in our study. However, a concomitant neck injury with an SRC increases the likelihood of neuropsychology referral. Further research is warranted to determine etiologic factors contributing to more prolonged SRC recovery in females versus males.

COMPUTERIZED NEUROCOGNITIVE TESTING (CNT) is a part of a multi-faceted approach to post-concussion assessment. Accurate baseline (pre-injury) CNT scores aid post-concussion management which allows the athlete to serve as their own control. Prior research suggests maximal exertion negatively affects CNT scores immediately following exercise. However, the appropriate wait time for administering CNT following maximal exertion is unknown. PURPOSE: To compare differences in neurocognitive performance following submaximal and maximal exertion with varied recovery intervals in healthy college-aged students. METHODS: A prospective, randomized cross-over, repeated measures design was used for this study. Twenty-six participants (22 ± 2y) completed four experimental visits. Three visits consisted of a maximal effort graded exercise treadmill test (VO2 max), with a prescribed post-exertion rest period, and CNT administration. Baseline symptom scores were negatively influenced by maximal exertion, and continued to be elevated 20 minutes post-exertion. However, cognitive performance was unaffected. Sports medicine professionals should wait at least 20 minutes following maximal exertion to obtain a more accurate representation of symptoms.

PURPOSE: An increase in female participation in contact sports has resulted in an increase in female athletes presenting with sport-related concussion (SRC). It has been theorized that females have longer SRC recovery time related to lower neck strength compared to males, which may also relate to concomitant neck injury. We proposed that female athletes with SRC have a higher incidence of acute cervical strain, resulting in a longer duration of SRC symptoms. Additionally, we investigated if athletes with acute cervical injury were more likely referred to a neurosurgeon in the post-SRC period compared to those without neck injury.

METHODS: This retrospective study assessed male and female youth, high school, and collegiate athletes (n=431; ages 12–21 years old) for post-SRC symptoms. We analyzed whether females who suffer a SRC are more prone to having an accompanying neck injury in comparison to males. Additionally, we assessed whether athletes who suffer an SRC with a neck injury display longer post-SRC recovery times, leading to increased referrals to a neurosurgeon; Statistical analyses were conducted using chi-square tests.

RESULTS: Of the 431 SRC cases, 92 reported concomitant acute neck strain. When comparing recovery time between male and female athletes, a significant difference was seen with females requiring more time to recover (p<0.001). However, when comparing recovery time in males and females with SRC and acute cervical strain, no significant differences were found (p=0.416). Additionally, when comparing the initial symptom burden using the post-concussion symptom scale in athletes with acute neck injury, females have a non-significant increased number of symptoms compared to males (p=0.157). Athletes with an SRC and neck injury are more likely to need a neuropsychology referral compared to those without a neck injury (p<0.027).

CONCLUSION: Evidence has been established that females have an extended recovery time following SRC when compared to males. A sex-based difference in regards to neck injury altering the recovery time were not found in our study. However, a concomitant neck injury with an SRC increases the likelihood of neuropsychology referral. Further research is warranted to determine etiologic factors contributing to more prolonged SRC recovery in females versus males.

Computers were prepared by the authors and printed as submitted.
were reported, the number of reported symptoms, and the severity of symptoms. RESULTS: Patients were 16.0 ± 2.6 years of age, 56.3% were male, and they had experienced 1.2 ± 1.5 previous concussions. Reaction time was 0.64 ± 0.13 seconds; visual motor speed score was 44.7 ± 34.6; visual memory score was 92.0 ± 69.3; verbal memory score was 98.0 ± 80.9; cognitive efficiency score was 0.34 ± 0.12. Reaction time was a significant predictor (p=0.05) of balance problems, dizziness, mental fogginess, and sensitivity to light and noise; it was a trending predictor (p=0.061) of the summed symptom score. Verbal memory was a significant predictor (p<0.05) of balance problems, sleeping problems, and fatigue. Visual memory, visual motor speed, and cognitive efficiency index were poor predictors of injury severity. CONCLUSIONS: Reaction time and memory are common components of testing batteries for concussed athletes. In our sample, reaction time and verbal memory emerged as useful predictors of severity among patients suffering long-term symptoms of TBI. It may be of value for coaches and athletic trainers to establish baseline values at the onset of a competitive season.

A growing body of literature suggests athletes are at increased risk for acute musculoskeletal injury following return to play after concussion. The association between concussion and musculoskeletal injury has yet to be explored in youth athletes. PURPOSE: Compare the proportions of acute lower extremity injuries between youth football players following concussion and upper extremity injury. METHODS: Injury surveillance was conducted on 19 youth tackle football leagues (336 teams; 5,177 unique athletes; 6,799 athlete-seasons) from 2012-2015. Athletic trainers entered injury information into an electronic medical record, from which data were de-identified and aggregated for analysis. Musculoskeletal injuries to the lower (at and distal to the hip joint) and upper (at and distal to the shoulder joint) extremities and concussions were identified. The proportion of subsequent acute lower extremity injuries was compared between athletes suffering one of two initial injuries: 1) Concussion, or 2) Time-loss (sport participation loss > 24 hours) upper extremity injury. Only musculoskeletal injuries in the same season as the index injury were analyzed. RESULTS: Of the 209 unique athletes who suffered a concussion, 14 had a subsequent same-season acute lower extremity injury (6.7%; 95% CI: 3.2%, 10.2%). Of the 141 unique athletes sustaining a time-loss upper extremity injury, 10 sustained a subsequent same-season acute lower extremity injury (7.1%; 95% CI: 2.7%, 11.5%). There was no difference in the proportion of youth athletes who sustained an acute lower extremity injury after concussion or time-loss upper extremity injury (p=0.89; mean diff=0.4%; 95% CI: -4.9%, 6.5%). CONCLUSIONS: This is the first study to examine musculoskeletal injury risk in youth football athletes following concussion. Although evidence suggests that high school, college, and professional athletes are at increased risk for musculoskeletal injury following concussion, no increased risk was observed in this sample of youth football players. Our findings may be limited by the short time span of the youth football season, providing limited opportunity for re-injury. Despite these null findings, further research is needed to clarify the relationship between concussion and subsequent musculoskeletal injury in youth football athletes.

CONCUSSIONS: Individual head impact exposure was similar during two consecutive seasons of youth football, despite increased age and playing experience during the second season. Thus, extrinsic factors such as game rules, practice structure and coaching style may play a greater influence on head impact exposure from year to year in youth football, making these aspects of play key targets for strategies aimed at reducing repetitive head impacts in this population.

Concussion may inflict widespread disturbance throughout the brain, including visual network impairments. The King-Delvecchio (KD) test is a rapid number naming test of oculomotor functioning, however, it is limited to evaluating networks involved with saccadic eye movements and vergence. Recently, the Mobile Universal Lexicon Evaluating system (MULES), which requires object identification and color perception, was developed to encompass additional networks which may be a beneficial addition to concussion assessment. However, no published data describes MULES scores in an athlete-specific cohort. PURPOSE: To compare the relationship between KD and MULES scores in an athletic population. METHODS: Twenty-nine ice hockey players (17.1±3.3 years old, 27M/2F) completed both tests at baseline. The MULES consists of two cards totaling 54 color figures of foods, animals and objects; KD consists of 3 cards totaling 120 numbers in random order. Both tests were administered twice and the fastest time without errors was recorded as the “best” time. Descriptive statistics were used to describe test scores and a Pearson correlation examined the relationship between the tests. RESULTS: Mean scores of “best” KD and MULES trials were 47.8±9.4 seconds (Range: 31.77-68.0) and 37.7±6.7 (Range: 27.73-50.47), respectively. Every MULES trial 2 improved from trial 1 with a mean improvement of 6.8±3.7 seconds; KD mean change between trials was 2.4±3.7 seconds, where 8/29 subjects performed slower on the second trial. Pearson correlation revealed a significant (p<0.003) moderate relationship between KD and MULES best times (r=0.543). CONCLUSION: These data are the first to report on MULES test scores in an athlete-specific cohort. While the significant correlation denotes a relationship exists between the two tests, the moderate strength suggests that the two may be providing somewhat different information. This may be due to the MULES utilizing additional neurological resources as it requires additional object and color recognition. These findings support the use of MULES in a clinical concussion testing battery, as it is also easy to administer and takes a short time to complete. Future studies should focus on MULES scores through concussion recovery.
These group differences were gone by Wk1. CONCLUSIONS: These findings demonstrate that effenter autonomic discharge to the peripheral vasculature was reduced as evidenced by LF by the middle season without the LF-BP, LF-HR. The State of the art MOT placed a dramatically greater discordance in autonomic discharge after concussion such that the majority of the concussion group distribution fell below the lower limit of the 95% CI of controls. Thus, the central autonomic mechanism(s) regulating MW discharge were discordant after concussion with apparent resolution by 1 week.

Ice hockey is a high intensity contact sport with elevated risk of injuries including concussion. Three dimensional multiple object tracking (3D MOT) has been proposed as an intervention to reduce the incidence of concussion, and potentially improve cognitive function. PURPOSE: The purpose of this study was to examine the effects of using 3D MOT on the frequency and force of head impacts and cognitive function (CTMT and Stroop) in men’s ice hockey. METHODS: Eight male collegiate ice hockey players (NCAA Division III) (mean age = 22.87 ± 1.46; yrs; mean ht = 177.48 ± 16.82 cm; mean wt = 90.31 ± 4.6 kg), had head impacts and cognitive function assessed throughout the regular season with 3D MOT versus without 3D MOT. Paired samples t-tests were performed to test for differences between first half (without 3D MOT) and second half (with 3D MOT) for all measures. RESULTS: Utilizing 3D MOT did not reduce the number of head impacts. With 3D MOT there was an increase in rotational force versus without 3D MOT (rotational acceleration (p = 0.010) 3.49 ± 2.31 vs. 3.88 ± 2.29 krads/sec respectively), (rotational velocity (p = 0.001) 16.21 ± 8.71 vs. 14.35 ± 8.38 krads/sec respectively) as well as force applied to the right side (p = 0.001) (13.10 ± 7.34 vs 16.67 ± 9.73 krads/sec), and of the head (p = 0.019) (13.26 ± 8.40 vs 17.25 ± 9.43 krads/sec). CTMT improved with 3D MOT (p = 0.004) (49.57 ± 35.97 vs 65.15 ± 36.36%) while Stroop had no significant differences.

CONCLUSION: The use of 3D MOT during the second half of the competitive ice hockey season did not reduce the number of head impacts. The increase in rotational forces when using the 3D MOT may be attributed to the different time in the season that 3D MOT was utilized, where more aggressive play leading to higher forces was possible. CTMT improvement was not surprising as the CTMT measures all qualities the 3D MOT intervention improves, while the Stroop only measures working memory and opposition to distraction.

Visual impairments are common following sport-related concussion and may negatively affect athlete performance and safety if unresolved. PURPOSE: To examine differences in baseline visual assessment measures in high school football players with and without previous concussion. A secondary purpose was to examine the correlations between these assessments. METHODS: High school varsity football players (n=64, n=24 with concussion history) from a single high school (mean age=15.6±1.3 years) were enrolled in the study. Participants completed the following assessments prior to the start of the competitive football season: 1) three near-point of convergence (NPC) trials, 2) vision and sensory performance testing via the Senaptec Sensory Station, and 3) a demographic questionnaire. The independent variable was previous concussion history (with vs. without). Primary outcomes were average NPC across three trials (measured in centimeters) and the Senaptec Sensory Station scores for: visual clarity, contrast sensitivity, depth perception, near-far quickness, perception span, multiple object tracking, and reaction-time. Independent samples t-tests were used to examine differences in visual assessments between those with and without previous concussion and Pearson correlations examined the association between all Senaptec Sensory Station and mean NPC measures. Alpha level was set to P < 0.05 a priori. RESULTS: Over half (62.5%) of those who reported a concussion history indicated that their most recent concussion was within the last year. There was no significant effect of concussion history on any of the visual assessment measures. There was a significant, but clinically insignificant correlation between mean NPC and binocular visual clarity (r=0.26; p=0.03). No other significant correlations among the visual assessment measures were identified (P < 0.05). CONCLUSION: High school football athletes, regardless of concussion history, exhibit similar baseline clinical and functional vision.
burden of those randomly assigned to the HBO, therapy arm, all treatment and placebo groups returned to activity in a similar timeframe (HBO, \( \sim 13.7 \pm 5.1 \) days; HBA=13.0: 5.7 days; \( \alpha_1=19.0 \pm 16.5 \) days).

