Measuring resting heart rate variability (HRV) indices constitutes an interesting, non-invasive and simple tool to monitor fatigue and performance responses. The orthostatic test (OT) where heart beat-to-beat (RR) intervals are measured is widely used to measure HRV. The feasibility of the OT would however, increase considerably if vagal related HRV indices could be analysed from free living physical activity. PURPOSE: To determine the reliability and validity of HRV indices during daily routine situations. METHODS: Eight white-collar workers were recruited to participate in this study. RR intervals were recorded using a personal HR monitor (V800, Polar Electro Oy, Kempele, Finland). Data was collected every morning at home upon awakening and at work during routine situations on 16 different days. A total amount of 127 cycles of sitting periods followed by walking breaks were included for consecutive pairwise analysis of trials for reliability[SD1] (coefficient of variation (CV) and typical error (TE) with confidence limits of 95% were calculated). When reliability was found, the values from the morning OT were plotted against the corresponding routines at work. RESULTS: Mean RR-interval and HR values at work showed high levels of repeatability [CV during sitting and walking was 4.71 and 3.99, respectively, with a TE of 3.73 (3.34-4.25) and 3.65 (3.31-4.09)]. Although reliable, HR data recorded in the morning did not correlate with the corresponding routines at work (r = 0.28 for sitting and r = 0.05 for standing vs. walking, r > 0.05). The root-mean-square difference of successive normal RR (RMSSD) was revealed not to be repeatable in those routine situations [CV during sitting and walking was 19.99 and 29.05, respectively, with a TE of 7.9 (7.15-8.85) and 9.43 (8.53-10.57)]. Furthermore, RMSSD values analyzed from the HRV recordings during sitting did not correlate (r = 0.138, p > 0.05) with the respective values during walking in the morning upon awakening. CONCLUSION: Analyzing RMSSD from daily routine activities was not reliable or valid. To monitor training status, RMSSD should therefore be calculated from recordings in standardized conditions such as the OT in the morning. It would be much more feasible to get this information from free living physical activity.

Higher levels of physical activity are associated with a lower risk of cardiovascular events. Nevertheless, there is debate on the dose-response curve of exercise and cardiovascular outcomes and whether high volumes of exercise may accelerate coronary atherosclerosis. PURPOSE: To determine the relationship between lifelong exercise volumes and atherosclerotic coronary artery disease (CAD) characteristics. METHODS: Middle aged men engaged in competitive or recreational leisure sports underwent a non-contrast and contrast-enhanced computed tomography scan to assess coronary artery calcification (CAC) and plaque characteristics. Participants reported lifelong exercise history patterns. Exercise volumes were multiplied by Metabolic Equivalent of Task (MET) scores to calculate MET-min/week. Participants were allocated to <1000 MET-min/week, 1000-2000 MET-min/week or >2000 MET-min/week. RESULTS: 284 participants (55±7 years) were included. CAC was present in 150/284 (53%) participants with a median CAC score of 33.8 (9.3-145.8). Athletes with a lifelong exercise volume >2000 MET-min/week (n=75) had a significantly higher CAC score (9.4 [0-60.9] versus 0 [0-45.3], p<0.02) and prevalence of CAD (68%, OR=3.2 (95%CI: 1.6-6.6)) and plaque (77%, OR=3.3 (95%CI: 1.6-7.1)) compared to <1000 MET-min/week (n=88, 43% and 56% respectively). Among participants with CAC=0, there was no difference in CAC score (p>0.20), area (p>0.25) and regions of interest (p>0.20) across exercise volume groups. Among participants with plaque, the most active group had a lower prevalence of mixed plaques (48% versus 60%, OR=0.59 (95%CI: 0.35-0.85) and more often only had calcified plaques (38% versus 16%, OR=3.57 (95%CI: 1.28-9.97)) compared to the least active group. There was no difference in location of CAC or plaque. CONCLUSION: Participants in the >2000 MET-min/week group had a higher prevalence of CAD and atherosclerotic plaques. The most active group did however have a more benign composition of plaques, with fewer mixed plaques and more often only calcified plaques. These observations may explain the increased longevity typical of endurance athletes despite the presence of more coronary atherosclerotic plaque in the most active participants.

The menopause is generally associated with lower cardiovascular function. However, most investigations have only assessed resting function, and the impact of the menopause on functional capacity and cardiac plasticity is poorly understood. PURPOSE: To investigate the impact of menopausal status on left ventricular (LV) function and rotational mechanics in response to exercise training and acute exercise.

The Impact of Menopausal Status on Cardiac Responsiveness to Exercise Training and Acute Moderate-Intensity Exercise

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(No relationships reported)
METHODS: Eleven pre-menopausal (Pre-M) and 14 post-menopausal (Post-M) middle-aged women (age 45–58 years) completed 12 weeks of exercise training (3 sessions/week consisting of 4 × 4 min intervals at 90–95% maximum heart rate). Maximal aerobic capacity on an upright cycle ergometer was assessed before and after exercise training. LV function was assessed via echocardiography at 20, 40 and 60% peak power output during supine cycling. Due to poor image quality, data on LV rotational mechanics are only reported for 8 pre- and 10 post-menopausal women.

RESULTS: Peak power output and maximal aerobic capacity increased after exercise training (P < 0.01), but this increase was greater in pre-menopausal than post-menopausal women (mean±SD; Pre-M-before 147±29 vs. after 179±28; Post-M-before 145±26 vs. after 169±24 W; Pre-M-before 29±5 vs. after 37±5, Post-M-before 29±6 vs. after 34±5 mL/min/kg, respectively, both P < 0.05).

General hemodynamics, and LV function and rotational mechanics both at rest and up to 60% exercise were mostly similar in pre- and post-menopausal women in response to training (interaction effects P > 0.1). Specifically, the increase in peak basal rotation during exercise was smaller in post-menopausal women after training (three-way interaction P < 0.01; mean increase from rest to 60%: Pre-M-before 4.0, Pre-M-after 3.9; Post-M-before 3.7, Post-M-after 2.6).

CONCLUSION: Middle-aged pre-menopausal women showed greater adaptability to 12 weeks of interval training than middle-aged post-menopausal women. The functional cardiac reserve up to 60% exercise was largely similar in pre- and post-menopausal women. Future work investigating LV function and mechanics at higher exercise intensities will likely provide further insight into the impact of menopausal status on training adaptations.

Amanda Nio is the beneficiary of a doctoral grant from the AXA Research Fund.

PURPOSE: Renal transplant recipients (RTR) have a high risk of cardiovascular mortality, despite surgical treatment and physical exercise is normally allowed to reduce the global morbidity risk. Quantification of myocardial function by Global Longitudinal Strain (GLS) from 2-dimensional images based on speckle tracking echocardiography plays an important role in detecting the early myocardial dysfunction in many diseases. The aim of this study was to analyze the changes in myocardial strain during 12 months of exercise as prescription model.

MATERIALS AND METHODS: We studied 17 renal transplant recipients, mean age 56 ± 8 y, submitted to the exercise prescription model followed ACSM guidelines. Longitudinal peak systolic strain were determined by velocity vector imaging from apical 4- and 2-chamber views (MyLab seven -Esaote). All the other standard 2D echo parameters (LVd, LVSd, CMI, IVS, PW; EF) and the diastolic parameters were evaluated.

RESULTS: Mean heart rate and systolic and diastolic blood pressure and the LV sístolic and diastolic parameters maintain normals during the follow up. After training, GLS and Longitudinal peak systolic strain at basal and mid-segments of the lateral wall were significantly higher after 6 months GLS 10 -20,7±4% vs GLS 8-12 : 23,7 ±4,1% with p<0.05) and after 12 months of exercise (GLS : -24,4±3% ) in RTR with respect of the values of the onset of the protocol (p<0.01). Average longitudinal systolic strain from the 4-chamber view and GLS was normal in controls (22.3±2.6 % 8-12 , 23.8±3.6 % 8-12 , 23.4±4.2 % 10-12) and not significantly different if compared to RTR during all the time of the protocol.

CONCLUSIONS: Differences in myocardial function in patients renal transplant recipients submitted to the exercise prescription can be found and it can be quantified by strain imaging. Any possible other differences comparing subjects with end-stage renal or before the transplantation and RTR will need further studies.

The effects of exercise on the heart and its resistance to disease are well-documented. Recent studies have identified exercise-induced resistance to arrhythmia is due to the preservation of mitochondrial membrane potential. PURPOSE: To identify novel metabolic changes that occurred parallel to these mitochondrial alterations, we performed non-targeted metabolomics analysis on hearts from sedentary (Sed) and exercise-trained (Ex) rats challenged with isolated heart ischemia-reperfusion injury (I/R). METHODS: Eight week old Sprague-Dawley rats were treadmill trained five days/week for six weeks (exercise duration and intensity progressively increased to 1 hour at 30 m/min up to 10.5% incline, 75-80% VO2max). RESULTS: The recovery of pre-ischemic function for sedentary rat hearts was 28.8±5.4% (N=12) compared to exercise trained hearts which recovered 51.9%±5.7% (N=14, p<0.001). Non-targeted GC-MS metabolomics analysis of 1) Sedentary rat hearts; 2) Exercise-trained rat hearts; 3) Sedentary rat hearts challenged with global ischemia-reperfusion (I/R) injury; and 4) Exercise-trained rat hearts challenged with global I/R (10/group) revealed 20 statistically significant metabolites between groups by ANOVA using Metaboanalyst (p<0.001). Enrichment analysis of these metabolites for pathway-associated metabolic sets indicated a >10 fold enrichment for ammonia recycling and protein biosynthesis (L-Glutamic acid; L-Proline; L-Histidine; L-Serine; L-Aspartic acid; L-Glutamine)(p<=4.05E-05, FDR=0.0024). Subsequent comparison of the sedentary hearts post-I/R and exercise-trained hearts post-I/R further identified significant differences in metabolites related to Aminoacyl-tRNA biosynthesis and nitrogen metabolism (4) (p<1.24E-05, FDR<=5.07E-4). CONCLUSION: These studies shed light on novel mechanisms in which exercise-induced cardioprotection occurs in I/R which complement both the mitochondrial stabilization and antioxidant mechanisms recently described. These findings also link protein synthesis and protein degradation (protein quality control mechanisms) with exercise-induced cardioprotection and mitochondrial susceptibility for the first time in cardiac I/R.
Maximal fat oxidation (FOX) is the exercise intensity at which the highest caloric expenditure is attributed to fat metabolism and appears to be influenced by aerobic capacity and obesity. Determining, directly or indirectly, FOX holds relevance with respect to optimal intensity for exercise prescription for weight loss and maintenance. 

**Purpose:** To determine if FOX is sex-dependent and its agreement with the anaerobic threshold (AT), another intensity at which exercise can be prescribed for improving aerobic capacity and obesity. 

**Hypothesis:** We hypothesised that: 1) FOX is higher in obese men and women is similar; 2) FOX is not concordant with AT; and 3) heart rate (HR) at FOX is equivalent to that relative to HRpk predicted from a recognized prediction formula (208.0·7×age). 

**Methods:** Forty obese adults (BMI: 40.3±1.1 kg/m2; women, n=20) and men (n=20), aged 20 to 45 years, underwent a cardiopulmonary exercise test (CPX). Oxygen uptake (VO2), carbon dioxide production (VCO2), respiratory exchange ratio (RER) and heart rate (HR) were measured at 80%±1% of HRpk (HRpk) and HRpk, respectively. Although VO2 at FOX and HR at FOX differed from AT and at the peak of the test (pk), fat oxidation rates were calculated (FOX-R=1.67×VO2-1.67×VCO2). 

**Conclusions:** Maximal fat oxidation rates were graphic at 80.5±1.2% and 85.5±1.2% of HRpk for both groups (p=0.01), sex-adjusted positive correlations between them were observed (FOX-R vs AT for VO2 [r=0.74; for HR [r=0.61], p<0.001). Six-base comparisons showed that OW had higher FOX-R, and at the AT higher HR, VO2 percent of MaxHR and HR peak (p<0.05). Moreover, OM had a higher percent of VO2 at FOX. Similar HR at FOX-R and percent of HRpk were observed in both groups. HR at FOX-R relative to the predicted HRpk from the formula (208.0·7×age) were 66.1±1% in OM and 67±1% in OW. 

**Conclusions:** Six differences exist between AT and FOX for VO2. Meanwhile, chronotropic responses (HR at FOX-R) are equal for both and can be inferred from a usual formula when CPX is unavailable. Funding: Fundação de Amparo à Pesquisa do Estado de São Paulo (2009/01842-0, 2013/15681-3), SP, Brazil.
METHODS: Subjects (Age: 57.8±2.2y, BMI: 34.5±2.2kg/m²) were screened for prediabetes using the American Diabetes Association criteria (75g OGTT and HbA₁c). Subjects were randomized to 60 min/d of supervised INT (n=7), 90% HRmax for 3 min and 50% HRmax for 3 min) or work matched CONT (n=6, 70% HRmax) exercise for 12 bouts. Fitness (VO₂max), body composition (BIA), and glucose tolerance (180 min 75g OGTT) were assessed pre- and post-intervention. Respiratory exchange ratio (RER; indirect calorimetry) was measured at 0, 60, 120 and 180 min of the OGTT and post-prandial (average of 60-180 min) metabolic flexibility. RESULTS: INT and CONT training increased VO₂max (+2.06±0.53 vs. +0.48±1.06 mL/kg/min, P=0.04), decreased skeletal muscle mass (SMM; -0.51±0.12 vs. -0.33±0.15 kg, P=0.001), and reduced fasting RER (+0.05±0.02 vs. -0.03±0.01 a.u., P=0.01). However, only INT exercise lowered 2-h plasma glucose (-10.43±4.10 vs. +9.50±5.55 mg/dL, P=0.03) and increased post-prandial RER (+0.003±0.02 vs. -0.005±0.02 a.u., P=0.10) when compared with CONT training. Decreased SMM was significantly correlated with increased 2-hr glucose (r=0.59, P=0.04) and enhanced post-prandial RER (r=−0.61; P=0.04). CONCLUSION: Independent of fitness and despite reductions in muscle mass, INT training favorably shifts fasting fat oxidation and post-prandial carbohydrate use in people with prediabetes. This suggests that exercise dose may be important for glycemic control and type 2 diabetes prevention.

Variability in glucose and insulin response to exercise is a largely neglected phenomenon. Here we analyze this variability by measuring the rate of response, defined as the number of individuals with an improvement in glucose and insulin values beyond the day-to-day variability of measurement. Purpose: To determine the separate effects of exercise amount and intensity on the rate of response for glucose and insulin. Methods: Participants were 171 sedentary, middle-aged abdominally obese adults who completed at least 90% of 5 weekly exercise sessions prescribed over a 24-week intervention. Participants were randomly assigned to (1) no-exercise control (n=51), (2) low-intensity exercise (LALI; n=38), (3) moderate-intensity low-intensity exercise (HALI; n=52), or (4) high-intensity high-intensity exercise (HAHI; n=30). Two-hour glucose level, insulin area under the curve (AUC), and fasting insulin were measured at 16 and 24 weeks in response to a 2-hour, 75g oral glucose tolerance test. Biological variability for these measures was calculated to be ±1.2 mmol/L, ±940.2 pmol/L, and ±38.9 pmol/L, respectively. Results: At 24 weeks, the rate of response for 2-hour glucose was 2.0%, 13.2%, 5.8%, and ±38.9 pmol/L, respectively. The rate of response for insulin AUC was 12.0%, 21.6%, 25.0%, and 20.0% in the control, LALI, HALI, and HAHI groups, respectively. The rate of response for fasting insulin was 11.8%, 15.8%, 15.4%, and 6.7% in the control, LALI, HALI, and HAHI groups, respectively. The rate of response was not different between control and any of the exercise groups for 2-hour glucose, insulin AUC, and fasting insulin (p<0.05). Exposure to exercise did not affect the rate of response for 2-hour glucose or fasting insulin between 16 and 24 weeks (p=0.05). Exposure data was not available for insulin AUC. Conclusion: There was substantial variability of response for all measures of insulin and glucose that was not reduced by increasing exercise amount or intensity, where a maximum of 25% of participants improved in these measures beyond the day-to-day variability. This observation underscores the importance of accounting for the variability of measurement when interpreting treatment efficacy for a given individual.

METHOD: An electronic search of the literature was performed from earliest record to September 2016. Eligible trials were RCTs in T2D which included an objective or subjective measure of PA at baseline and at least one follow-up time point ≥ 6 months after enrolment. Mean differences, relative effect sizes (ES; Hedge’s) and heterogeneity statistics (I²) were calculated using a random effects model. Results: Among 107799 citations reviewed, 23 RCTs (including 18 RCTs of lifestyle advice and 5 RCTs of exercise) met the inclusion criteria (n=11673, 46.1% men, age 60.0±4.8). All 5 exercise trials demonstrated increased PA relative to control [2.5 reported stable habitual PA plus an additional 3 d/week structured exercise; 3/5 reported moderate to large increases in total PA (relative ESs 0.6 to 1.5)]. The relative ESs for PA advice trials are shown in Fig.1 (pooling not appropriate; F= 96%). Only 10/18 trials demonstrated significantly increased total PA (ES ranging from 0.3 to 0.8 and one very large ES of 6.6). Subjective PA measurement was used in 60% of trials that reported significant increases in PA; vs. only 12.5% of non-significant trials. Conclusion: Supervised exercise was associated with increased overall PA (inclusive of study-related and habitual activity levels) in T2D in 5/5 trials. By contrast, only 55% of PA advice trials reported significant increases in PA. This heterogeneity, plus reliance on subjective reporting methods, limits confidence in the efficacy and consistency of unstructured/unsupervised PA advice in T2D.
Milk consumption post-exercise may provide additional lean mass gains and body fat loss. Such favorable body composition changes could promote further improvements in glycemic control and quality of life (QoL) in exercising older adults with type 2 diabetes (T2D).

**Purpose:** To determine if the addition of post-exercise low-fat milk to high-intensity interval training (HIIT) improves metabolic health more than HIIT and isolated milk-protein, or HIIT alone.

**Methods:** In a proof-of-concept, randomized double-blind controlled trial, 47 adults with physician-diagnosed T2D (58 ±10 y, A1c: 7.1 ± 0.8%, BMI: 35 ± 7 kg/m²) were randomly assigned to one of three nutritional beverages (500 mL skim-milk, milk-protein isolate or flavored water placebo) after HIIT exercise (2x cardio- and interval training (HIIT) improves metabolic health more than HIIT and isolated milk-protein, or HIIT alone.

**Conclusion:** The consumption of milk or protein after HIIT does not result in additional benefits of power training on functional performance.

**B-09 Thematic Poster - Exercise Psychology and Clinical Populations**

**Wednesday, May 31, 2017: 1:00 PM - 3:00 PM**

**Chair:** Melanie Poudievigne, FACSM, Clayton State University, Morrow, GA.

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

**Leisure Time Physical Activity Among U.S. Adults with Elevated Symptoms of Attention Deficit Hyperactivity Disorder**

Kathryn Fritz, 30606, Ashlyn Powell, Patrick J. O’Connor, FACSM. University of Georgia, Athens, GA. (Sponsor: Patrick O’Connor, FACSM)

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**Purpose:** To examine the changes in serum BDNF levels after high aerobic intensity training (HIT) compared to long slow distance training (LSD).

**Methods:** In an intranidividual design, 16 patients (6 women/10 men; 36±11 yrs) with depression (ICD-10: F32-F33) performed the LSD and HIT with an interval of one week. HIT was warm up at 60-70 % of HR

**Conclusion:** The serum BDNF response to aerobic exercise is intensity dependent in patients with clinical depression.

**B-10 Board #3 May 31 1:00 PM - 3:00 PM**

**The Effects of Exercise Training on Anxiety in Fibromyalgia Patients: A Quantitative Synthesis**

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Physical inactivity and comorbid anxiety symptoms are prevalent among fibromyalgia (FM) patients. Exercise training may be an effective alternative therapy to reduce these symptoms. **Purpose:** To evaluate the effects of exercise training on anxiety levels in FM and to examine whether variables of theoretical or practical importance moderate the estimated mean effect. **Methods:** Twenty-five effects were derived from 10 articles published before June 2016 located using Google Scholar, MEDLINE, PsyCINFO, PubMed, and Web of Science. Trials involved 2,914 participants with FM and included both randomization to exercise training or a non-active control condition and an anxiety outcome measured at baseline and during and/or after exercise training. **Results:** Increase in serum BDNF after HIT was more pronounced compared to LSD (p = 0.001; Cohen’s d = 2.81). Baseline BDNF levels were 32.11 ± 0.64 ng/mL and 30.62 ± 5.61 ng/mL in LSD and HIT, respectively.

**Conclusion:** The serum BDNF response to aerobic exercise is intensity dependent in patients with clinical depression.
than 26 weeks (A=0.35; 95%CI: 0.03-0.66) compared with those losing less than 26 weeks (A=0.26; 95%CI: 0.13-0.39). Session duration (r=0.53), frequency (r=0.25), intensity (r=0.66), anxiety recall time frame (r=0.07), and exercise setting (r=0.45) were not significantly related to effect size (all p<0.07). Conclusion: Exercise training improves anxiety symptoms among FM patients. Thus, in addition to the physical benefits of exercise, persons with FM should be encouraged to exercise as a potential low-risk, adjuvant treatment for anxiety symptoms. The findings also suggest that larger studies involving different populations will be achieved by focusing on longer exercise programs while promoting long-term adherence. Future well-designed investigations are required to examine the potential moderating effect of pain-related improvements in FM patients.

RESULTS: The participants variously reporting being impacted by pain (SF-36 bodily pain 59.4± 8.1 range: 22.5 - 100) during the 4 weeks before testing commenced. Following two weeks of training, bodily pain was reported at 41.9 ± 23.8 out of 100. Pressure pain thresholds increased after exercise on day 1 (Mean diff: SD: 0.54 ± 0.40 kg/cm²; Cohens d (95% CI): 0.2 (0.04 - 0.49), p<0.05), indicative of exercise-induced hypalgesia. This response was similar following 2 weeks of training (mean: SD: 0.52 ± 0.09 kg/cm²; Cohens d (95% CI): 0.43, p<0.001). CONCLUSIONS: Cancer survivors experienced an analgesic response to a single bout of exercise. This response was stable across a 2 week training period, despite higher levels of self-reported bodily pain.

Chronic medically unexplained muscle pain (CMP) is a primary complaint among the more than 200,000 US Gulf War Veterans (GVs) currently suffering from debilitating multisymptom illnesses. Veterans of the more recent Iraq War are also dealing with CMP. Previously our lab demonstrated a positive relationship between physical activity (PA) and brain responses to pain modulation (PM) in civilian CMP patients. We also reported significant correlations between PA and behavioral indices of PM in healthy GV participants. The relationship between PA and the underlying brain responses during PM, however, has not been thoroughly explored. PURPOSE: To examine the association between brain responses during PM and objectively-measured PA in GV’s with and without CMP. METHODS: Twenty two GVs (12 CMP; 10 healthy) underwent thermal pain testing with and without distraction during an fMRI scan. Veterans were exposed to 15 heat stimuli (20 s) relativized to ‘slightly intense’ pain. Stimuli were administered alone or with distraction (i.e., congruent [CS] and incongruent versions [IS] of the Stroop Task). Pain intensity and unpleasantness ratings were collected for each stimulus. PM was assessed with hip-mounted accelerometers worn for a week. Brain responses during PM were modeled using SPM12 and correlated to six PA indices derived from the PA data. Voxel-level significance was set to 0.005 with a minimum cluster size of 330 mm³. RESULTS: Ratings of pain with distraction, CS and IS, were significantly (p=0.01) reduced compared to without for both groups. During CS, healthy GVs exhibited a positive correlation between activity in the right precentral gyrus during PM and sedentary minutes, while activity in the middle and prefrontal cortices was negatively related to PA at light, moderate and vigorous intensities. For IS, positive correlations were found between activity in the contralateral insula and indices of low intensity PA. GV’s with CMP had only a negative correlation between activity in the right anterior cingulate cortex during CS and minutes spent in activities of daily living. CONCLUSIONS: Pain modulation during distraction appears uncompromised in GV’s with CMP. However, the influence of PA on modulatory responses seems diminished in GV’s with CMP compared to their healthy peers.

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Abstracts were prepared by the authors and printed as submitted.

Physical activity (PA) is a significant indicator of present and future health in adolescents. However, it is unknown whether engaging in regular PA is associated with measures of child flourishing as well as bullying and emotional difficulties in children with Autism Spectrum Disorder (ASD). PURPOSE: To examine associations between physical activity levels and measures of child flourishing as well as bullying and emotional difficulties. METHODS: Analyses included 1, 363 (82% male) aged 6-17 (mean 11.54 ± 3.29 years) with ASD from the 2011-12 National Survey of Children’s Health. Adolescents were grouped into two categories: those who engaged in regular PA (≥ 3 days/week) and those who did not engage in regular PA. Outcomes included emotional difficulties (excessive arguing and unhappiness), bullying, interpersonal closeness to others, and measures of flourishing (finishing tasks, staying calm and in control when faced with a challenge, showing interest in learning new things, and caring about doing well in school). Logistic regression models, adjusted for age, sex, gender, household income, and education assessed the odds of each outcome comparing those who engaged in regular PA (≥ 3 days/week) and those who did not. RESULTS: Unadjusted prevalences showed that 69% of those with ASD were regularly physically active (≥ 3 days/week). Regular physical activity was not associated with excessive arguing, bullying or being cruel to others, or unhappiness. Those with ASD who participated in regular PA were 58% more likely to finish tasks (OR=1.58; p=0.001) compared to those who did not.
engage in regular PA. Additionally, those who engaged in regular PA were 44% more likely to stay calm and in control when faced with a challenge (OR=1.44; p=0.007). Furthermore, those who engaged in regular PA were 75% more likely to show interest and curiosity in learning new things (OR=1.75; p=0.006), and 65% more likely to care about doing well in school (OR=1.65; p=0.004) compared to those who did not engage in regular PA. CONCLUSIONS: Children with ASD that engaged in regular PA were significantly more likely to finish tasks, stay calm when faced with a challenge, show interest and curiosity in learning new things, and care about doing well in school. These findings suggest engaging in regular PA may increase flourishing in children with ASD.

Evidence supports the effects of exercise training on clinical severity, associated signs and symptoms, dimensions of sleep quality and quantity, and health-related quality of life among individuals with Generalized Anxiety Disorder (GAD). However, little is known about the acute effects of exercise among individuals with clinical or subclinical GAD.

Purpose
This study quantified mood responses to either acute aerobic exercise or quiet rest, examined potential sex-related differences in response, and explored potential moderators of response among young adult men and women with worry symptoms indicative of GAD.

Methods
Twenty-five young adults (8 males; 17 females; 21.1±1.3y) with Penn State Worry Questionnaire scores ≥45 (58±8) completed two 30-min conditions in counterbalanced order: vigorous treadmill running or seated quiet rest. Outcomes included worry symptoms, state anxiety, feelings of tension, depression, anger, energy, fatigue, and confusion, and total mood disturbance. RM-ANOVA examined differences across condition and time and between males and females. Hedges’ $d$ effect sizes (95%CI) were calculated to quantify and compare the magnitude of change in response to exercise compared to control. Regression explored potential moderators of mood response.

Results
Average heart rate was 163±5.4 bpm and participants reported an average session RPE of 13±2 (range: 9 to 17). Compared with control, acute exercise significantly improved state anxiety, feelings of depression, anger, energy, fatigue, and confusion, and total mood disturbance (all p≤0.04). Moderate-to-large improvements were found for anger (d=0.57, 95%CI: 0.01, 1.13), fatigue (d=0.67, 95%CI: 0.10, 1.24), confusion (d=0.87, 95%CI: 0.29, 1.45), and energy (d=0.87, 95%CI: 0.29, 1.45), and total mood disturbance (d=1.10, 95%CI: 0.50, 1.69). The magnitude of improvements were greater (i.e., larger effect sizes) among men for all outcomes except feelings of energy and fatigue and worry symptoms. High trait anxiety, depression, and poor sleep did not moderate exercise effects (all p>0.10).

Conclusion
Findings provide initial support for both the positive effects of acute aerobic exercise on mood and potential sex-related differences in exercise effects among young adults with worry symptoms indicative of GAD.

Physical activity (PA) guidelines for children recommend accruing 60 minutes or more of moderate to vigorous physical activity (MVPA) per day. Rural children accumulate the majority of their PA at school, so PA opportunities, such as physical education (PE), recess, and classroom-based PA (CBPA) in the rural school environment are critical for this population. There is limited research exploring these PA opportunities in the rural elementary school setting to understand which opportunities provide the most MVPA.

PURPOSE: To determine the proportion of time rural children spend at different intensities during three specific PA opportunities available during the school day: PE, recess, and CBPA.

METHODS: Objectively measured PA levels were collected over a period of four school days at six rural elementary schools using research-grade accelerometers. Accelerometers were worn on the waist during school hours by 292 children (grades 1-5). Daily wear times and school schedules were provided by teachers and were matched to the children’s accelerometer data to determine the amount of time spent at different intensities during each PA opportunity.

ANOVA was used to detect differences with an alpha level of 0.05. RESULTS: The average duration for each PA opportunity was 44 minutes of recess, 32 minutes of PE, and 19 minutes of CBPA. Children in our sample of rural elementary schools spent 18 ± 14% (M±SD) of recess time in MVPA, 16 ± 15% of PE in MVPA, and 11% ± 15% of CBPA in MVPA. Boys engaged in higher levels of MVPA than girls across all PA opportunities (p<0.001). First grade children accrued more time in MVPA across domains when compared to their fifth grade counterparts (p<0.001).

Sedentary and light intensity activities were higher for older children and girls (p<0.001).

CONCLUSION: Scheduling PA opportunities with the highest proportion of MVPA may be an effective method to increase activity in rural elementary school children. This sample of children are not meeting the recommendations of 50% for proportion of time spent in MVPA during recess and PE. Targeting approaches to increase MVPA during these already scheduled opportunities may help children reach daily recommendations. Supported by a grant from the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2011-68001-30020.
examine the modifying effect of MVPA and VPA (adjustments for monitor wear time included). RESULTS: The mean age (sd) of the 147 participants (45.6% girls) were 11.0 (6.61) years. There was a positive association between infancy weight gain and total FM (B=1.1, 95%CI=[0.04, 1.18] and trunk FM (B=0.5 95%CI=[0.16, 0.89]). MVPA did not modify the association between infancy weight gain and total FM (P=0.157) and trunk FM (P=0.116), whereas VPA modified both total FM (B gain x VPA = -0.061, P=0.026) and trunk FM (Bigain x VPA x P=0.034, P=0.014). CONCLUSION: These findings indicate that VPA, but not MVPA, modifies the associations between weight gain during the first year of life and total FM and trunk FM in youth. Vigorous intensity PA may be considered as one of many public health strategies to curb childhood obesity, especially in those who are prone to obesity due to rapid infant weight gain.

RESULTS: Sedentary time was not associated with any of the individual cardio- metabolic risk factors nor clustered cardio-metabolic risk in prospective analyses. Moderate physical activity at baseline predicted higher levels of triglycerides (β = -0.086 (-0.160 to -0.013, P=0.021) and insulin resistance (β = -0.070 (-0.132 to -0.008, P=0.027) at follow-up independent of sex, socio-economic status, Tanner stage, monitor wear time, and waist circumference. One SD increase in moderate-to-vigorous physical activity predicted 0.056 SD lower clustered cardio-metabolic risk at follow-up (P=0.043). However, these associations were attenuated following adjustment for waist circumference.

CONCLUSIONS: Physical activity, but not sedentary time, is prospectively associated with cardio-metabolic risk in healthy children. Public health strategies aimed at improving children’s cardio-metabolic profile should strive for increasing levels of physical activity of at least moderate intensity rather than reducing sedentary time.
days attached to an elastic belt placed around the right hip area. T-tests were conducted to detect gender differences, and Spearman correlations to detect associations between ST, ST%, STB, LSTB, age, and anthropometric variables. RESULTS: No gender differences were detected for ST (4.9±1.2 hrs/day girls, 4.9±1.1 hrs/day boys), ST% (41.1±8.2 % girls, 40.5±6.6 % boys), STB (4.7±2.1 breaks/day girls, 5.0±1.8 breaks/day boys), LSTB (65.3±2.4 min/day girls, 63.5±2.1 min/day boys), and most anthropometric measurements (BMI percentile (65.7±29.8 girls, 64.5±28.7 boys) vs. waist circumference girls, 57.3±5.9 cm boys, vs. waist height ratio (0.45±0.08 girls, 0.46±0.03 boys). Percent body fat was higher in girls compared with boys (21.1±5.9 % girls, 16.6±7.2 % boys; P<0.01). No correlation was observed between sedentary related measures (ST, ST%, STB, LSTB), anthropometric and body composition measures. However, age correlated with ST (r=0.27, p<0.01), ST% (r=0.30, p<0.01), STB (r=0.29, p<0.01), LSTB (r=0.24, p<0.01), BMI percentile (r=0.19, p<0.04), percent body fat (r=0.33, p<0.01), and waist circumference (r=0.40, p<0.01). CONCLUSIONS: Although too much ST is not likely a concern, the observed increase in ST, BMI percentile, percent body fat, and waist circumference with age in this group of young children could represent a future health problem. Interventions must be implemented to help reduce this possible trend. Funded by University of PR-FIPI Institutional Grant.

Board #7
May 31 1:00 PM - 3:00 PM
Longitudinal Changes in Normalized Grip Strength is Associated with Cardiometabolic Health Maintenance and Improvement among Adolescents.

Mark D. Peterson, FACSM1, Sonja Smeding2, Paul Visich3, Paul Gordon, FACSM2. 1University of Michigan, Ann Arbor, MI; 2Baylor University, Waco, TX; 3University of New England, Biddeford, ME.

(Paper presentation)  

PURPOSE: There is an association between normalized grip strength (NGS) and prevalent cardiometabolic health among adolescents; and yet, what remains to be determined is the extent to which changes in NGS predict subsequent changes in health status. The purpose of this study was to determine the longitudinal effect of NGS on changes in health status in a cohort (n=368) of adolescents. METHODS: Cardiometabolic risk variables included elevated fasting glucose, high blood pressure, elevated plasma triglycerides levels, and low HDL-cholesterol. Fully-adjusted, multinomial logistic regression models were used to quantify the odds of experiencing health maintenance (no risk factor identified at either time point), health improvement (presence of ≥1 baseline risk factor, and no risk factors at follow-up), or onset of health deterioration (≥1 risk factor at baseline, and presence of ≥1 risk factor at follow-up) over a 2-year period. RESULTS: For every 0.05 unit increase in NGS from baseline, there was a 1.35 (95%CI: 1.05-1.74) and 1.33 (95%CI: 1.06-1.73) increased odds for health maintenance and health improvement, respectively, even after adjusting for baseline risk factor burden, and risk factors at follow-up, or onset of health deterioration (no risk factor at baseline, and presence of ≥1 risk factor at follow-up) over a 2-year period. CONCLUSIONS: Longitudinal increases in NGS are associated with health maintenance and health improvements in adolescent boys and girls. On the other hand, declines in NGS could be used as a prognostic indicator of onset cardiometabolic risk and to identify adolescents that would benefit from lifestyle interventions to improve muscular fitness and reduce risk.

Board #8
May 31 1:00 PM - 3:00 PM
Physical Activity Bout Patterns From Childhood Through Adolescence: NHANES 2003-2006

David A. White1, Erik A. Willis2, Kimberly J. Reid1. 1The Children’s Mercy Hospital, Kansas City, MO; 2National Cancer Institute, Bethesda, MD.  

Email: dawhit@cmh.edu

(NO relationships reported)

Moderate-to-vigorous intensity physical activity (MVPA) accumulated in bouts greater than 5 minutes in length are related to beneficial cardiometabolic health outcomes independent of total MVPA in youth. While it has been established that total MVPA decreases as youth age, the associations between age and MVPA bout patterns in youth is unknown. Purpose: To identify physical activity (PA) bout patterns by age and sex is unknown 6-18 years old youth. Methods: This cross-sectional analysis examined accelerometer data from the National Health and Examination Survey 3 (NHE3) and 2005’-06. Participants (n=4069; male =2036, female =2033; mean age 12.5 ± 3.6yrs) were required to wear uniaxial accelerometers set on 1-minute epochs on the right hip for 7 days. Included data had a minimum of 3 days of at least 10 hours of valid wear time. PA patterns were assessed by comparing percent time of total MVPA in sporadic (1-4 days), short (5-9 minutes), and medium-to-long (med-long) (≥ 10 minute) bouts. MVPA by age and sex. Multivariable regression analysis was used to determine independent associations of age, sex, race, ethnicity, income, and PA bout patterns. Results: Data are presented as percent time. Significant differences by age group observed for: sporadic bouts (6-7yrs, 91.2 ± 3.9; 8-9yrs, 92.5 ± 4.1; 10-11yrs, 93.7 ± 4.2; 12-13yrs, 93.7 ± 5.4; 14-15yrs, 93.4 ± 6.3; and 16+yrs, 93.5 ± 8.3; p<0.001), short bouts (6-7yrs, 14.2±2.7; 8-9yrs, 5.5±2.8; 10-11yrs, 4.7±3.1; 12-13yrs, 4.5±3.8; 14-15yrs, 4.6±4.5; and 16+yrs, 4.6±5.8; p<0.001), and med-long bouts (6-7yrs, 2.4±3.8; 8-9yrs, 2.0±3.2; 10-11yrs, 1.6±2.1; 12-13yrs, 1.8±2.6; 14-15yrs, 2.0±3.1; and 16+yrs, 1.9±4.4; p=0.002) of MVPA. Males participated in less sporadic bouts of MVPA (male: 91.7% ± 2.6; female: 94.6% ± 5.6; p<0.001), more short bouts of MVPA (male: 5.8% ± 4.3; female: 4.1% ± 4.1; p<0.001), and more med-long bouts (male: 2.5% ± 3.1; female: 1.4% ± 3.0; p<0.001) of MVPA. Results remained significant after multivariable adjustment for sex, race/ethnicity, income, and age. Conclusions: In addition to decreasing total minutes of MVPA, there are also changes in PA patterns as youth age. Changes in PA bout patterns by age are moderated by race/ethnicity and sex. Future interventions could focus on changing PA patterns in addition to increasing total minutes of MVPA.

B-11 Thematic Poster - Landing Biomechanics
Wednesday, May 31, 2017, 1:00 PM - 3:00 PM
Room: 101

Board #1
May 31 1:00 PM - 3:00 PM
The Role of the Midtarsal Joint in Drop Landings
Dustin A. Bruening, Mark T. Olsen, A. Wayne Johnson, Sarah T. Ridge, Brigham Young University, Provo, UT.

Email: dabruening@byu.edu

(NO relationships reported)

Multi-segment foot models have allowed the foot to be studied in greater detail, in particular separating the functions of the ankle and midtarsal joints. While these models have been used in walking and running, they have been limited in application to other sports movements, such as jumping and landing. Purpose: To investigate the role of the midtarsal and ankle joints in energy absorption during drop landings using a multi-segment foot modeling approach, and to compare these results with those obtained from a single segment model. Methods: Twelve volunteer female collegiate athletes [age: 20.5±1.4 years, height: 162.1±15.4 cm, weight: 58.2±6.1 kg] performed one legged barefoot drop landings from a height of 40 cm. Hitting from wooden rings, each subject dropped onto two adjacent force platforms, so that the hindfoot and forefoot contacted separate plates. Sufficient trials were performed until 3 accurate landings were achieved. 28 reflective markers, attached to the subjects’ dominant leg, were used to create a custom kinetic multi-segment foot model. Ankle and midtarsal joint angles, powers, and total work were calculated from initial contact through the lowest point of the subject’s center of mass, representing the energy absorption phase of the landing. Results: The midtarsal joint was plantarflexed prior to contact and moved through nearly as great a range of motion (90%) as the ankle (24.6° ± 7.3° ankle vs. 21.9 ± 7.5° midtarsal), while performing two-thirds the amount of work done by the ankle (0.63 ± 0.21 J/kg at the ankle vs. 0.42 ± 0.17 J/kg at the midtarsals). The single segment foot overestimated both range of motion (40.4° ± 8.8°) and work done (1.05 ± 0.28 J/kg) by 40%. Conclusion: The midtarsals can play a substantial role in impact energy absorption, which may have implications in injury prevention strategies. Future studies should attempt to separate active (i.e. muscles) and passive (e.g. ligaments, windlass mechanism, etc.) contributions to midtarsal function.
production with various ankle taping techniques during athletic tasks. **PURPOSE:** To examine the effects of an Achilles tendon assistive taping technique and gender on lower extremity muscle power generation, power absorption during jumping and landing in healthy recreational athletes. **METHODS:** 29 subjects - 16 males (20.9 ± 2.4 years, 179 ± 6.6 m, 79.0 ± 11.9 kg) and 13 females (21.4 ± 3.2 years, 1.66 ± 0.06 m, 66.1 ± 7.6 kg) - participated in the study. Each subject’s dominant limb underwent an Achilles tendon assistive taping procedure by a certified athletic trainer. Subjects performed 5 trials of a stop jump task in both a taped and non-taped condition (randomized test order). The first landing and subsequent jump were analyzed with a 10-camera motion analysis system (240Hz). Joint power was determined based on data from 2 embedded force plates (1920 Hz) using inverse dynamics and was integrated to yield joint work. 2x2 ANOVAs were performed (p<0.05) to determine gender and taping condition effects on peak power generation, power absorption, and work at each joint during landing and jumping. **RESULTS:** Subject height (p=0.001) and mass (p=0.002) differed based on gender, but age (p=0.633) did not. No significant interactions and no taping condition main effects existed for power or work during either jumping or landing. A main effect of gender was identified, with females showing decreased peak power generation at each joint during jumping (Table 1). **CONCLUSIONS:** The assistive taping does not alter peak power generation, power absorption or joint work during landing and jumping in healthy subjects, but gender-specific differences in power generation do exist. Future work is needed to determine the effect of this taping technique in injured athletes.

**Table 1: Peak Power Generation**

<table>
<thead>
<tr>
<th></th>
<th>Females</th>
<th>Males</th>
<th>Gender Effect</th>
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</thead>
<tbody>
<tr>
<td><strong>Ankles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landing</td>
<td>-12.3 ± 4.6</td>
<td>-12.3 ± 4.5</td>
<td>-13.0 ± 4.6</td>
</tr>
<tr>
<td>Jumping</td>
<td>15.6 ± 5.4</td>
<td>13.4 ± 4.2</td>
<td>18.1 ± 3.8</td>
</tr>
<tr>
<td><strong>Knee</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landing</td>
<td>-17.3 ± 4.9</td>
<td>-18.6 ± 5.3</td>
<td>-21.0 ± 6.0</td>
</tr>
<tr>
<td>Jumping</td>
<td>11.2 ± 3.1</td>
<td>11.5 ± 4.3</td>
<td>15.2 ± 3.5</td>
</tr>
<tr>
<td><strong>Hip</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landing</td>
<td>-7.6 ± 5.0</td>
<td>-6.1 ± 3.2</td>
<td>-13.3 ± 6.1</td>
</tr>
<tr>
<td>Jumping</td>
<td>6.3 ± 5.0</td>
<td>4.6 ± 1.9</td>
<td>10.2 ± 8.1</td>
</tr>
</tbody>
</table>

* Units in N*m/(BW*BH*s)

A single leg, barefoot landing is a functional movement often executed in athletic events. The inability to quickly stabilize the ankle joint during a landing may contribute to injury risk. **PURPOSE:** To determine whether the size of specific medial and lateral extrinsic foot muscles can be used to predict shorter time to stability in female athletes performing single leg, barefoot landings. **METHODS:** Participants were female athletes performing single leg, barefoot landings and included in the study if they were between the ages of 18 and 40 years. **CONCLUSIONS:** It appears athletes with larger FB and FL had shorter time to stability. These results suggest strengthening of the lateral extrinsic foot muscles can be used to predict shorter time to stability in female athletes performing single leg, barefoot landings.

**CONCLUSION:** A stepwise regression (including height, weight, and CON work per repetition) was used to collect three trials of a drop vertical jump and quantify the left limb's sagittal, frontal, and transverse plane hip and knee joint excursions and peak external joint moments, normalized to body weight and height (BWHT). Separate step-wise, linear regressions determined the extent to which CON and ECC work predicted landing biomechanics in males and females. **RESULTS:** In males, the average ECC and CON work per repetition was 0.96±0.15 J/BWHT and 0.92±0.18 BWHT, respectively. In females, the average ECC and CON work per repetition was 0.91±0.25 J/BWHT and 0.94±0.21 J/BWHT, respectively. Greater ECC work predicted less hip adduction moment (0.40±0.29 Nm/BWHT, R=0.411, P=0.025) in females. ECC and CON work was not predictive of any other hip or knee joint excursions or peak moments in males or females. **CONCLUSIONS:** With the exception of hip adduction moment in females, ECC and CON hip strength was not predictive of landing biomechanics. This suggests that a combination of neuromuscular factors at the hip, such as muscle activation, combine to predict lower extremity biomechanics during dynamic activities. Further work is needed to clarify this relationship in more demanding tasks.
Muscle activity patterns can be modulated in response to soft-tissue vibrations of lower extremity induced by the magnitude of the peak impact and the high loading rate of vertical ground reaction force during landing to reduce the high injury risk. However, the sudden changed pattern of unexpected landing would potentially influence the impact force (as a input signal) and the soft-tissue vibration (as a response), which may further affect the landing performance or even cause injury.

**PURPOSE:** To determine the biomechanical differences of impact force and soft-tissue vibration between active landing (AL) and unexpected landing (UL).

**METHODS:** Twelve trained male basketball volunteers were requested to land from self-made elevated platform at three heights (30, 45, and 60cm) in two different landing maneuvers (AL & UL). The 3D force plates and accelerometers were used to collect the impact and soft-tissue vibration characteristics. The variables for AL & UL included: 1) impact characteristics: the peak of impact force (BW), maximum loading rate (kN/s) and impact frequency (Hz); 2) soft-tissue vibration: maximum amplitude (g) and damping coefficient (’s’) of soft-tissue vibration of quadriceps & hamstrings. A 2 × 3 (landing style × height) repeated measures analysis of variance was used to examine the differences between conditions. **RESULTS:** For the impact characteristics, the peak impact force (30cm: 3.90 ± 1.16 vs. 2.17 ± 0.50; 45cm: 4.35 ± 1.02 vs. 2.82 ± 0.80; 60cm: 4.73 ± 0.84 vs. 3.60 ± 0.64), maximum loading rate (30cm: 240.3 ± 63.8 vs. 88.4 ± 22.5; 45cm: 273.9 ± 77.3 vs. 153.7 ± 36.0; 60cm: 301.6 ± 73.3 vs. 203.3 ± 46.0), and impact frequency (30cm: 15.6 ± 2.3 vs. 7.96 ± 2.2; 45cm: 23.1 ± 2.2 vs. 8.73 ± 1.7; 60cm: 26.1 ± 2.4 vs. 10.38 ± 1.5) in UL was significantly higher than those in AL (p ≤ .05) for all three drop heights, respectively. For soft tissue vibration, UL had a significantly greater maximum amplitudes of vibration of quadriceps (except for 60 cm) and hamstrings (p < .01) and lower damping coefficients (p < .05) compared with AL. **CONCLUSION:** If the neuromuscular system fails to prepare properly for an unexpected landing impact, increased magnitude of impact forces and soft-tissue vibrations emerged which might be detrimental to the impact-related injury.

Supported by NSFC grant (81302131).

**Anterior Cruciate Ligament (ACL) injury is common in adolescent female athletes, with those who participate in soccer (SC) being at the highest risk for primary and secondary ACL injury. However, little is known about the biomechanical differences that may contribute to the variance in injury rate between SC and other sports in adolescent females. Previous research demonstrates that college-age females who participate in SC exhibit greater frontal plane projection angle (FPPA) values than those who participate in basketball (BKB).**

**PURPOSE:** To assess for differences in hip and knee frontal plane kinematics between adolescent female SC and BKB.

**METHODS:** Cross-sectional study design. Females (N = 30) participating in BKB (Age = 15.33 ± 1.68 yrs; Ht = 167.14 ± 5.91 cm; Mass = 60.49 ± 9.59 kg) or SC (Age = 15.33 ± 1.68 yrs; Ht = 162.86 ± 3.84 cm; Mass = 56.55 ± 5.85 kg). Participants had International Knee Documentation Committee Subjective Knee Form (IKDC) scores ≥ 95, were healthy at time of testing, and were matched by age and side of dominance (DOM = limb used to kick a ball). During three separate jump-landing tasks, bilateral lower extremity joint angles and moments were assessed at initial contact. Joint displacement (DSP) and joint abduction (ADD) DSP was significantly greater in the SC group (9.51 ± 1.3º) compared to the BKB group (4.9 ± 3.1º, t(28) = -2.7, p = .01). DOM hip abduction DSP was significantly greater in the BKB group (-3.7 ± 3.2º) compared to the SC group (-1.0 ± 0.9º, t(28) = -3.1, p =.004). DOM FPPA negative DSP (knee varus) (BSK = -9.8 ± 8.0º, SC = -5.29 ± 3.9º, t(28) = -1.96, p = .05) and non-DOM FPPA negative DSP (BKB = -13.5 ± 4.7º, SC = -6.3 ± 3.0º, t(28) = -2.7, p = .01) was significantly greater in the BKB group compared to the SC group. No other significant differences were observed. **CONCLUSIONS:** Greater hip ADD DSP is associated with higher ACL injury risk. Female SC players may be at increased ACL injury risk partially due to higher hip ADD DSP exhibited during landing as compared to the BKB group. The ability of female BKB players to maintain greater knee varus when compared to SC may also contribute to the variance in ACL injuries in these sports.
Although higher physical activity (PA) levels are associated with lower psychological stress, real-time associations between PA and stress have not been adequately examined. It is unclear how stress responds to an increase in PA, thus reducing the likelihood of exercising when stress is high, or whether PA is used as a coping strategy for reducing stress. PURPOSE: This study combined objective PA monitors with real-time psychological stress assessments to examine the pattern of stress to prior and following an exercise bout and to determine whether the magnitude of stress predicted PA engagement.

METHODS: 52 women with overweight/obesity (BMI: 31.5±4.5 kg/m², age: 48.9±9.0 years) were instructed to respond to 5 semi-random prompts delivered daily via their smartphone over a 14-day period while simultaneously wearing an objective PA monitor (SenseWear armband). Stress ratings at each prompt were reported using a 1-7 Likert scale (ranging from ‘not at all’ to ‘very much so’). Moderate-to-vigorous intensity PA bouts (MVPA; ≥ 3 METS & ≥ 10 minutes in duration) were identified and examined in relation to stress ratings. RESULTS: Compliance to answering the surveys (88.0±9.1%) and wearing the armband was high (13.1±1.9 days; 14.1±1.6 hrs/day). On average, participants engaged in 17.3±16.2 min/d of MVPA; 26.1±23.4 min/d of VPA. Stress ratings were 2.17±0.03 (mean±SE). There was no association between participant’s total MVPA minutes and average stress over the 14-day period (r=-0.03, p=0.81). However when examined acutely, stress decreased in the time preceding exercise and continued to decrease following exercise (p=0.04).

Further, when stress was high during the first prompt of the day (stress ≥ 5, 16% of all cases), participants were significantly less likely to exercise on that day compared to when stress was low (stress <5); p=0.07, p=0.004). CONCLUSIONS: When PA and stress were assessed using a unique combination of real-time data collection methods, overweight women did not appear to use PA as a method of coping with stress; rather PA occurred more often when stress was low and on a downward trajectory. These findings suggest that reducing stress may be a useful strategy for promoting PA adoption. Future studies should examine this relationship in other populations, including those with higher stress levels.
Recent work suggests that inhibitory control influences affective regulation and is an important neurobiological mechanism that contributes to physical activity behavior. However, the effects of exercise intensity on this complex interaction of body-heart-brain remain unclear. **PURPOSE:** Investigate the effects of exercise intensity on inhibitory control, affect, autonomic function and prefrontal cortex (PFC) oxygenation. **METHODS:** 37 sedentary young adults were randomly assigned to two experimental conditions (control or exercise). For the exercise condition, a maximum incremental test was performed on a cycle ergometer with continuous measurements of PFC oxygenation, heart rate variability (HRV), inhibitory control (Stroop test), associative and dissociative thoughts (ADT). In each condition, subjects participated in two 20-minute sessions on the cycle ergometer, with a 20-minute rest period after each session. **RESULTS:** PFC deoxy was found at VT+2 intensity (r=-0.37; p<0.05). Pleasure perception was correlated with HRV lower frequencies analysis (r=-0.34; p<0.05) and ratio of parasympathetic to sympathetic activity (r=-0.37; p<0.05) during exercise. Inhibitory control and affect (ratings of pleasantness) were negatively correlated with PFC deoxy (r=-0.37; p<0.05) and HRV (r=-0.34; p<0.05). **CONCLUSION:** Exercise intensity modulates PFC oxygenation, HRV, and affective perceptions, suggesting that exercise intensity influences the body-heart-brain interaction.
Variation in lap time (LTV) during a fast pace 400m walk test is a new metric thought to be an early indicator of cognitive decline in older adults. While LTV has been found to associate with executive function, no study has examined the potential for LTV to predict capacity of the brain to divide attention and meet the demand of walking and performing other tasks simultaneously. PURPOSE: The purpose of this study was to test the hypothesis that greater LTV would associate with larger dual-task cost during walking. METHODS: Fifty-two cognitively healthy women (MoCA=25) women across a broad age range (30-80y) performed fast pace walking while balancing a tray (Dual1) or balancing a tray while vocalizing serial subtractions by 7’s (Dual2). Task error was quantified by degrees of tray tilt and subtraction error. On a separate day, women completed a fast pace 400m walk test (40m x 10 laps) with time to complete each lap recorded. LTV was defined as standard deviation of residuals estimated from the random effects linear model where each lap time was regressed on a person-specific random intercept and random slope associated with lap. Women were categorized into tertiles based on LTV. Comparisons were made between tertiles using ANCOVA after adjusting for age, years of education, and mean lap time. RESULTS: Gait speed (p=0.57) or the percent change in gait speed (p=0.34) were not significantly different between tertiles for the Dual1 condition, but tilt angle was larger in women with greater LTV (tertiles 1 vs. 3: 1.37±0.12 vs. 1.94±0.11 degrees; p=0.006). During the Dual2 condition, women with greater LTV had faster gait speed (p=0.02), lower percent change in gait speed (tertiles 1 vs. 3: 20.5±2.8 vs. 9.3±2.6%, p=0.02), similar subtraction error (p=0.58), but larger tilt angle (tertiles 1 vs. 3: 1.24±0.19 vs. 2.09±0.17 degrees; p=0.007). CONCLUSION: Lap time variation identified women that exhibited greater difficulty balancing an object while walking suggesting that LTV may be sensitive to deficits in the ability to share neural substrate for sensorimotor function. Supported by a Women’s Health Research Scholar Grant award from the Laura W. Bush Institute of Women’s Health and University Medical Center in Lubbock, TX.

The intensity of yoga is challenging to assess because the asanas of yoga include aerobic and anaerobic components; both of these components are measured through different methods. PURPOSE: The purpose of this project was to explore a method of assessing the physical activity completed during yoga. This study had two objectives: 1) Quantify characteristics of yoga (number of poses, body posture of a pose), and explore the concept of a pose rate (number of poses per minute of the routine), 2) Assess physical activity completed during yoga. This study had two objectives: 1) Quantify characteristics of yoga (number of poses, body posture of a pose), and explore the concept of a pose rate (number of poses per minute of the routine), 2) Assess physical activity completed during yoga.

The activPAL™ has been increasingly used in field-based studies as a valid measure of posture and activity. Practical issues relating to its use have been raised in adults but limited information is available in adolescents. PURPOSE: To examine the validity of the activPAL™ when asked to perform dual-task walks. METHODS: Six secondary schools in Hong Kong were randomly chosen for the study. 368 students (12-18 yrs; 47.6% boys) agreed to wear the activPAL™ for 7 consecutive days. The device was worn on the midpoint of the anterior aspect of the right thigh using a water-proof Tagaderm adhesive dressing. Participants were asked to log the duration of and reasons for device removal. Semi-structured interviews with two focus group were conducted to further examine practical wearing issues. Each interview (30 mins) included 6 participants, 3 of them had worn the device continuously for 7 days and the remaining 3 participants had self-reported removing the device. 14 questions were asked to seek further information on the reasons for removal and uncomfortable feelings experienced. RESULTS: Of the 368 log records of the participants, 8 of them (2.2%) reported that they lost the monitor while wearing it. 184 participants (50%) wore the device for 7 consecutive days without removal while the other 50% reported removal in their logs. In total, 248 accounts of removal were reported and the main reasons included automatic dropping (48%), allergic reaction (34.7%), loss of adhesiveness during water based activities (10.1%) and voluntary removal (4.4%). For automatic dropping, sweating (78.5%) was the most commonly reported reason; and for allergic reaction, 61.6% of unknown allergy, 20.9% of itch, 7.0% of red skin, 5.8% of erythema, 2.3% of pain and 2.3% of blisters were reported. Uncomfortable skin feeling related to wearing the device was commonly reported during the interviews and the majority of them claimed that they would like to wear this monitor again but without adhesive dressing. CONCLUSIONS: The primary practical issue related to continuous wearing of the activPAL™ among adolescents was automatic dropping caused by sweating and allergic reaction to the adhesive dressing. The use of adhesive dressing caused uncomfortableness among adolescents and reduced their compliance to wear the device.

The LeanScreen™ app (LS) uses photographs taken from the front and side views, touch screen technology and manufacturer algorithms to estimate circumferences of the neck, abdomen, waist, and hips. The LS app then estimates body composition using the Department of Defense (DOD) circumference regression equations. PURPOSE: This study evaluated the validity and reliability of estimates of percent body fat (%BF) in adult men and women using the LS app compared to DEXA as the criterion method. METHODS: Height and body mass were measured on 63 males and 58 females between 18 and 50 years of age. The participants were categorized as normal weight (n=61) or overweight (n=60) based on BMI. A DEXA scan was performed on each participant once. To assess the within-day and between-day reliability of the LS app, an administrator took front- and side-view photographs of each subject twice on the same day and once on a second day. The LS app was used to identify landmarks of the neck, abdomen, waist, and hips on each set of photographs of each subject. The LS app provided an estimate of %BF. Estimates of %BF from the LS app were compared to %BF values obtained from DEXA. RESULTS: A mixed model ANOVA indicated that the LS app significantly (p=0.001) underestimated DEXA %BF by an average of 3.6 %BF. The difference in %BF values between the LS app and DEXA were not influenced by gender or BMI category. Regressing the %BF determined from the LS app with DEXA %BF provided an R squared of 0.83. This study demonstrated that assessing certain characteristics of routines may be one way to describe activity performed during yoga. A common method to assess the activity performed during yoga will allow for easy comparisons between studies and provide a basis to better interpret results. Further research could assess if similar results are found between different yoga styles and if the number of poses completed corresponds to larger physiological or metabolic responses.
app against DEXA resulted in an $R^2 = 0.83$ and a SEE = 3.4 %BF. The intercept (2.84 %BF) and slope (1.035) of the regression line confirmed the significant bias. Bland-Altman analysis showed that the mean bias of the LS app estimates of %BF increased with increasing body fatness. Use of the LS app to estimate %BF resulted in high intrarater reliability within and between days. CONCLUSIONS: The results of this study show that the LeanScreen™ app, although highly reliably, significantly underestimated DEXA %BF. We suspect that this is related more to the DOD regression equation rather than the use of photographs and touchscreen technology.