**Conclusion:** HBO, there may be an effective option to acutely treat post-concussive symptoms, particularly in young athletes presenting with high symptom burdens. Future research is needed to determine appropriate and standardized treatment protocols for HBO, therapy in this population following concussion.

Supported by the National Operating Committee on Standards for Athletic Equipment

---

**S192 Vol. 49 No. 5 Supplement**

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**WEDNESDAY, MAY 30, 2018**

**Board #240**

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

**The Affect of ADD on Baseline King-Devick and Clinical Reaction Time Performance In the Pediatric Population**

Paul J. Gubaniach, FACSM\(^1\), Blake Simpson\(^2\), Eric W. Slattery\(^2\), Kelsey Logan\(^3\), Cincinnati Children’s Hospital Medical Center, Cincinnati, OH. \(^1\)Miami University, Oxford, OH.

(NO relevant relationships reported)

**PURPOSE:** It is estimated that 1.5-3.5 million concussions occur annually in the US related to sports participation. Recent studies of the King-Devick (KD) and Clinical Reaction Time Test (CRT) have shown promise in the diagnosis and management of concussive injuries in older teens and young adults. The purpose of this study is to evaluate if a history of ADD may affect the baseline performance and hence interpretation of these novel tests in the pediatric and adolescent population.

**METHODS:** Non-concussed, 6-18 year-olds were recruited from sports medicine clinics during evaluation of other conditions or during participation in their schools’ baseline concussion surveillance program. Participants whom were felt to be limited in their ability to perform these tests due to comorbid conditions or injuries were excluded from the study. History of ADD or related medication use was assessed through review of the patient’s intake questionnaire or through examination of their past medical history and medication list as previously documented in the EHR on the day of assessment. Subjects completed the KD and CRT tests as previously described in the literature.

**RESULTS:** 563 participants (333 M, 230 F) were included in the study. Participants (44) were categorized as having a diagnosis of ADD (20 M, 24 F). The average age in the normative group was 12.58(2.71) years in the ADD group. Baseline KD performance was 50.17(12.42) in the ADD group versus 48.54(11.89) in the ADD group (p=0.43). CRT-RR was measured at 232.32(23.27) ms versus CRT-RR=223.89(22.71) ms (p=0.02) and CRT-LH=231.81(23.38) ms versus CRT-LH=224.75(22.75) ms (p=0.07) in the normative and ADD groups, respectively. Stratification by age group (6-13 vs. 14-18) did not reveal a difference in performance between groups on either test.

**CONCLUSIONS:** Baseline performance on the KD and CRT tests did not differ in this population of subjects with or without a history of ADD. Although limited by sample size, this study provides evidence that children with ADD perform similar to their peers on these baseline measures. Clinicians may therefore interpret these scores without adjustment. Additional factors which influence test performance need to be evaluated.

---

**Board #241**

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

**Treating Pediatric Acute Sport-Related Traumatic Brain Injuries with Hyperbaric Oxygen Therapy: A Case Series**

Patricia R. Combs\(^1\), Robert C. Lynall\(^2\), Stephen W. Marshall\(^2\), Janna C. Fonseca\(^1\), James R. Stevens\(^3\), Jason P. Mihalik\(^4\), Bentley A. Krause\(^5\), Eric W. Slattery\(^2\), Stephen W. Marshall\(^2\).

\(^1\)University of North Carolina at Chapel Hill, Chapel Hill, NC. \(^2\)University of Georgia, Athens, GA. \(^3\)Duke University, Durham, NC. \(^4\)Carolina Family Practice & Sports Medicine, Raleigh, NC. 

(Sponsor: Kevin Guskiewicz, FACSM)

(NO relevant relationships reported)

Athletes often experience symptoms and neurologic deficits following sport-related concussion. Higher initial symptom burden is associated with longer recovery times. The current standard of care for concussed athletes includes cognitive rest and non-specific subthreshold physical activity until self-reported symptom resolve and objective concussive measures demonstrate clinical recovery. There is a paucity of treatment options beyond this wait-and-see approach. Hyperbaric oxygen (HBO) therapy has benefited severe and moderate traumatic brain injury patients. It is unknown how HBO, therapy affects acute post-injury symptom burden and recovery time following concussion. **Purpose:** To explore the effect of HBO, therapy on reducing initial symptom burden in acutely concussed high school student-athletes compared to two different placebo treatments. **Methods:** Eight high school student-athletes suffering from sport-related concussion were randomly assigned into one of three blinded clinical intervention groups: 1) HBO, therapy (n=3); 2) Hyperbaric therapy with compressed medical-grade air (HBA) (n=2); or 3) normobaric 100% O\(_2\) therapy (n=3). All groups completed five one-hour treatments within the first 10 days following their injury. Main outcome measures included change from initial post-concussion symptom burden and days until the physician (blinded to study group) permitted the student-athlete to return to activity. **Results:** The HBO, treatment group experienced a considerably larger mean symptom reduction (A symptom score = 27.8) than the HBA (A symptom score = -27.8) or O\(_2\) placebo treatment groups (A symptom score = -22) over the 5 treatment sessions. Despite the considerably higher symptom burden of those randomly assigned to the HBO, therapy arm, all treatment and placebo groups returned to activity in a similar timeframe (HBO, \( \sim 13.7 \pm 5.1 \) days; HBA=13.0: 5.7 days; \( \alpha_1=19.0 \pm 16.5 \) days).

**Conclusion:** HBO, therapy in this population following concussion and military personnel were excluded. **RESULTS:** A total of 360 articles were identified for formal review. Forty-two articles met our inclusion criteria. The earliest published article was in 2002, but 41 articles (97.6%) were published 2009 or later. Only three studies (7.14%) were level III evidence and one (2.38%) level IV case series was identified. Thirty-seven papers (88.1%) were either literature reviews or perspectives on the role of SLPS in concussion management. Our search revealed no high-quality, randomized controlled trials or systematic reviews related to the role of SLPS in concussion management. **Conclusions:** A common theme of the studies we reviewed suggest a recent interest in highlighting the value of SLPS in a comprehensive team approach to concussion care. Concussion management continues to evolve, including the identification of clinical subtypes and rehabilitation trajectories. SLPS may assist in neurocognitive testing administration and the assessment of verbal memory, language processing, attention deficits and behavioral aspects of communication. Finally, SLPS may contribute to the planning and implementation of academic accommodations and returning to learning strategies.

---

**Board #242**

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

**Emerging Practice of Speech-Language Pathologists in Sport Related Concussion Care: A Systematic Review**

Jennifer D. Best\(^1\), Bentley A. Krause\(^2\), Thomas M. Best, FACSM\(^1\), ‘Ohio University, Athens, OH. ‘University of Miami, Coral Gables, FL. 

(Sponsor: Thomas Best, FACSM)

(NO relevant relationships reported)

Speech-Language Pathologists (SLP) prevent, assess, and treat cognitive-communication and swallowing disorders. Due to their experience in caring for people with cognitive-linguistic disorders following traumatic brain injury, SLPS have the potential to play an important role in the management of sport-related concussion (SRC) using strategies that promote increased focus, attention, memory and mental agility. **Purpose:** The goal of this systematic review was to summarize the emerging practice roles of SLPS in SRC concussion management. **Methods:** The following databases were accessed: MEDLINE, CINAHL, PsycINFO, Cochrane Library, and SPORTDiscus. Key words included in the searches were: concussion, mild traumatic brain injury, speech-language pathologist, speech language pathology, speech therapy and cognitive communication. All articles included were published in peer-reviewed journals prior to October 2017. Studies on traumatic brain injury or papers that investigated concussion and military personnel were excluded. **Results:** A total of 360 articles were identified for formal review. Forty-two articles met our inclusion criteria. The earliest published article was in 2002, but 41 articles (97.6%) were published 2009 or later. Only three studies (7.14%) were level III evidence and one (2.38%) level IV case series was identified. Thirty-seven papers (88.1%) were either literature reviews or perspectives on the role of SLPS in concussion management. Our search revealed no high-quality, randomized controlled trials or systematic reviews related to the role of SLPS in concussion management. **Conclusions:** A common theme of the studies we reviewed suggest a recent interest in highlighting the value of SLPS in a comprehensive team approach to concussion care. Concussion management continues to evolve, including the identification of clinical subtypes and rehabilitation trajectories. SLPS may assist in neurocognitive testing administration and the assessment of verbal memory, language processing, attention deficits and behavioral aspects of communication. Finally, SLPS may contribute to the planning and implementation of academic accommodations and returning to learning strategies.

---

**B-71**

**Free Communication/Poster - Exercise-Diabetes**

**Wednesday, May 30, 2018, 1:00 PM - 6:00 PM**

**Room: CC-Hall B**

**Board #243**

**May 30 2:00 PM - 3:30 PM**

**Maintenance of Health-Related Fitness Gains Following Underwater Treadmill Training in Adults with Type 2 Diabetes**

Ryan T. Connors\(^1\), John M. Coons\(^2\), Dana K. Fuller\(^3\), Youngdeok Kim\(^1\), Don W. Morgan, FACSM\(^1\), ‘University of Alabama in Huntsville, Huntsville, AL. ‘Middle Tennessee State University, Murfreesboro, TN. ‘Texas Tech University, Lubbock, TX. 

(Sponsor: Dr. Don W. Morgan, FACSM)

(NO relevant relationships reported)

**Purpose:** To document short- and long-term effects of a 12-week aquatic exercise walking program on components of health-related fitness in middle-aged adults with type 2 diabetes. **Methods:** Thirteen adults with type 2 diabetes (age = 59.5 ± 4.5 y; 7 females, 6 males) completed 12 weeks of underwater treadmill training (UTT) (3d/wk), followed by a 12-week follow-up period that involved no UTT. Exercise intensity and duration, which were initially set to 40-50% of heart rate reserve (HRR) and 30 minutes (three 10-min bouts) were systematically and progressively increased to 50-70% HRR and 60 minutes (three 20-min bouts) by week 12. During the follow-up period, study participants maintained their current diet and were given permission to perform any type or amount of physical activity except a formalized exercise program.
Primary outcome variables included cardiovascular function [resting heart rate (HR) and 6-min walk distance (6MWD)]; body composition [body mass (BM), body fat percentage (BF%), waist circumference (WC) and leg strength (peak isokinetic torque at 30°/sec and 60°/sec)]. Baseline, post-UTT, and post-follow-up scores were analyzed using 1-way repeated measures analysis of variance. RESULTS: Compared to baseline scores, significant (p < .05) improvements in cardiovascular function, body composition, and leg strength were noted (p < .05). Baseline HR was 87.3 ± 11.5 beats/min and post-UTT HR was 76.0 ± 10.5 beats/min (p < .05). CONCLUSIONS: UTT improved cardiovascular function, body composition, and leg strength.