569 May 31 1:45 PM - 2:00 PM

Body Composition and Bone Mineral Density of NCAA Division I Football Players
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(No relationships reported)

**Purpose:** To examine positional differences in total and regional body composition in Division 1 football players using dual X-ray absorptiometry (DXA). Data is from the Consortium of College Athlete Research (C-CAR) group. Methods: Height, weight, total and regional fat mass, lean mass and bone mineral density were measured on 467 players in the preseason (June-August). Players were categorized by their offensive or defensive position (offensive linemen [OL] and defensive linemen [DL], linebacker [LB], tight end [TE], running back [RB], wide receiver [WR], defensive back [DB], quarterback [QB], kicker/punter/long snapper [ST]). An ANOVA tested the effect of position on body composition and bone density, and the Tukey honest significant difference test compared the differences between each group. Results: Table 1 presents the positional comparisons. If the rows do not share a letter, the positions are significantly different (p<0.05). All positions were classified as overweight or obese based on body mass index (BMI (>25 kg/m²)), yet other than OL and DL, all positions had healthy percent body fat (13-20%) and low visceral fat mass (>500 g). For bone mineral density (BMD), player position had an effect on total and regional (ex. legs) BMD with OL and DL being similar to TE/LB/RB (p>0.05 for all), but higher than WR/DL/QB/ST (p<0.05). Conclusions: Position had a significant effect on body composition measures and is likely associated with on-field positional requirements. From a health perspective, while most positions had higher BMIs, the majority had relatively low body fat and visceral fat. However, OL and DL had elevated total visceral fat which could place them at higher health risk. Compared to other methods, DXA increases the accuracy and reliability of body composition and BMD, thus improving within and between position comparisons.

| Table 1: Positional Body Composition Characteristics mean (±SD) |
|---------------------|----------------|---------------------|---------------------|---------------------|---------------------|
|                      | OL              | DL                | TE                | LB                  | RB                  |
| Percent Fat (%)      | (n=83)          | (n=53)            | (n=30)            | (n=58)              | (n=36)              |
| Total Lean Mass (kg) | 89.9±6.5        | 87.6±6.8          | 82.9±6.5          | 77.4±6.5            | 71.6±6.5            |
| Total Fat Mass (kg)  | 40.1±7.9        | 27.8±10.8         | 26.5±8.3          | 14.1±4.6            | 11.0±3.7            |
| Visceral Fat (g)     | 645±184        | 465±142          | 228±142           | 241±184             | 181±142             |
| Visceral Fat (%)     | 30.8±4.2       | 23.5±4.6          | 19.8±4.9          | 28.9±4.8            | 21.9±4.9            |

**Bone mineral density in female athletes is influenced by many factors including genetics, menstrual cycle, calcium and vitamin D levels, hormonal changes, and physical activity. Percussive activity has been shown to lead to increased BMD. Peak BMD is achieved between the ages of 16-20 in females. Females begin participation in both ice hockey and synchronized swimming during crucial bone building years, which may affect peak BMD and therefore risk of osteoporosis later in life. PURPOSE: To evaluate BMD in the lower limb between ice hockey and synchronized swimming female collegiate athletes. METHODS: 41 female collegiate athletes (n=22 hockey players, n=19 synchronized swimmers) received a total body and left femur iDXA scan to evaluate total and regional BMD. Average age of the athletes was 20.30±1.77 yrs. Average weight of the athletes was 65.36±8.37 kg (synchronized swimmers: 62.62±8.45 kg, hockey players: 67.73±7.13, F(1,40)=4.09, p<0.05). Analysis of covariance (ANCOVA) was used to compare BMD of the legs, pelvis, femur, femoral neck, femoral shaft, trochanter, and total body while controlling for age and weight. RESULTS: Average body fat percentage as measured by DXA for all athletes was 28.55±9.7%. Hockey players had higher BMD than synchronized swimmers in their legs (F(1,37)=17.31, p≤.01), pelvis (F(1,37)=34.63, p≤.01), femur (F(1,37)=15.2, p≤.01), femoral neck (F(1,37)=7.30, p≤.01), femoral shaft (F(1,37)=13.77, p≤.01), trochanter (F(1,37)=25.88, p≤.01), and total body (F(1,37)=17.58, p≤.01). CONCLUSIONS: Female collegiate hockey players have higher weight and age adjusted BMD than female collegiate synchronized swimmers in the lower limb and multiple sites around the femur. A lower BMD puts these female athletes at a greater risk of developing osteoporosis later in life. Exercise scientists should develop alternative land training programs that focus on bone loading exercises for female synchronized swimmers to optimize bone health at a young age.

630 May 31 2:00 PM - 2:15 PM

Bone Mineral Density in Aesthetic and Performance Sports in Female Collegiate Athletes
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(No relationships reported)

**Purposes:** To address the worldwide childhood obesity epidemic, afterschool physical activities (PA) could play an important role. Yet, little is known about the status and impact of afterschool PA on U.S. youth. This study was to examine the impact through a national survey. METHODS: Data from the 2012 National Youth Fitness Survey were used for the study, in which a representative/weighted national sample of 4,647,684 youth, aged 12-15 yr. old (51.30% male) responded to the PA questionnaire and were assessed for their physical fitness, including Plank, Handgrip, Pull-ups, Leg extension, Body mass index (BMI), and Waist circumference. A descriptive statistical summary of the PA participation was created first and then, the relationships between PA participation and PA times, as well as the difference in physical fitness measures between PA participation and no participation, groups were examined. RESULTS: The top 5 afterschool PA for boys of this age group are basketball (19.60%), roller blading (14.50), volleyball (12.43), football (11.83), and bike riding (11.68), and for girls are roller blading (11.52), volleyball (11.37), basketball (8.49), dance (7.01), and bike riding (5.98), respectively. Although the correlation is not high, the afterschool PA participation was positively correlated with the number of PA days in the past week (r = .23), total time of vigorous PA on a typical day (15), total time of moderate-vigorous PA (r = .17), and total time walking (.17). The participation in afterschool PA was found also to have a positive impact on the physical fitness measures. CONCLUSIONS: Positive impact of afterschool on promoting youth’s overall PA time and improving their physical fitness was confirmed. It is also interesting to find out that activities such roller blading have become popular afterschool PA for U.S. youth. Future school physical education curriculum and afterschool programs should reflect the new interest and trend of this population.
Instant metabolic power (IMP) to assess energy cost (W) in running tasks with variable velocity (v) has come under critique in terms of substantial underestimations. IMP is based on assumptions that W per meter running distance at constant v (Cr) is invariant and that acceleration and deceleration can be modelled as constant v uphill and downhill running (CrIMP), respectively. PURPOSE: To test the hypotheses that the observed underestimation of W via IMP is caused by a dependence of Cr on v at running speeds at and above the v corresponding to VO2max (vVO2max) and the limited validity of the IMP-model to acceleration and deceleration less than ~ 4 m/s² under interval training (IT) conditions. METHODS: 9 males (25.6 ± 2.0 yrs, 176.8 ± 4.2 cm, 76.8 ± 4.1 kg) performed an incremental load test on the treadmill, 15 min constant v runs (2.5 m/s) and IT of 30 x 10 s (average v = vVO2max) with 20 s breaks on treadmill (TM) and outdoor track (OT), respectively. Total energy costs (WTOT) of all tests were calculated from respiratory gas measurements and net lactate appearance. W assessed via IMP (WIMP) for TM and OT was estimated using CrIMP: 1) as published previously and, and the previously published IMP-model (WIMP1), 2) using a modified CrIMP-model considering also acceleration and decelerations higher than ~ 4.4 m/s² (WIMP2), 3) considering individual dependence of Cr on v at v > vVO2max (WIMP3). RESULTS: WIMP of running at 2.5 m/s on TM (9210 ± 442 J/kg) and OT (8926 ± 1028 J/kg), and IT on (8970 ± 559 J/kg) were not different but all higher (p < 0.05) than WIMP1 at IT on TM (7856 ± 515 J/kg), WIMP2 (TM: 6363 ± 442 J/kg; TM: 5691 ± 367 J/kg) and WIMP3 (OT: 6528 ± 368 J/kg; TM: 5691 ± 367 J/kg) were lower (p < 0.001) than the corresponding WIMP1. WIMP1 (OT: 8731 ± 484 J/kg; TM: 7009 ± 572 J/kg) and WIMP2 on OT but still underestimated (p < 0.001) WIMP of TM conditions possibly due to neglecting W of jumping onto and of the TM. CONCLUSIONS: Realistic estimates of WIMP via IMP require adjustments for increased Cr at high v and accelerations and decelerations higher than ~ 4.4 m/s².
United States, completed a brief medical history and gait analysis. Following the collection of these data, subjects were assigned to one of two groups based on having fallen (F; n=90) or not fallen (NF; n=160) in the past year. Independent t-tests were conducted to explore group differences (walking aid, arthritis; α = 0.05) in time spent in active propulsion. For these analyses the F and NF groups were analyzed separately with percentage spent in active propulsion as the dependent variable and both walking aid use and self-reported diagnosis of arthritis were the independent variables. RESULTS: Cw per kilogram (P = 0.023) and Kvert per kilogram (P = 0.053) were statistically different across all conditions. A positive correlation existed between Kvert and Cwkg (P < 0.05) and Cwkg is likely due to the greater muscle force needed to support larger body mass.

CONCLUSIONS: Specific to those with a history of falls, use of a walking aid or history of arthritis does not affect gait cycle percentage spent in active propulsion. However, for individuals with no history of falling and the last year, both use of walking aid and diagnosis of arthritis significantly reduces percent of the gait cycle spent in active propulsion which has been previously shown to differ between people with and without a history of falls.

**RESULTS**

2:00 PM - 2:15 PM

**Concurrent Validity Of Zeno Compared To Gaitrite With Backward Walking In Healthy Older Adults**

Rebecca Lin, Shagun Patel, Coty Thomas, Jane Freund, Srikant Vallabhajosula. Elon University, Elon, NC. (Sponsor: Dr. Stephen Bailey, FACSM)

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(NO relationships reported)

Previous research has identified an age-related decline in backward walking performance measured via spatio-temporal parameters using GAITRite walkway. Moreover, it has also been shown that older adults exhibited a lower rate of gait and non-fallers during backward walking. Zero and GAITRite are both instrumented walkway systems used to assess spatio-temporal parameters of gait. The Zero has a wider walkway than the GAITRite but is less portable for similar configurations. The GAITRite has been used extensively for measuring spatio-temporal parameters of backward gait. The Zero has been less researched. PURPOSE: To determine concurrent validity of the Zero and GAITRite walkways to assess spatio-temporal parameters of backward walking in healthy older adults. METHODS: 30 healthy older adults (19 females, 75.1 ± 6.3 years of age) participated in this study. Participants were 65 or older, could walk 30 feet independently, and were not at risk for falls as determined by American Geriatric Society guidelines. The participants walked backwards at a comfortable pace on both the Zero walkway (16’ x 2’) and GAITRite walkway (14’ x 2’). Participants performed one practice walk and five test walks on each walkway. ICC values (2,5) were calculated using GAITRite compared to Zero measurements for stride length, width, and velocity, step, stance, and swing time, stance and swing percent, single support time, single support percent, velocity, and cadence. A paired sample t-test was used to determine a significant difference between measurements from both systems. RESULTS: The ICC values ranged from 0.665 to 0.971. Backwards walking stride width was significantly greater when walking on GAITRite (16.0±0.74cm) compared to Zero (14.9±3.58cm; P<0.001). CONCLUSION: The validity between the GAITRite and Zero walkway systems showed excellent correlation on most spatial measurements and moderate agreement for some temporal parameters. Differences in stride width could have been due to method of calculation or perception of participants while walking on a narrower walkway. The results indicate clinicians can use Zero for clinical assessment of backwards gait, keeping in mind the differences in temporal measurements if compared with published GAITRite results for healthy older adults.

2:15 PM - 2:30 PM

**Gait Variability Among Breast Cancer Survivors During Forward And Backward Walking**

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(NO relationships reported)

Increase in gait variability measured using instrumented techniques has been associated with increased risk of falls in persons with Parkinson’s disease, decreased
functional performance and increased fall-risk in older adults. Recently research on breast cancer survivors (BCS) has focused on estimating fall-risk in this population attributed to gait performance. However, little is known about gait variability characteristics among BCS. PURPOSE: To assess the differences in gait variability among BCS compared to healthy controls during forward, backward, and accelerated forward walking. METHODS: 13 postmenopausal BCS (mean age: 58.5±8.5 years) and 8 healthy controls (mean age: 60.8±6.1 years) participated. Participants completed 5 trials each of forward, backward, and accelerated forward walking conditions on a 16x4’ Zeno walkway with a lead and follow-up distance of 1m to capture steady-state gait. Coefficient of variation (CV) was calculated as % of standard deviation over mean of 5 trials. CV of stride length, stance time, and stride width were used as dependent variables. A Group (BCS vs healthy controls) X Condition (forward, backward, accelerated forward walking) ANOVA was performed. RESULTS: Significant interaction for stance time showed that BCS had greater CV during forward (4.89±0.63%) and accelerated forward (6.94±0.78%) but lesser CV during backward walking (6.28±1.09%) compared to healthy controls (forward: 3.81±0.80%; accelerated forward: 4.23±1.00%; backward: 9.20±1.38%; P=0.018). Significant group main effect indicated that BCS (7.09±3.59%) had greater stride length variability compared to healthy controls (3.59±1.32%) across all conditions (P<0.05). Significant condition main effect was observed for stride length and stance time CV (both P<0.02) but not stride width (P=0.063). During forward walking, stride length (by 5%) and stance time (by 5.3%) CV were significantly less compared to backward walking (both P<0.004). There were no other significant differences. CONCLUSION: Increased stance time variability during backward walking and overall greater stride length variability may be indicative of increased fall-risk among BCS. Future studies need to examine other balance tests in conjunction with these measures to determine the level of fall-risk among BCS.

641 May 31 2:30 PM - 2:45 PM
Upper Body Accelerations During Walking are Altered in Individuals Post-ACL Reconstruction
Cornteny N. Armitano, Steven Morrison, Daniel M. Russell. Old Dominion University, Norfolk, VA. (Sponsor: David P. Swain, FACSM)
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One function of the trunk and neck segments is to act as a filter to dampen gait-related oscillations, so ensuring the head is stabilized. While persons with ACL reconstruction exhibit similar overall spatiotemporal gait features to healthy controls, there has been no direct assessment of whether ACL reconstruction impacts the ability of the upper body to attenuate oscillations while walking. PURPOSE: This study was designed to assess and compare the pattern of acceleration from the lower trunk, neck and head regions for individuals with reconstructed ACL compared to healthy controls during walking. METHODS: Seventeen participants with unilateral ACL reconstruction and 17 control persons matched for age, height, and weight participated in the study. Participants performed 3 trials of over-ground walking at their preferred pace (distance: 55 m). Acceleration were collected using three triaxial accelerometers attached to the head (occipital), neck (C7), and lower trunk (L3). Measures of amplitude (i.e., RMS, peak frequency power) and signal regularity (i.e., ApEn) of the acceleration data were performed. A within-subject, repeated-measures linear model was used to analyze the data. RESULTS: Similarities were seen between both groups with regards to the general acceleration patterns in all three axes with trunk acceleration generally being of greater amplitude (both RMS and peak power) than the head (p<0.05). However, the results also revealed that the individuals with ACL reconstruction had significantly greater peak power in the AP and ML directions at higher frequencies (3-10 Hz, p<0.05), indicating a reduced ability to attenuate frequency signals. Further, the ACL group had an increase in ApEn values for VT at higher frequencies (3-10 Hz, p<0.05), indicating a reduced ability to attenuate control head motion during gait. CONCLUSIONS: Both groups demonstrated a similar pattern of gait-related oscillations across the head, neck and trunk segments. However, adults with a reconstructed ACL demonstrated a reduced capacity to compensate for the higher frequency components of the gait signal, which may have led to a decline in head control. Overall, these findings indicate that previous damage to the ACL is not simply localized to the knee joint, but is widespread, impacting on upper body control as well.

642 May 31 2:45 PM - 3:00 PM
Characterizing Shank Angular Velocity During Gait in Individuals Post-ACL Using IMUs in Ecological Settings
Paige E. Lin, Gabriel M. Glasser, Ming-Sheng M. Chan, Susan M. Sigward. University of Southern California, Los Angeles, CA.
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(No relationships reported)

Individuals post ACL reconstruction (ACLR) exhibit decreased knee extensor moments during gait in the absence of visible gait deviations that can last up to 2 years post-surgery. Inertial measurement unit (IMU) derived shank angular velocities (skAV) can be used to detect knee extensor moment asymmetries during gait in individuals 3 months post-ACLR: providing a clinical tool for identification of altered mechanics. These methods could be expanded to quantify gait mechanics during daily activities if skAV asymmetry can be detected during more ecological gait tasks. PURPOSE: To compare skAV asymmetry during ecological gait in individuals 3 months post-ACLR to controls. METHODS: 7 individuals (4F, 33 ± 9.6 yrs) 84 ± 20 days post-ACLR without observed deficits and 5 healthy controls (4F, 24 ± 2.8 yrs) performed 2-5 bouts of unconstrained walking intermixed with standing and sitting. Sagittal skAV was measured using IMU tri-axial gyroscopes (128Hz) affixed to lateral shanks bilaterally. Peak negative skAV after heel strike was identified (2nd order Butterworth filter; high pass 0.25 Hz; low pass 6 Hz) using a previously validated algorithm. skAV for each limb was averaged for 20-231 continuous steps of gait per walking bout. skAV asymmetry was calculated as the ratio between surgical/non-surgical limbs (ACLR) and dominant/non-dominant limbs (control). Independent t-test was used to compare skAV ratios between groups; α ≤ 0.05. RESULTS: On average, skAV ratios were 0.89 ± 0.09 and 1.00 ± 0.09 for the ACLC and control groups, respectively (p=0.024). CONCLUSIONS: Consistent with previous studies, individuals after ACLC demonstrated reduced skAV in the surgical limb during loading response as evidenced by a smaller ratio compared to controls. Differences between groups during natural gait tasks performed with other daily tasks suggest that skAV asymmetries are detectable in less controlled settings. Given the capabilities of IMUs to collect and store large amounts of data, these data support the use of IMUs for assessing the quality of gait mechanics throughout the day. Understanding the extent to which individuals adopt altered loading outside of the laboratory is needed for the development of training interventions aimed at mitigating altered gait mechanics during early rehabilitation following ACLC.

B-15 Clinical Case Slide - Lumbosacral Spine I
Wednesday, May 31, 2017, 1:00 PM - 2:40 PM
Room: 504

643 Chair: Pierre Rouzier, FACSM. University of Massachusetts, Amherst, MA.
(No relationships reported)

644 Discussant: Jimmy D. Bowen. Advanced Orthopedic Specialists, Cape Girardeau, MO.
(No relationships reported)

645 Discussant: Robert C. Cantu, FACSM. Emerson Hospital, Concord, MA.
(No relationships reported)

646 May 31 1:00 PM - 1:20 PM
Low Back and Bilateral Posterior Hip Pain in an Adolescent Female
Jasmin Molsky Gooden, Michael Fong, Marissa S. Vasquez. Kaiser Permanente, Los Angeles, CA. (Sponsor: Aaron Rubin, FACSM)
(No relationships reported)

HISTORY: 14-year-old female presenting with persistent low back pain of insidious onset for 1.5 years. Patient initially managed at outside hospital. Work-up included MRI lumber that noted possible early lumbosacral facet arthritis. Pain persisted despite oral anti-inflammatory medications, functional modifications, and physical therapy. On presentation to our institution, patient was referred by primary care to rheumatology. Patient’s generalized low back pain noted to progress to involve the posterior aspect of both thighs with occasional weakness of the legs, right more than left. Pain worsened with prolonged walking and sitting. No radiating pain, night time or early morning pain, nor pain nor swelling of other joints. Rheumatologist recommended Naprosyn, advanced imaging, and referral to sports medicine.

PHYSICAL EXAMINATION: Normal neck exam; lower motor strength; muscle tone; and hip and back range of motion. No muscle atrophy. She had posterior hip tenderness in the Ichiya-gluteal region that worsened with resisted hip abduction. Negative FABERE, OBER, and straight leg raise. Negative FADIR for anterior hip pain; maneuver produced tenderness in gluteus region Femoral stretch equivocal bilaterally Positive Trendelenberg

DIFFERENTIAL DIAGNOSIS: - Spondyloarthropy - Bilateral Ischiofemoral Impingement - Bilateral Meralgia Paresthetica

Abstracts were prepared by the authors and printed as submitted.
TEST AND RESULTS: EMG LE (08/16): normal MRI Pelvis with/without contrast (05/08/16): 
- No osteonecrosis, joint effusion, synovitis.
- Narrowed ischiofemoral interval bilaterally: 11mm on left, 10mm on right; Quadratus femoral space measured 7mm on left, 9mm on right.
- Quadratus femoris soft tissue edema, Left more than Right X-rays (04/25/16): Normal alignment. No fracture. Spina Bifida Occulta at L5.

HLA-B27; Cocci IgG/IgM; ESR, CRP; ANA within normal limits MRI lumbar (04/17/15): facet arthritis

FINAL WORKING DIAGNOSIS: Bilateral Ischiofemoral Impingement.

TREATMENT AND OUTCOMES: 
1. Naprosyn - minimal improvement 
3. Ultrasound guided corticosteroid Injection to right quadratus femoris and relative rest. If symptoms improve will inject left quadratus femoris in 1-2 weeks post treatment.

History and Presentation: 22-year-old female presented to sports medicine clinic for acute on chronic coccyx pain. She initially sustained an injury 6 years ago when she slipped on some steps, pain resolved until 4 years ago when she slipped stepping out of a car. The pain at that time was identical to previous, with coccygeal pain when seated or supine for extended periods. X-rays were negative at the time, and her pain resolved with PT and meloxicam. She was lost to follow up for 2 years after that time, until she presented with increased pain again. No new injury, but pain feels similar. She has been unable to exercise including bike riding since the onset of her pain. She reported no ambulatory pain. She denied radicular symptoms, systemic symptoms, or bowel/bladder incontinence. PMH was unremarkable, non-smoker, no significant family history.

Physical Examination: Vitals were revealed and normal. No deformity of the lumbar spine, sacrum, or coccyx. She did have some mild tenderness to palpation at the sacral-coccyx joint, but range of motion was normal. Straight leg raise negative. Distal sacral plexus sensation intact. 

Differential Diagnosis:

Testing and Results: Repeat x-ray was negative for fracture, dislocation. There was some non-specific soft tissue edema around the sacral coccyx junction which is unclear. MRI was obtained which revealed a large expansile midline mass occupying the sacrum and coccyx and extending into the anterior pelvis measuring 7.2 x 9 x 8.5 cm. Tissue sampling would confirm a chordoma.

Final Diagnosis: Sacral chordoma Treatment & Outcomes: NSAIDs and opioids for pain control. Neurosurgical consultation. This patient’s treatment is still ongoing at time of submission. Initial surgical resection was modestly successful although the size of the tumor complicated complete resection Possible complications include chronic surgical site pain, nerve damage, continue chronic coccydynia. Median survival rate for sacral chordoma is approximately 7 years.

ACSM May 30 – June 3, 2017 Denver, Colorado
2. No findings to indicate transverse myelitis.

FINAL WORKING DIAGNOSIS: T8-9 intervertebral disc herniation resulting in myelopathy.

TREATMENT AND OUTCOMES:
1. Neurosurgery consult with no surgical intervention taken. Patient admitted for continued monitoring, PT, and OT.
2. Notable lower limb strength improvement seen over the first three days, however, acute inpatient rehabilitation was needed to assure ability for safe ambulation with impaired lower limb sensation.
3. After 12 days of inpatient rehab, lower body sensation was still impaired, but patient demonstrated improved lower limb strength and was ambulating with proper technique multiple times around the unit without assistance.
4. Patient discharged with outpatient therapy and a follow-up with neurosurgery in one month with repeat spine MRI.
5. Patient instructed to not return to cheerleading until follow-up.

PHYSICAL EXAMINATION:
Postural and quadratus lumborum muscle spasm were palpated. Straight leg raise test, sacroiliac mobility tests were negative on both sides. There was no strength and sensorial deficit. Lumbar lordosis increased.

DIFFERENTIAL DIAGNOSIS:
Facet joint syndrome
Fracture of lumbar vertebra (transverse or spinous process)
Spondylolysis (pars interarticularis defect)

TEST AND RESULTS:
Lumbar spine Computed Tomography:
– Chronic fracture at L5 level (pars interarticularis fracture)
– Scoliotic joint T1 and T2 weighted coronal and transverse plane MRI:
  – Right scoliotic joint subchondral lesion (anterosuperior side)
  – Left facet joint effusion (L5-S1 intervertebral disc level)

FINAL WORKING DIAGNOSIS:
Pars interarticularis fracture

TREATMENT AND OUTCOMES:
– 21 sessions of physiotherapy applied to decrease muscle spasm, gain painless range of motion and functional restoration.
– During therapy, lumbar orthoses was used to stabilization.
– Physiotherapist guided lumbar stabilization exercise applied (4 months follow-up, progression started with positional and went on dynamic and resistive tasks).
– Sport related running, one leg balance and coordination, agility tasks were performed with transversus abdominus muscle contraction.
– After therapy he has painless extension and running.

Thematic Poster - Behavioral Aspects and Correlates of Physical Activity in College Students

Wednesday, May 31, 2017, 3:15 PM - 5:15 PM
Room: 403

721 Chair: Janet Buckworth, FACSM. University of Georgia, Athens, GA.
(No relationships reported)

722 Board #1 May 31 3:15 PM - 5:15 PM
The Relationship Between Fitness App Use and Physical Activity Behavior Is Mediated By Exercise Identity
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(No relationships reported)

There is evidence that cell phone use is associated with greater sedentary behavior and decreased cardiorespiratory fitness. Conversely, certain cell phone functions (e.g., listening to music, mHealth care) may promote healthy behaviors. The use of cell phone based software applications designed to monitor and/or promote exercise behavior (i.e., fitness apps) are a cell phone function which may promote physical activity. However, the relationship between fitness app use and physical activity is not well studied.

PURPOSE: To assess the relationship between physical activity and fitness app use and then to determine if this potential relationship was mediated by measures of exercise identity (i.e., the degree to which someone defines themselves as being an exerciser).

METHODS: A sample of 351 (21.0 ± 2.1 years old, n = 201 females) college students were surveyed for: weekly vigorous, moderate, walking and total physical activity and sedentary behavior via the validated International Physical Activity Questionnaire, exercise identity via the validated Exercise Identity Scale and were asked to report the number of fitness apps they had on their cell phones. Participants were then split into groups of those who use one or more (apps group, dummy coded 1, n = 207) and do not use any (no apps group, dummy coded 0, n = 144) fitness apps.

RESULTS: Correlation analyses revealed that exercise identity was positively associated (r ≥ 0.13, p ≤ 0.02) with all measures of physical activity except walking (r = 0.06, p = 0.31). Exercise identity was inversely associated (r = -0.20, p < 0.001) with sedentary behavior. The app group reported a greater exercise identity (4.61 ± 1.6 app, 3.44 ± 1.8 no app, r = 0.32, p < 0.001) and participated in greater vigorous (2690 ± 2775 MET min per week app, 1651 ± 2344 MET min per week no app, r = -0.19, p < 0.001) and total (6541 ± 4091 MET min per week app, 5122 ± 4381 MET min per week no app, r = 0.15, p = 0.007) physical activity than the no app group. However, when controlling for exercise identity, via partial correlation, physical activity differences between groups were rendered non-significant (r = 0.04, p = 0.50).

CONCLUSIONS: Differences in weekly physical activity between participants who use at least one fitness app on their cell phone versus those with no apps were mediated by exercise identity.

723 Board #2 May 31 3:15 PM - 5:15 PM
Pokémon Go! Play May Promote Walking And Discourage Sedentary Behavior In College Students
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(No relationships reported)

Pokémon Go! is a downloadable video game for use on an internet-connected cellular telephone (cell phone). The game encourages the player to traverse real-world locations (e.g., neighborhoods) and tracks the player, via GPS, as they move through these locales. The purpose of the game is to find computerized characters as the player moves through the real-world locations. Because the game requires players to move through real-world locales, it may promote physical activity.

PURPOSE: The purpose of this study was to assess self-reported walking and sedentary behavior in young adults before and after downloading Pokémon Go!.

METHODS: A sample of 238 (19.5 ± 1.7 years old, n = 119 females) college students who had downloaded Pokémon Go! on their cell phone for a minimum of two weeks were surveyed for weekly walking and sedentary behavior via the International Physical Activity Questionnaire. Participants reported their walking and sedentary behavior at three time points: the week immediately preceding their download of Pokémon Go!.
Pokémon Go!, the first week after downloading the game and currently. Differences in self-reported physical activity and sedentary behavior across the three time points were compared via repeated-measures analyses of variance. RESULTS: There was a significant main effect of time (f² = 3.84, p ≤ 0.001) for walking and sedentary behavior. Participants reported greater (r = 0.74, p ≤ 0.001) daily walking during the first week after downloading Pokémon Go! (206 ± 138 min) and currently (191 ± 202 min) versus the week before downloading (105 ± 101 min). There was no difference (r = 0.11, p = 0.27) before the first week after downloading and current walking behavior. Participants reported greater (r = 0.65, p ≤ 0.001) daily sedentary behavior during the week before downloading (329 ± 219 min) versus both the first week after downloading (242 ± 181 min) and currently (255 ± 152 min). There was no difference (r = 1.5, p = 0.15) between the first week after downloading and current sitting behavior. CONCLUSIONS: Use of the popular, physically-interactive cell phone game, Pokémon go!, had effective influences upon self-reported physical activity (96% to 82% increase) and sedentary behavior (26% to 22% decrease). Such games promise a new technology that may promote physical activity and discourage sedentary activity.

Approximately 1 in 6 college aged adults in the United States engage in no leisure time physical activity. Still, a paucity of literature exists regarding what influences physical activity participation in this age group. PURPOSE: To determine the effects of social support on physical activity participation in college students enrolled in the HERD (Higher Education Reducing Diabetes) Study at Marshall University in Huntington, West Virginia. METHODS: The HERD Study is a prospective, randomized study examining the effects of a freshman year, healthy lifestyle intervention on the reduction of student’s risk factors for type 2 diabetes and cardiometabolic disease. Freshman students were recruited during the University’s Week of Welcome activities throughout the fall semester and randomly assigned to either the intervention or control groups. All other variables were obtained from a university database, including demographic data, alcohol consumption, exercise behaviors, and cumulative credit difference (CD, credits attempted - credits completed) among other variables. Matched samples (n=1,796; 898 pairs) were generated based on these relationships within intramural sports participation specifically rather than recreational sports as a whole. RESULTS: First semester cumulative GPA was significantly higher (p-value=0.001) for participants (3.25±0.63) than non-participants (3.07±0.78). First semester cumulative CD was significantly lower (p-value=0.001) for intramural sports participants (5.53±7.00) than non-participants (6.63±7.72). Finally, first year cumulative CD (p-value=0.001) was also significantly lower for participants (6.09±7.13) than non-participants (7.70±8.20). CONCLUSIONS: Results suggest that freshmen students participating in intramural sports during their first year of college achieve higher cumulative first semester and first year GPAs, and have a lower first semester and first year cumulative CD than students who do not participate in intramural sports. Future studies should investigate intramural sports participation and academic variables beyond the first year, and also include retention as an outcome variable.

An incongruous association between regular participation in physical activity (PA) and binge drinking (BD) among college students (CS) has been reported in the literature. PURPOSE: The purpose of this study was to qualitatively investigate the relationship between PA and BD among CS. METHODS: CS (18-24 years, non-varsity athletes) who were meeting the national physical activity recommendation (≥ 150 minutes/ week of moderate and/or vigorous PA) and reported consuming at least five or more alcoholic beverages in a single sitting within the previous 30 days were recruited to participate in the study. A trained facilitator asked open-ended questions based on the social ecological model during focus groups, separated by sex, to inquire about PA and BD experiences among CS. The sessions were audio-recorded and transcribed verbatim. Transcripts were analyzed by three researchers (first independently, then jointly) to determine emergent themes. RESULTS: Participants (n = 58, 19.7 ± 0.2 years, 76% Caucasian) described how PA and BD were related in their everyday lives as full-time students. Several intrapersonal, interpersonal, institutional and community factors were identified. The most frequently occurring theme among females (n = 25) was “caloric conscious.” “Damage control: healthy/unhealthy” was the most frequent theme/sub-theme among males (n = 33). CONCLUSION: The results indicate there are multiple social ecological levels that influence PA and BD behavior in CS. Although additional research is warranted, results of this study suggest that community level factors greatly influence several intrapersonal and interpersonal level factors described by participants. It is imperative that all social ecological levels are considered when designing interventions to promote PA and reduce BD among CS.

An extant research gap in the physical activity and alcohol consumption literature is the lack of information on whether PA and BD are related in college students in CS. PURPOSE: To investigate how SE is related to each component of HRF in male and female college students. METHOD: Participants included 399 male and 327 female college students (Mage = 20.57 ± 3.82 years) enrolled in a physical health and wellness course. Students completed survey items assessing exercise SE (Resnick & Jenkins, 2000) and a HRF battery (FITNESSGRAM®; Cooper Institute, 2013) assessing cardiorespiratory fitness (HRF), body composition, and overall health-related fitness. RESULTS: First semester cumulative GPA was significantly higher (p-value=0.001) for participants (3.25±0.63) than non-participants (3.07±0.78). First semester cumulative CD was significantly lower (p-value=0.001) for intramural sports participants (5.53±7.00) than non-participants (6.63±7.72). Finally, first year cumulative CD (p-value=0.001) was also significantly lower for participants (6.09±7.13) than non-participants (7.70±8.20). CONCLUSIONS: Results suggest that freshmen students participating in intramural sports during their first year of college achieve higher cumulative first semester and first year GPAs, and have a lower first semester and first year cumulative CD than students who do not participate in intramural sports. Future studies should investigate intramural sports participation and academic variables beyond the first year, and also include retention as an outcome variable.

Previous research has shown small, positive relationships between academic success and overall recreational sports participation. However, few studies have focused on these relationships within intramural sports participation specifically rather than recreational sports as a whole. PURPOSE: To investigate differences in cumulative grade point average (GPA) and cumulative credit difference (CD, credits attempted - credits completed) among intramural sports participants and non-participants following their first year of college. METHODS: Participants included first time, on campus, freshmen from the FS13 and FS14 semesters. Matched samples (n=1,796, 898 pairs) were generated based on cohort, high school GPA, race, socioeconomic status, first generation status, and gender. Intramural sports usage was obtained via an online database system (IM Leagues). All other variables were obtained from a university database, including GPA and CD. Means/SD and percentages were calculated for all variables of interest. Paired sample t-tests were used to assess differences in cumulative GPA and CD between participants and non-participants after first semester and first year time point.
Results: Among males, SE was weakly correlated with curl-ups (r = .11, p < .05) and push-ups (r = .14, p < .01), but SE was not significantly correlated with PACER, hand grip, or body fat percentage (p > .05). Among females, SE was significantly correlated with PACER (r = .23, p < .001), push-ups (r = .33, p < .001), handgrip (r = .23, p < .001), and body fat percentage (r = .22, p < .001), but SE was not significantly correlated with curl-ups (p > .05).

Conclusion: Overall, SE was weakly correlated to each component of HRF. Compared to males, females had slightly stronger correlations between SE and each component of HRF. The lack of moderate or strong relationships between SE and HRF may be due to the focus on academic outcomes in undergraduate courses. Thus, fitness class instructors should consider making additional efforts to promote SE among their students. Techniques could include positively reinforcing small improvements in fitness, discussing ways to overcome barriers, or helping students to experience success.

Board #7
May 31 3:15 PM - 5:15 PM
Motivational and Self-Perceptions of College Students Who Exercise for Different Reasons
James R. Whitehead, FACSM, Amanda Dufner, Jesse L. Rhodeas, Tanis J. Walch. University of ND, Grand Forks, ND. Email: james.whitehead@email.und.edu

College students exercise for a variety of reasons, but specific differences in their motivations and perceptions have not been extensively studied. PURPOSE: The main purpose was to see if students whose primary reason for exercise is to lose fat (FATCON), gain muscle (MUSC), or maintain health (HLTH) had differences in their exercise motivations, social physique anxiety, and body image self-perceptions. A secondary purpose was to explore if the participants’ supplement use reflected their exercise priorities. METHODS: Data were collected at a university Wellness Center, or from exercise classes. Participants (N = 216) completed a packet of four questionnaires: Multidimensional Body Self Relations Questionnaire (MBSRQ), Social Physique Anxiety Scale (SPAS), The Behavioral Regulation of Exercise Questionnaire (BREQ-3), and an ad hoc Dietary Supplement Questionnaire (DSQ).

RESULTS: MANOVA revealed a significant difference between groups (F (14, 350) = 4.89, p < .001). Post hoc tests showed significant differences between groups on six out of seven dependent variable scales. Specifically, MUSC was significantly higher in autonomous motivation than FATCON and HLTH (p < .001), but FATCON scores on SPAS, appearance evaluation, body areas satisfaction, overweight preoccupation, and self-weight classification were all less positive than the scores of MUSC and HLTH (p < .001 to p < .005). Supplement use was low in HLTH (11%), but higher in MUSC (49%). In addition, some of the supplements listed by MUSC were of questionable efficacy and safety. CONCLUSIONS: The majority of these college student exercisers were autonomously motivated, but those who exercised primarily for fat control had more negative body-related perceptions than those who exercised primarily for health, or for muscle gain reasons. Additionally, the data on supplement use indicates a need for consumer education, especially for those who report they are exercising primarily to gain muscle.

Board #8
May 31 3:15 PM - 5:15 PM
An Analysis Of Physical Activity Knowledge, Motivators, and Self-Efficacy In An Undergraduate Wellness Course
Monica M. Maldari¹, Michelle Scribner-MacLean², David J. Rice³. Fitchburg State University, Fitchburg, MA. ¹University of Massachusetts Lowell, Lowell, MA. ²Florida Southern College, Lakeland, FL. Email: mary@dreamfarhsm.org

Research suggests that many undergraduates do not achieve the minimum recommended amounts of physical activity (PA). These findings are concerning as habits developed during college are likely to be continued into adulthood. PURPOSE: The purpose of this investigation was to identify changes in health-related fitness knowledge (HRFK), PA practices, self-efficacy and motivations for exercise that occurred while participants were enrolled in a conceptually-based, mandatory, health and fitness course. METHODS: One hundred and thirty-five students (66 females) enrolled in the course (mean ±SD; age 19.89 ± 2.3 years; BMI 24.5 ± 5.24 kg/m²) completed a pre-course survey on the first day of classes and a post-course survey during the last week of classes. The survey collected demographic data and information on HRFK, PA practices, motivations, and self-efficacy for exercise. RESULTS: Analysis demonstrated that HRFK increased significantly (p<.001) during enrollment in the course. Self-efficacy and BMI values were largely unchanged between pre- and post-course values. Results for PA practices noted increases in miles walked (p<.05) and flights of stairs climbed (p<.05) per day. Significantly more (p<.002) male students reported muscle development, whereas significantly more (p<.046) female students reported weight management as a motivators for exercise. Motivations shifted slightly post-course with a significant increase (p<.014) in the number of females exercising for muscle development at the end of the course compared to beginning. Responses to Likert scale (1=Strongly Disagree, 5=Strongly Agree) questions on course outcomes revealed that most students “agreed” (4) that as a result of the course they understood physical responses to exercise training (M=4.3, SD= .67), improved understanding of their current fitness levels (M=4.0, SD = .69), and learned tools to design effective, individualized exercise plans (M=4.2, SD = .64). However, most students “neither agreed nor disagreed (3)” that they exercised more at the end of the course compared to the beginning. CONCLUSION: Enrollment in a conceptually-based, health and fitness course can increase HRFK over the course of the semester, however this increase in knowledge is not associated with concurrent increases in activity levels or self-efficacy.

B-40 Thematic Poster - Distance Running Issues
Wednesday, May 31, 2017, 3:15 PM - 5:15 PM
Room: 505

Chair: Adam S. Tenforde. Spaulding Rehabilitation Hospital, Cambridge, MA. Email: mary@dreamfarhsm.org

Board #1
May 31 3:15 PM - 5:15 PM
A 5-Year Descriptive Epidemiology and Performance Study of Adolescent Recreational Marathon Runners
Mary A. Kennedy¹, Matthew W. Penney², Dai Sugimoto², Anna N. Brilliant³, Christopher R. Cuna³, Pierre A. d’Hemecourt, FACSM⁴. DREAMFAR High School Marathon, Chestnut Hill, MA. ¹Advanced Sports Therapy, Wellesley, MA. 2The Michelli Center for Sports Injury Prevention, Waltham, MA. 3Boston Children’s Hospital Department of Orthopaedic Surgery and Division of Sports Medicine, Boston, MA. 4Harvard Medical School, Boston, MA.

PURPOSE: To descriptively examine injuries, treatments, and performance of adolescent recreational runners who trained for a half or full marathon from 2011-12 to 2015-16. METHODS: Musculoskeletal injuries and medical treatments of high school recreational runners who committed to a 30-week half or full marathon training program (mean=3.5 practices/week) were recorded by physical therapists over a 5-year period. The recorded information included number of injured participants, number of injuries, injury sites, diagnosis, and number of treatment sessions. Number of participants who completed a half or a full marathon at the end of the 30-weeks of training was recorded annually for the last 5 years. Obtained information was descriptively analyzed. RESULTS: Throughout the 5 training seasons, a total of 448 adolescent runners (age: 16.2±1.0 years; 55% female N=247, 45% male N=201) participated in the 30-week training period. During the training periods, 165 adolescent runners (36.8%) reported 225 musculoskeletal injuries (50.2%). The most common injury site was the lower leg (29.9%) followed by knee and ankle/foot as the second and third most commonly injured sites (25% each). Achilles/posterior/popliteal tendinitis was the most common injury diagnosis reported (16.1%) followed by patellar tendinopathy (14.7%) and shin splints (14.3%). Overall 87.1% of the injuries required 3 or fewer treatment sessions with a mean of 1.82 treatment sessions per injury. Of the 448 adolescent runners, a total of 441 adolescent runners completed either a half (N=62) or full marathon (N=379). The completion rate was 98.4% in this cohort following the 30-weeks of training. CONCLUSIONS: Despite the number of injured runners and reported injuries, most adolescent participants completed a half or full marathon following 30-weeks of training. Also, the injuries do not appear to be severe as evidenced by the low number of treatment sessions required and high percentage of students able to complete the race. Further research detailing volume of training with more precise measures of training time lost to injury is needed to more thoroughly validate these results.

Board #2
May 31 3:15 PM - 5:15 PM
Runner’s Perceptions And Expectations Of Medical Coverage At Ultramarathons
Jeff S. Lynn, Kim Keeley, Kristen Zaitz, Kelly Holzberger. Slippery Rock University, Slippery Rock, PA. (Sponsor: Patricia Pierce, FACSM)

As the popularity of ultramarathons grows, medical directors and staff could benefit from greater understanding of runners’ needs and expectations. PURPOSE: The purpose was to describe runners’ expectations and perceptions of medical coverage at 100-mile trail races. METHODS: A survey was distributed via email to 230...
registrants of a 100-mile trail race in the Northeast United States. Questions included expectations of medical coverage at ultramarathons as well as perceptions of coverage at prior races. RESULTS: One hundred sixteen runners completed the survey (98 men, 18 women, age=42.8). Ultramarathon experience ranged from 2-50+ races with runners reporting 1-20 years’ experience (mean 4.6 years). Ninety-one percent (n=110) of runners reported a medical issue during prior ultramarathons. The most common were chafing (n=81; 70%), blisters (n=66; 57%), muscle cramps (n=64; 55%), blood under toenail (n=56; 47%), and GI distress (n=47; 41%). Of those who received medical care during a race, 45 of 46 were satisfied with the treatment they received. Runners thought that medical aid should be available every 10 miles (n=49; 45%) or 20 miles (n=33; 30%) and should include medical tape (n=89; 81%), sodium (n=88; 80%), Band-Aids (n=88; 80%), anti-chafe products (n=86; 78%), emergency blankets (n=82; 75%), and ice packs (n=78; 71%). Runners reported carrying few medical items with them including sodium (n=65; 57%), anti-chafe lube (n=46; 35%) anti-inflammatories (n=39; 34%), and Band-Aids (n=28; 24%). While only 4% (n=4) of respondents believed that there are no conditions under which medical personnel should stop a runner from continuing, others thought that appropriate reasons include venomous bite (n=90; 84%), seizure (n=82; 73%), head injury (n=80; 71%), altered consciousness (n=70; 63%), irregular heart beat (n=60; 54%), chest pain (n=58; 52%), or blood in urine (n=56; 50%). CONCLUSIONS: Based on this small sample, a large percentage of ultramarathoners suffer from non-emergent conditions, but most do not seek medical care during the race. Those who sought treatment tended to be satisfied with the care received. Medical directors should provide supplies to care for skin care but have the expertise to recognize and treat more serious issues that may require the runner to stop.

We previously reported a high rate of medical complications (1/121 race starters) in a cohort of 65 865 runners participating in 21.1km and 56km races over a 4-year period (2008-2011) (SAFER study 1). PURPOSE: To determine if an online pre-race medical screening and educational intervention program reduces medical complications in distance running events. METHODS: An online pre-race medical screening (based on the European guidelines for pre-screening of leisure athletes participating in moderate- to high-intensity sports) and an educational intervention program was designed and introduced as part of the race registration process, in the period 2012 to 2015 at the Two Oceans Marathon races (21.1km and 56km). The incidence of medical complications (per 1000 starters, adjusted for age group, gender and race distance) of all medical complications in all runners by 29% [pre=8.6 (7.9-9.4); post=6.1 (5.6-6.7), (per 1000 starters, 95% CI; adjusted for age group, gender and race distance) of all medical complications in all runners by 64% [pre=0.6 (0.5-0.9); post=0.2 (0.1-0.4), p=0.0003, adjusted for age group and gender]. CONCLUSION: An online pre-race medical screening and educational intervention program significantly reduced medical complications and serious life-threatening complications among all runners in community-based mass participation distance running events. The reduction in all medical complications was significant in both the 21.1km and 56km races. Pre-race screening and educational intervention programs could be introduced to reduce medical complications during endurance running events.

There is an ongoing debate about the significance of cardiac troponin T (cTnT) elevation after strenuous exercise: heart muscle cell death versus physiologic mechanism of release through an intact cell membrane. While cTnT is a small molecule (37 kDa), cardiac specific myosin heavy chain-alpha (MHC-a) is much larger (224 kDa) and an increase after exercise could hardly be explained by passage through an intact cardiac cell membrane. PURPOSE: To measure MHC-a, and other biomarkers (C-reactive protein (CRP); cTnT; creatine kinase (CK), myoglobin (MG), creatinine (C), and N-terminal prohormone of brain natriuretic peptide (NT-proBNP) before and after a full distance Ironman in order to answer the question of heart muscle cell death versus physiologic changes. METHODS: In 52 non-elite athletes (14 female, 38 male; age 41.1 ± 9.7, range 24-70 years; all completed the race) biomarkers were measured by standard laboratory methods 7 days before, directly after, and day 1, 4 and 6 after the race. MHC-a was measured with a commercially available ELISA with no cross reactivity with other myosins. RESULTS: The course of MHC-a concentration [µg/L] was 1.33 ± 0.53 (before), 2.57 ± 0.78 (directly after), 1.51 ± 0.53 (day 1), 2.74 ± 0.55 (day 4) and 1.83 ± 0.76 (day 6). Other biomarkers showed a one-peaked increase with maximal values either directly after the race or at day 1: cTnT 76 ± 80 µg/L (12-440; reference <15), NT-proBNP 776 ± 684 ng/L (92-4700; reference < 300), CK 68 ± 55 µkat/L (5-280; reference < 1.9), MG 2088 ± 2350 µg/L (130-7000; reference < 72), and creatinine 100 ± 20 µmol/L (74-161; reference < 100), C 49 ± 21 mg/L (15-119; reference < 5). There was a significant correlation between MHC-a and NT-proBNP (R=0.48; p<0.001) but neither between MHC-a and cTnT (R=0.13; p=0.36) nor MHC-a and myoglobin (R=0.18; p=0.2). CONCLUSION: An Ironman leads to remarkable disturbances in biomarkers as e.g. cTnT was in the range of myocardial infarction in 100% of women and 97% of men. This is to our best knowledge the first investigation of MHC-a after strenuous exercise and its two-peaked increase most likely represents first release from the cytosolic pool and later from cell necrosis including the contractile apparatus. However, many questions remain, not at least why MHC-a baseline levels are as high as 1.33 ± 0.53 µg/L.
Hematological Changes in Elite Collegiate Cross Country Runners Residing at Moderate Altitude: A Retrospective Analysis

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PURPOSE: This study assessed selected seasonal hematological changes in elite male and female collegiate cross-country (XC) runners residing at a moderate altitude (1655 m). METHODS: Previously collected de-identified data from 29 members of the University of Colorado’s XC team (12 males, 17 females) were analyzed for this project. The data was part of the regularly scheduled monitoring of these athletes through the CU Sports Medicine program. This program involves blood samples being taken following a rest day, after an overnight fast, at five time points across the season, (August, October, January, April, and August of the new season). Hematological parameters measured included red blood cell count (RBC), hemoglobin concentration (Hb), hematocrit (Hct), mean corpuscular volume (MCV), red cell distribution width (RDW) and serum ferritin. A linear mixed model was used to assess changes over time, significance set at p < .05. For variables that violated the assumptions of the mixed model, a non-parametric analysis was used. RESULTS: Males (M) and females (F) had significantly different baseline values for Hct (%) (M: 46.5 ± 8 vs females (F): 43.0 ± 6) and Hb (gm/dL) (M: 16.3 ± 3 vs F: 14.6 ± 2), although they exhibited the same pattern of change across the season. Overall, Hct increased from baseline at the October time point (+5.4%) before returning to near baseline levels for the remainder of the season. Hb had a similar trend, being higher at the October time point (+2.2%, p = 0.083) before returning to near baseline levels. MCV (Aug-90.4 ± 6, Aug2-92.7 ± 1, Aug2-127.1 ± 1, Aug12-127.1 ± 1) were the only two variables whose August time points were significantly different. Serum ferritin (ng/mL) was stable over all five time points for males (average of all time points excluding January: 56.9). CONCLUSIONS: Hematological parameters were measured over five time points across the season. Hematological changes appeared to follow a pattern across each season, with the largest increase in Hct observed at the October time point. Serum ferritin was stable over all five time points for males.
RESULTS: Peak exogenous carbohydrate oxidation rates did not differ between GLU+FRU and GLU+SUC (1.2 g·min\(^{-1}\)) compared to GLU and were 46.8% higher when compared to GLU+FRU or GLU+SUC (1.9±0.12, 1.13±0.21, and 0.82±0.16 g·min\(^{-1}\), respectively, P<0.05).

CONCLUSION: Fructose co-ingestion (0.6 g·min\(^{-1}\)) with glucose (1.2 g·min\(^{-1}\)) provided either as monosaccharide or as sucrose strongly-increases exogenous carbohydrate oxidation rates during prolonged exercise in trained cyclists.

**Funding:** Knowledge Centre Sugar and Nutrition, Utrecht, the Netherlands and Sugar Nutrition UK, London, United Kingdom.

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**Purpose:** In the laboratory, the ingestion of multiple-transportable carbohydrates (fructose, glucose) in beverages at high rates (>1.3 g·min\(^{-1}\)) enhances exogenous carbohydrate oxidation, fluid absorption, gut comfort, and performance, relative to single carbohydrate equivalents. In competition, however, endurance athletes prefer single-transportable carbohydrates, as multiple-transportable carbohydrates in the mixed format also enhance competition performance is unknown. The objective of the study was to determine the effect of multiple- vs. single-transportable carbohydrate on triathlon race performance when ingested in the common format of bars, gels and drinks.

**Methods:** A double-blind randomized controlled trial was conducted within two sanctioned half-ironman triathlon races held 3 weeks apart in 74 well-trained male triathletes (18-60 y; >2 y competition experience). Carbohydrate was ingested before (94 g) and during the race from bars (25%), gels (35%) and drink (40%) comprising a 2:1 glucose/maltodextrin:fructose ratio vs 1:5 iso-energetic placebo glucose/maltodextrin only. Ingestion was apportioned by unit-distance covered during the cycle (2.5 g·km\(^{-1}\)) and run (7.8 g·km\(^{-1}\)) resulting in a 0.96±0.06 g·min\(^{-1}\) (MED), 1.29±0.07 g·min\(^{-1}\) (LOW), 90 g·h\(^{-1}\) (MED), 100 g·h\(^{-1}\) (HIGH)

**Results:** Total CHO oxidation was elevated, and total fat oxidation suppressed in HIGH compared to LOW (1.40±0.06 vs 1.29±0.07 g·min\(^{-1}\), ES = 0.70, P = 0.39) and more modest increase from the second hour in all conditions (ES = 1.38-2.00, P < 0.014). However, increasing GF dose beyond intestinal saturation increased exogenous carbohydrate oxidation and final hour (101.6±16.6 g·h\(^{-1}\) in HIGH, -23.5 to 11.1 g·h\(^{-1}\) higher [95% CI] vs. LOW, ES = 0.47, P = 0.61 & 16.1, 0.9 to 31.4 g·h\(^{-1}\) [95% CI]) higher vs. MED, ES = 0.68, P = 0.16, and second hour (ES = 0.51 & 0.48, P = 0.05). A small, non-significant reduction was seen in liver glycogen oxidation with HIGH in the last hour compared with LOW (-2.6, -5.6 to 0.4 g·h\(^{-1}\), ES = 0.40) and MED (-2.6, -6.8 to 1.6 g·h\(^{-1}\), ES = 0.42).

**Conclusions:** Increasing CHO ingestion beyond previously reported saturation rates produces higher exogenous oxidation, but results in an increased reliance on muscle glycogen. Ingestion of 90 g·h\(^{-1}\) GF can attenuate the rate of muscle glycogen oxidation by the end of 3 hours prolonged exercise, but recommendations should remain in the region of 80 to 90 g·h\(^{-1}\).

**Declaration of Interests:** This research was supported by the Swiss National Science Foundation (No relationships reported).
In this small sample of apparently healthy above average aerobic fitness and average body fat men, treadmill walking to expend 200 kcals in conjunction with BFRE resulted in significant less insulin needed to elicit the same glycemic response post exercise than CON.

Understanding the relationship between passive hip ROM and hip muscle activation during landing is needed to identify individuals at risk for knee injuries. PURPOSE: To examine the relationship between transverse plane hip passive ROM and hip muscle activation during a landing task. METHODS: Twenty female Division 1 soccer players (19.2±0.9yrs, 167.2±5.7cm, 65.9±6.6kg) volunteered to participate. Passive hip internal (HIR) and external (HER) ROM of the left limb was measured with participants prone and the knee flexed to 90 degrees using a digital inclinometer by a single examiner (ICC=0.87). The average of three HIR and HER ROM measures was used for analysis. Surface electromyography (sEMG) was used to assess activation of the gluteus medius (GMED) and glutus maximus (GMAX) during 3 trials of a drop vertical jump (DVJ) task from a 31 cm high box. The average root mean square amplitude (RMS) of the sEMG signal of the GMED and GMAX 150ms following initial contact across three DVJ trials was normalized to the peak RMS amplitude across three maximal voluntary isometric contractions (%MVIC). Pearson’s Product Moment Correlations were calculated to determine the relationship between passive hip ROM and muscle activation during the DVJ (p<0.05). RESULTS: Greater HIR ROM (39.9±11.1 degrees) was correlated with less GMAX activation during the DVJ task (RMS=0.61±0.40%MVIC, R=0.45, P=0.02). HIR ROM was not correlated with GMAX activation during the DVJ task (RMS=0.24±0.12%MVIC, R=0.38, P=0.10). HER ROM (30.6±8.1 degrees) was not correlated to GMAX (R=0.10, P=0.69) or GMD activation (R=0.21, P=0.37) during the DVJ task. CONCLUSIONS: Greater HIR ROM potentially influences the length-tension relationship of the GMAX, decreasing its ability to effectively activate during dynamic activities and increasing the risk of knee injuries. Ongoing work is needed to examine whether the effects of hip ROM on muscle activation contribute to landing biomechanics known to increase risk of knee injuries.

CONCLUSION: In this small sample of apparently healthy above average aerobic fitness and average body fat men, treadmill walking to expend 200 kcals in conjunction with BFRE resulted in significant less insulin needed to elicit the same glycemic response post exercise than CON.
Muscular activation and recruitment patterns of the hamstrings and quadriceps may play an important role in knee joint stabilization with unanticipated reactions during sport.

**PURPOSE:** To examine lower limb muscle activation during a lateral lunge jump reaction task.

**METHODS:** Female soccer players participated in the study (n=10, age: 15.1±1.0yrs, height: 162.3±6.4cm; mass: 54.5±4.5kg). While wearing standardized cleats, each participant was instrumented with reflective markers for motion analysis. Surface EMG sensors were placed on the semimembranosus (MH), biceps femoris (LH), vastus lateralis (LQ), and vastus medialis (MQ). While standing in a ready position (feet shoulder width apart, knees slightly bent) on force platforms covered with artificial turf, a visual cue of an arrow pointing either left or right was projected on a screen in front of the participant, at which time they were to lunge jump laterally in the correct direction as quick and far as possible. Right directed lunge trials were analyzed. Mean onset time was defined as greater than 0.9S above the resting threshold for RF on the visual cue. Peak root mean square EMG amplitudes of the left leg were calculated and normalized to maximum amplitude (%) during a cutting task. Reaction time (RT) was defined as the difference between the visual cue popup and left toe off from the force platform. Paired t-tests (p<0.05) were used to determine differences in muscle onset time and amplitude during the task. Stepwise linear regression was utilized to determine significant predictor variables for RT.

**RESULTS:** RT from visual cue to toe off was 0.99±0.10s. There was a significant difference (p=0.039) between LH (0.40±0.12s) and LQ (0.47±0.11s) onset times with no significant difference (p=0.2) between MH (0.42±0.09s) and MQ (0.48±0.10s) onset times. Differences were not found between peak EMG amplitude (LH: 67.2±24.9%, LQ: 80.9±8.2%, p=0.16; MH: 66.3±24.1%, MQ: 79.2±14.9%, p=0.18). Stepwise linear regression indicated that the single predictor variable of RT was LH onset time (R²=0.616, F(1,8)=12.81, p=0.007).