984 Board #246 May 30 2:00 PM - 3:30 PM The Acute Effects of Exercise Intensity on Blood Glucose Levels in Type 1 Diabetics
Charles Fontaine, Christine Laughlin, Shane Bleecher.
University of Minnesota Duluth, Duluth, MN. (Sponsor: John R. Keener, FACS/SM)

For individuals with Type 1 diabetes mellitus (T1DM), regular physical activity is a fundamental strategy in the management of glycemic control. Previous studies have shown that continuous, moderate-intensity exercise in individuals with T1DM decreases blood glucose concentrations, often resulting in hypoglycemia, whereas vigorous-intensity exercise can increase blood glucose, impacting the risk of hyperglycemia. Sprint interval training (SIT), characterized by brief, all-out bursts of supramaximal exercise, has been shown to improve indices of cardiometabolic health, despite a minimal time commitment. However, the effects of low volume SIT on glycemic control in individuals with T1DM is largely unknown. PURPOSE: To contrast the acute effects of exercise intensity on blood glucose levels in Type 1 diabetic. METHODS: Four recreationally active college-age students with T1DM, completed a treadmill test to determine maximal aerobic speed (MAS), and performed each of the following 20-min treadmill-based protocols: 1) Moderate-intensity continuous training (MCT): 5-min warm-up (WU), 10 minutes at 70% MAS, 5-min cool-down (CD); 2) high-intensity interval training (HIIT): 5-min WU, 1-min at 90% MAS, 1-min at 30% MAS repeated 5 times, 5-min CD; 3) SIT: 5-min WU, 30-sec at 120% MAS, 2-min, 50-sec at 30% MAS repeated 3 times, 5-min CD. Blood glucose was monitored via glucometer every 5-min during exercise and for 45-min after. RESULTS: A statistically significant decline in blood glucose was observed in both the MCT and HIIT conditions (p < .001), respectively but not in the SIT condition (p = .696). From baseline to the 45-min mark, blood glucose decreased by 27% in the MCT (180 ± 27 to 132 ± 39 mmol/l, p < .05) and CE (7.7 ± 1.1 mmol/l, p = .06, d = .05) lowered mean 24 h glucose, and this was largely driven by a markedly lower glycaemic response (AUC) to dinner in both instances (<1%, p < .05 and d = .8 for both). The prevalence of hyperglycemia was reduced with all three exercise bouts compared with CON (REHIT; time commitment, 10 min). Tukey’s tests compared baseline data and rates of improvement between the two groups. CONCLUSIONS: These data suggest that REHIT may offer a genuinely time-efficient alternative exercise option for improving 24 h glycemic control in men with type 2 diabetes.
body fat percent (p=0.507), Hba1c (p=0.512), other cardiometabolic parameters, or the other six assessments of physical functioning. The patients who completed the exercise intervention improved in 13 of 15 assessments (p<0.05), including Hba1c (p=0.045). There were no differences in improvement between exercise groups. Regression analysis found elevated baseline body fat percent (p=0.001) and improvements in strength, assessed by arm curls (p=0.009) and grip strength (p=0.042) to correspond to poorer outcomes in Hba1c; the overall model was significant (R²=0.733; p=0.001).

CONCLUSIONS: Ten weeks of combined aerobic and resistance exercise improved cardiometabolic profiles of diabetic patients, including Hba1c. Additional volume of aerobic exercise did not enhance outcomes and improvements in strength associated with poorer outcomes.

987 Board #248 May 30 2:00 PM - 3:30 PM

The Effects Of Simulated Hypoxia Bouts On Resting Blood Glucose Levels And Hemodynamics Of A Type 1 Diabetic: A Case Study
Devin J. Rettke, Scott Drum, FACSM. Northern Michigan University, Marquette, MI. (Sponsor: Scott Drum, FACSM)
(No relevant relationships reported)

Individuals diagnosed with diabetes may choose adventure travel vacations at higher altitudes, thereby perturbing formerly control sea level (SL) blood sugar (BG) levels. Purpose: We sought to describe change in resting BG concentration, heart rate (HR), and mean arterial pressure (MAP) during repeat acute exposure to simulated altitude bouts in a type 1 diabetic (T1D) vs a non-diabetic (ND). We hypothesized T1D would encounter less stable readings on all variables. Methods: Two male participants (n=2), a T1D and ND, 22 and 23 years old, respectively, completed this case study. Participants, simultaneously, visited a lab on six different days [i.e., three days in a row one week (M, T, W) and the same three days the following week (M, T, W)]. They ingested the same meals the night before and day of (1.5-hrs before chamber use). At each visit, BG (Contour Next Link; Parippany, NJ), HR (Polar, Lake Success, NY), and MAP (Briggs Healthcare, Waukegan, IL) were assessed at rest at SL and during 2-hr/bouts at 10-min intervals using a hypoxic chamber (Hypoxico Inc., New York, NY) set randomly to varying altitudes: SL; 915 m; 1,829 m; 2,743m; 3,658m; and 4,572m. Results: For each variable, magnitude of change (A) was averaged over the 6 lab visits and compared among conditions and all variables. SL, A-BG (mg/dL), A-HR (bpm), and A-MAP (mmHg) for T1D and ND, respectively, were: 19, 16, 18; 34, 18, 12. T1D maintained a more stable BG at SL over 6 days. When averaging the five altitude levels over 6 days, A-BG (mg/dL), A-HR (bpm), and A-MAP (mmHg) for T1D and ND, respectively, were: 58, 9, 10; and 47, 9, 10. Notably, T1D had a less stable BG during hypoxic exposure. Conclusion: Simulated hypoxia perturbed BG to a greater extent in T1D. This could have practical application for when a T1D travels to higher, natural elevations, at which point they should more closely monitor their BG levels with normal food and fluid intake.

988 Board #249 May 30 2:00 PM - 3:30 PM

Effects of Aerobic Exercise on Plasma Metabolites in Prediabetes Subjects
Bowen Li1, Mian Jia1, Ningning Zhang1, Chaojun Li1, Yan Wang1, Xianbo Zhang2, Juan Wang1, Zhengzhen Wang, FACSM1,2. Beijing Sport University, Beijing, China. 1Beijing Hospital, 2Beijing, China. (Sponsor: Zhengzhen Wang, FACSM)
(No relevant relationships reported)

Objective: Regular exercise can improve the insulin sensitivity in Prediabetes(PDM). However, the mechanisms remain unclear. This study aimed to examine the effect of aerobic exercise on PDM subjects plasma metabolites. METHODS: 24 PDM subjects were selected [mean age of (54.41±10.34) yr, body mass index of (25.70±3.80)kg/m², 8 males]. Each 10 age and sex-matched normal subjects and new-onset T2DM subjects were enrolled. PDM subjects received exercise (n=13) or health education (n=12) for 12 weeks. Exercise training: 3 times/week, 50 min per session at 40%-60% of VO2 reserve. The body composition (dual-energy x-ray absorptiometry) and cardiorespiratory fitness (VO2 peak) were detected before and after exercise. Plasma metabolites were analyzed by using liquid chromatography/mass spectrometry (LC/MS). RESULTS: After training, the body fat percentage, 2-hour OGTT plasma glucose, and low density lipoprotein cholesterol of PDM patients were significantly reduced by (4.6%, 16.22% and 9.27%, on average). The metabolic characteristics were significantly different before and after exercise, there were 31 endogenous metabolites (VIP > 1 and P < 0.05), of which 25 were increased and 6 were decreased. Main metabolites that changes with training included phosphatidylcholine, lyso-phosphatidylcholines, sphingomyelins, betaine, inositol acidiolcic acid and docosahexaenoic acid. CONCLUSION: Aerobic exercise intervention has a marked effect on the plasma metabolites in PDM patients, which can improves the glucose and lipid metabolism by regulating the metabolic pathway of inositolic acid and phospholipid. These findings may lead to a better understanding of the mechanism of aerobic exercise in preventing T2DM. Supported by Key Projects of State General Sports Administration of China (2014B007), Specialized Research Fund for the Doctoral Program of Higher Education of China (20131112110002).

Among American adults (age ≥ 18), 36.3% have obesity, 9.3% have diabetes, and more than 4 million have dementia. These pathologies do not develop and progress independently. Compared to adults with a body mass index (BMI) less than 23, overweight adults (BMI=25) have a 10-fold increase in the odds of developing diabetes. In turn, body weight and diabetes appear to exert independent effects on the risk of dementia. More work is necessary to elucidate these relationships. PURPOSE: To assess the effects of obesity and diabetes on incidence of dementia. METHODS: We analyzed a hospital population that included 2,306 consecutively admitted patients. We conducted a health history, diagnosed cerebral, metabolic, and cardiovascular diseases, and measured anthropometric and cardiometabolic parameters. Chi-square tests analyzed rates of dementia among patients with and without obesity and diabetes. Logistic regression tested the effects of obesity and diabetes on odds of a dementia diagnosis, holding constant potential confounders. RESULTS: Across the total sample, 16.3% of patients were obese, 14.3% had diabetes, and 4.6% had dementia. Among obese patients, 26.0% had diabetes; 12.0% of non-obese subjects had diabetes (p<0.001). Among obese patients, 1.6% had dementia; 5.1% of non-obese patients had dementia (p=0.003). Among patients with diabetes, 8.9% had dementia; 3.8% of patients without diabetes had dementia (p<0.001). Logistic regression, holding age and history of stroke constant, found trends for obesity to reduce odds of dementia by 56% (p=0.079) and diabetes to increase odds by 63% (p=0.060). Sex (p=0.418), depression (p=0.608), mean arterial pressure (p=0.837), smoking status (p=0.920), and histories of heart attack (p=0.250), congestive heart failure (p=0.627), and peripheral vascular disease (p=0.943) were not significant. Among patients age ≥ 65 (n=724), 13.8% were obese, 27.2% had diabetes, and 14.0% had a diagnosis of dementia. The same logistic regression preserved its trends for obesity (OR=0.376; p=0.054) and diabetes (OR=1.600; p=0.079). CONCLUSIONS: Obesity appears to carry a protective role, lowering risk of dementia. More work is necessary to elucidate these relationships with vascular disease, which is more likely a consequence of glucose, insulin, and amyloid metabolism.

990 Board #251 May 30 2:00 PM - 3:30 PM

The Dose Effect of Whey Protein on Insulin Responses in Pre-Diabetic and Type 2 Diabetics
Todd J. Castleberry, Christopher Irvine, Michael Oldham, Matthew Brisebois, Sarah E. Deemer, Ryan Gordon, Aubrien Henderson, Vie Ben-Ezra. Texas Woman’s University, Denton, TX. (Sponsor: David Nichols, FACSM)
(No relevant relationships reported)

BACKGROUND: People with pre-diabetes and type 2 diabetes have shown an increase in insulin secretion after ingesting 55 g of whey protein coupled with a glycemic challenge. However, the effect of lower amounts of whey protein on insulin responses remains unclear. Our hypothesis was that both 20 g and 30 g of whey consumption prior to an oral glucose tolerance test (OGTT) would produce an increase in insulin secretion, with 30 g producing the greatest increase compared to a control.

ACSM May 29 – June 2, 2018
Minneapolis, Minnesota
**Purpose:** The purpose of the study was to examine the effect of two different doses of whey protein ingested 30 min prior to a 50 g OGTT on glucose, insulin, C-peptide, and glucagon responses.

**Methods:** Diabetic or pre-diabetic participants (n=9, mean ± SD; age: 64.3 ± 8.1 yrs; BMI: 29.4 ± 6.0 kg/m²; body fat percentage: 42.5 ± 7.8 %; fasting plasma glucose: 6.9 ± 1.2 mmol/L; HbA1c: 6.4 ± 0.6 %) completed three trials. The randomly assigned trials consisted of: 250 mL of water (CON), 250 mL of water + 20 g whey (20g), and 250 mL of water + 30 g whey (30g), followed by an OGTT. Blood was collected at -30, 0, 15, 30, 60, 90, 120, and 150 min for the measurement of glucose, insulin, C-peptide, and glucagon. The whey protein mixture was administered immediately following the -30 min blood draw and the 50 g OGTT began immediately following the 0 min blood draw. Glucose was analyzed using a YSI 2900D glucose analyzer and insulin, C-peptide, and glucagon were measured via multiplex fluorescent detection (MagPhx).

A one-way repeated measures ANOVA (p<0.05) with a Bonferroni post hoc was used for statistical analysis for each dependent variable.

**Results:** Integrated area under the curve (AUC) for glucose presented no difference between the 3 trials. Insulin AUC was significantly increased from CON to 20g (p=0.004, 36.3%), CON to 30g (p=0.002, 61.7%), and 20g to 30g (p=0.030, 18.6%). C-peptide and glucagon AUC significantly increased from CON to CON (p=0.018, 20.6%); p=0.046, 33.1%) and CON to 30g (p=0.001, 30.1%; p=0.017, 33.7%).