**CONCLUSION:** Earlier hamstrings activation may provide increased co-activation during an unanticipated reaction requiring a rapid lunge jump. However, quicker quadriceps activation is strongly correlated with improved reaction time performance.

**Electromyographic Activation Of Quadriceps In Single And Multi-joint Exercises**

Jessica F. Perle, Danilo S. Felipe, Tamires F. da Silva, Fabiano F. da Silva, Wonder P. Higino, Elisângela Silva, Wagner Z. de Freitas, Daniela G.M. Bueno, Dénis B. da Silva, Renato A. de Souza. IFSULDEMINAS, Muzambinho, Brazil. (No relationships reported)

Resistance training (RT) is a form of physical activity that is designed to improve muscular fitness. Considering the need to adequately prescribe RT, a better understanding about the effects of mono and multi-joint exercises is required, mainly using electromyographic (EMG) findings. **PURPOSE:** To compare EMG activation of quadriceps in mono- and open kinetic chain exercises. METHODS: Ten healthy male (25.3 ± 3.7) with no previous experience with RT were recruited. This study was conducted as a cross-over design; i.e., the subjects were randomly assigned either to mono-joint (n = 5; seated knee extension machine) or multi-joint (n = 5; back squat at knee joint angle of 90°) for the 1(st) trial and 15 days later the subjects were switched conditions for the 2(nd) trial. Surface electromyography was used to measure muscle activation of the vastus lateralis (VL), vastus medialis (VM) and rectus femoris (RF) using Root Mean Square (RMS) signal normalized by peak during dynamic contraction. A 12-RM test was used in order to promote some standardized load for both experimental situations. For statistical analysis a two-way ANOVA was performed. **RESULTS:** RF showed a lower (p<0.05) EMG activation than VL and VM in multi-joint exercise (26.81 ± 7.84% versus 33.43 ± 5.49% and 33.27 ± 4.96, respectively). In another way, RF showed a higher (p<0.05) EMG activation than VL and VM in mono-joint exercise (41.17 ± 5.08% versus 37.87 ± 4.94% and 37.12 ± 3.79%). Mono-joint exercise increased ~34% the EMG activation of RF than multi-joint exercise. There are no significant differences between the vastus (p>0.05). **CONCLUSION:** A mono-joint and open kinetic chain exercise promoted higher RF-EMG activation and not altered vastus-EMG activation when compared with a multi-joint and closed kinetic chain exercise. These findings suggest that EMG pattern may be muscle-dependent even within the same muscle group as the quadriceps.
Adequacy of activation during rapid voluntary contractions is limited in young and old adults and can be shown by comparing the voluntary rate of force development (RFD) and electrically evoked RFD. Nonetheless, it is unknown whether the activation of rapid voluntary contractions differs between young men and women.

**PURPOSE:** The purpose of this study was to compare the maximal RFD of young men and women during electrically evoked isometric contractions and rapid voluntary contractions with the knee extensor muscles across a range of torques.

**METHODS:** Eight young adults (18–26 years; 4 men, 4 women) consented to sets of single and double pulse (10 ms interval) stimulations of the femoral nerve at maximal intensities followed by rapid voluntary isometric knee extensions at target torques matched to the electrically evoked torques. For the rapid voluntary isometric contractions, subjects were instructed to kick as fast as possible rather than as accurately as possible. Voluntary target torques ranged between 10–40% of maximal voluntary contraction (MVC) and were set to match the electrically evoked torques. Maximal RFD for each trial (voluntary and electrically evoked) was calculated as the peak values of the first derivative of the torque signal.

**RESULTS:** Torques (between 10–40% MVC) were similar for the electrically evoked and voluntary contractions \((F_{1,12} = 0.54, P = 0.49)\) for both the men \((25.0 ± 0.6 \%\text{MVC} vs. 26.4 ± 0.7 \%\text{MVC})\) and women \((26.0 ± 2.0 \%\text{MVC} vs. 26.5 ± 2.7 \%\text{MVC})\).

Although torques were similar, RFD from electrically evoked contractions in men \((514.8 ± 30.4 \%\text{MVC} \cdot \text{s}^{-1})\) and women \((475.1 ± 78.0 \%\text{MVC} \cdot \text{s}^{-1})\) was 36% greater than the voluntary contractions (men: \(330.2 ± 18.8 \%\text{MVC} \cdot \text{s}^{-1}\), \(F_{1,12} = 23.1, P = 0.003\)). The linear association between relative torque (%MVC) and electrically evoked RFD \((R^2 = 0.85, b = 0.92, P < 0.001)\) was larger and steeper than the association with voluntary RFD \((R^2 = 0.72, b = 0.85, P = 0.001)\) indicating that the difference in RFD between the electrically evoked and voluntary contractions increased at the higher forces.

**CONCLUSIONS:** Young men and women had marked reductions in the ability to voluntarily generate isometric knee extension torque rapidly compared with electrically evoked contractions that were independent of the central nervous system.

Supported by NIA RO1 AG084262 to SKH

Sensorimotor deficits due to ankle sprains often result in altered lower extremity muscle activation during cutting. Interventions focusing on the ankle and hip could enhance muscle activation and subsequent sensorimotor function in patients with chronic ankle instability (CAI).

**PURPOSE:** To examine the effect of a 6-week ankle and hip intervention program on vastus lateralis (VL), medial hamstring (MH), gluteus medius (GM), and gluteus maximus (GX) activation during cutting in patients with CAI.

**METHODS:** 15 CAI subjects in a rehab group (23±2 yrs, 178±8 cm, 76±9 kg, 83±7% FAAM ADL, 3.4±1.2 FAAM Sports, 5.9±3.3 sprains). Subjects performed 10 jumps on a force plate, ankle disk, etc.) 3 times/week for 6 weeks under supervision. 14 CAI subjects participated in a control group (22±2 yrs, 177±9 cm, 75±12 kg, 81±9% FAAM ADL, 5.6±12% FAAM Sports, 3.4±1.2 FAII, 5.9±3.3 sprains). Subjects performed 10 jumps consisting of a max vertical jump plus a side cut. Functional analyses (α=.05) were used to detect a group x treatment interaction over time. If 95% CI did not cross the line of identity, a significant interaction was detected.

**RESULTS:** Torques during cutting \((514.8 ± 30.4 \%\text{MVC} \cdot \text{s}^{-1})\) were similar for the electrically evoked contractions that were independent of the central nervous system.

**THURSDAY, MAY 31, 2017

**B-43 Thematic Poster - Running**

**B-43 Thematic Poster - Running**

**Wednesday, May 31, 2017, 3:15 PM - 5:15 PM**

**Room: 404**

**Chair:** Andy Bosak. Liberty University, Lynchburg, VA.

**No relationships reported**

Walking and running are widely used modes of exercise to improve fitness and promote weight loss. The energy expended during walking or running can be measured in a lab or estimated based on speed, grade, and body weight. However, these assessments are not easily completed by the general population, so a crude estimate of energy expenditure (EE) of 100 kcal/mile\(^{-1}\) is commonly used. Although the equations for estimating EE at a given walking or running speed have been validated, the accuracy of the 100 kcal/mile\(^{-1}\) value has not been evaluated.

**PURPOSE:** The purpose of this study was to determine the accuracy of the 100 kcal/mile\(^{-1}\) estimate across a wide range of walking and running speeds.

**METHODS:** A sample of 21 subjects (age 23.6±8.8 y) walked or ran one mile at a self-selected speed on a motorized treadmill while VO\(_2\) was measured. The EE was calculated from VO\(_2\) measured after subjects achieved steady-state. The significance of differences in measured EE and the 100 kcal/mile\(^{-1}\) estimate were determined using t-tests.

**RESULTS:** There were no significant differences between the measured EE and the 100 kcal/mile\(^{-1}\) estimate (108.6±31.5 vs. 100±0 kcal/mile\(^{-1}\), p=0.22) across both running and walking speeds (range: 72.4-187.6 m\(^{-1}\)). There were also no significant differences between the actual and estimated EE at walking speeds (95.6±12.6 m\(^{-1}\); 100.1±23.1 vs. 100.0 kcal/mile\(^{-1}\), p=0.98) or running speeds (158.8±19.4 m\(^{-1}\); 115.0±36.2 vs. 100.0 kcal/mile\(^{-1}\), p=0.18). However, the measured EE during running was significantly higher \((p=0.03)\) than during walking.

**CONCLUSION:** The widely used EE estimate of 100 kcal/mile\(^{-1}\) appears to be accurate across a wide range of walking and running speeds. While the measured EE during running was significantly higher than during walking, neither was significantly different from the 100 kcal/mile\(^{-1}\) estimate. This suggests that this value may be useful for estimating EE for fitness or weight loss purposes in a general population.
Reduced body mass and/or relative fat mass is expected to improve endurance running performance, by lowering energy cost of running and allowing the runner to maintain higher mean race velocity using identical %VO2max. The majority of studies during the last 40 years have been centered mainly on the effect of adding external load on energy cost of walking and running. PURPOSE: The purpose of this study was to examine the effect 5% and 10% reduction of inactive body mass on metabolic responses and 3km running performance. METHODS: Eleven trained (8 male, 3 female) club level runners (mean ± sd body mass, 75.8 ± 3.55%, 56.30 ± 4.57 ml.kg⁻¹.min⁻¹ and 17.1 ± 1.4 km.h⁻¹ respectively) participated in a series of 4 maximal trials 4-6 days apart. During the first trial, the subjects completed an exhaustive incremental peakVO2 test on the treadmill. On the second visit they completed a 3 km race time trial on the treadmill running with normal body mass (BM). During the last two visits the subjects completed two 3 km race trial in random order on the treadmill while body mass (a rope through a system of pulleys lifted the runner with the calculated body weight throughout striding phases while not interfering with running technique) was reduced 5% (5%BM) or 10% (10%BM). Repeated Anova was used for the statistical analysis. RESULTS: Mean (sd) 3km race performance time was lowered (improved) during 5%BM (663.5 ± 76.05 s) and 10%BM (648.9 ± 74.9 s) trials (p<0.05) compared with BM (684.9 ± 74.8 s). The 5% and 10% reduction in body mass induced a mean 3.1% and 5.2% improvement in 3km race performance accordingly. Every kg reduction of inactive body mass improved 1.4% running endurance performance. Mean values of the Rate of perceived exertion, heart rate, VO2 ml.min⁻¹, RO, Blood lactate and Volume of expired air were not different between time trials and peak VO2max test (p<0.05). CONCLUSIONS: The results of the present study showed that the reduction of 5% and 10% of inactive body mass may improve significantly 3km performance time without noticeable effects on metabolic parameters and are supportive of the notion that one way to maximize further running performance is to reduce inactive body mass.

Due to the fact circuit weight training (CWT) maximizes exercise density by minimizing rest intervals, individuals with limited time to exercise may rely on CWT to meet caloric expenditure with progressive adaptations for the prevention of weight gain. Exercise density may lead to an inaccurate perception of energy expenditure (EE). PURPOSE: To compare acute EE indices and RPE between traditional CWT and an equivalent bout of treadmill running (T). METHODS: College-aged males (n=9) regularly engaged in running and resistance training volunteered. CWT session was performed first and consisted of 10 resistance training stations performed for 30 sec each at 40%IRM for 20 min. HR (Polar monitor) and EE (Cosmed K4 b2) were monitored continuously, and RPE (0-10) was assessed after each exercise session. A 20 min T session occurred 2 days later at the average HR maintained during CWT. A dependent samples t-test was used to determine significant differences between RPE, total EE (TEE, kcal), rate of EE (REE, kcal/min), and relative rate of EE (RREE, kcal/kg·min). Pearson’s correlation was used to assess the relationship between EE and RPE. RESULTS: The average HR elicited by CWT was 58% HRR, a value within ACSM recommendations for aerobic conditioning. There was a significant association between RPE and EE indices for either CWT or T. *P<0.001

CONCLUSIONS: CWT elicited an average HR suitable for aerobic conditioning. At equivalent HRs, CWT resulted in a significantly higher RPE and not significantly lower EE. It is imperative for participants engaged in CWT to understand that although CWT results in HR values within an aerobic training zone and feels more strenuous than T, it is not associated with greater acute energy expenditure than steady-state treadmill running.

ACSM May 30 – June 3, 2017
Denver, Colorado
Running shoe features (low mass, cushioning, midsole bending stiffness) have been shown to individually reduce the energetic cost of running. Recently, energetic cost has been directly linked to time-trial performance.

**PURPOSE:** To quantify the energetic cost of running in three marathon racing shoes: a prototype and two shoes currently available to runners. **METHODS:** 18 sub-elite runners (sub-3:1min 10km at altitude or equivalent; altitude VO2max: 72.1±3.4 ml O2/kg/min) ran six 5 min trials (3 shoes × 2 replicates) in: a prototype shoe (NP), and two established marathon shoes (NS6 and AB2), all equilibrated to 250g/shoe (the mass of AB2, size 10) during three separate sessions - 14, 16 and 16 km/hr. The order of the shoe conditions within a session and the session speed order were pseudo-randomized, mirrored and counterbalanced. The NP shoe has a novel, lightweight and highly resilient midsole and a carbon fiber plate that stiffens the shoe in longitudinal bending. We measured submaximal VO2 and VCO2 during min 3-5 and averaged metabolic rate (W/kg) for the 2 trials in each shoe model. Blood [La] measured after the last trial of each session and RER indicated running energetics were at steady-state (>3.0 mmol/L and <0.91, respectively). We compared the 3 shoe over 3 speeds using a two-way ANOVA with repeated measures. **RESULTS:** A significant main effect for shoe (P<0.0001) indicated the NP shoes required 4.0±1.3% (mean±SD) less energy than the NS6 and AB2 shoes (NP vs. NS6: P<0.001; NP vs. AB2: P<0.0001), which had similar metabolic costs (NP vs. NS6: 0.05±0.09; NS6 17.1±10.92 and AB2 17.1±0.97 W/kg averaged across 3 speeds. Although the shoe × speed interaction effect was significant (P<0.0005), post-hoc analyses suggest that relative percent differences between shoes were similar at the 3 running speeds (all P>0.56).

**CONCLUSIONS:** The new shoe reduces the cost of running by 4.0% as compared to two other established marathon racing shoes. This study was supported by Nike Inc. EF and GL are employees of Nike Inc., RK is a paid consultant to Nike Inc.
researchers were blinded to treatment. Maximum ear swelling occurred at 24 hours post injection. Results were expressed as the difference between the right and left ear thickness.

RESULTS: We found a significant time main effect (p<0.001) indicating a significant increase in anti-OVA IgG at one, two and four weeks relative to pre-immunization. However, there were no significant time x treatment (p=0.652) nor treatment main effects (p=0.764). There was a significant difference between ECC and SED groups in ear DTH at 24 hours post injection (p=0.028), indicating eccentric exercise increased the DTH response.

CONCLUSION: Acute eccentric exercise immediately before vaccination improved the DTH (i.e. cell-mediated immune), but not the antibody, response to vaccination in aged mice.

**Table 1. Inflammatory markers and changes in body weight in boys and girls before and after the intervention.**

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EX</td>
<td>CON</td>
</tr>
<tr>
<td>Baseline MCP-1 (pg/uL)</td>
<td>256±17</td>
<td>258±26</td>
</tr>
<tr>
<td>Baseline IL-6 (pg/mL)</td>
<td>0.9±0.6</td>
<td>0.7±1.0</td>
</tr>
<tr>
<td>Baseline TNF-alpha (pg/uL)</td>
<td>4.4±0.3</td>
<td>3.4±0.5</td>
</tr>
<tr>
<td>Percent change MCP-1 (%) #</td>
<td>12±5</td>
<td>7±8</td>
</tr>
<tr>
<td>Percent change IL-6 (%) #</td>
<td>52±23</td>
<td>55±35</td>
</tr>
<tr>
<td>Percent change TNF-alpha (%) #</td>
<td>0±5</td>
<td>8±7</td>
</tr>
<tr>
<td>Change in weight (kg) *</td>
<td>2.3±0.5</td>
<td>0.4±0.8</td>
</tr>
</tbody>
</table>

* Significant sex by group interaction # Significant main effect of sex

**Supported by NIH RO1DK071081**

Evidence recent implicates chemokine (C-C motif) ligand 5 (CCL5, also known as RANTES) and its receptor CCR5 in mediating T cell infiltration into adipose and other tissues, which contributes to chronic low-grade inflammation in obesity and type 2 diabetes (T2D). Exercise may relieve obesity-related inflammation but the effects of interval training on T-cell migration and tissue infiltration in T2D are unknown. PURPOSE: To examine the impact of interval walking training (IWT) versus continuous walking training (CWT) on circulating RANTES along with T cell and adipose tissue CCR5 in patients with T2D. METHODS: Participants with T2D were randomized to control (n=8), IWT (n=12) or CWT (n=12). Training groups were prescribed five 60-minute sessions per week of free-living training with intensity monitored with an accelerometer and heart rate monitor. Fasting blood samples and subcutaneous abdominal adipose tissue biopsies were obtained before and 6 days after completion of the 16-week intervention period. Plasma RANTES was measured by ELISA. Peripheral blood mononuclear cells (PBMCs) were isolated for subsequent measurement of CD8+ T cell CCR5 surface protein expression using flow cytometry. mRNA expression of RANTES, CCR5 and CD8 were measured in subcutaneous adipose tissue biopsy samples by qPCR. RESULTS: Training duration and mean intensity were well-matched between IWT and CWT. A significant group X time interaction (p<0.05) was detected for CD8+ T cell CCR5 surface protein expression, with post-hoc tests revealing a reduction of ~20% after IWT (p<0.05) with no changes seen in CWT or control. Plasma RANTES concentration and adipose tissue mRNA expression of RANTES, CCR5 and CD8 were not altered in IWT, CWT, or control groups following the intervention period (all p>0.05). CONCLUSIONS: Sixteen weeks of IWT, previously shown to benefit physical fitness, insulin sensitivity, body composition, and glycemic control in patients with T2D, resulted in lower CD8+ T-cell CCR5 protein expression. These findings suggest lower migratory potential for circulating T cells but future research is needed to determine if IWT influences infiltration of T cells into adipose and other tissues. JPL is funded by a CHIR New Investigator Award (MSH-141890)
Acute dynamic exercise enhances Natural Killer (NK) cell cytotoxicity against HLA-expressing tumor target cells. This enhanced killing capacity of NK cells occurs during recovery from exercise. A preferential repleteploidy of NK cells with an activated phenotype has been proposed as one mechanism to explain increased function. However, NK cells frequently co-express activating and inhibitory molecules, complicating interpretation of earlier results that have failed to fully characterize the mobilized cells. PURPOSE: To thoroughly investigate changes in NK cell phenotype due to acute dynamic exercise. METHODS: 12 physically active adults accustomed to cycling exercise cycled for 30 minutes at 115% of lactate threshold power. Blood collected pre-, post-, and 1h post-exercise was analyzed using 10 parameter flow cytometry to identify NK cell subsets present at each time point. NK cytotoxicity against the HLA-expressing U266 tumor cell line was assessed following a 4h incubation using a flow-based assay. Differences in NK cell cytotoxicity and NK cell subset proportions between the three time points were assessed using maximum likelihood linear mixed models. RESULTS: Similar to earlier reports, NK cell cytotoxicity per cell against U266 tumor cells was highest 1h post exercise (0.36 ± 0.67 vs 37.2 ± 6.7%; p<.05). The co-expression of inhibitory receptors (CD158a, CD158b) and markers of late differentiation. These terminal differentiation marker CD57 were at their lowest proportion 1h post exercise (31.6 ± 6.7 vs 37.2 ± 6.7%; p<0.05). CONCLUSIONS: Enhanced NK cell cytotoxicity against HLA-expressing tumor target cells 1h following exercise corresponded to changes in NK cell phenotype towards expression of activating receptors (NKG2C), and away from inhibitory receptors (CD158a, CD158b) and markers of late differentiation. These data lend support to the growing idea that acute exercise may be used clinically to enrich the blood of cytotoxic NK cells for immunotherapy.

Monocytes express the CD14 receptor involved in LPS ligation to TLR4 and subsequent production of anti-inflammatory (IL-6 and IL-10) and pro-inflammatory (TNF-α) cytokines. However, under pro-inflammatory conditions, there is an increased proportion of monocytes expressing the CD16 receptor, which amplifies TLR4-mediated TNF-α production. PURPOSE: We therefore examined the hypothesis that decreased proportions of classical monocytes (CD14+/CD16-) and LPS expression following maximal exercise would be accompanied by reduced CD14 expression. Conversely, the mobilization of pro-inflammatory monocytes (CD14+/CD16+) expressed elevated TLR4 would exhibit increased CD14 and CD16 expression. Concomitantly, LPS-stimulated ex vivo production of IL-6 and IL-10 would be attenuated, while TNF-α would be enhanced post exercise. METHODS: Human mononuclear cells (n = 25) were isolated prior to and following exercise to assess CD14, CD16, and TLR4 expression by flow cytometry. RESULTS: Exercise reduced the proportion of classical monocytes and increased pro-inflammatory monocytes. In addition, TLR4 expression decreased to a greater extent on classical compared to pro-inflammatory monocytes. However, while CD14 expression was reduced on all monocytes, CD16 expression tended to increase on pro-inflammatory monocytes. LPS-stimulated production of IL-6 and IL-10 was also significantly decreased, while TNF-α significantly increased. CONCLUSIONS: Exercise shifts monocytes towards a pro-inflammatory phenotype, raising additional questions regarding the anti-inflammatory impact of chronic exercise and the mechanisms involved monocyte immune function.

Despite the known benefits of physical activity on physical, cognitive and mental health, there is a trend in many countries to decrease physical activity opportunities for children and adolescents during the school day. PURPOSE: To investigate the influence of a school-based intervention with a tripling of physical education (PE) lessons from two (90 min) to six lessons per week (270 min) added to the normal curriculum on scholastic performance in school-aged children. METHODS: This study is a part of the CHAMPS study-DK, a quasi-experimental study that began in 2008. The intervention group consisted of six schools and four matched schools served as the control group (mean age at baseline ~ 8.4 years). Academic performance was extracted from the Danish national test system from 2010 to 2014 (Math and Danish were measured at 3rd and 6th, and 2nd, 4th and 6th grade, respectively). Participants for this investigation include 1,888 students, participating in at least one national test of scholastic performance. Mean of three different domains (Danish: language understanding, decoding, and text comprehension, and Math: algebra, geometry, and basic mathematics skills) were obtained as the test results (from 0-100 points). Mother’s educational status was used as an indicator of socioeconomic status (SES). Linear mixed models were applied to test for differences between Groups. RESULTS: No significant differences were observed between groups in any of the academic performance tests (control group reference); Danish 2nd grade β = -1.34 (95% CI -9.90, 7.22), 4th grade β = -0.22 (95% CI -6.12, 5.66), 6th grade β = 1.03 (95% CI -5.02, 7.08) and all grades combined β = -0.28 (95% CI -5.74, 6.31) and Math 3rd grade β = -2.87 (95% CI -9.65, 3.90) and both grades combined β = -1.28 (95% CI -8.10, 5.71). Across groups girls performed significantly better in Danish, whereas boys performed better in Math (all p < 0.05). CONCLUSIONS: No significant differences were observed between intervention and control schools for scholastic performance, which may be interpreted as a positive result, given that a tripling of PE did not result in a cost to scholastic performance. Such findings suggest that increasing physical activity opportunities during the school day does not detract from academic goals, although making the school days longer.

purpose: To evaluate the Kaiser Permanente Thriving Schools Initiative, a program designed to increase physical activity (PA) in Colorado public schools. METHODS: This cross-site examination evaluated 27 public school districts funded to incorporate PA into the school day, operationalized as classroom PA (CPA), shifts after school program (BPA, and PA occurring in physical education classes or recess (PERPA). All data were collected during the 2014-2015 academic year using an online data management system. CPA were collected by asking randomly selected teachers in each school to report classroom PA during a one-week period, 2-3 times each semester. Programming for BAPA was reported by each district’s health coordinator and included day w’ offered, min d’ offered, and number of students participating. PERPA schedules were collected for each school and entered into an aggregate database containing all PA. Mean minutes of PA d’ calculated was using the sum of CPA, BAPA, and PERPA

Abstracts were prepared by the authors and printed as submitted.
girls and 48 boys (age=7.9 ± 0.7 yrs, range=7-9 yrs) were an accelerometer during 7 consecutive week-days over the right hip area. A filter was created to determine DSST for those children who wore the accelerometer during at least 3 weekdays. The SPE was evaluated taking into consideration the physical education class, recess time, and use of facilities that promoted PA. Time in physical education and recess was provided by the school’s administration. To determine the use of facilities, a score was generated based on self-reported activities during school, and the time spent in each activity. Correlation analyses were conducted to test the relationship between: 1) physical education class (min/wk) and DSST (hr/wk); 2) recess time (min/wk) and DSST (hr/wk); and 3), use of school facilities (score) and DSST (hr/wk). RESULTS: DSST was different by gender (girls: 4.3 ± 0.5 hr/wk; boys: 4.4 ± 0.3 hr/wk; p = 0.01) and type of school (private: 4.3 ± 0.4 hr/wk; public: 4.6 ± 0.2 hr/wk; p = 0.04). No relationship was observed between DSST and time in physical education (r = -0.15, p > 0.05), or use of facilities that promoted PA (p = 0.001, p < 0.05). However, a direct association between DSST and recess time was observed (p = 0.34, p < 0.01). CONCLUSION: Although the average DSST was very low in this group of children, more recess time was associated with more DSST. More research is needed to confirm these observations, and the importance of school interventions to discourage sedentary time during recess time. Funded by University of PR-FIPI Institutional Grant.

**PURPOSE:** Addressing athletic competence (AC) may shape children’s physical activity (PA) behaviors through participation in organized and unorganized PA, but these opportunities may be limited in low-income children. We aimed to assess the association between children’s perceived AC and daily moderate-to-vigorous PA (MVPA) and whether socioeconomic status (SES) modifies this relationship.

**METHODS:** Schoolchildren (n=1157; grades 3-4) were recruited from 24 schools in Massachusetts communities to participate in the Fueling Learning through Exercise study. Demographic data were collected by parent report. Free or reduced price lunch (FRPL) eligibility was used as an indicator of SES. Seven-day accelerometer data were collected by parent report. Free or reduced price lunch (FRPL) eligibility was used as an indicator of SES. Seven-day accelerometry (Actigraph GT3X+) was used to measure MVPA. Measured height and weight were used to derive weight status category. The AC domain (6 items, scored 1-4) from the Harvard Self-Perception Profile for Children was used to assess perceived AC, and categorized by tertiles into low, moderate, and high. The association between AC and MVPA were examined using mixed effects models adjusting for sex, race, grade, FRPL, weight status category, accelerometer wear time, and controlling for school-level clustering.

**RESULTS:** Of those participants with valid accelerometer wear time of ≥3 days and ≥10 hr/day (n=1054, 44% male, 87±0.7 years), 81% did not meet the 60-min MVPA recommendation (44.9±20.1 min/day). AC scores differed by sex (high AC=37% male vs. 31% female; p<0.05) and FRPL eligibility (high AC=42% non-FRPL eligible vs. 28% FRPL eligible; p<0.001). A significant interaction between FRPL eligibility and AC was found (p<0.01). Non-FRPL eligible children who reported either moderate AC (β=10.9 mins/day; 95% CI: 1.1, 2.0; p<0.01) or high AC (β=9.4 mins/day; 95% CI: 1.0, 2.4; p=0.05) were more likely to engage in more MVPA compared to children who reported low AC. This association between AC and MVPA did not exist for FRPL-eligible children (p>0.05).

**CONCLUSION:** Self-reported AC was positively associated with MVPA, but not for low-income children. These findings suggest that AC may not correlate with greater engagement in PA behaviors among low-income children. Further research is warranted to assess which social and environmental factors affect the association between AC and MVPA.

**Background:** Short and long term exposure to prolonged sitting is associated with excess food intake and weight gain in children. Interrupting prolonged sitting with low-intensity activity does not alter subjective appetite sensations or food intake

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concluded that short-term follow-up of program implementation during a two-year period (p=0.041) with Control and JM increasing in SED (6.2 [95%CI: 2.7, 9.5], p<0.001 and 233 ± 43 min) of their school day. There was a significant effect of program on SED of school-time MVPA (9%; 18.1 ± 7.9 min) and children were sedentary for 59.7% both study visits. At baseline, few children achieved the recommended 30 minutes of physical activity (MVPA) tends to decrease while sedentary time (SED) increases, contributing independent effects on health outcomes. There is insufficient research on activity performed at a higher intensity will alter appetite sensations in children. PURPOSE: The purpose of this study is to examine the acute effects of interrupting prolonged sitting with intermittent activity performed at varying intensities on hunger, satiety, and prospective food consumption (PFC) in elementary school-age children. METHODS: Using a randomized crossover design, thirty-nine children (ages 7-11 years; 18 male, 21 female; 33% overweight/obese and 59% non-white), completed four experimental conditions: 8 hours of sitting interrupted with 20, 2-minute low-intensity (L), moderate-intensity (M), or high-intensity (H) activity breaks or 20, 2-minute sedentary (S) screen time breaks. Exercise intensity for the L, M, and H conditions corresponded with 25%, 50%, and 75% of heart rate reserve, respectively. Hunger, satiety, and PFC were measured at baseline (Fall 2015) and short-term follow-up (Spring 2016) for each experimental condition. RESULTS: Satiety sensations tended to be lower during the L and H conditions compared to the S condition (S: 5.3±0.3, L: 4.8±0.3, M: 5.2±0.3, H: 4.7±0.4, p<0.05). There were no significant differences across conditions for hunger (S: 4.6±0.3, L: 4.6±0.3, M: 4.6±0.3, H: 4.7±0.3, p=0.99) and PFC (S: 4.5±0.3, L: 4.4±0.3, M: 4.5±0.3, H: 4.7±0.3, p=0.06). There were no significant differences between post-breakfast vs. post-lunch scores (p<0.05), and pre-lunch vs. pre-dinner scores (p>0.05). CONCLUSIONS: These data suggest interrupting prolonged sitting with moderate-intensity activity may be an effective strategy to increase physical activity energy expenditure without triggering increases in hunger and PFC or reductions in satiety. Future studies should examine the long-term effects of interrupting prolonged sitting with activity on appetite sensations, food intake, and weight outcomes in elementary school-age children.