**Conclusion:** Whey protein elicited a dose response on plasma insulin, increasing concentrations from CON to 20g, and 20g to 30g, however plasma glucose was unaffected. 20g and 30g displayed similar responses for glucagon. Neither 20 g nor 30 g of whey protein may be adequate to provide glycemic improvement in the disease management of type 2 or pre-diabetes.

---

**PURPOSE:** The aim of this study was to determine whether changes in peripheral hemodynamics result in large changes in central hemodynamic parameters and to investigate whether changes in peripheral hemodynamics affect central hemodynamic measurements.

**Methods:** Twenty healthy young adults (BMI: 24±2.8; 55% F). Brachial pressure waveforms were simultaneously measured in a supine position using an oscillometric device (SpohgmoCor XCEL) and control (Oscar, SunTech) arm.

The experimental arm was positioned 30° above, 30° below, and at heart level, in a randomized order. The control arm remained at heart level. **Results:** For the experimental arm, there was a large effect change in SBP (eta=0.82, p<0.001) and cSBP (eta=0.81, p<0.001) when the arm was above (cSBP Δ4.9, SBP Δ4.6) and below (cSBP Δ-12.5, SBP Δ-9.8). AIx increased (p=0.023) when the arm was below but not above. No change occurred in Pb. In the control arm, no change occurred in SBP or cSBP, but AIx decreased when the experimental arm was above (p=0.04).

**Conclusions:** Changes in peripheral hemodynamics result in large changes in cSBP and AIx, but not in Pb. Findings provide a rationale for standardizing the upper limb position during BP measurement, and may have important clinical implications regarding pharmacological prescription.
observed for many of the body composition and diastolic BP variables. The differences observed for BMD and fat% may have been related to the number of years the OA AW had been running. These data suggest that greater physical activity participation by A AW can aid in managing many aspects of body composition. Since BP and fat% are cardio-metabolic risks for cardiovascular disease, an active lifestyle may aid in increasing the quality and perhaps the quantity of their lives.

994 Board #255
May 30 2:00 PM - 3:30 PM
Effect of Intra-Venous Antioxidant Infusion on the Development of Neuromuscular Fatigue During Whole Body Exercise in Hypertensive Middle-Age Individuals
Taylor S. Thurston1, Joshua C. Weavil1, Thomas J. Hureau2, Jayson R. Giftford1, Russell S. Richardson1, Markus Amann1.
1University of Utah, Salt Lake City, UT; 2University of Strasbourg, Strasbourg, France.
(Brighton Young University, Provo, UT.

No relevant relationships reported)

PURPOSE: To investigate the effects of intravenous antioxidant supplementation on the development of neuromuscular fatigue during whole body exercise in middle-age hypertensive patients.

METHODS: Clinically diagnosed hypertensive males performed fatiguing, constant-load cycling exercise to exhaustion (80% Wmax = 150 ± 27 W) following both a 2 g intra-venous infusion of L-ascorbic acid (AOX; dissolved in 20 mL saline) and saline (PLA; 20 mL) randomized and separated by at least 5 days. The trial characterized by shorter exhaustion time was later repeated (i.e., iso-time) under the opposite supplemental condition. Peripheral fatigue was quantified as the pre- to post-exercise change in quadriceps twitch force. Cardiopulmonary responses were recorded continuously. Exercise-induced fatigue was quantified during time-matched trials. RESULTS: AOX had no effect on blood pressure at rest (MAP: 107 ± 2 mmHg) or during the final minute of exercise (MAP: 137 ± 3 mmHg; P < 0.05). Q was similar between conditions at baseline and during exercise (-0.2, -1.5, -2.1, -2.7 L/min, respectively). Furthermore, heart rate (-15 BPM), minute ventilation (-17 L/min), O2 consumption (-2.2 L/min), and CO decreased in the final minute of exercise were similar between trials. While AVO2 (-6%) and AVO2max (-45%) were not altered by AOX, AQw and APRR were attenuated in AOX compared to PLA (-40 vs 5% vs -58 vs 19% vs -44 ± 9%, respectively; P < 0.05). Finally, AOX had no effect on cycling time to exhaustion (PLA: 488 ± 22 vs AOX: 487 ± 65 s). CONCLUSION: AOX attenuates the development of fatigue while not altering the cardiopulmonary response and locomotor muscle blood flow during cycling exercise in hypertensive males. This ergogenic effect is likely determined by intracellular mechanisms and independent of muscle O2 transport. Importantly, the observed AOX-induced reduction in the development of peripheral fatigue does not appear to improve endurance capacity in hypertensive patients.

995 Board #256
May 30 2:00 PM - 3:30 PM
Effects of High Intensity Interval Exercise Training on Blood Pressure in Patients with Hypertension
Jung Jun Park1, Eun-Ah Jo1, Kyong-Im Cho2, Do-sun Im3.
1Pusan National University, Busan, Korea, Republic of; 2Kosin University, Busan, Korea, Republic of; 3Korea University, Seoul, Korea, Republic of.

No relevant relationships reported)

PURPOSE: To compare the effects of HIIT and CAE on changes in blood pressure reduction and endothelial function in hypertensive patients.

METHODS: Seventeen hypertensive patients, aged 52.1±7.6, participated in this study, tapered off their medications, if necessary, and were randomized to either HIIT (n=9) or CAE (n=8) group. HIIT was composed of 35 min exercise at 60% HRR. Both groups were designed to use same HRR, and each interval was separated by 3 min recovery at 40% HRR. CAE was composed of 5 sets of 3 min exercise at 80% HRR. Seventeen hypertensive patients, aged 52.1±7.6, participated in this study, tapered off their medications, if necessary, and were randomized to either HIIT (n=9) or CAE (n=8) group. HIIT was composed of 35 min exercise at 60% HRR. Both groups were designed to use same HRR, and each interval was separated by 3 min recovery at 40% HRR. CAE was composed of 5 sets of 3 min exercise at 80% HRR. Both groups were designed to use same

RESULTS: HIIT significantly decreased in DBP during exercise and EPCs and DBP was significantly decreased in HIIT (p<0.01), but not in CAE. During exercise, DBP was significantly decreased in CAE (p<0.05), but not in HIIT, and DBP was significantly increased in HIIT (p<0.01), but not in CAE. FMD and EPCs were significantly improved in HIIT (p<0.01 and p<0.05), respectively, but not in CAE. There were significantly different changes in DBP during exercise and EPCs between groups (p<0.05). However, PWV was not changed in both groups.

CONCLUSIONS: The results of this study suggest that HIIT and CAE equally have beneficial effects on blood pressure reduction at rest and during exercise. However, HIIT may improve endothelial function greater than CAE. Therefore, HIIT could be a better exercise program than CAE for hypertensive patients.

996 Board #257
May 30 2:00 PM - 3:30 PM
24 Hour Ambulatory Blood Pressure Dipping And Variability Characteristics Following Maximal Treadmill Exercise In Community Dwelling Healthy Older Adults.
Thomas R. Petrella, Narlon C. B. S. Silva, Ashleigh De Cruz, Alan Solomon, Robert J. Petrella, FACSM.
Western University, London, ON, Canada.
(Sponsor: Robert Petrella, FACSM)

No relevant relationships reported)

Abnormal blood pressure (BP) response to maximal exercise may lead to cardiovascular health. PURPOSE: To examine the 24-hour ambulatory blood pressure response in older adults following a maximal exercise treadmill test.

METHODS: Ambulatory BP was recorded every 30 minutes (daytime) and 60 minutes (nighttime) on the day preceding and then 24 hours following a symptom limited maximal exercise treadmill test. Participants were a convenience sample of healthy older adults free of cardiovascular and musculoskeletal limitations who were participants in a community-based exercise program in London, Ontario, Canada. Symptom limited exercise was performed in the AM in a fasted state, during which VO2max was estimated. The study outcomes included mean systolic and diastolic BP (daytime, nighttime and 24-hour), as well as mean change in BP from daytime to nighttime (BP dipping), and BP variability (APV). Mixed between-within ANOVA was used in the statistical analysis, exploring main effects for time (pretset vs postset), grouping factors (presence of hypertension [normotensive vs hypertensive]), gender [men vs women], and fitness level [low, average and high VO2max], and interaction effects for time × grouping factors.

RESULTS: 11 men and 9 women, mean age 71.5 (SD=5.4) years were included in the analysis. Mean VO2max was 34.8 (SD=7); 10 subjects had documented hypertension. No difference in the mean pre-maximal exercise systolic BP was 129.2 (120.3-138.1) vs 124.8 (116.7-132.9) and post-maximal systolic BP was 126.3 (118.8-133.9) vs 122.8 (116-129.6) in normotensive and hypertensive subjects respectively (p=0.67). Nighttime diastolic BP dipping differed significantly between VO2max groups, whereby it increased in participants with low VO2max, while it decreased in those with average VO2max and high VO2max (p=0.037). As well, post-maximal systolic BP variability was decreased in men but increased in women (p=0.07). CONCLUSIONS: Healthy older normotensive and hypertensive subjects had similar post 24-hour systolic BP dipping. However, nighttime diastolic blood pressure as significantly different according to fitness level and systolic BP variability was reduced in men suggesting low fitness and male gender may alter BP response to maximal exercise in older adults.

997 Board #258
May 30 2:00 PM - 3:30 PM
Post-Isometric Exercise Hypertension After Moderate Intensity Handgrip Exercise In Hypertensive Elderly
MILTON R. MORAES1, VIVIAN E. MORAES1, JOYCE B. VICENTE1, GEIZIANE R. MELO1, RAFAEL R. OLHER1, IORRANY C. SOUSA2, LUIZ H. PERUCH1, RODRIGO V. NEVES1, THIAGO S. ROSA1, APARECIDO P. FERREIRA1, RAFAEL R. OLHER1, LUIZ R. SOUZA1, 1CATHOLIC UNIVERSITY OF BRASILIA, BRASILIA, Brazil. 2University of Mogi das Cruzes, Mogi das Cruzes, Brazil.

No relevant relationships reported)

Hypertension is common in people aged 65 or more. The isometric handgrip (IHG) is a model of effective exercise in reducing blood pressure (BP). However, the mechanisms involved in post-isometric exercise hypertension (PIEH) are not yet completely understood. Nitric oxide (NO) is a potent vasodilator and may be involved in PIEH. PURPOSE: To determine the response hypertensive and mechanism involved in older with arterial hypertension.

METHODS: Ten sedentary hypertensive elderly (73±2; 2.2 years), underwent two experimental sessions using a portable isometric handgrip dynamometer Januar; (i) sham session with 3 percent of maximal voluntary isometric contraction (MVIC); and (ii) experimental isometric session with 30 percent of MVIC, total of 8 sets of 1 min contraction and 1 min rest interval. The BP and heart rate (HR) were evaluated at rest and post-exercise (1, 5, 10, 15, 30, 45 and 60 min). Saliva samples were collected at rest, 0, 30 and 60 min post-exercise. RESULTS: Systolic BP (SBP) presented a reduction from the 10th min post-exercise to 30 percent MVIC (p < 0.05). At 60 min post-exercise the SBP was lower 30 percent vs. 3 percent MVIC (p = 0.006). There were no differences for diastolic BP, mean arterial pressure, HR and NO metabolites. The results demonstrated that IHG exercise at 30 percent MVIC was tolerated by elderly individuals and induced an PIEH for up to 60 min, but there was no association signal NO and MVIC. Yet, portable equipment of cost-effective, easy performance and short duration can be an excellent adjuvant strategy in the control and prevention of arterial hypertension in elderly.

Supported by FAPDF Grant 032015 193.000.963
Effects Of Isometric Handgrip Versus Aerobic Exercise On Blood Pressure In Elderly Hypertensive Patients
(No relevant relationships reported)

PURPOSE: The aim of this study was to compare the antihypertensive effects of isometric handgrip exercise (IHE) versus aerobic exercise (AE) on office, central and 24-h ambulatory blood pressures in elderly hypertensive patients. METHODS: We conducted a randomized controlled trial with a three-arm design. Thirty-seven elderly hypertensive patients (mean age 69.6 ± 6 years) were randomized to IHE training (n=14), AE training (n=11), or no-exercise control group (n=12) for 12 weeks. Bilateral IHE training was performed at 30% of maximal voluntary contraction using a digital handgrip device. AE training was performed brisk walking for 30-min at moderate intensity with 3 times per week. Resting office, central, and 24-h ambulatory blood pressures were obtained at baseline and after intervention. RESULTS: No group differences were found at baseline for any variable. Following 12 weeks, resting office blood pressures decreased in both IHE and AE groups (IHE: SBP 135.4±14.1 to 125.8±9.9 mmHg (p=0.004), DBP 84.8±8.5 to 79.6±5.8 mmHg (p=0.005); AE: SBP 130.3±13.3 to 123.1±8.1 mmHg (p=0.022), DBP 80.5±7.0 to 76.8±5.5 mmHg (p=0.037)), without any improvement in the control group. Furthermore, central SBP (122.0±13.5 to 117.9±9.8 mmHg (p=0.05)) and mean 24 ambulatory DBP (80.3±8.8 to 75.6±7.2 mmHg (p=0.021)) decreased only in the IHE group, but not in the AE or control groups. CONCLUSIONS: These findings suggest that both IHE and AE training reduces resting office blood pressure, but only IHE training is effective in improving central and ambulatory blood pressures. Thus, IHE training may be an alternative antihypertensive therapy for the elderly hypertensive patients.

Effects of Whole-body Vibration On Strength, Body Composition, and Function in Skilled Nursing Home Residents
Brandon F. Grubbs1, Arturo Figueroa, FACSM2, Jeong-Su Kim, FACSM3, Karla Schmitt1, Lynn B. Panton, FACSM1. 1Middle Tennessee State University, Murfreesboro, TN. 2Texas Tech University, Lubbock, TX. 3Florida State University. Tallahassee, FL. (Sponsor: Lynn B. Panton, FACSM)
(No relevant relationships reported)

PURPOSE: To compare the effects of 12 wks of whole-body vibration training (WBVT; n=10) to standard care, which served as the control (CON; n=10), on strength, body composition, and functional performance in 20 (16 female) pre-frail and frail skilled nursing home residents (82±5 yrs).

METHODS: Participants were screened for frailty syndrome using the FRAIL scale. Isometric knee extension strength (KE) was measured using a mechanical push-pull dynamometer. Bioelectrical impedance analysis was used to measure lean mass (LM) and fat mass (FM). The short physical performance battery (SPPB) was used to assess function. Participants were assigned to 12 wks of WBVT (3x/wk) or CON. WBVT consisted of 3 sets of 10 reps of 4 lower body exercises (partial squat, narrow squat, wide squat, calf raises) during vertical vibration (25-40 Hz). Data were analyzed using two-way ANOVA (group x time) and post-hoc paired t-tests. Significance was set at p<0.05.

RESULTS: There were no changes in LM or FM. There were significant group-by-time interactions for KE and SPPB. Post-hoc paired t-tests found improved KE (WBVT: 22.3±4.0 to 29.0±4.5 kg; CON: 23.8±6.3 to 23.6±9.6 kg) and improvement in SPPB performance approached significance (WBVT: 4.5±2.3 to 5.2±2.1 units, p=0.09, CON: 4.1±1.9 to 3.7±2.3 units).

CONCLUSIONS: WBVT was well tolerated and occurred without adverse health complications. WBVT can be used to counteract losses in leg strength. Interventions of greater frequency and duration may help improve functional performance in pre-frail and frail older adults. This study was supported by grants from the College of Human Sciences and FSU.

Adaptations In Bedridden Oldest-old.
Massimino Venturelli1, Anna Pedrinolla1, Silvia Pogliaghi, FACSM2, Alessandro Colosio3, Ettore Muti4, Emiliano Ce3, Stefano Longo5, Fabio Esposito6, Federico Schena6. 1University of Verona, Verona, Italy. 2Mons Mazzali Foundation, Mantua, Italy. 3University of Milan, Milan, Italy. (No relevant relationships reported)

PURPOSE: With aging, vascular function (VF) declines. Indeed, a conspicuous number of oldest-old individuals are in chronically bedridden, and literature indicates that chronic immobility exacerbates VF decline. Although studies have suggested that passive mobilization of the limbs (PM) may improve local VF, the effect of PM on nitric oxide (NO)-mediated VF has not been studied yet. Therefore the aims of this study were determine whether PM is effective to counteract VF worsening in bedridden oldest-old. We hypothesized that bedridden patients who underwent a month of PM would have gained significant improvement in NO-mediated VF.

METHODS: Twenty bedridden individuals (86±7 yrs) were randomly assigned to PM or control (CT) group, treated with standard therapies only. PM groups underwent a program of 30 min of passive knee (flexo-extension) mobilization (4-week, twice a day/5 days a week) in addition to their standard therapies. Pre and post treatment, NO-mediated VF has been measured by means of single passive limb movement (sPLM) test.

RESULTS: All PM patients completed all sessions. Concerning sPLM test, PM group improved significantly sPLMmax (+33%), ΔPLM (+55%), as well as Area Under the Curve (AUC, +200%). CT group did not exhibit any change in VF.

CONCLUSIONS: Results suggest that the reduction in VF exhibited in chronically bedridden oldest-old individuals can be reversed by a PM program. PM seems to be an effective strategy to counteract the deleterious effects of bedridden.
Post-exertional malaise (PEM) is an exacerbation of symptoms that leads to a reduction in functional ability. Recognizing the triggers, onset, symptoms and duration of PEM is important for the diagnosis of Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS). PEM following serial exercise tests has not been examined. PURPOSE: To compare descriptions of symptoms by ME/CFS and control subjects after two maximal exercise tests, each separated by 24 hours. METHODS: Open-ended questionnaires were provided to 11 control subjects and 49 ME/CFS patients who underwent two maximal exercise tests, 24 hours apart. Each subject evaluated how they felt immediately after the first exercise test, before and immediately after the second exercise test, and in the week following the tests. Responses were analyzed and categorized by two reviewers, blinded to subject diagnosis. Repeated measures ANOVA was used to examine differences between groups. RESULTS: Over the two days of testing, ME/CFS subjects reported an average of 15.4±7.7 symptoms compared to 5.5±1.8 in the control group. Following the tests, ME/CFS subjects reported an average of 5.0±2.8 symptoms compared to 0.1±0.3 in the control group. Among the ME/CFS subjects, fatigue, cognitive dysfunction, and sleep problems were reported with the greatest frequency. Out of the eighteen symptom categories, ME/CFS subjects reported seventeen at a higher frequency than control subjects. The largest differences were observed in cognitive dysfunction, headache, light-headedness, muscle/joint pain and weakness. Other symptoms included decreased function, pain, flu-like and gastrointestinal symptoms. Forty-nine percent of ME/CFS subjects recovered within an average of 4.5 days while fifty-one percent had not recovered by day seven. In contrast, all but one control subject recovered within 1 day. CONCLUSION: A standardized exertional stimulus produces prolonged and more diverse symptoms in ME/CFS subjects compared with those seen in control subjects. Understanding PEM more comprehensively may provide clues to the underlying pathophysiology of ME/CFS and lead to improved diagnosis and treatment.

Veterans of Iraq and Afghanistan frequently report dyspnea on exertion following deployment despite the presence of normal pulmonary function testing. Determining underlying causes of exertional dyspnea is difficult due to the variety of potential contributing factors, but a ventilatory limitation to exercise is one factor that may contribute to the perception of dyspnea. PURPOSE: The goal of the present study was to determine ventilatory limitation to exercise and compare pulmonary function between those individuals with (VL+) and without (VL−) ventilatory limitation. METHODS: 83 deployed Iraq and Afghanistan Veterans (43±9.8 years; 72 men and 11 women) were referred for our dyspnea clinic and completed pulmonary function and cardiopulmonary exercise testing (CPX). VL+ during CPX was defined as a peak exercise ventilation (VE) that was ≥80% of the maximal voluntary ventilation (VE/MVV) = 0.90. All Veterans completed pulmonary function testing (PFT) including body plethysmography, spirometry, diffusing capacity (DLco), and forced oscillometry testing (FOT). Veterans with abnormal baseline PFTs and cardiopulmonary exercise testing (CPX) were included. RESULTS: A ventilatory limitation to exercise was present in 37% (VE/MVV > 0.80) of Veterans. All Veterans completed pulmonary function testing (PFT) including body plethysmography, spirometry, diffusing capacity (DLco), and forced oscillometry testing (FOT). Veterans with abnormal baseline PFTs and cardiopulmonary exercise testing (CPX) were included. Veterans were classified as VL+ if they demonstrated a ventilatory limitation to exercise. Comparisons between VL+ and VL− revealed a statistically significant difference in the percentage of VO2peak on usual (71% vs. 55%, p = .12), rapid (85% vs. 75%, p = .31) and standard pace walking (95%, CI: 0.75, -.51). There was a strong trend for VL participants to walk at a higher percentage of VO2peak on usual (71% vs. 55%, p = .12), rapid (85% vs. 75%, p = .31) and standard pace walking (95%, CI: 0.75, -.51). CONCLUSIONS: In comparison to VL− older adults, VL older adults had lower gross metabolic rate due to their slower walking speed. Despite their slower pace, VL older adults walk at a higher percentage of their peak energy expenditure. Collectively, these
Official Journal of the American College of Sports Medicine
Vol. 49 No. 5 Supplement  S199

results support the notion that LF older adults favor a walking speed that optimizes metabolic cost, but are susceptible to higher relative energy expenditure due to their lower peak capacity.

B-73 Exercise is Medicine®/Poster - EIM: Exercise and the Older Adult
Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1006 Board #267  May 30 3:30 PM - 5:00 PM
Comparative Th1 Th2 of Elderly Women Engaged in a Program of Resistance or Aerobic Exercise
Otavio Machado1, Maria Elizabeth Pereira Passos1, Heloisa Helena de Oliveira1, Vinicius Leonardo Diniz1, Laiiane Cristina dos Santos1, Marianna Mendes de Almeida1, Eliane Borges da Silva1, Cesar Miguel Momesso1, José Paulo de Moraes Junior2, Evandro Diniz Corvino2, Luiz Francisco Killiari1, Renata Gorjao1. 1UNICSUL, SAO PAULO, Brazil. 2FEPIS, SOROCABA, Brazil.

It is well-known the alterations that occur in the immune response with aging that can generate an imbalance of the immune response leading to a low-grade chronic inflammation. Some studies have described the decrease in proliferative capacity of Th1 cells in elderly. The imbalance between Th1 and Th2 cells seems to play a role in the development of autoimmune and inflammatory diseases. PURPOSE: Therefore, the aim of this study was to evaluate Th1 and Th2 responses and verify Th1/Th2 ratio in elderly women engaged in different exercise programs. METHODS: Initially, 27 elderly women (65± 3.2 years old) were selected and distributed into four groups accordingly to exercise program that they practiced: 1. sedentary (SED); 2. resistance training practitioners (RE); 3. aerobic exercise practitioners (AE); 4. resistance and aerobic exercise practitioners (REAE). Th1 and Th2 cell populations were assessed by flow cytometry. RESULTS: Th1 response was higher in RE groups (RE, 16.7± 5.3; REAE, 15.7± 4.7%) when compared with AE (12.5± 2.9%), and SED (12.9± 4.4%). Inversely, Th2 had a trend to decrease in exercise programs (SED, 10.4± 5.3; RE, 9.6± 4.9; AE, 7.6± 3; RE: 4.9± 2.4%). Finally, the Th1/Th2 ratio was higher in RE (3.2± 1.4) versus AE (2.2± 1.4), AE (1.9± 0.9) and SED (1.3± 0.3). CONCLUSIONS: Increased Th1/Th2 ratio was due to a higher response of Th1 cells and lower response of Th2 cells. These findings suggest an improvement in Th1 response in elderly women engaged in exercise program, mainly in resistance exercise groups.