May 31 4:45 PM - 5:00 PM
The Fueling Learning Through Exercise (FLEX) Study: Short-term Findings On Sedentary Time In Lower-income Schoolchildren
Jennifer M. Sachcek, FACSVM1, Catherine Wright1, Sarah Amin1, Stephanie Anzmann-Frasca2, Virginia Chimoziz1, Kenneth Chui2, Miriam Nelson, FACSFM, Christina Economos1. 1Tufts University, Boston, MA. 2University of Buffalo, Buffalo, NY. (No relationships reported)

PURPOSE: Throughout the elementary school years school-time moderate-to-vigorous physical activity (MVPA) tends to decrease while sedentary time (SED) increases, contributing independent effects on health outcomes. The purpose of this study is to examine the acute effects of interrupting prolonged sitting with intermittent activity performed at varying intensities on hunger, satiety, and prospective food consumption performed at varying intensities on hunger, satiety, and prospective food consumption (PFC) in elementary school-age children. METHODS: Using a randomized crossover design, thirty-nine children (ages 7-11 years; 18 male, 21 female; 33% overweight/obese and 59% non-white), completed four experimental conditions: 8 hours of sitting interrupted with 20, 2-minute low-intensity (L), moderate-intensity (M), or high-intensity (H) activity breaks or 20, 2-minute sedentary (S) screen time breaks. Exercise intensity for the L, M, and H conditions corresponded with 25%, 50%, and 75% of heart rate reserve, respectively. Hunger, satiety, and PFC were measured at baseline (Fall 2015) and short-term follow-up (Spring 2016) for each experimental condition. RESULTS: Satiety sensations tended to be lower during the L and H conditions compared to the S condition (S: 5.3±0.3, L: 4.8±0.3, M: 5.2±0.3, H: 4.7±0.4, p<0.05). There were no significant differences across conditions for hunger (S: 4.6±0.3, L: 4.6±0.3, M: 4.6±0.3, H: 4.7±0.3, p=0.99) and PFC (S: 4.5±0.3, L: 4.4±0.3, M: 4.5±0.3, H: 4.7±0.3, p=0.06). There were no significant differences between post-breakfast vs. post-lunch scores (p<0.05), and pre-lunch vs. pre-dinner scores (p>0.05). CONCLUSIONS: These data suggest interrupting prolonged sitting with moderate-intensity activity may be an effective strategy to increase physical activity energy expenditure without triggering increases in hunger and PFC or reductions in satiety. Future studies should examine the long-term effects of interrupting prolonged sitting with activity on appetite sensations, food intake, and weight outcomes in elementary school-age children.

May 31 4:45 PM - 5:00 PM
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Nerve Posterior Tibial Nerve Impingement Stress Reaction/Fracture of Calcaneus
Fat Pad Syndrome Plantar Fascitis Tests and Results Previous MRI’s of the foot and ankle as well as lumbar spine were negative. A reported electromyographic and nerve conduction study was negative for lumbar radiopacity but without evaluation of calcaneal nerves. Given the entire clinical picture, we proceeded with a lidocaine challenge with ultrasound guidance at the location of the bifurcation of posterior tibial to calcaneal nerves. She received complete relief of pain within five minutes.

**Working Diagnosis** Posterior Tibial Nerve Impingement at Level of Bifurcation of Calcaneal Nerves

**Treatment & Outcomes** Given the positive Lidocaine challenge, the decision was made to proceed with hydro-dissection at the level of posterior tibial nerve bifurcation of medial and lateral calcaneal nerves. In plane short axis hydrodissection technique with 1% plain Lidocaine and Triamcinolone was performed. The patient had complete resolution of pain at 5 minutes, 24 hours, 72 hours, 90 days post procedure. The patient has returned to training without restriction with hopes of competing for a spot on the next Olympic Team.

**Notes**

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**May 31 3:35 PM - 3:55 PM**

**Foot Pain - Recreational Skier**

Kelly L. Roberts Lane, FACS. *Fix It Physical therapy, Mahomet, MN.*

- Email: Kelly@fixitpt.com

(No relationships reported)

**History:** 35 yo slipped down her back deck steps 1/25/16. She experienced severe pain and inability to stand on her R foot with immediate swelling and minimal bruising on day 1. She was evaluated at an Orthopedic Clinic, where X-ray showed a talar avulsion fx. She was given a cast boot and instructed to follow-up in 4 wk. She saw me at the physical therapy clinic 7 days post fx with complaints of severe pain and inability to weight-bear on her R foot. The boot was not fitted correctly with the front piece missing air and the bladder not inflated. The boot fit was corrected and she left for Colorado. She returned 2 wk later with continued severe pain.

**Physical Examination:** Examination 3 wk post talar avulsion fracture revealed severe tenderness with palpation R foot, significant bruising and severe R lower leg, ankle, and foot swelling. Her R foot skin was cool to touch compared to the L and had a mottled appearance. She had painful and severe tightness with R calcaneal and forefoot varus and valgus PROM and R dorsiflexion PROM. She had limited ability to wiggle her toes, but no complaints of numbness or tingling.

**Differential Diagnosis:**
1. Additional Fracture
2. Ligament Tear
3. Complex Regional Pain Syndrome
   - MRI of R ankle/foot 2/23/16:
   - Avulsion fragment along the talar head. No acute ligament injury, impaction of plantar aspect of talar with extensive marrow edema talar head and neck, calcaneus contusion

**Final Working Diagnosis:**
- Complex Regional Pain Syndrome post avulsion/ impaction fx of the talar head complicated by the ill-fitting cast boot

**Treatment & Outcomes**
1. Discontinuation of boot 8 wk post fx
2. Knee walker for 10 wk
3. Gabapentin 900 mg / day 4. Facilitation of joint movement to improve gross
   - sx resolved over 9 mo post fx

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**May 31 3:55 PM - 4:15 PM**

**Tarsal Dysostosis in the Adolescent Athlete**

Blavesh B. Joshi. *Mill Creek Community Hospital, Erie, PA.* *(Sponsor: Patrick F Leary, DO FACS, FACS)*

Email: blavesh.joshi.bb22@gmail.com

(No relationships reported)

Articular Dysostosis is a rare musculoskeletal condition due to an abnormal bridging of two bones by cartilage, bone, or fibrous tissue. This abnormality changes the intrinsic physiologic motion of those two bones and surrounding structures. The most common site involves the talus, calcaneus, and navicular bones- known as Tarsal Dysostosis or Tarsal Coalition (TC). The condition has been linked to a gene mutation that can affect physiologic motion of those two bones and surrounding structures. The most common site involves the talus, calcaneus, and navicular bones- known as Tarsal Dysostosis or Tarsal Coalition (TC). The condition has been linked to a gene mutation that can affect physiologic motion of those two bones and surrounding structures.

A 12-year old male with no significant medical history presented to the Sports Medicine office complaining of worsening left non-traumatic foot pain for over one year. He had been participating in high school football and sustained an inversion ankle injury. On physical exam tenderness to palpation at the proximal dorsal surface of his left foot was elicited. Osteopathic exam of the foot and ankle was noted for Pes planus with fallen arch and the inability to induce medial arch, Hammer ten, talus, and hallux valgus deformities of the foot. The patient was empirically started on a rehabilitation program consisting of foam rolling exercises of the lower quarter, increase flexibility, ankle and foot intrinsic exercises, ambulation with a non-inflating walking boot. With only minimal clinical improvement, magnetic resonance imaging (MRI) was ordered revealing bony contusions in the talus, calcaneus, and navicular bones. He was referred to Shriners Hospitals for Children and underwent a resection of the left calcaneonavicular coalition. He has since has returned to pain-free athletics after completing rehabilitation and therapy.

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**May 31 4:15 PM - 4:35 PM**

**Ciprofloxacin Induced Achilles Tendinopathy**

Igor Prus*, Kenneth Bielak, FACS#1; Rebecca Morgan*.

*University of Tennessee Graduate School of Medicine, Knoxville, TN; **University of Tennessee, Knoxville, TN.* *(Sponsor: Kenneth Bielak, FACS)*

(No relationships reported)

**History:** 30 year old college graduate student with past medical history of a kidney stone had painful urination and increased frequency over several days. He was seen by internist at student health center, prescribed Ciprofloxacin for 14 days for acute bacterial prostatitis. Two months later he developed right Achilles tendon pain which had started insidiously upon awakening one morning, with no inciting event except for taking Ciprofloxacin 6 weeks earlier. **Physical Examination:** Swelling of the of the Achilles tendon noted. Tenderness to palpation at the insertion site of a tight Achilles tendon was acknowledged. **Differential Diagnosis:** 1. Ciprofloxacin induced Achilles tendonopathy 2. Idiopathic Achilles tendonopathy 3. Posttraumatic Achilles tendonopathy **Test and Results:** 1. Ultrasound: Thickening and swelling of Achillies tendon. 2. Ankle X-ray: No bony abnormalities. **Final Working Diagnosis:** Ciprofloxacin Induced Achilles Tendonopathy **Treatment and Outcomes:** 1. Walking boot 2. NSAIDS 3. Physical therapy. Patient has recovered after six month of treatment.

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**May 31 4:35 PM - 4:55 PM**

**Ankle Pain and Swelling - Tennis**

Gabriel Carpio-Bracho, Poornam Thaker, Anthony Rizzo, Brian Donohue. *Preservation Resurrection Medical Center, Chicago, IL.* *(No relationships reported)*

**History:** 19 yo F D3 collegiate tennis player presented to the atheltic training room for evaluation of b/l ankle pain on 9/12/2016. Pain began 2 months prior, while at home in Germany, starting in the left ankle, progressing to the right ankle a few weeks later with accompanying swelling, numbness & weakness. Denied trauma or acute injury. Initial evaluation in Germany consisted of serum blood analysis and joint aspiration without joint fluid analysis. She returned to school & began course with the athletic training staff, with improvement in the numbness and weakness, but continued to have intermittent ankle pain and swelling. She denied taking any medications or herbal supplements. History of “allergic” reactions to many medications, which vary from blisters on her body to GI upset. At the time of initial presentation ROS neg. **Physical Examination:** Ankle: mild non pitting edema b/l. No erythema, ecchymosis, or deformity. Full A/P PROM. Pain with passive and active dorsiflexion, plantar flexion, eversion, and inversion b/l. TTP over anterior and inferior aspect of lateral malleoli b/l; Achilles’ insertion b/l. Anterior drawer negative b/l. Altered gait due to pain. Normal arches. Toe walk elicited pain, heel walk was painless. Strength 5/5 b/l in ankle and foot. DTR 2+ at Achilles’ tendon b/l. Sensation intact b/l in all fields. **Differential Diagnosis:** 1. Systemic Lupus Erythematosus (SLE) 2. Drug Induced Lupus 3. Rheumatoid Arthritis 4. Serecongative Spondyloarthropathy 5. Lyme Disease 6. Sympotaxis/Tenosynovitis 7. Stress fracture / Stress reaction 8. Hypercholesterolemic Arthritis **Test and Results:** Initial labs: Chol 202, TG 178, LDL 110, CBC (WBC = 9.5, Hb = 12.4, PLT = 473), CMP wnl. ASO neg, Fe wnl, Uric acid = 3.1, CRP = 5; CCP, Lyme neg. MRI = synovitis & edema around talar joint. Otherwise normal. F/u Labs: ESR = 26; Anti-histone = 13 (weak positive); CRP, CCP, ANA, dsDNA, Smith Ab, RNP Ab, SSA, SSB, SCL70, myeloperoxidase Ab, Anti-Centromere Ab, Lyme neg **Final Working Diagnosis:** Early Lupus or drug induced lupus **Treatment and Outcomes:** She was prescribed prednisone but preferred nonpharmacologic therapy. Continue PT, repeat labs. F/u in 2 wks: Symptoms improved. Work up ongoing. Continues to have occasional foot and ankle pain without functional limitation. Final diagnosis pending
HISTORY: A 7-year-old male comes in to the office with low back pain which is worse with activity. Mother states that there is no specific injury or mechanism just progressive pain over the last 2-3 months prior to this visit. He was seen by an OSH where he obtained X-rays and was prescribed physical therapy. Pain began to progress despite PT and now he is unable to bend over and touch his toes. There is no numbness, tingling, or overt weakness in the lower extremity. He does have an occasional radicular pain into the left leg. No recent infections, fever, or change in bowel or bladder habits.

PHYSICAL EXAMINATION: Inspection: stiff gait otherwise reciprocal and non-antalgic; able to walk on toes and heels. No swelling, erythema or superficial skin stigmata in the lower lumbar spine. Palpatation: midline tenderness to palpation over the L2-L4 vertebrae. Mild paraspinal tenderness left greater than right. ROM: unable to forward flex at the waist; decreased ROM in extension, lateral side bending and rotation. Special tests: + 2 patellar and achilles reflexes; sensation intact throughout. Negative straight leg raise test. No tenderness. Full ROM of left hip and knee. Mild left hip flexion weakness. Stinchfield negative. Decreased L2-L3 light touch sensation. Anterior thigh tingling reproduced with palpation inferomedial to left anterior superior iliac spine.

DIFFERENTIAL DIAGNOSIS:

- Lumbosacral plexopathy
- Meralgia Paresithestica
- Lumbar disc herniation
- Paraneoplastic syndrome
- Lumbar radiculopathy

TEST AND RESULTS: X-ray of lumbar spine shows obliteration of the left L3 pedicle, + winking owl sign. MRI L1 spine- L3 vertebral body severe compression deformity on the left, essentially vertebral plana appearance, bulging/extravasation of enhancing tissue involving the left vertebral body, pedicle, and posterior elements extending into paraspinal tissues. Findings may represent Langerhans cell histocytosis or other neoplasm. CT needle guided biopsy- confirmed LCH. Skeletal survey- no other bony involvement. Possible LCH.

TREATMENT AND OUTCOMES:

1. Symptomatic treatment including-TSLO brace and activity modifications - close monitoring and followup - no chemo or radiation therapy.
2. Symptomatic LCH management - orthopedic consultation
3. Return of physical therapy for core strengthening and wound care awareness.
4. Return to physical therapy for core strengthening program for 8 weeks. 3. Negative radiographs rule out compression fracture with continued symptoms 9 months post injury. 4. Return to 65% capacity mountain biking with new onset low back weakness and radiation of pain into left buttock/esticle. Continued to deny red flag symptoms. 5. MRI revealed an annular tear of the L4-L5 disc. 6. Return to physical therapy for core strengthening program. Pain decreased to only upon awakening after 12 of 16 sessions. Gradual return to activity will be implemented with continued pain free progress with physical therapy.

FINAL WORKING DIAGNOSIS: Central annular tear of the L4-L5 disc.
PHYSICAL EXAMINATION: Full flexion, extension, sidebending, and rotation at waist. Bilateral lumbar paravertebrals are tight and TTP, worse on left. Left S1 region TTP. Spinosus processes are non-tender. Full sensation in bilateral L5-S1 dermatomes 5/5 strength in bilateral L3-S1 myotomes 2+ patellar and achilles reflexes bilaterally. No clonus. SLR equivocal left, negative right. Stork test positive left, negative right. DIFFERENTIAL DIAGNOSIS: 1. Lumbar radiculopathy. 2. Lumbar paraspinal strain. 3. Spondylolisthesis. 5. Degenerative disc disease

TEST AND RESULTS: XR L-spine, AP/Lat/Flexion/Extension views: Negative MRI L-spine: 1. Stress fracture with nondisplaced fracture of anterior pedicle on left and pars interarticularis on right of L4. Early stress injury without fracture at the pedicle and pars interarticularis of L5. 2. Left paracentral protrusion compressing left S1 nerve root at L5-S1. CT scan L-spine: Bilateral posterior element fractures at L4 vertebral body level, involving right lamina and pars interarticularis and left pedicle. No evidence of spondylolisthesis.

FINAL WORKING DIAGNOSIS: Left L4 pedicle fracture. Right L4 pars fracture. Bilateral L5 pars and pedicle stress reactions. L5-S1 disc protrusion with left S1 nerve root compression.

TREATMENT AND OUTCOMES: 1. L4-L5 and L5-S1 transforaminal epidural steroid injections: Complete resolution of leg pain.
2. Restricted from practice, weight lifting, and extension activities for 4 weeks with LSO brace.
3. Returned to running at 4 weeks, progressed to non-contact drills without pain.
4. Progressed to full contact practice and game play at 8 weeks without pain.
5. Plan for surgical fixation with screws at end of season with 3 to 6 month recovery.
6. If any setbacks, will be withheld from football and plan for earlier surgery.

May 31 4:35 PM - 4:55 PM
Back Pain in a High School Soccer Player
Laura M. Nilan, Greg Canty. Children’s Mercy, Kansas City, MO.
Email: lmnilan@cmh.edu
(No relationships reported)

History: A 16-year-old male soccer player presenting to primary care sports medicine with 2 months of low back pain that was first noticed after a throw-in during a game. The patient has previously been evaluated by a pediatric orthopedic spine surgeon and was noted to have scoliosis and mild kyphosis but no other diagnosis. On further history he recalled intermittent low back pain prior to injury, but it has become much more consistent since the injury. He has not had any numbness, tingling, weakness or incontinence. Upon further review of systems he has crampy, loose stools daily for over 2 months. Stool studies by his primary care provider have been negative so far. He denies any recent fevers. He has started probiotics and cholesteramine.


Differential Diagnosis
1. Spondylosis
2. Disc Herniation
3. Muscle strain
4. Scoliosis
5. Infection
6. Inflammatory bowel disease

Test and Results:
- Spine radiographs show a mild scoliotic curve but no signs of spondylosis or listhesis
- No clear indications for MRI
- Labs:
  - CBC: WBC 7.02 (4.5-11)
  - HBG 14.8 (13.5-17.5)
  - Platelet 236 (150-450)
  - BMP Normal
  - ESR 33 (0-15)
  - CRP 2.3 (0-1)

Final Diagnosis
1. Crohn’s Disease
2. Treatment
   1. Gastroenterology consultation. He had an extensive work-up including a colonoscopy which showed inflammation of the terminal ileum consistent with Crohn’s disease. GI has tried multiple immunomodulators including steroids, vedolizumab, ciprofloxacin, vancomycin and infliximab. He remains difficult to control and is being considered for a fecal transplant.
   2. He has continued to participate in soccer

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May 31 4:55 PM - 5:15 PM
Sacral Stress Fracture in a Collegiate Distance Runner
Samuel F. Carlson, Ward McCracken, Suzanne Hecht, FACSM. University of Minnesota - Twin Cities, Minneapolis, MN.
(Sponsor: Suzanne Hecht, FACSM)
(No relationships reported)

HISTORY: A 20-year-old male NCAA D1 distance runner presented with gradual onset of left low back pain present for two weeks without acute injury. He was running 60 miles per week and had been running seven days a week for an extended period of time. The pain was notably aggravated the week prior to presentation while practicing hurdles. He has no history of stress fractures. He endorsed mild radiation of the pain to the lateral buttoc and hip, but not further down the thigh. He experienced no numbness or tingling.

PHYSICAL EXAMINATION: FROM of the lumbar spine, but with painful F/E. Negative SLR and Slump. 5/5 strength throughout LE b/l. Reflexes 2+ b/l TTP over L. SJ and sacrum. The left sided pain was reproduced with single leg hopping, worse on the left than the right. He had a non-antalgic gait.

DIFFERENTIAL DIAGNOSIS:
1. Lumbago with Radiculopathy
2. Sacroiliac Joint Dysfunction
3. Sacral Stress Injury

TEST AND RESULTS:
- Z score L1-4 = -1.4
- Laboratory Testing:
  - normal range for all labs including Vitamin D, Calcium, Testosterone Free and Total, BMP, PTH, Ferritin, CBC, L/H, FSH, TSH, and free T3 & T4

FINAL WORKING DIAGNOSIS: 1) Left grade 4 sacral stress fracture 2) Low bone mineral density for an athlete

TREATMENT AND OUTCOMES:
1. Initial treatment — stop high impact activity and running, cross-train, and counselled regarding appropriate calcium intake
2. At 8 weeks, started return to run program under team’s ATC
3. At 4 months, returned to regular training, running up to 5 days per week
4. At 5 months, began to have discomfort in the left lower back. Repeat MRI showed resolution of previous fracture, but now showed marrow edema involving the right peripheral aspect of S5, most consistent with stress reaction. This area is asymptomatic to the patient and he has no TTP at either site.
5. Presently, working with formal PT and returned to reduced volume running.

B-48 Clinical Case Slide - Shoulder IV
Wednesday, May 31, 2017, 3:15 PM - 5:15 PM
Room: 402

Chair: Dina C. Janse van Rensburg, FACSM. University of Pretoria, Pretoria, South Africa.
(No relationships reported)

Discussant: Wayne Franklin Sease, FACSM. Steadman Hawkins Clinic of the Carolinas, Greer, SC.
(No relationships reported)

Discussant: Andrea Arruda. São Paulo, Brazil.
(No relationships reported)

May 31 3:15 PM - 3:35 PM
An Unusual Cause Of Arm Pain - Lacrosse
Bradly J. Bowen, Deborah L. Light, Alexander Gozman, Hamish A. Kerr, FACSM. Albany Medical Center, Albany, NY. (Sponsor: Hamish A. Kerr, FACSM)
Email: bowenb1@mail.amc.edu
(No relationships reported)

HISTORY: A 17-year-old female presented with 2 days of right arm pain. The day after lacrosse practice, she awoke with a dull ache, swelling and redness starting at the elbow then progressing to the shoulder, worse with movement and improved with elevation.

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She denied recent trauma, shortness of breath, cough, paresthesias or arm weakness. There was no recent immobilization or travel, no history of or similar symptoms. Past medical, surgical and birth history were unremarkable. She denied tobacco use or known allergies. She was started on levonorgestrel-ethinyl estradiol four months ago. Her Father had a remote post-surgical deep vein thrombosis.

**PHYSICAL EXAMINATION:**
Vitals: Temp 36.7, BP 112/64, HR 58, RR 16, 99 % O2 on room air. Well-appearing female in no apparent distress. Normal heart sounds. Lungs were clear, abdomen was benign. Pulses were intact and bilaterally symmetric throughout. Good muscle tone and bulk. The right arm was swollen from the elbow to the shoulder with mild erythema and warmth. Moderate tenderness to palpation of the elbow and shoulder, worse one the medial brachium. Elbow and shoulder range of motion was full but painful, limiting provocative maneuvers. Adson’s test and costoclavicular compression tests were negative. Reflexes were 2+ throughout.

**DIFFERENTIAL DIAGNOSIS:**
1. Undisclosed trauma or non-accidental injury
2. Septic or reactive arthritis
3. Cellulitis or bursitis
4. Upper extremity DVT
5. Thoracic outlet syndrome or overuse injury

**TESTS AND RESULTS:**
- CBC, CMP, PTT, INR unremarkable
- Hypercoagulable work up pending
- Chest x-ray: No cervical or acute pathology
- Venous Doppler: Extensive right subclavian and axillary vein DVT
- Venogram: subacute thrombosis of the axillary and subclavian veins likely due to stenosis at the level of the first rib and medial clavicle

**FINAL WORKING DIAGNOSIS:** Paget Von Schroetter Syndrome

**TREATMENT AND OUTCOME:**
1. Initial anticoagulation with Enoxaparin
2. Thrombectomy with heparin and tPA infusion
3. Repeat thrombectomy and balloon venoplasty for residual stenosis
4. Discharged on Apixaban
5. Right thoracic outlet decompression with anterior scalenectomy and balloon venoplasty
6. Hypercoagulable work up was negative
7. Three months oral anticoagulation with Apixaban
8. Held from contact sports for the duration of anticoagulation

**History**
14 year male swimmer who was seen on 2/24/16, for evaluation of left upper extremity numbness and weakness of 2 month duration. Symptoms had begun the day after receiving his second of three injections for HPV vaccination series in his left shoulder on December 29, 2015. The patient woke up the following day with tightness in his left shoulder. Intense, sharp pain and weakness of his arm developed inhibiting participate in swim practice the following evening.

The patient had previously been seen by his pediatrician as well as an orthopedist, neurologist, and physical therapist. Parsonage-Turner syndrome was diagnosed clinically. The patient received a six-day course of oral methylprednisolone and underwent physical therapy for shoulder strengthening and range of motion. There was improvement of pain though weakness with shoulder flexion and abduction, decreased tactile sensation over the shoulder, and paresthesias of the fingertips had persisted.

**Examination**
Decreased tactile sensation over the dorsal hands and fingers. Passive ROM full, active ROM was limited to 90 of forward flexion and abduction. Scapular winging with flexion and abduction. 5/5 strength with resisted internal and external rotation. 4+/5 strength with empty can and Speed’s test. Lift off test was positive.

**Differential Diagnosis**
cervical disk herniation, cervical neural foraminal stenosis, mass lesion compressing the brachial plexus, calcific tendonitis, acustabacular bursitis, adhesive capsulitis, thoracic outlet syndrome

**Tests/Results**
NCS/EMG of the left upper extremity (2/24/16)
- NCSE with neuropathy at the left wrist
- Left shoulder MRI without contrast (5/31/16)

**Final Working Diagnosis**
Parsonage-Turner syndrome

**Treatments and Outcomes**
Two rounds of IVIG at 2 g/kg (135 g) separated by 24 hours were given on 3/7/16 - 3/8/16. Shoulder strength improved significantly and pain resolved completely within one week of treatment. There was slightly diminished muscle bulk of the supraspinatus, deltoid, bicep, triceps, and latissimus dorsi as well as scapular winging with wall push-up and scapular dyskinesia at follow-up exam (3/28/16). Mild (4+/5) weakness with shoulder shrug/protration/retraction, resisted internal rotation, and supraspinatus testing persisted to visit on 5/31/16.

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**TREATMENTS AND OUTCOMES:**
Musculoskeletal Ultrasound left periscapular region showing no subcapsular bursal fluid collection. MRI: medial border of right upper scapula, within the intermuscular planes between trapezius, erector spine, serratus anterior muscles there is a 2.9 x 1.1 x 1.1 cm mass. Lobulated cluster of grapes morphology with interspersed fast and central low T2 signal dots. No surrounding soft tissue edema. 3cm soft tissue mass consistent with a vascular lesion such as soft tissue hemangioma.

**FINAL WORKING DIAGNOSIS:**
3cm soft tissue hemangioma

**TREATMENT AND OUTCOMES**
Consult Vascular Surgery
Continue activities as tolerated

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**801 May 31 3:35 PM - 3:55 PM**
**Unusual Cause of Periscapular Pain**

**History**
A 16 year old, right handed, multi-sport male athlete presented with right shoulder pain which has gradually worsened over the past 4 months. Denies any previous trauma, injury to the area. It 8/10 sharp quality pain localized to posterior scapula with radiation to the neck. Denies any numbness, tingling, weakness, instability or crepitus. Symptoms are worse with activity. She tried PT and has modified her activities. On 4/29/16 she reports symptoms had resolved. On 7/29/16 she reported her symptoms returned with a feeling of crunching under the shoulder blade. Underwent a second injection into the subscapular bursitis, MRI was obtained and she restarted physical therapy home exercise program.

**Physical Examination:**
- Peripheral pulses intact, normal capillary refill
- Gross asymmetry and atrophy in right trapezius, latissimus dorsi muscle bulk with prominence of right scapula inferior angle. Right acromion 2-3 cm inferior to left. Normal activation of serratus and stabilization of scapula with wall push with no frank scapular winging.

**Tests and Results:**
Musculoskeletal Ultrasound left periscapular region showing no subcapsular bursal fluid collection. MRI: medial border of right upper scapula, within the intermuscular planes between trapezius, erector spine, serratus anterior muscles there is a 2.9 x 1.1 x 1.1 cm mass. Lobulated cluster of grapes morphology with interspersed fast and central low T2 signal dots. No surrounding soft tissue edema. 3cm soft tissue mass consistent with a vascular lesion such as soft tissue hemangioma.
Soccer Player with Neck Pain and Upper Extremity Parasthesias

Adam Susmarski1, Stephanie Giammottoro1. 1University of Pittsburgh Medical Center and US Navy, Pittsburgh, PA. 2University of Pittsburgh Medical Center, Pittsburgh, PA. (Sponsor: Dr. Bradley C. Nindl PhD, ACSM)

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No relationships reported

HISTORY: An 18 year old right hand dominant female Division 1 soccer goalie with no medical history presented in February to clinic with neck pain and right upper extremity parasthesias radiating to her wrist. Initial symptoms began in October after diving for a ball when an opponent fell on to her right shoulder, neck, and head. She was diagnosed with a concussion and was held out of competition for 3 weeks during which she reports resolution of her symptoms. Her symptoms gradually returned and then remained present during activity only after she was cleared to return to play from her concussion.