1007 Board #268  May 30 3:30 PM - 5:00 PM
The Effects Of Core Muscle Training Combined With Lower Limbs Strengthening On Physical Fitness Of community Elderly
YU-TSAI TU, Hsiang-Ying Hsueh, Feng-Chiao Lo, Mu-Jung Kao.  TAIPEI CITY HOSPITAL, TAIPEI, Taiwan.

According to the long-term care service planning proposed by the Ministry of Health and Welfare in Taiwan, 10% of the aging population requiring long-term care service would also require community-based or home-based care. The strength of lower limbs and core muscle plays important role in prevention against fall behavior, especially for the community elderly. PURPOSE: To evaluate the physical fitness of the elderly in local community care-concern center in Taiwan, a four-month course of regular core muscle training and lower limbs strengthening was conducted. METHODS: Four elderly (Age: 66±1.6 years of age; Body height: 156±6.6 cm; Body weight: 62.5±13.7 kg) without any severe illness were included in this study. The training of core muscle training and lower limbs strengthening last for four months with 3 sessions per week, 60 min per session, and an intensity of 5-6 on the Ratings of Perceived Exertion scale. Physical fitness was evaluated one week before and after the intervention. Data of multiple variables were collected by using questionnaire and examination on functional fitness including grip, two-min step test, back scratch test, and 8-foot up-and-go test. The ranges of motion and isotonic strength of lumbar spine and knee were measured by the microFET3. Descriptive statistics, independent sample t-test, and paired-samples t test were used to evaluate the effects of the intervention. RESULTS: The results showed significant improvement after the 4-month course in back scratch test, 2-min step test, chair sit-and-reach test, and isotonic strength of lumbar spine and knee (p < 0.05). Among the other tests, no significant differences were observed. CONCLUSION: Core muscle training combined with lower limbs strengthening for community elderly can improve physical fitness and isotonic strength of low back and knee.

1008 Board #269  May 30 3:30 PM - 5:00 PM
Multicomponent Exercise Program Effects On Functional Capacity And Cognition In Frail Hospitalized Patients
Mikel Lopez Saez de Asteasu1, Nicolas Martinez-Velilla2, Álvaro Casas-Herrero2, Fabricio Zambom-Ferraresi3, Francisco Antonio Amu-Ruiz1, Javier Alonso-Renedo1, Mikel Izquierdo1. 1Public University of Navarre, Pamplona, Spain. 2Complejo Hospitalario de Navarra, Pamplona, Spain.

Frail older adults have reduced functional and physiological reserves, rendering them more vulnerable to the effects of hospitalization, which frequently results in failure to recover from functional decline related to the hospitalization and new disability. PURPOSE: To analyze the effects of a multicomponent exercise program on functional capacity and cognition in frail hospitalized patients. METHODS: Randomized clinical trial conducted in 326 patients admitted in an Acute Care Unit were randomly assigned to the intervention (IG) or control group (CG). The intervention consisted of a multicomponent exercise training program, composed of supervised progressive resistance exercise exercise training at low-moderate intensities 30-60%RM (Repetition Maximum), balance training, and walking for 5-7 consecutive days. Evaluations of functional capacity (Short Physical Performance Battery (SPPB), Gait velocity Test (GVT), GVT under dual task conditions, Barthel index), strength assessments; maximal isometric force of handgrip (HG), knee extension and hip flexion, IRM and leg press knee extension exercises, and cognitive tasks; Mini Mental State Examination (MMSE), Trail Making Test Part A (TMT-A) and verbal fluency test were conducted at admission and previous to discharge in both groups. RESULTS: 326 completed pre/post evaluations (IG n= 126, CG n=141). Drop-out rate was 18%. The differences in significant improvements were observed at discharge in the following functional capacity outcomes (SPPB 4.4 vs. 7.0 points, GVT 14.1 vs. 10.9s., Verbal GVT 17.6 vs. 13.2s., Arithmetic GVT 17.6 vs. 12.9s., p<0.001 and Barthel score 83.8 vs. 85.9 points p<0.05) strength measurements (HG 17.2 vs. 18.8kg., knee extension 97.8 vs. 112.7N., hip flexion 90.5 vs. 104.4N., IRM leg press 57.7 vs. 76.3kg., IRM chest press 24.2 vs. 28.4kg. IRM knee extension 36.5 vs. 47.0kg., p<0.001) and cognitive tasks (MMSE 22.1 vs. 24.3 points, TMT-A 154.6 vs. 121.3s., verbal fluency 6.0 vs. 8.0 words, p<0.001). In contrast, in the CG, no significant improvements were found in those outcomes. CONCLUSIONS: A multicomponent exercise program, with special emphasis in progressive resistance training, is an effective therapy to improve functional capacity and cognitive function in frail patients during hospitalization.

1009 Board #270  May 30 3:30 PM - 5:00 PM
Correlation between One-leg Standing Time and Trail Making Test in Japanese Older Adults
Yasuo KIMURA1, Kazuko OHKIF, Mamoru HISATOMI1, Mieko SHIMADA1, Nobuko K. HONGU1. 1Inst. Fitness & Health Sciences, Tohoku, Tokyo, Japan. 2Sigaoyama Jogakuen University, Nagoya, Japan. 3Chiba Pref. University of Health Sciences, Chiba, Japan. 4The University of Arizona, Tucson, AZ.

PURPOSE: For older adults maintaining the ability to control balance is closely associated with the risk of falling, an independent mobility, including walking, and engagement with active life. The aim of this study was to examine the one-leg standing time with eyes open and its association with physical, cognitive, and psychological functions in community-dwelling older adults residing in Japan. METHODS: Sixty-five women aged 65 years and over (mean age 73±7 yrs.) participated in the study. They were being involved in habitual physical activity at least once a week for three months prior to the study. At the first assessment session, participants completed a demographic questionnaire and one-leg standing balance test. The participants were then divided into two groups according to time of one-leg standing time with eyes open: 1) longer than 15 seconds (n=46, high group - HG: 75.4±61.7 sec.) and 2) shorter than 15 seconds (n=19, lower group - LG: 7.8±3.0 sec.). All participants performed hand-grip strength (HGS), chair-stand (CS), timed up-and-go (TUG), 10-m maximal gate speed (MGS), mini-mental state examination (MMSE), and trail making test (TMT). Data were analysed using unpaired t-test and ANCOVA. RESULTS: For all participants the mean length of one-leg standing time was 60.2±45.2 sec. (2 - 120 sec.). Significant difference (p<0.05) were observed between two groups: age (HG: 70.3±3.4, LG: 72.3±3.6 yrs.), HGS (HG:24.9±3.8, LG:22.2±5.8 kg), CS (HG:8.0±2.1, LG:9.0±2.2 sec.), TUG (HG:5.5±2.0, LG:5.7±0.8 sec.), MGS (HG:1.82±0.24, LG:1.69±0.28 sec.), MMSE (HG:28.4±1.8, LG:26.9±2.2 score). After adjusting for age, the only significant difference (p<0.05) observed between the two groups was for TMT (HG:99.5±23.0, LG:119.8±49.3 sec.).

Abstracts were prepared by the authors and printed as submitted.
CONCLUSIONS: Physical, cognitive, and psychological functions were significantly related to one-leg standing time. The results of this study also identified the balance ability and cognition decline. Future studies need to confirm these observations in larger samples to track balance-cognitive decline over time among older adults.

Exercise treatment is recommended for older patients with lumbar spine diseases that result in degeneration of muscles and the skeletal system and a resultant decline in function. However, it is often difficult for patients to exercise by themselves and assistance from an exercise professional can be valuable to maintain health status and improve quality of life. PURPOSE: This study was designed to evaluate the effect of personalized exercise instruction on changes in body composition, physical fitness and pain management in older adults with degenerative lumbar spinal disorders (DLSD).

METHODS: Three individuals (Range, 66-78 yrs), who no prior experience with a personal trainer and who reported chronic low back pain for more than 12 weeks, participated in the study. This study was conducted by a researcher and a professional personal trainer who had more than 10 years’ experience in the personal training area. The data was collected by employing a single-subject, ABA repeated measure design. In addition, schematic analysis was utilized to visualize the changes of participants’ body composition, physical strength and rating of perceived pain. A paired t-test using SPSS 20.0 was employed to examine before-and-after differences for key outcome measures. RESULTS: The results showed that muscle mass was increased and body fat mass and central obesity were decreased at the end of phase B, which coincided with the period of supervision by the personal trainer. Additionally, there were statistically significant changes in strength of upper and lower extremity, cardiovascular endurance, upper and lower body flexibility and the rating of perceived pain. CONCLUSIONS: This study resulted in better understanding of the role for individualized instruction by exercise professionals for older adults with degenerative lumbar spinal disorders. Furthermore, the results may have some applicability to the design and implementation of future personal training programs for older adults with similar conditions.

The benefits of regular physical activity on health, fall prevention, and quality of life are widely recognized. However, only a small percentage of older adults meet the current recommendations for aerobic exercise and strength. Primary care providers are in a unique position to counsel patients about exercise and provide them with exercise locations and prescription. PURPOSE: The aim of this study was to assess the perceptions of health care providers regarding knowledge and confidence to assess and counsel older adult patients about physical activity and fall prevention. METHODS: One hundred and twenty health care providers in Pierce County, Washington received a link to an online survey. The survey consisted of 35 questions including demographic and general practice questions, and questions that assessed knowledge and counseling practices of primary care providers about physical activity and fall prevention. Chi-square was used to determine if categorical variables differed from one another. Significance was set at p < 0.05. RESULTS: Thirty-four (28.3% response rate) individuals responded to the questionnaire. Most of the respondents were women (56%). Fifty-six percent of the respondents (χ² = 2.25, p < 0.01) indicated that they routinely administer fall risk screening. Twenty-seven percent (χ² = 9.0, p < 0.01) of the respondents described their knowledge of fall prevention assessment and management as “not very knowledgeable” to “somewhat knowledgeable.” Most of the health care providers (68.8%, χ² = 2.25, p = 0.13) indicated that they routinely administer fall risk screening. CONCLUSION: These results show that while half of these primary care providers counsel their patients to participate in exercise programs, only a small percentage of them refer their clients to an exercise specialist. Furthermore, the lack of knowledge of the Exercise is Medicine® initiative and website by health care providers indicates the importance of further education of health care providers.

Exercise treatment is recommended for older patients with lumbar spine diseases that result in degeneration of muscles and the skeletal system and a resultant decline in function. However, it is often difficult for patients to exercise by themselves and assistance from an exercise professional can be valuable to maintain health status and improve quality of life. PURPOSE: This study was designed to evaluate the effect of personalized exercise instruction on changes in body composition, physical fitness and pain management in older adults with degenerative lumbar spinal disorders (DLSD).

METHODS: Three individuals (Range, 66-78 yrs), who no prior experience with a personal trainer and who reported chronic low back pain for more than 12 weeks, participated in the study. This study was conducted by a researcher and a professional personal trainer who had more than 10 years’ experience in the personal training area. The data was collected by employing a single-subject, ABA repeated measure design. In addition, schematic analysis was utilized to visualize the changes of participants’ body composition, physical strength and rating of perceived pain. A paired t-test using SPSS 20.0 was employed to examine before-and-after differences for key outcome measures. RESULTS: The results showed that muscle mass was increased and body fat mass and central obesity were decreased at the end of phase B, which coincided with the period of supervision by the personal trainer. Additionally, there were statistically significant changes in strength of upper and lower extremity, cardiovascular endurance, upper and lower body flexibility and the rating of perceived pain. CONCLUSIONS: This study resulted in better understanding of the role for individualized instruction by exercise professionals for older adults with degenerative lumbar spinal disorders. Furthermore, the results may have some applicability to the design and implementation of future personal training programs for older adults with similar conditions.

The benefits of regular physical activity on health, fall prevention, and quality of life are widely recognized. However, only a small percentage of older adults meet the current recommendations for aerobic exercise and strength. Primary care providers are in a unique position to counsel patients about exercise and provide them with exercise locations and prescription. PURPOSE: The aim of this study was to assess the perceptions of health care providers regarding knowledge and confidence to assess and counsel older adult patients about physical activity and fall prevention. METHODS: One hundred and twenty health care providers in Pierce County, Washington received a link to an online survey. The survey consisted of 35 questions including demographic and general practice questions, and questions that assessed knowledge and counseling practices of primary care providers about physical activity and fall prevention. Chi-square was used to determine if categorical variables differed from one another. Significance was set at p < 0.05. RESULTS: Thirty-four (28.3% response rate) individuals responded to the questionnaire. Most of the respondents were women (56%). Fifty-six percent of the respondents (χ² = 2.25, p < 0.01) indicated that they routinely administer fall risk screening. Twenty-seven percent (χ² = 9.0, p < 0.01) of the respondents described their knowledge of fall prevention assessment and management as “not very knowledgeable” to “somewhat knowledgeable.” Most of the health care providers (68.8%, χ² = 2.25, p = 0.13) indicated that they routinely administer fall risk screening. CONCLUSION: These results show that while half of these primary care providers counsel their patients to participate in exercise programs, only a small percentage of them refer their clients to an exercise specialist. Furthermore, the lack of knowledge of the Exercise is Medicine® initiative and website by health care providers indicates the importance of further education of health care providers.
Lower limb proprioception, muscle strength and standing balance are all proposed as important factors in relation to mobility of the elderly. However, it is not clear what the relative contributions are for hip, knee and ankle proprioception, and strength and postural sway.

PURPOSE: To determine the relative contributions of proprioception at each lower limb joint, muscle strength and standing balance, to mobility in community-dwelling older adults.

METHODS: A group of 102 community-dwelling adults, with mean age of 68.4 years, volunteered. Hip, ankle and knee joint proprioception were measured in standing using joint-specific versions of the active movement extent discrimination apparatus (AMEDA). Muscle strength was determined by grip strength with a hand dynamometer as a proxy variable, and bicipal postural sway was assessed via the Biodex Balance System, tested in anterior-posterior and medio-lateral directions, with eyes open and with eyes closed. Mobility was measured using the timed-up-and-go test (TUG).

RESULTS: TUG scores for the group were significantly worse with low ankle proprioception ($r = -0.29$, $p<0.01$) and low hand grip strength ($r = -0.25$, $p = 0.01$), and across age in years, TUG scores showed an inverted-U shaped function ($p < 0.001$) with the greatest decline after 75 years of age. From multiple regression, ankle proprioception was shown to be the most important factor in predicting TUG performance ($Adj R^2 = 0.13$, $p < 0.001$).

CONCLUSIONS: Results here add a specific proprioceptive component, ankle proprioception in standing, to the known association of strength with mobility in the elderly. Further, these results suggest that to effectively improve mobility in the elderly, and reduce falls risk, intervention methods should focus on improving ankle proprioception ability as well as increasing strength.

In response to the aim of active aging promoted by the World Health Organization, a plan for intervention in elderly frailty through exercise is in urgent need. In 2016, New Taipei City’s elderly health check-up program introduced frailty assessments and exercise intervention. However, 10-57% of frail elderly showed no immediate improvement after exercise intervention.

PURPOSE: The establishment of “Exercise is Medicine” (EIM) Taiwan personnel training and standardized training modules through EIM Taiwan, in the hope of enhancing exercise intervention effectiveness for individuals assessed as pre-frailty or frailty in New Taipei City’s elderly frailty assessments.

METHODS: 1. Planning of exercise intervention options and training courses:

Training content included assessment before exercise and exercise recommendation principles, and exercise prescriptions and recommendations for various chronic diseases. 2. EIM training for physicians and allied health professionals: The EIM Taiwan training included 16-hour courses for physicians and allied health professionals, respectively. Through the training of EIM Taiwan professional personnel, the provision of individualized exercise plans for pre-frail and frail elderly can be implemented.

RESULTS: On March 14, 2017, Eric Liulian Chi, the mayor of New Taipei City, signed a Memorandum of Cooperation (MOU) with EIM Global. After signing the MOU, a total of 195 physicians and 344 allied health professionals were trained as the EIM-certified professional personnel in Taiwan. Through these EIM-certified physicians, individualized exercise prescriptions were given to elderly assessed as pre-frailty or frailty, with exercise plans then implemented through the guidance of allied health professionals. In 2017, a total of 24,778 people have taken elderly frailty assessments and 23.8% of above elderly received the implementation of exercise plans.

CONCLUSIONS: In addition to continuing to implement exercise intervention for pre-frail and frail elderly, our program aims to establish an EIM Taiwan training guidance handbook. Through these actions, it is expected to enhance exercise intervention effectiveness and reverse frailty in New Taipei City.
Purpose: To investigate the effects of a 24-week multiple-modality exercise intervention with additional mind-motor training on cardiovascular health and fitness. The secondary objective was to investigate whether the intervention had gender-specific effects on the study outcomes. Methods: Community-dwelling older adults (n = 127; age = 67.5 [7.3] yr, 71% women) were randomized to a 45-min multiple-modality exercise intervention with additional 15 minutes of either mind-motor training (M4 group) or an active control intervention (15 minutes of balance, range of motion and breathing exercises, [M2 group]). Assessment occurred at: baseline, 24 weeks (intervention endpoint), and 52 weeks (after a 28-week no-contact follow-up). The study outcomes were: predicted maximal oxygen consumption (pVO2max), 24-weeks (intervention endpoint), and 52-weeks (after a 28-week no-contact follow-up). Changes in Cardiovascular Health Following Exercise in Older Men and Women at Risk for Dementia

Andrea F.M. Petrella, Narlon C. Boa Sorte Silva, Dawn P. Gill, Robert J. Petrella, FACSIM, Western University, London, ON, Canada. (Sponsor: Robert J. Petrella, FACSIM) (No relevant relationships reported)

Purpose: To evaluate predictors of dementia in a patient population. METHODS: We obtained the patient registry of a hospital in the Midwestern United States. Demographic data, vital signs, health history, and current diagnoses were recorded. There were 2,244 consecutive patients admitted over a 3-year period who met inclusionary criteria; 105 of these patients had a diagnosis of dementia. Logistic regression tested the effects of age, sex, vital signs, and diagnostic history on incidence of dementia in this sample. RESULTS: Significant predictors of dementia were age (p<0.001), diastolic blood pressure (p=0.048), core temperature (p=0.040), presence of a bleeding disorder (p=0.028), and diagnosis of a previous stroke (p=0.001). For each degree F that core temperature increased, the odds of dementia were elevated by 44% (95% CI: 1.02 to 2.05). A history of stroke was the most pronounced predictor of dementia (95% CI: 1.89 to 7.57). When history of stroke was analyzed as the dependent variable, core temperature continued to be a significant predictor (p=0.025); holding all other variables constant, each additional degree F associated with a 48% elevation in the odds of a stroke (95% CI: 1.05 to 2.10). CONCLUSION: Age and cardiovascular function are known risk factors for strokes, and strokes are a known risk factor for dementia. In this sample, core temperature emerged as the significant predictor of both stroke and dementia. While poor thermoregulation may be a consequence, rather than a cause, of dementia, a possible consideration is the relationship between heat in the brain, cerebral oxygen demand, and blood brain barrier permeability. The brain’s energy demand is several orders of magnitude greater than other body cells, and thus temperature dissipation for the brain is vitally important. Because exercise training improves thermoregulatory capacity, it is possible that this capacity could benefit the brain in previously unidentified ways.

Changes in Cardiovascular Health Following Exercise in Older Men and Women at Risk for Dementia

Saeqel G. Mohan1, J. Mark VanNess1, Jonathan M. Saxe2, Greg Roberts2, Lewis E. Jacobson2, Courtney D. Jensen1. 1University of the Pacific, Stockton, CA. 2St. Vincent Hospital, Indianapolis, IN. (No relevant relationships reported)

More than 5 million Americans live with dementia; it affects 10% of the population over age 65. There is no cure, but recognition of risk factors could be helpful for prevention. Identifying demographic, genetic, and behavioral risk factors can improve the prescription of lifestyle choices, such as exercise training, to minimize risk. PURPOSE: To evaluate predictors of dementia in a patient population. METHODS: We obtained the patient registry of a hospital in the Midwestern United States. Demographic data, vital signs, health history, and current diagnoses were recorded. There were 2,244 consecutive patients admitted over a 3-year period who met inclusionary criteria; 105 of these patients had a diagnosis of dementia. Logistic regression tested the effects of age, sex, vital signs, and diagnostic history on incidence of dementia in this sample. RESULTS: Significant predictors of dementia were age (p<0.001), diastolic blood pressure (p=0.048), core temperature (p=0.040), presence of a bleeding disorder (p=0.028), and diagnosis of a previous stroke (p=0.001). For each degree F that core temperature increased, the odds of dementia were elevated by 44% (95% CI: 1.02 to 2.05). A history of stroke was the most pronounced predictor of dementia (95% CI: 1.89 to 7.57). When history of stroke was analyzed as the dependent variable, core temperature continued to be a significant predictor (p=0.025); holding all other variables constant, each additional degree F associated with a 48% elevation in the odds of a stroke (95% CI: 1.05 to 2.10). CONCLUSION: Age and cardiovascular function are known risk factors for strokes, and strokes are a known risk factor for dementia. In this sample, core temperature emerged as the significant predictor of both stroke and dementia. While poor thermoregulation may be a consequence, rather than a cause, of dementia, a possible consideration is the relationship between heat in the brain, cerebral oxygen demand, and blood brain barrier permeability. The brain’s energy demand is several orders of magnitude greater than other body cells, and thus temperature dissipation for the brain is vitally important. Because exercise training improves thermoregulatory capacity, it is possible that this capacity could benefit the brain in previously unidentified ways.

More than 5 million Americans live with dementia; it affects 10% of the population over age 65. There is no cure, but recognition of risk factors could be helpful for prevention. Identifying demographic, genetic, and behavioral risk factors can improve the prescription of lifestyle choices, such as exercise training, to minimize risk.

Thermoregulation, Strokes, And Dementia: A Healthy Heart Begets A Healthy Brain.

Saeqel G. Mohan1, J. Mark VanNess1, Jonathan M. Saxe2, Greg Roberts2, Lewis E. Jacobson2, Courtney D. Jensen1. 1University of the Pacific, Stockton, CA. 2St. Vincent Hospital, Indianapolis, IN. (No relevant relationships reported)

More than 5 million Americans live with dementia; it affects 10% of the population over age 65. There is no cure, but recognition of risk factors could be helpful for prevention. Identifying demographic, genetic, and behavioral risk factors can improve the prescription of lifestyle choices, such as exercise training, to minimize risk. PURPOSE: To evaluate predictors of dementia in a patient population. METHODS: We obtained the patient registry of a hospital in the Midwestern United States. Demographic data, vital signs, health history, and current diagnoses were recorded. There were 2,244 consecutive patients admitted over a 3-year period who met inclusionary criteria; 105 of these patients had a diagnosis of dementia. Logistic regression tested the effects of age, sex, vital signs, and diagnostic history on incidence of dementia in this sample. RESULTS: Significant predictors of dementia were age (p<0.001), diastolic blood pressure (p=0.048), core temperature (p=0.040), presence of a bleeding disorder (p=0.028), and diagnosis of a previous stroke (p=0.001). For each degree F that core temperature increased, the odds of dementia were elevated by 44% (95% CI: 1.02 to 2.05). A history of stroke was the most pronounced predictor of dementia (95% CI: 1.89 to 7.57). When history of stroke was analyzed as the dependent variable, core temperature continued to be a significant predictor (p=0.025); holding all other variables constant, each additional degree F associated with a 48% elevation in the odds of a stroke (95% CI: 1.05 to 2.10). CONCLUSION: Age and cardiovascular function are known risk factors for strokes, and strokes are a known risk factor for dementia. In this sample, core temperature emerged as the significant predictor of both stroke and dementia. While poor thermoregulation may be a consequence, rather than a cause, of dementia, a possible consideration is the relationship between heat in the brain, cerebral oxygen demand, and blood brain barrier permeability. The brain’s energy demand is several orders of magnitude greater than other body cells, and thus temperature dissipation for the brain is vitally important. Because exercise training improves thermoregulatory capacity, it is possible that this capacity could benefit the brain in previously unidentified ways.