PHYSICAL EXAMINATION: Full cervical and upper extremity range of motion. No tenderness or swelling in the cervical spine or upper extremities. Upper extremity strength was 5/5, reflexes were 2+/4, and sensation was intact to light touch and pinprick. Speed’s, Yergason’s, Empty Can, Hawkins’, O’Brien’s, Spurling’s, cervical facet provocation, Neer’s, and Tinel’s at the medial elbow were negative. Adson’s, Wright’s Hyperabduction, Allen’s, and Costoclavicular maneuvers reproduced her symptoms.

DIFFERENTIAL DIAGNOSIS:
- Brachial plexopathy
- Cervical radiculopathy
- Cervical discogenic pain syndrome
- Cervical fracture
- Clavicle fracture
- Mononeuropathy
- Shoulder impingement syndrome
- Spondylolisthesis
- Thoracic outlet syndrome

Tumor

TEST AND RESULTS: Cervical X-ray (November 2)-No abnormalities
MRI cervical spine without contrast (November 13)-Punctate focus of increased susceptibility in the cervical cord at C1-C2. Recommend MRI with contrast to exclude hemorrhage or vascular malformation
MRI cervical spine with contrast (November 19)-Previously questioned susceptibility at C1-C2 is not seen and most likely represents artifact
EMG/NCS (February 13)-Normal study without evidence of radiculopathy, brachial plexopathy, or mononeuropathy
Right upper extremity ultrasound (February 18)-Vascular compression with reproduction of symptoms in provocative positioning

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

FINAL WORKING DIAGNOSIS: Vascular Thoracic Outlet Syndrome

TREATMENT AND OUTCOMES: Through a comprehensive rehabilitation program adjustment in her throwing mechanics she was able to prevent provocation of symptoms without hindering her performance and ultimately was able to continue her college soccer career without symptoms or limitations

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Do Not Get Stung By What Is Not A Stinger In Boys Lacrosse Player

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(No relationships reported)

14 year old male is at the sports medicine outpatient clinic with his mother. She mentions that her son gets “stingers” all the time. The stingers are felt to be appreciated in the bilateral upper arms. The duration is for many months (greater than 6.) Time makes them better and they are worse with motion around the neck or playing lacrosse.


ABNORMAL CRANIOCLAVICAL ANGLE
Cranio-clavicular angle is the angle at the base of the skull that forms when a line is drawn at the posterior of the axis and the dorsum of the skull base. Normal angles range from 150 to 180 degrees. If the measurement is 150 degrees or less, there may be the concern for ventral spinal cord compression.

Disposition: Patient was referred to Orthopedic spine clinic. Consult performed there determined that there was no evidence of any symptoms at rest or baseline. There was no evidence of cord compression or injury on images. Only recommendations were to avoid contact sports and to follow up if any further symptoms presented . After discussion of the risks of (invasive surgery) and the benefits patient and his parents decided not to pursue further work up and and stop all contact sports including lacrosse.

B-59 Basic Science World Congress/Poster - Cognition, Intelligence, and Learning

Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall F

The Acute Effects Of A Physically Active Games Lesson On Cognition In Primary School Children

Andy J. Daly-Smith1, Margaret A. Defeyter2, Jim McKenna1, Pamela L. Graham3, Melissa A. Forthglar4, Scott Lloyd4. 1Leeds Beckett University, Leeds, United Kingdom. 2Northumbria University, Newcastle, United Kingdom. 3Redcar & Cleveland Borough Council, Redcar, United Kingdom.

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(No relationships reported)

Evidence regarding the impact of acute physically active bouts on cognition in schools is conflicting. Treatment fidelity of PA bouts is often unconfirmed, while many studies focus on few cognitive outcomes. PURPOSE: To investigate effects of a physically active games lesson (PAGL) on cognition in primary school children. METHODS: Six schools (N=123, F=73; 9±0.3yrs) were ranked and paired by socio-economic status, with one per pair randomly allocated, by coin toss, to a ~40 min PAGL (n=62) or sedentary class lesson (n=61). One week post-familiarisation, immediately before and 10-mins after each lesson, pupils completed a computerised cognitive battery (COMPASS); simple, easy and hard reaction time (correct response reaction time, RT), Stroop (RT and % correct answers, %C), Digit Vigilance (RT & %C), Tower of London (ToL; thinking time TT, RT & %C), immediate word recall (%C), delayed
Developmental research has demonstrated that Perceptual Speed is related to higher cognitive abilities and linked to increases in fitness and physical activity participation. Epidemiological research has also shown that there is an inverse relationship between cardiorespiratory fitness and all-cause mortality. PURPOSE: The purpose of the study was to examine the impact of 45 minutes of daily physical education on Perceptual Speed and on fitness performance among youth attending Legacy Charter School. METHODS: An analysis of variance (ANOVA) mixed effect linear model was used to evaluate the effectiveness of 45 minutes of daily physical education and Perceptual Speed among youth in grades 2nd-5th attending Legacy Charter, a Title I school in the southeastern US. Gain scores (final post-test assessment in May 2016 - pre-test assessment in September 2015) were calculated, stratified by ethnicity and gender, and analyzed using a mixed effect linear model with repeated measures. RESULTS: Legacy Charter School underserved males improved in fluid intelligence total score (Gain Score=2.16; F=5.88; df=1; p=.016), aerobic capacity (Gain Score=0.59; F=7.796; df=1; p=.006), number of push-ups performed (Gain Score=2.58 F=25.065; df=1; p=.000), and number of curl ups performed (Gain Score=5.64; F=37.592; df=1; p=.000) compared to controls. Legacy Charter School underserved males improved in aerobic capacity (Gain Score=1.94; F=4.316; df=1; p=.039), number of push-ups performed (Gain Score=2.60; F=35.542; df=1; p=.000), and number of curl-ups performed (Gain Score=11.27; F=4.290; df=1; p=.000) compared to controls. CONCLUSION: These findings suggest that daily physical education can influence the cognitive and fitness performance of underserved middle school youth. Funded by Campbell Young Leaders.

PURPOSE: After school programs have played a key role in engaging youth in the learning process by providing opportunities to explore interests, increase health and wellness, set goals, solve problems, and connect with adult role models. The purpose of this study is to measure the effects of an after school program with a fitness and informal health and nutrition science curriculum on cognitive processes and science achievement in previously sedentary middle school girls. METHODS: A between subjects design was used with n = 29 female adolescents (mean age = 12.03 ± 0.73) engaged in supervised triathlon training, health and nutrition science education in a 20 week intervention. A second group of n = 30 randomly selected females (mean age = 12.93 ± 0.91) served as the comparison group. To assess changes in science achievement, data were collected pre- and post- intervention. Hierarchical regression analyses examined the linear association of physical activity, aerobic fitness level, cognition and science content knowledge controlling for relevant covariates. RESULTS: Science achievement by treatment group was significantly predicted by fitness level F(5,53) = 6.27, p < .001; physical activity F(5,53) = 6.98, p < .001; aspects of cognition including behavioral regulation F(3,50) = 5.88, p < .001; and processing speed F(5,53) = 6.27, p < .001. CONCLUSIONS: The intervention with informal nutritional science learning and a controlled aerobic fitness component suggested improved cognition and science achievement in previously sedentary middle school girls.

The purpose of the study was to examine the impact of 45 minutes of daily physical education on fluid intelligence and fitness performance among middle school youth attending Legacy Charter School. METHODS: An analysis of variance (ANOVA) mixed effect linear model was used to evaluate the effectiveness of 45 minutes of daily physical education on fluid intelligence and the fitness performance among middle school youth attending Legacy Charter, a Title I school in the southeastern US. Gain scores (post-test assessment in May 2016 - pre-test assessment in September 2015) were calculated, stratified by ethnicity and gender, and analyzed for significance. The interaction between school and time was estimated for each outcome. Each analysis was adjusted by age to control for baseline differences by school. A control school that provided daily physical education was utilized as a comparison. RESULTS: Legacy Charter School underserved females improved in fluid intelligence total score (Gain Score=2.16; F=5.88; df=1; p=.016), aerobic capacity (Gain Score=0.59; F=7.796; df=1; p=.006), number of push-ups performed (Gain Score=2.58 F=25.065; df=1; p=.000), and number of curl ups performed (Gain Score=5.64; F=37.592; df=1; p=.000) compared to controls. Legacy Charter School underserved males improved in aerobic capacity (Gain Score=1.94; F=4.316; df=1; p=.039), number of push-ups performed (Gain Score=2.60; F=35.542; df=1; p=.000), and number of curl-ups performed (Gain Score=11.27; F=4.290; df=1; p=.000) compared to controls. CONCLUSION: These findings suggest that daily physical education can influence the cognitive and fitness performance of underserved middle school youth. Funded by Campbell Young Leaders.

The investigation of the impacts of regular physical activity on cognition and general intelligence is under studied, however findings from a report from the Institute of Medicine (IOM) suggest positive associations between participation in regular physical activity and youth brain health. Unfortunately, only 8% of American public middle schools provide daily physical education according to the CDC School Health Policies and Program Study. PURPOSE: Examine the impact of 45 minutes of daily physical education on fluid intelligence and fitness levels among underserved middle school youth attending Legacy Charter School. METHODS: An analysis of variance (ANOVA) mixed effect linear model was used to evaluate the effectiveness of 45 minutes of daily physical education on fluid intelligence and the fitness performance among middle school youth attending Legacy Charter, a Title I school in the southeastern US. Gain scores (post-test assessment in May 2016 - pre-test assessment in September 2015) were calculated, stratified by ethnicity and gender, and analyzed for significance. The interaction between school and time was estimated for each outcome. Each analysis was adjusted by age to control for baseline differences by school. A control school that provided daily physical education was utilized as a comparison. RESULTS: Legacy Charter School underserved females improved in fluid intelligence total score (Gain Score=2.16; F=5.88; df=1; p=.016), aerobic capacity (Gain Score=0.59; F=7.796; df=1; p=.006), number of push-ups performed (Gain Score=2.58 F=25.065; df=1; p=.000), and number of curl ups performed (Gain Score=5.64; F=37.592; df=1; p=.000) compared to controls. Legacy Charter School underserved males improved in aerobic capacity (Gain Score=1.94; F=4.316; df=1; p=.039), number of push-ups performed (Gain Score=2.60; F=35.542; df=1; p=.000), and number of curl-ups performed (Gain Score=11.27; F=4.290; df=1; p=.000) compared to controls. CONCLUSION: These findings suggest that daily physical education can influence the cognitive and fitness performance of underserved middle school youth. Funded by Campbell Young Leaders.

PURPOSE: A growing body of literature documents the beneficial effects of aerobic exercise on cognition. One of the most interesting findings dictates that aerobic exercise preferentially benefits executive function, a term for complex cognitive processes including attention, working memory, mental flexibility, reasoning, planning, and inhibition. The purpose of this study was to measure the effect of acute intervals of two different exercise modalities (soccer and running) on cognition and executive function among adolescents between the ages of 11-14 years. METHODS: Ninety-eight middle-school students (50 males, 48 females, mean age = 13.09 years) volunteered to participate in this prospective study. Baseline neurocognitive background data was collected at an initial study point. Two-weeks after the initial study point, subjects were matched by age, math class, and grade. Participants were randomized into one of three study groups involving soccer, running, or no aerobic activity for 30 minutes. Directly after the 30-minute exercise period, all participants were re-administered the neurocognitive battery. RESULTS: Subjects in the soccer group had significantly higher average score differences from baseline (M = .0588, SD = 0.556, p = .01) on a neuropsychological measure of executive functioning, specifically planning and organization (Rey-Osterrieth Complex Figure) compared to subjects who did not participate in aerobic activity (M = -1.770, SD = 0.573). There was no significant difference found for this measure between subjects who participated in 30 minutes of running and those who did not engage in aerobic activity. No significant differences found between groups on measures of creativity and divergent thinking, processing speed, perceived stress, self-efficacy, or inhibitory control and cognitive flexibility. CONCLUSIONS: The modality of physical activity may
influence subsequent cognitive performance. Specifically, physical activity involving strategy and planning may prime maturing adolescent brains toward enhanced organization. The duration of these cognitive effects are unknown; further investigation is needed.

It is not surprised that parents and educators struggled for time resources allocated to low academically-achieved students. Cutting physical activity (PA) time is one of the common practices as PA has been generally thought to produce negative impact on academic performance. Such belief has not yet been verified. PURPOSE: To examine the associations between mathematics performance and level of PA engagement in Chinese adolescents.

METHODS: A total of 882 grade 9 Chinese students were randomly recruited in Hong Kong that covered all 18 districts and three school bandings (high, middle, and low). Participants' mathematics performance was assessed at the beginning (T0) and the end (T1) of an academic year using validated and uniformed test papers. Their PA level was measured using self-reported questionnaire (PAQ-A). At both T0 and T1 time points, participants were classified as physically inactive, moderate-active, and inactive according to the composite ratings in PAQ-A. They were further categorized into Go-Active, Go-Inactive, and Unchanged-PA groups based on the changes in their PA status throughout the academic year. Longitudinal changes in mathematics scores over the year were compared among the groups using two-way repeated measures ANCOVA, adjusted for family income and revision time.

RESULTS: Significant Time (T0 - T1) × PA-group interaction effect on mathematics (F(5, 522, p<0.001) was observed. Significant improvement was found in Go-Active participants. When same analysis was split by school-banding, no adverse effect was shown in low-banding students (F(2, 253, p>0.14) but a significantly positive change in high- and middle-banding students. Shift of PA status from T0 to T1 was a significant predictor of mathematics score change (p<0.001). CONCLUSIONS: Higher school-banding students gained better mathematics scores from being more active. More importantly, a reduction in PA time among low-achieved adolescents seemed unrelated to academic performance. This study demonstrates that students' academic achievement (i.e. mathematics scores) may not be boosted considerably from cutting their PA time. However, such finding has yet to be examined in other learning areas such as languages and science subjects.

Working memory capacity (WMC) is a core cognitive process that involves holding and manipulating information to meet task goals. WMC, in conjunction with other cognitive processes, is essential for improving vocational performance, academic achievement and for developing skills to achieve life goals. While evidence indicates such belief has not yet been verified.

PURPOSE: To examine combined associations between sitting time and physical activity with cognition and academic achievement in young-adults.

METHOD: Participants were 26.0 (23.0-28.3) years old, with 19.4 (12.1-24.7) % male. Working memory capacity (WMC) was assessed using a multiple complex span task that included: Operation Span, Symmetry Span and Rotation Span. These tasks interleave a processing task with a short list of to-be-remembered items. General linear models - adjusted by PA, ST, gender and stress- assessed combined associations between ST and PA with WMC and academic achievement.

RESULTS: Performing at least 3 hrs/week of moderate-intensity PA was related to increases in WMC (p<0.001). However, PA intensity was not associated with academic performance. >3hrs seated on a weekend day while performing non-screen leisure activities (e.g., listening to music) was related to reduced WMC after adjusting for PA intensity (p=0.012). Similarly, >3hrs/weekday spent seated in these sedentary activities and in leisure-forms of screen time were inversely associated with academic performance regardless of PA time and intensity (p=0.033; p=0.048).

CONCLUSION: Moderate PA may benefit working memory; however, specific domains of leisure time sedentary behavior may have an unfavorable influence on working memory and academic performance regardless of time spent in PA.

PURPOSE: To determine the effect of Physical Activity (PA) on three differing types of cognitive processes, within an under-researched segment of the population.

METHODS: 45 College-Aged Students were recruited from a University in the Southwestern United States. These participants completed three computer-driven tests from a battery of measurements that assess various components of cognitive control (CC)- One Card Learning Test (Attention) Two Back Card Test (Working Memory) Revised Groton Learning Maze Test (Inhibition/Executive Function). Testing took place after a bout of Sedentary Activity, and two weeks later, after a bout of individualized PA (based on VO2 max).

RESULTS: Due to the high intellect/ high fit nature of the participants there was no statistical significance with the One Card Learning or Two Card Back Tests (i.e. many reached the test 'ceiling' on the initial attempt). After controlling for sex, age, GPA, BMI and aerobic capacity, there was significant differences between sedentary and PA conditions in both moves (mean differences = 0.156, p<0.001, Cohen’s-d = 0.85) and durations (mean difference = 22179, p<0.001, Cohen’s-d = 0.74) within the Revised Groton Maze Learning Test. The differences between conditions represented a medium-to-large effect. There were no moderating influences on the condition differences.

CONCLUSIONS: This study adds to the existing literature that suggests PA may facilitate increases in CC, dependent on the nature of the cognitive task.

PURPOSE: A positive relationship between exercise and cognition has been observed in the developing brains of school children and the degenerating brains of elderly adults. However, this relationship remains relatively unstudied in the fully functioning brains of young adults. Brain-derived Neurotrophic Factor (BDNF) is known to promote neurogenesis and long-term potentiation within the hippocampus and is believed to mediate the effect of exercise on brain structure and function. A recently discovered myokine, irisin, may upregulate expression of hippocampal BDNF in response to exercise. This study explored the impact of fitness on cognition in graduate students and considered BDNF and irisin as potential mediators of the relationship.

METHODS: Forty-four apparently healthy graduate student participants (19 women) completed a comprehensive online cognitive assessment (Lumosity®) and an incremental maximal treadmill exercise test immediately followed by blood collection. Aerobic fitness was measured in terms of maximum oxygen uptake (VO2 max) during the exercise test and expressed relative to body mass (mL/kg/min) for data analysis. Plasma concentrations of BDNF and irisin were determined by enzyme-linked immunosorbent assay (ELISA).

RESULTS: Participants were 26.0 (23.0-28.3) years old, with 19.4 (12.1-24.7) % body fat and a VO2 max of 44.8 (38.3-53.5) mL/kg/min; median (IQR). The median score on the cognitive assessment was 63.5 (55.8-74.0) %. The median plasma BDNF concentration was 1.00 (28-2.09) ng/mL and irisin was 19.79 (16.98-24.65) ng/mL. Significant correlations between aerobic fitness and performance on the cognitive assessment were not found. An inverse relationship was observed between aerobic fitness and BDNF (r = 0.32, P = 0.03) as well as irisin (r = 0.27, P = 0.11). Irisin was moderately and positively correlated with cognitive assessment score (r = 0.33, P = 0.03).

CONCLUSIONS: Irisin may be a valuable peripherally detectable marker of cognitive ability. An inverse relationship between fitness and irisin is inconsistent with the original understanding of irisin’s role. The lack of correlation between aerobic fitness and cognitive performance may suggest the presence of a cognitive ceiling, above which the benefits of exercise on cognition significantly taper off.
Exercise has been shown to affect central nervous system arousal, which in turn may impact cognitive performance during certain tasks. What is not known is if there is an intensity threshold for these effects to occur. PURPOSE: To investigate changes in cortical neural arousal as a result of increasing exercise intensity. METHODS: This study included 22 recreational runners (12 women, 10 men) with a mean (SD) age of 25.1 (6.2) years. Subjects were asked to complete three 30 minute runs on a motorized treadmill at prescribed rating of perceived exertion (RPE) levels of 13, 15 and 17. These correspond to the verbal descriptors of “somewhat hard,” “hard,” and “very hard,” respectively. Individuals were blind to the treadmill control panel but allowed to adjust their speed throughout the trials in order to maintain the prescribed RPE. Prior to and immediately after each exercise session, subjects were asked to complete a critical flicker fusion threshold test (CFFT). This test is designed to assess cortical neural arousal via visual stimuli and requires individuals to determine the precise moment in which a low frequency flashing light fuses into a solid light (ascending) and vice versa (descending). Subjects identified the change by pressing a handheld button on a wired panel. A random sequence of ascending and descending values. RESULTS: No changes occurred from pre (37.5±3.8 Hz) to post (37.4±4.2 Hz) exercise at RPE13 (p = 0.729). Similarly, pre (37.1±4.2 Hz) and post (37.3±4.4 Hz) values did not differ at RPE15 (p = 0.082). However, there was a significant increase from pre (36.7±6.5 Hz) to post (38.7±6.8 Hz) values after exercise at RPE17 (p = 0.019). CONCLUSIONS: These results confirm that a specific threshold exists where cortical sensitivity is determined by the intensity level of exercise. These findings may be useful when considering ways in which to enhance cognitive performance during certain tasks that require substantial focus and attention. Increases in cortical arousal as the result of exercise could positively affect cognitive functioning, and could be advantageous for athletic, professional, and military populations.
Effects of a Combined Aerobic and Cognitive Training Intervention on Cognitive Function in Cancer Survivors

Brent M. Peterson1, Cynthia Johnson2, Kaylene Case2, Daniel Y.K. Shackelford3, Jessica M. Brown3, Trent L. Lalonde3, Reid Hayward2. 1Biola University; 2La Mirada, CA. 3University of Northern Colorado, Greeley, CO.

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(No relationships reported)

INTRODUCTION: Cancer-related cognitive impairment (CRCI) has been reported to negatively affect upwards of 75% of cancer patients undergoing treatment. Treatment and management of CRCI has proven to be a difficult task due to the fact that it has yet to be fully characterized. Some studies have shown that cognitive training or aerobic exercise may mitigate aspects of CRCI. Yet, it is unclear whether simultaneously combining these two interventions could provide additive or synergistic benefits on cognitive function in cancer survivors. PURPOSE: To determine the effects of a quasi-randomized, controlled aerobic and cognitive training intervention on cognitive function in cancer survivors (N = 28).

METHODS: Pre and post physical and cognitive assessments were administered. A 36-session computer-based cognitive, aerobic, and flexibility training intervention was completed. Participants were assigned to one of the following groups: aerobic exercise only (AER), cognitive training only (COG), simultaneous aerobic exercise plus cognitive training (AER+COG), or a control flexibility only group (CON).

RESULTS: No significant (p > 0.05) main effects between groups and variables were observed. Within groups measures revealed that the AER logical memory scaled scores (+33%), delayed recall scaled scores (+27%), block design scaled scores (+19%), and letter-number sequencing scaled scores (+12%) significantly increased (p < 0.05, respectively) pre-to-post. The CON group significantly (p < 0.05) increased from pre-to-post in controlled oral word association gender, age, and education verbal fluidity subtests (Z-scores). All cognitive scores (AER+COG and COG groups) failed to significantly (p > 0.05) increase pre-to-post.

CONCLUSIONS: Aerobic training alone had the greatest impact on cognitive function. Individually, these methods may be appropriate for addressing CRCI in this population, but combined training of this nature may be too demanding for cancer survivors suffering from CRCI.

Gait speed is an important predictor of successful aging. For example, slow gait speeds are associated with poor health outcomes and decreased dual-task (DT) walking performance is associated with increased fall risk. We hypothesize that golf may improve gait speed, DT gait speed, and cognitive function in older military veterans.

METHODS: Gait speed and cognition were measured before and after a 12-week golf intervention (2 x weekly; 90 min per session). Two male participants (74 and 67 years old) completed 5 gait trials walking as fast as possible, 5 dual-task gait trials walking as fast as possible while performing a backwards counting task, and the Dimensional Change Card Sort Test, Flanker Inhibitory Control and Attention Test, List Sorting Working Memory Test, Picture Sequence Memory Test, and Pattern Comparison Processing Speed Test, which make up the Fluid Cognition composite score of the NIH Cognition Toolbox.

RESULTS: Participants improved gait speed by 5.3% and 15.8% and fast DT gait speed by 29.2% and 26.1%. Fluid Cognition composite scores improved by 11% and 1% and the percent change in DT accuracy were -2.9% and 0%. CONCLUSION: Following the 12-week golf intervention, both participants improved their fast gait speed, fast DT gait speed, and prefrontal cognitive function. There was little to no decrease in counting accuracy during the fast DT gait test. These results demonstrate that the participant’s improved gait speeds were not at the expense of maintaining cognitive performance. These preliminary findings suggest that the physical and cognitive demands of golf (navigating the course, walking hilly terrain, bending over, swinging, shifting the center-of-pressure, planning and strategizing) may improve physical and cognitive function in older military veterans. Future expansion of this study will inform the development of golf programs to improve everyday function and quality of life in older adults.
840 Board #19
May 31 2:00 PM - 3:30 PM
Differences Between Functional Fitness and Cognitive Impairment in Independent Older Adults in the Community
Linda L. Lin, Yen-Ting Shen, Nai-Hsin Yang, Wei-chi Tseng, Tai-You Lin. National Cheng Kung University, Tainan, Taiwan. Email: lin22@mail.ncku.edu.tw

No relationships reported

PURPOSE: The purpose of this study is to examine the performance of functional fitness in a community-dwelling elderly population with different levels of cognitive impairment.

METHODS: 316 community-dwelling older adults aged 60 to 91 years were divided into normal cognitive group (NOR, N=84, 68.5±0.76 yrs), mild cognitive impairment group (MCI, N=124, 71.8±6.2 yrs) and serious cognitive impairment (SCI, N=108, 75.8±0.67 yrs) group using the Saint Louis University Mental Status (SLUMS) examination. The Senior Functional Fitness Test (SFFT) was used to measure upper extremity strength (30-second arm curl), lower muscle strength (30-second chair-to-stand), aerobic endurance (two-minute step), upper (back scratch) and lower (chair sit-and-reach), agility and dynamic balance (foot-and-foot up-and-go).

RESULTS: There was a significant relationship between the SLUMS score and SFFT (p<.05). The NOR subjects scored significantly higher than the SCI subjects in BMI(5%), lower- and upper-body strength (33.1%; 17.4%), max strength (22.5%), upper- and lower-body flexibility (102.1%; 83.1%), cardiovascular endurance (16.2%) and dynamic balance (29.5%). The SCI subjects also had better performance than the SCI group with regard to lower- and upper-body strength (23.9%; 13.7%), cardiovascular endurance (13.8%), upper- and lower-body flexibility (71.3%; 34.0%), and dynamic balance (20.5%) p<.05. Furthermore, there were no significant differences between MCI and NOR group in cardiovascular endurance and muscle strength.

CONCLUSIONS: The level of cognitive impairment was correlated to the degree of body composition and functional fitness in the group of community-dwelling elderly adults examined in this work, influencing muscle strength, flexibility, cardiovascular endurance and dynamic balance. The MCI period is perhaps the key phase during which it is still possible for most elderly people to return the normal condition of functional fitness in cardiovascular endurance and muscle strength. Therefore, the any director or interventions aimed at achieving this should be properly developed modified to reflect the elderly subject adult’s level of cognitive abilities.

841 Board #20
May 31 2:00 PM - 3:30 PM
Peak Heart Rate during the 6-Minute Walk Test Predicts Cognitive Performance of Healthy Older Adults

No relationships reported

PURPOSE: Cardiorespiratory fitness positively correlates with cognitive function in healthy older adults (Barnes et al., 2003) and quality of life depends on maintaining cognitive and physical health (Ortman et al., 2014). The submaximal 6-minute walk test (6MWT) is a commonly used clinical assessment of cardiorespiratory fitness in older adults, but the relationship between 6MWT and cognitive performance remains undefined. Here, we tested the relationship between 6MWT and cognitive performance in healthy, ethnically diverse older adults. Methods: In this cross-sectional study, 90 participants (69 female, 21 male), ages 60-95 years (75 ± 9.5 yrs.; mean ± SD), were recruited from the local area. Cognitive performance was measured in the Modified Mini-Mental State Test (3MS), Trailmaking tests A and B, and Animal Naming test. Physical activity level and peak heart rate were correlated with 6MWT performance. Results: Mean 6MWT scores (95.3±7.7) revealed that our population was cognitively healthy. Controlling for demographic covariates, peak heart rate recorded during the 6MWT (6MWT HRpeak) significantly predicted performance on 3MS (R²=0.462, p<0.001), and Trailmaking A (R²=0.397, p<0.001) and B tests (R²=0.197, p<0.001). Controlling for age and education level, 6MWT was found to significantly predict Animal Naming test performance (R²=0.397, p<0.001). Conclusions: Results suggest that peak exercise intensity, as determined by 6MWT HRpeak, significantly contributes to executive function and self-reported physical activity levels with verbal fluency.

842 Board #21
May 31 2:00 PM - 3:30 PM
Physical Activity, Fitness And Cognitive Function Among Community-dwelling Elderly -baseline Data Of Fujisawa Plusten Project.
Yuko Oguma1, Yoshinobu Saito1, Takayuki Tajima1, Yumi Narumi1, Riri Kato1, Yasumichi Arata1, Yuji Ohgi1, Hiroko Komatsu1, Miki Akiyama1, Motohiko Miyachi2, Masaru Minimura2, Toru Takebayashi3. Keio University, Kasagawa, Japan. 2Keio University, Tokyo, Japan. 3National Institute of Health and Nutrition, NIBIOHN, Tokyo, Japan.