Changes in Cardiovascular Health Following Exercise in Older Men and Women at Risk for Dementia

Saeqel G. Mohan1, J. Mark VanNess1, Jonathan M. Saxe2, Greg Roberts2, Lewis E. Jacobson2, Courtney D. Jensen1. 1University of the Pacific, Stockton, CA. 2St. Vincent Hospital, Indianapolis, IN. (No relevant relationships reported)

More than 5 million Americans live with dementia; it affects 10% of the population over age 65. There is no cure, but recognition of risk factors could be helpful for prevention. Identifying demographic, genetic, and behavioral risk factors can improve the prescription of lifestyle choices, such as exercise training, to minimize risk. PURPOSE: To evaluate predictors of dementia in a patient population. METHODS: We obtained the patient registry of a hospital in the Midwestern United States. Demographic data, vital signs, health history, and current diagnoses were recorded. There were 2,244 consecutive patients admitted over a 3-year period who met inclusionary criteria; 105 of these patients had a diagnosis of dementia. Logistic regression tested the effects of age, sex, vital signs, and diagnostic history on incidence of dementia in this sample. RESULTS: Significant predictors of dementia were age (p<0.001), diastolic blood pressure (p=0.048), core temperature (p=0.040), presence of a bleeding disorder (p=0.028), and diagnosis of a previous stroke (p=0.001). For each degree F that core temperature increased, the odds of dementia were elevated by 44% (95% CI: 1.02 to 2.05). A history of stroke was the most pronounced predictor of dementia (95% CI: 1.89 to 7.57). When history of stroke was analyzed as the dependent variable, core temperature continued to be a significant predictor (p=0.025); holding all other variables constant, each additional degree F associated with a 48% elevation in the odds of a stroke (95% CI: 1.05 to 2.10). CONCLUSION: Age and cardiovascular function are known risk factors for strokes, and strokes are a known risk factor for dementia. In this sample, core temperature emerged as the significant predictor of both stroke and dementia. While poor thermoregulation may be a consequence, rather than a cause, of dementia, a possible consideration is the relationship between heat in the brain, cerebral oxygen demand, and blood brain barrier permeability. The brain’s energy demand is several orders of magnitude greater than other body cells, and thus temperature dissipation for the brain is vitally important. Because exercise training improves thermoregulatory capacity, it is possible that this capacity could benefit the brain in previously unidentified ways.

Changes in Cardiovascular Health Following Exercise in Older Men and Women at Risk for Dementia

Saeqel G. Mohan1, J. Mark VanNess1, Jonathan M. Saxe2, Greg Roberts2, Lewis E. Jacobson2, Courtney D. Jensen1. 1University of the Pacific, Stockton, CA. 2St. Vincent Hospital, Indianapolis, IN. (No relevant relationships reported)
High Intensity Interval Training (HIIT) Protocols are well established in the literature as a beneficial health inducing strategy to improve health, fitness levels and metabolic biomarkers. Risks management of participation of HIIT programs is challenging despite benefits. Cardiovascular, Musculoskeletal and Metabolic issues, such as dehydration status may play an important role on pre-participation screening of participants.

**Purpose:** The purpose of this study was to evaluate energy cost and metabolic stress biomarkers due a HIIT protocol.

**Methods:** 8 males (23±6years) were evaluated during a HIIT protocol (30 minutes of CrossFit based multitask pattern) using a Portable Metabolic Analyzer (K4b2® - Cosmed®) for VO2, energy expenditure and substrate oxidation. Blood samples were taken before and after protocol for Creatine-Kinase (CK), Creatine-Kinase Myocardial Band (CK-MB), Lactate Dehydrogenase (DHL), and Cortisol levels analysis. **Results:** VO2 peak during HIIT protocol were 53.1mL/kg.min, 16.2mL/kg.min; with peak energy cost of 17.3±4.1 kcal.min; being the fat oxidation less than 10% during the protocol. Pre vs Post levels for CK, CK-MB, DHL and Cortisol were 1129.6±213.6U/L vs 1300.8±541.2U/L; 57.1±3.2U/L vs 68.0±3.7U/L; 646.1±27.1mg/dL vs 720.8±32.7mg/dL; and 12.1±1.9µg/dL vs 17.2±1.8µg/dL respectively. **Conclusions:** Energy cost of the HIIT protocol evidences some of the benefits, thus leading to weight-loss strategy. Stress biomarkers CK, CK-MB, DHL and Cortisol responses to HIIT protocol suggests metabolic overload on systemic and local: skeletal muscle and myocardial tissue, despite clinical outcomes (pain or claims). Risk versus Benefit analysis of HIIT protocols should be focused on general populations and specific patients, which may lead to detrimental health outcomes.

**REFERENCES:**

1. Official Journal of the American College of Sports Medicine

**Authors:** Franz H. Burini, Rafael Rezende, Pedro Rodstein, Thalles Messora, Julio Mariano, Roberto C. Burini, FACSM. UNESP Medical School, Botucatu, Brazil. (Sponsor: Roberto C Burini, FACSM)

**No relevant relationships reported**
T'ai Chi can be tailored based on five major styles, over 108 forms, and three fundamental elements that include breathing techniques, mental relaxation, and movement principles. However, it is not clear if T’ai Chi interventions tailored for specific health outcomes will result in different health benefits. Purpose: To compare the health benefits of two different T’ai Chi interventions targeted for improvements in blood pressure (BP) (PRESSURE) or balance (BALANCE). Methods: We tailored PRESSURE to emphasize breathing techniques and mental relaxation; and BALANCE to emphasize movement principles that challenge balance. Participants were randomized based on baseline values to PRESSURE (n=12), BALANCE (n=13), or CONTROL (n=10). Tai Chi was practiced 3 sessions/week, 60 minutes/session, for 12 weeks. CONTROL (n=10) performed normal daily activities. We measured a variety of cardiovascular function, and functional fitness health outcomes pre- and post-intervention. Differences among groups were tested with analyses of covariance with age, body mass index, heart rate, and baseline BP as covariates. Results: Participants were older (78.9±5.7 yr), overweight (25.9±4.3 Kg/m²) adults, with high-to-normal blood pressure (systolic BP/ diastolic BP, 126.5±14.4/69.3±8.4 mmHg), and mostly women (77%). PRESSURE improved Chair Sit-to-Stand Test (CSTS) by 1.0±1.8 times/30s versus CONTROL (p = 0.029); and BALANCE improved Single Leg Stance Test by 5.4±18.0 s (p = 0.049) and CSTS by 1.0±1.7 times/30s (p = 0.027), and tended to lower SBP by 4.2±16.0 mmHg (p = 0.052) versus CONTROL. However, there were no differences between PRESSURE and BALANCE versus CONTROL for any health outcome (p < 0.05). Conclusion: Contrary to our hypothesis, T’ai Chi interventions tailored for specific health outcomes did not result in different health benefits. Yet, our results suggest that older adults who are naive to T’ai Chi achieve a variety of health benefits from different types of T’ai Chi practice within the first few months of participation.

PURPOSE: Recent studies show that prolonged ICT use is associated with increased sedentariness and postural imbalances. This has implication for the prevalence of musculoskeletal pain among ICT users. To investigate the implications of ICT use for physical activity level and musculoskeletal pain among tertiary institution students in Kwara State Nigeria Seidina Yakubu Iliaua1, Olufunmiola Leah Dominic1, Fatihah Adheyen Niyi-Ofodumosu2, Talabi Euben Adetayo3.1University of Ilorin, Ilorin, Nigeria. 2Loughborough University, Loughborough, United Kingdom. (No relevant relationships reported)
CONCLUSIONS: A growing number of cancer patients receive hematopoietic stem cell transplants (HSCT), a potentially curative treatment, but engenders adverse symptoms of fatigue, reduced physical function and decreased quality of life. Maintaining physical fitness for functional independence and the ability to perform activities of daily living is a high priority for patients. Exercise programs have been found to be effective in improving physical fitness and quality of life and reducing fatigue level in haematological cancer patients, and recently supervised programs have been offered to patients as part of Wellness treatment. PURPOSE: To evaluate adherence, safety and physiological effects of an eight-week supervised exercise program in post HSCT patients. METHODS: A retrospective study including 55 patients (N=22 female) referred to the optional exercise program after undergoing HSCT for a haematological malignancy. Safety and adherence information was collected throughout the program. Physiological outcomes were measured at baseline and post program (fatigue, quality of life, strength, 6 minute walk test (6MWT), balance and body composition). RESULTS: No adverse events were reported during the program and patients demonstrated a high (86.1%) adherence to supervised sessions. Fatigue decreased (4.6±1.9 to 3.4±2.1, p<0.003) and Quality of Life increased (105.9±17.8 to 113±17.8, p<0.040) from baseline to post intervention. Physical function increased in all measures (6MWT, 413.8±97.2 m to 497.4±82.5 m, p<.001; 1RM leg press 56.3±34.7 kg to 68.0±36.6 kg, p=.011; 1RM seated row, 32.7±15.0 kg to 40.0±17.5 kg, p=.001; Chair stand, 12.0±3.7 to 15.0±3.0, p<.001). Reported weekly physical activity also increased (114.2±132.7 min to 205.7±137.8 min, p<.001). Body mass, fat free mass and body fat percentage did not change. CONCLUSIONS: In line with prior findings, this supervised exercise program was an effective treatment for comorbidities associated with HSCT. Importantly, these results include participants who self-enrolled in the program, and paid a contribution to the cost. The high adherence and significant improvements confirm the efficacy of an exercise program and support the continued offerings of such Wellness treatment as part of usual care.

PAPER: 

1032 Board #293 May 30 3:30 PM - 5:00 PM 
Post-menarcheal Trabecular Bone Score as a Function of Organized Physical Activity
Jodi N. Dowthwaite1, Renaud Winzenrieth2, Tamara A. Scerpella1. 1SUNY Upstate Medical University; Binghamton University, Syracuse, NY; 2Medimaps Group, Merignac, France. 1University of Wisconsin, Madison, Madison, WI. (Sponsor: Jill Kanaley, FACSM)

PURPOSE: Trabecular bone score (TBS) grades lumbar spine trabecular texture based on DXA scan gray level variation. In adults, TBS correlates with trabecular density indices and predicts fracture risk, independent of areal bone mineral density (BMD). However, few pediatric studies have evaluated TBS, with none demonstrating significant exercise loading associations. Bone accrual accelerates circum-menarche; thus, we hypothesized that circum-menarcheal organized physical activity (OPA, h/wk) would correlate with post-menarcheal TBS, suggesting potential for improvement of baseline adult trabecular texture via circum-menarche exercise. METHODS: Annual DXA scans and semi-annual OPA records were collected via a prospective, longitudinal study of exercise and bone accrual. Analysis inclusion criteria were: 1) a postero-anterior lumbar spine DXA scan (Hologic, Waltham MA) from 0-1 year post-menarche; 2) prior year OPA records. Raw TBS data were generated using proprietary TBS in-sight software (v2.2, Medimaps, France), adjusted for pediatric-specific soft-tissue effects. Multiple regression evaluated linear and quadratic associations between prior year OPA and TBS, accounting for gynecological age; p and significance are reported for each predictor. To reduce variance inflation, the quadratic function was mean-centered. RESULTS: Data were included for 111 girls, with means as follows: age 13.4 yrs (10.0 to 15.6, sd 1.1), age at menarche 12.9 yrs (sd 1.1), gynecological age 0.5 yrs (sd 0.3), OPA 8.0 h/wk (sd 5.8) and TBS 1.38 (1.15 to 1.58, sd 0.08). In a regression model entering OPA, OPA2 and gynecological age, a significant non-linear association was observed with OPA (respective β = 0.003, -0.001, 0.043, p<0.08, 0.003, 0.12). CONCLUSIONS: Our data suggest a target circum-menarcheal OPA range of 5 to 15 h/wk. Further research is needed to confirm that TBS is modifiable via pediatric exercise to optimize baseline adult trabecular texture.