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No relationships reported

PURPOSE: Physical activity (PA) are important for maintenance and improvement of cognitive health as well as prevention of non-communicable diseases. We are conducting a 2-year (2015-2017) community-wide campaign to promote PA in Fujisawa city, Kanagawa, Japan. The campaign contains multilevel interventions. As a part of these interventions, community-dwelling elderly groups who commit doing exercise together at least once a week were registered. We analyzed the baseline data and examined the relationship between PA, fitness levels and cognitive function. Methods: Participants were 157 elderly group. Physical activity levels were assessed using a triaxial accelerometer for 1 week. We used steps and duration of moderate-to-vigorous PA as indicators of PA level. In terms of fitness level, one foot standing, grip power, chair stand test and sit & reach test were examined. Cognitive function were assessed by Cognitive Assessment for Dementia iPad version 2 (CADi2) which consists of 10 simple questions and is self-administered. We dichotomized CADi2 score as less than 9 (low) and 9 or 10 (high) and compared physical activity level, physical fitness level between the two groups using unpaired t-test. RESULTS: The sample consisted of 104 women (age: 76.0±6.9 yrs, mean/SD) and 53 men (74.4±5.1 yrs). CADi2 score (median: 7.5; range 0-10) in women (9-10) in men (6-9). Other results were shown in the table. CONCLUSION: Fitness level of low-score elderly of cognitive function is tend to lower compared to high-score elderly. Longitudinal observation with intervention is necessary to know further relationships. Supported by Comprehensive Research on Aging and Health Science Research Grants for Dementia R&D from the Japan Agency for Medical Research and Development (AMED).
Exercise training is gaining attention regarding its role in the prevention and treatment of Alzheimer’s disease (AD). PURPOSE: The purpose of our meta-analysis was to evaluate: the effect of exercise on cognitive function in individuals at risk for or diagnosed with AD; potential moderators of the cognitive effects of exercise; and whether the cognitive effects of exercise are dependent upon Frequency, Intensity, Time, and Type (FITT) of the exercise. METHODS: Databases were searched for trials that measured pre- and post-exercise cognitive function in adults at risk for or diagnosed with AD. Analyses followed random-effects assumptions. RESULTS: 19 studies with 23 interventions qualified (1,256 subjects [71.1% women; 28.3% men]) that were 77.0±7.5 yr and who completed 9.2±3.7 yr of school. A majority of the sample was at risk for AD due to mild cognitive impairment (64%), another 1% was at risk due to a parent diagnosed with AD, and 35% had AD. Exercise interventions were performed at vigorous intensity for older adults (3.7±0.6 metabolic equivalents) for 18.6±10.0 wk. A majority were aerobic exercise training (AET) interventions (65%) and 35% other types (i.e., concurrent [31%] or resistance exercise training [4%]). Only questionnaires were used to assess cognitive function with the Mini-Mental State Examination most commonly used (61%). Overall, there was a positive, moderate effect of exercise on cognition (SMD=0.20, 95% CI=0.11, 0.28; I²=59%). The within group analysis revealed exercise improved performance on tasks that measure inhibitory control. However, few studies have investigated whether the cognitive effects of exercise are dependent upon FITT. CONCLUSIONS: Our findings suggest that exercise may reverse the decline in cognitive function that occurs among older adults who are at risk for or have AD, with favorable exercise effects that are largely mediated by AET. Future randomized clinical trials that include objective measurements of cognitive function are needed to confirm our novel findings.
as soccer, that involve attention to multiple aspects of the environment and for which performance success depends on the active engagement of executive control processes.

**PURPOSE:** To compare the effects of acute treadmill exercise versus futsal (indoor soccer) on performance and electroencephalographic event-related potentials measured during an inhibitory control task. **METHODS:** Twelve experienced soccer players (24.8±2.3 y) completed three counterbalanced 20-minute sessions of: 1) seated rest; 2) moderate intensity treadmill exercise; and 3) a game of futsal. Once heart rate (HR) returned to within 10% of pre-activity levels, participants completed the Stroop Color Word Conflict Task while reaction time (RT) and P300 event-related potentials were measured. **RESULTS:** HR did not significantly differ during treadmill exercise (122.4±15.4 bpm) compared to futsal (126.7±16.7 bpm). Reaction time during Stroop performance was significantly faster following the futsal game (765±29 ms) compared to seated rest (835±28 ms), but was not significantly different than treadmill exercise (784±22 ms). However, the P300 amplitude at three midline recording sites was significantly greater following futsal (F(5,57) = 2.87; C = 4.84±1.16; P = 0.25±1.43 μV) compared to both the treadmill exercise (F(4,96) = 2.62; C = 4.02±1.58; P = 0.37±1.02 μV) and seated-rest conditions (F(4, 191) = 1.58; C = 3.12±1.69; P = 0.59±1.42 μV).

**CONCLUSIONS:** These findings suggest that single bouts of indoor soccer among college-aged soccer players, compared to treadmill and seated-rest conditions, may engender the greatest effect on brain networks controlling attention allocation and classification speed during the performance of an inhibitory control task. Future research is needed to determine if cognitively engaging forms of sport-related aerobic exercise may differentially impact executive control processes in less experienced and older adult participants.

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**847 Board #26 May 31 2:00 PM - 3:30 PM The Effects of Repeated, Consecutive High-Intensity Exercise on Cognitive Performance in Well-Trained Team Sports Players**

Sarah E. Browne¹, Barry V. O’Neill¹, Phillip G. Bell¹, Ken van Someren¹, Glyn Howatson, FACSM², Crystal F. Haskell-Ramsay², GSK Human Performance Lab, Brentford, United Kingdom. ¹Northumbria University, Newcastle-upon-Tyne, United Kingdom. Email: sarah.e.browne@gsk.com

(No relationships reported)

Improvements in cognitive performance and mood are generally accepted following moderate intensity exercise; however, the impact of high-intensity exercise is less clear. Given that professional team sports are performed at high or maximal intensity, which can be further compounded during periods of intensified periods of competition, investigations into the effect of such exercise on cognition are needed. **PURPOSE:** To determine the effect of repeated high-intensity exercise on cognitive function, mood and perceptions of both physical and mental energy, and fatigue. **METHODS:** In a counterbalanced crossover design, twenty-four well-trained, sub-elite rugby players (mean ± SD age, height, mass were 20.7± 1.9 yrs, 181.7± 5.5 cm, 88.2± 9.0 kg, respectively) completed a series of repeated sprints (20 x 20 m, three times per day for two consecutive days) or a seated control. Prior to and following each set of sprints or equivalent control duration, a selection of cognitive tests including simple reaction time, four-choice reaction time (FCRT), Corsi blocks and Stroop task (ST) were completed in addition to visual analogue scales assessing mood, energy and fatigue. Repeated-measures ANOVAs were conducted with pairwise comparisons where necessary (α = 0.05). **RESULTS:** No changes were observed in any cognitive, mood, energy or fatigue measures after one single high-intensity session. However, compared to the control, ST accuracy was lower in the exercise condition (0.6 %, P < 0.05) which was largely due to a sharp decline at bout 3 on day 1 that continued throughout day 2. Additionally, FCRT was slower on day 2 (+2.2 %) whilst feelings of alertness (-12 %), contentedness (-5 %), and physical (-22 %) and mental (-24 %) energy were reduced and ratings of physical (+22 %) and mental (+40 %) fatigue increased (all day 2 vs. day 1, P < 0.05). No changes were observed in the control condition. **CONCLUSION:** Intensified periods of exercise have detrimental effects on cognitive performance, mood and perceptions of physical and mental energy, and fatigue. The deleterious effects on these parameters could be contributing to increased injury rates during fixture congestion alongside decrements in performance. Player rotation may help alleviate these effects whilst also prompting further research into cognitive recovery strategies.

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**848 Board #27 May 31 2:00 PM - 3:30 PM Injury-Related Reductions in Skilled Visuomotor Learning Revealed by Single Trial Analysis and Response Time Variability**

Courtney Dunn-Lewis¹, Shawn D. Flanagan¹, James A. Onate¹, Jeff S. Volek¹, Carl M. Maresh, FACSM², William J. Kraemer, FACSM². ¹University of Pittsburgh, Pittsburgh, PA. ²Ohio State University, Columbus, OH. (Sponsor: William J. Kraemer, Ph.D., FACSM)

(No relationships reported)

Classical psychometric tests emphasize measures of central tendency as it relates to response times, contact times, and errors. More sophisticated techniques, however, may complement neurophysiological measures of neuroplasticity in response to behavioral interventions or changes in intrinsic state. **PURPOSE:** To determine whether learning on a skilled lower extremity visuomotor task was affected by prior ACL injury. **METHODS:** Eighteen healthy women between 18 and 32 yr participated. Nine women served as controls; nine others had unilateral ACL reconstruction between 6 months and 5 years from the start of the investigation. All participants completed 120 trials of a choice reaction test with a Stroop-like effect and randomly-ordered stimulus presentation order (3 sets of 40 repetitions with 30 sec rest between sets and 1 sec intertrial interval) (The Quick Board, LLC Memphis TN). Response time, contact time, and error count was recorded for each leg during each trial.

**RESULTS:** In total, controls performed 525 trials with the dominant leg and 555 trials with the non-dominant leg. ACLs performed 550 trials with the injured leg and 530 trials with the uninjured leg. Average time to set completion, response time, contact time, and error count did not differ by group or leg or measurement (mean or median). ACLs displayed better initial response times but failed to improve to the same extent as controls (6.1% improvement, y = −1.51 x + 1110.2, R2=0.74 for non-injured; 2.7% improvement, y=−0.97 x + 1004.8, R2=0.62 for ACL). Greater improvements in response time were generally observed in the (initially worse performing) non-dominant leg. In the less frequently injured (3/9) dominant leg, virtually no improvement (1.4%) in response time was observed in ACLs overall, resulting in a 341.5% relative improvement in controls. The variability of single trial response time increased from the dominant to the non-dominant leg and from the healthy to injured leg.

**CONCLUSIONS:** Single trial analysis revealed injury-related deficits in skilled visuomotor learning years after ACL rupture and rehabilitation despite the apparent recovery of the musculoskeletal system. This suggests a central neurological association with musculoskeletal injury that may affect neuroplasticity in the affected and unaffected extremity.

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**849 Board #28 May 31 2:00 PM - 3:30 PM Unique Leg-specific Executive And Motor BOLD Activity With Visually-guided Imagery Following ACL Injury**

Shawn D. Flanagan, 15203¹, Courtney Dunn-Lewis¹, James A. Onate¹, Jeff S. Volek¹, Carl M. Maresh, FACSM², William J. Kraemer, FACSM². ¹University of Pittsburgh, Pittsburgh, PA. ²Ohio State University, Columbus, OH. (Sponsor: William J. Kraemer, Ph.D., FACSM)

(No relationships reported)

Given the change in sensorimotor system activation during limited movements of the injured leg after unilateral ACL rehabilitation, we asked whether the frontostriatal network might be involved during visually-guided action-imagery. **PURPOSE:** To determine whether injured individuals displayed different activity during a proprioceptive cognitive-motor-oriented imagery task. **METHODS:** Healthy women (18-32 yr, n=19) provided written informed consent. Ten served as controls; nine others experienced unilateral ACL rupture, repair, and rehabilitation between 6 months and 5 years from the start of the study. All participants completed a proprietary attention-switching task for 4 trials of 10 repetitions. The test required subjects to react to congruent and incongruent signals prompting them to jump and land with the right or left leg. Subjects were a camera to record first person perspectives of test performance. Brain images were acquired with a three tesla Siemens Trio MRI with TIM system. Subjects watched the cues and their first person performance while imagining themselves physically reacting/jumping in response to the cues. A three-dimensional magnetization-prepared rapid gradient-echo (MP-RAGE) sequence acquired whole-brain structure. Voxel size was set at 1.0mm<sup>3</sup> for structural scans and 3.0mm<sup>3</sup> for functional scans. Significant clusters were included if meeting a six-voxel cluster threshold. A false discovery rate (FDR) threshold was set at q<0.05. Map clusters were then converted to voxels of interest, and small cluster suppression highlighted the most affected brain regions. **RESULTS:** Occupations increases in activity were found in visual cues. BOLD signal increased in the prefrontal cortex, primary somatosensory cortex, and the primary, pre- and supplementary motor areas (p<0.01). Activity was lower in ACLs than controls, particularly when using the injured leg, however.
activity was increased in the right dorsolateral prefrontal cortex in both groups, with more pronounced increases in the injured group; the highest dPPFC activity was observed when participants imagined jumping and landing with their injured leg.

CONCLUSIONS: Prefrontal regions of the brain displayed heightened activity after ACL injuries, whereas motor regions tend to display decreased activity compared to controls.

850 Board #29  May 31 2:00 PM - 3:30 PM
Cardiovascular Dynamics During The Cold Pressor Test In Recently Concussed College Athletes
Email: blairjohn@buffalo.edu

Concussion patients who are experiencing symptoms appear to have impaired cardiovascular responses during sympathoexcitatory tests such as handgrip exercise and head-up tilting. However, it is not known if impaired cardiovascular responses are present during a cold pressor test (CPT).

PURPOSE: We tested the hypothesis that recently concussed college athletes would have a blunted cardiovascular response during a CPT.

METHODS: Four college athletes (age: 19 ± 1 years, 2 women) who were within 7 days of concussion diagnosis and still reporting symptoms and four healthy controls (age: 27 ± 4 years, all men) underwent a CPT. During the CPT, the participant’s right hand was submerged in ice-cold water (4°C) for 4 minutes. Heart rate (HR) and blood pressure (photoplethysmography) were continuously measured and averaged at baseline and every 30 seconds during the CPT.

RESULTS: Heart rate was increased at 30 seconds (20 ± 5 bpm, P = 0.001) and 60 seconds (20 ± 13 bpm, P < 0.001) in the healthy controls but remained unchanged throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the healthy controls with a peak increase of 27 ± 6 mmHg at 120 seconds (P < 0.001). The peak increase in mean arterial pressure of 9 ± 6 mmHg in the concussed athletes was observed at 120 seconds, but did not reach statistical significance (P = 0.079). Systolic blood pressure was elevated at 60 seconds and throughout the remainder of the CPT in healthy controls reaching a peak increase of 28 ± 6 mmHg at 120 seconds (P < 0.001). Systolic blood pressure in concussed athletes did not increase at any point of the CPT (P > 0.196 for all time points). Diastolic blood pressure in healthy controls was elevated throughout the CPT and reached a peak increase at 120 seconds (21 ± 4 mmHg, P < 0.001). In concussed athletes, diastolic blood pressure was elevated only at 75 seconds (7 ± 5 mmHg, P = 0.014) of the CPT.

CONCLUSIONS: These preliminary data show that recently concussed athletes have a blunted cardiovascular response to the CPT. These data support evidence indicating that concussed patients who are experiencing symptoms have impaired cardiovascular responses to sympathoexcitatory stimuli.

851 Board #30  May 31 2:00 PM - 3:30 PM
Effects of Multiple Sports Related Concussions On Neurocognition and Cerebral Vascular Function
Nicholas G. Evanno1, Kara L. Marlati2, Bryon A. Mueller1, Suzanne S. Hecht, FACSM1, Jeffrey R. Wozniak1, Kevin O. Lim1, Donald R. Dengel, FACSM1.
1University of Minnesota, Minneapolis, MN. 2Pennington Biomedical Research Center, Baton Rouge, LA. (Sponsor: Donald R. Dengel, FACSM)
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PURPOSE: To determine the differences in neurocognition (NC) and cerebral vascular reactivity (CVR) between athletes with multiple sports related concussions (mTBI) and matched controls (C).

METHODS: Twelve athletes (22±0.5 SEM) who reported multiple sports related concussions (≥3) and 12 matched [age, sex, body mass index (BMI), and athletic activity] healthy concussion free controls (23±0.5 y) were recruited.

CONCLUSIONS: Peak HR was reached at 30 seconds (121 ± 15 bpm, P < 0.001). In concussed athletes, diastolic blood pressure was elevated only at 75 seconds (7 ± 5 mmHg, P = 0.014) of the CPT.

852 Board #31  May 31 2:00 PM - 3:30 PM
The Effect of Industrial Hyperthermia on Firefighters' Cognitive Function in Warm Humid Environment
Ali M. Aljaroudi1, Amit Bhattacharya2, Darren S. Kadis2, Amandla L. Strauch1, Tyler Quinn3, W. Jon Williams1. 1CDC/ NIOSH, Pittsburgh, PA. 2University of Cincinnati, Cincinnati, OH. 3Cincinnati Children's Hospital Medical Center, Cincinnati, OH.
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(NO relationships reported)

PURPOSE: To investigate the effect of industrial hyperthermia [rectal temperature (T_R) ≥ 38°C] on cognitive performance while wearing a firefighters' encapsulating protective ensemble after exercise in a warm, humid environment.

METHODS: Eight healthy male subjects (VO_2max: 52.8 ± 5.60 ml/kg·min⁻¹; Age: 26 ± 4 yrs) performed computer-based cognitive tests (Go/No-Go) before and after exercise under hyperthermic conditions (30°C/70% relative humidity). Exercise included 40-min treadmill walking at 40% VO_2max or until T_R ≥ 39°C while wearing a firefighters' protective ensemble. For the Go/No-Go tests, participants were required to button-press to a target stimulus, and withhold button-presses to a non-target. The test appears as a 2 x 2 grid with one star (P) as the target and two circles (R) as non-targets. The mean differences found between hyperthermic and normothermic conditions are: Trex = 13.6 ± 1.3ms, p > 0.05; P-No-Go RT: -36.31 ± 28.11ms, p = 0.0081; and PE: 1.02 ± 2.20%, p = 0.2333. Significant increases were found in PE compared to normothermic conditions (p = 0.0081). The mean differences found between hyperthermic and normothermic conditions are: Trex = 13.6 ± 1.3ms, p > 0.05; P-No-Go RT: -36.31 ± 28.11ms, p = 0.0081; and PE: 1.02 ± 2.20%, p = 0.2333.

CONCLUSION: Cognitive function was not altered negatively by hyperthermia. However, the hyperthermia condition resulted in accelerated reaction time which may have been influenced by change in human mood following mentally stressful hyperthermic conditions. Accelerated reaction time may cause a non-significant change in firefighters' performance.

853 Board #32  May 31 2:00 PM - 3:30 PM
Annual Baseline Drift in Professional Rugby League Players
Lisa Hodgson1, Peter Walker2, Paul Maruff3, David Derby2, Conor Gissane3. 1The FA, Burton Upon Trent, United Kingdom. 2Yorkshire and Humberside Deanery, West Yorkshire, United Kingdom. 3CogSport, Australia. 4Cognitive Function in Warm Humid Environment. Played over 7 seasons.
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(NO relationships reported)

PURPOSE: Annual baseline testing within professional Rugby League has been mandatory since 2004. The question: “Do annual baselines drift over time or as a result of a concussion in rugby league players” is unanswered. If they do drift, what is the magnitude and in what tasks and is this correlated with associated concussions. This study evaluated if baselines drift over time and if so is this related to concussive injury or accumulating injury.

Design: Retrospective study

Method: Participant players were those who held a professional contract between the 2006-2012 season. It is mandatory to provide an annual baseline test using CogSport and following any diagnosed concussion, with full symptom resolution, a valid return to play test. Concussion test data was provided by CogSport Australia from tests performed over 7 seasons.
Vitamin D insufficiency and deficiency are well-documented in populations living north or south of approximately 35° N or S latitude, respectively; these are even more pronounced during winter months. Athletes have been shown to be more susceptible to insufficiency and deficiency than non-athletes. Vitamin D has been linked to mental cognition. Winter-sports athletes residing in the circumpolar north may experience sub-optimal vitamin D levels and depressed cognitive abilities during the competitive season.

**PURPOSE:** To determine if significant differences of vitamin D concentrations and manual dexterity exist in winter athletes mid- and post-season in the circumpolar north. **METHODS:** Fifteen competitive cross country skiers residing at 64° N were recruited for this study. Blood samples were taken in early February (“mid-season”) and in late April (“post-season”). Subjects completed the Purdue Pegboard Test (PPT), an assessment of mental cognition and manual dexterity, at the time of the blood draw. Plasma vitamin D concentration was measured as 25-hydroxyvitamin D (25(OH)D) using an ELISA. Significance was determined by permutation test with 95% confidence interval. **RESULTS:** Subjects exhibited significantly lower mean concentration of plasma 25(OH)D in post-season (μ=3.39 ng/mL, SD=4.53) as compared to mid-season (μ=5.94, SD=3.37). PPT revealed significantly higher scores in three of four tests in post-season (μ=18.00, SD=1.31; μ=16.89, SD=1.12; μ=46.64, SD=3.40) versus mid-season (μ=17.04, SD=1.82; μ=15.98, SD=1.62; μ=41.69, SD=4.37) with no significant differences in the remaining test. **CONCLUSION:** Post-season mean plasma 25(OH)D concentration was significantly lower than mid-season. This could be explained by significantly reduced intake of vitamin D supplements post-season. PPT scores improved significantly in two of four tests in the post-season suggesting that 25(OH)D may not necessarily be linked to cognitive function measured with PPT. However, mean 25(OH)D concentrations from both mid- and post-season fell below the Institute of Medicine's definition of "deficient" suggesting that subjects’ improvement on PPT may have been attributable to another factor or factors such as reduced stress levels. Supported by NIH, Award Numbers UL1GM118891, TL4GM118992, or R56GM118890.

Supported by NIH, Award Numbers UL1GM118891, TL4GM118992, or R56GM118890.
the post-intervention test was significantly greater for men (pre = 138.1 ± 3.68 Nm; post = 127.4 ± 3.2 Nm) than for women (pre = 84.7 ± 3.4 Nm; post = 80.4 ± 2.9 Nm), regardless of intervention. There was a significant main effect (p< 0.05) for percent torque decline, where the torque decline was greater for the post-intervention test (45.8 ± 1.2%) than the pre-intervention test (43.2 ± 1.3%). There were no significant interactions or main effects involving diverting conditions (p > 0.05).

CONCLUSIONS: These findings indicate that listening to self-selected music, slow or fast tempo, was not an effective diverting activity.

B-61 Free Communication/Poster - Activity Interventions and Programming in Adults II
Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall F

858 Board #37
May 31 3:30 PM - 5:00 PM
How Sociodemographic Characteristics Of Activity Monitor Users Relate To Device Use And Perceived Physical Activity.
Ciaran P. Friel, Joseph T. Ciccolo, Carol E. Garber, FACSM. Teachers College, Columbia University, New York, NY. (Sponsor: Carol Ewing Garber, FACSM)
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(No relationships reported)

Weareable activity monitors (AM) have been well accepted in some randomized controlled trials and have contributed to an increase in levels of physical activity (PA) in some, but not all participants. The sociodemographic profiles of users may be associated with the length of time (number of months) they wear the device, and how they perceive it impacts their PA behavior.

PURPOSE: To assess whether sociodemographic characteristics of AM users are related to 1) duration of device use, and 2) perceived changes in PA behavior.

METHODS: Current (n=1355) and former (n=590) AM users from across the United States were recruited online and completed a web-based survey. Sociodemographics, health information, and AM use were queried. Moderate to vigorous PA (MVPA) score was calculated using the Godin Leisure Time PA Questionnaire. Respondents also reported how AM use influenced their PA. Descriptive statistics are reported as medians, means ± standard deviations, and frequencies. AM users were categorized related to 1) duration of device use, and 2) perceived changes in PA behavior.

RESULTS: Current users were 18-81 years old (33.0 ± 12.2) with 73.1% women. A majority were current AM users (69.7%) and BMI was 26.7 ± 6.6. The number of months of AM use among current users was 10.1 ± 11.6, and 6.8 ± 6.4 among former users. Age (χ²=38.8), income (χ²=22.0), MVPA (χ²=22.4) and relationship status (partnered vs single; χ²=14.7) were all significantly different across the device-use categories (p<0.001). A majority of current (76%) and former (53.2%) users perceived that the AM contributed to increased PA. Across all respondents, purchasing an AM themselves, as opposed to receiving it as a gift, was associated with a perceived increase in PA after device use (p<0.05).

CONCLUSION: Duration of activity monitor use was associated with the sociodemographic characteristics of users, with a majority perceiving an increase in their physical activity as a result of use. This supports the need for further research to explore how sociodemographic data can be used to tailor interventions to specific populations using technology-based objective monitoring.

859 Board #38
May 31 3:30 PM - 5:00 PM
Predictive Indicators of Early Fitness Club Membership Termination in Japan: A Cohort Study
Nobumasa Kikuga1, Susumu S. Sawada, FACSM2, Munehiro Matsuzawa3, Yoko Gando4, Nutsumi Watanabe5, Yuko Hashimoto6, Yoshiho Nakata2, Robert A. Sloan5, Steven N. Blair2, FACSM2, Noritoshi Fukushima1, Shigeru Inoue6. 1Tokyo Medical University, Tokyo, Japan. 2National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan. 3Waseda University, Saitama, Japan. 4Juntendo University, Tokyo, Japan. 5University of Tsukuba, Ibaraki, Japan. 6Kagoshima University, Kagoshima, Japan. 7University of South Carolina, Columbia, SC.
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(No relationships reported)

Approximately 40% of fitness club members in Japan have been reported to opt for early termination (within one year) of their membership. Identifying common indicators among members who choose early termination may allow for the development of prevention strategies. PURPOSE: Identifying the characteristics of those who opt for early termination via a cohort study. METHODS: Across 17 fitness clubs, members completed a self-report questionnaire at baseline and follow-up. The survey included the following indicators 1) baseline characteristics; 2) purpose of membership; 3) health status; and 4) psychological factors (perceived benefit of exercise, perceived barriers to exercise, and exercise self-efficacy). Participants were followed to determine whether they terminated their memberships. Odds ratios (OR) and 95% confidence interval (95%CI) for the incidence of early termination adjusted for age and gender were obtained using a logistic regression model. RESULTS: There were 1,839 participants (average age 37.9 years, 520 males and 1319 females) were involved in this observational study. During the follow-up period (six months on average), 428 participants early terminated. For every five-year increase in age, the gender-adjusted OR (95% CI) was 0.91 (0.85-0.98) for early termination (p=0.004). Members that joined an fitness club to relieve stress had an adjusted OR of 1.33 (1.06-1.68) for early termination. Additionally, the participants who joined at a fitness club to improve their health had an adjusted OR of 0.81 (0.65-1.01) for early termination. The participants who agreed with the statement “I believe I have the ability to exercise regularly,” regarding the benefits of exercise, had a higher adjusted OR for early termination 1.46 (1.11-1.91). Similarly, the participants who agreed with the statement “I have more time to exercise” had an higher adjusted OR for early termination 1.03 (1.03-1.72).

CONCLUSIONS: The predictive indicators for early fitness club termination included young age, perceived exercise benefit for stress reduction, "recognition of one’s ability to others," and "improve appearance". Lastly, perceived benefit of health improvement may prevent early termination.
Studies have suggested that the light emitted from electronic devices can impair sleep. However, it is unclear whether removing electronic devices from the sleeping environment in the evening and overnight provides an extended sleep opportunity. **Purpose** To investigate the effects of removing electronic devices in the evening and overnight on measures of sleep and anxiety during a seven-night training camp. **Methods** Twenty-six water-polo athletes (12 males, 14 females, aged 17±1 y) were randomized to one of two groups for the remaining six nights was due to athletes in the ND group seeking other means of delaying bedtime (e.g. by engaging in other activities). Future research on the high completion rates and no added time commitment, including behavior change strategies as part of an exercise trial is feasible. This trial is ongoing, and upon completion, effectiveness of the counselling session for increasing PA at three-month follow-up will be examined.

**Conclusion**

Cohen's $d$ effect sizes were calculated for anxiety scores. Twenty-six water-polo athletes (12 males, 14 females, aged 17±1 y) attending a training camp were allocated to either a no-device group (no electronic devices could be used after dinner or overnight; ND) or a control group (unrestricted electronic device use; CON). Athletes in the ND group also spent longer in bed (52±0.41 min vs. 47±1.41 min; $p=0.015$) and slept for longer (474±5.5 min vs. 433±4.1 min; $p=0.044$) than the CON group on the first night. However, there were no differences between groups for any other nights. Electronic device-related anxiety in the ND group did not significantly change from the first (61±27) to the last night of the camp (64±17), although a moderate effect size for the change in scores over time ($d=0.50$) suggested a trend towards decreased anxiety over time. **Conclusion** Removing electronic devices from athletes overnight resulted in sleep extension on the first night of the training camp. It is possible that the lack of differences between the two groups for the remaining six nights was due to athletes in the ND group seeking other means of delaying bedtime (e.g. by engaging in other activities). Future research is needed to better understand the effects of electronic device use in young adults and athletes, particularly in relation to evening electronic device use habits.

**Exercise prescription** is a multifaceted topic with the singular goal of defining a protocol that maximizes health and adherence. The ACSM guidelines referenced previous results that there is an intensity threshold to continually improve fitness and reduce disease risk. The threshold for well-trained individuals is 95-100% max heart rate (HR) whereas the threshold for less-trained individuals is only 70-80% max to achieve the same benefits. Exercising at these intensities can be uncomfortable and unpleasant leading to low compliance. However, past research has demonstrated that engaging distractions such as an instructor, music, or digital images can enhance enjoyment while diminishing rate of perceived exertion (RPE). It is therefore possible that an instructor-guided workout with digital images synchronized to music could be the ideal combination to reach higher intensities with a lower perception of effort. **PURPOSE:** The aim of this study was to compare an audio (AUD; music + digital images) environment with an immersive (IMM; music + digital images) environment during group fitness cycling classes in both well-trained and less-trained individuals. **METHODS:** To date, 6 elite participants (more than 10 hours PA/wk) and 6 novice (less than 2 hours PA/wk) completed 8 AUD and 8 IMM classes in 8 wks. Both class formats were approximately 40 minutes in duration with equal pedal strength and speed intervals led by an instructor. We collected HR (% time in 80-100% max zone) during each class and survey data (RPE, satisfaction, enjoyment) immediately after each class. **RESULTS:** For the elite participants, % time in the max zone and RPE were significantly greater during AUD (54 ± 8%; 18 ± 1) compared to IMM (46 ± 9%; 15 ± 2; p < 0.05). In contrast, for the novice participants, RPE was significantly less during IMM (16 ± 2) compared to AUD (18 ± 1; p < 0.05) while the % time in the max HR zone did not differ between the two conditions (AUD = 62 ± 11%; IMM = 64 ± 12%; all values mean ± sd). Satisfaction ratings were high for both groups and both conditions, but the novice participants rated IMM as more enjoyable than AUD. **CONCLUSION:** Both AUD and IMM group fitness cycling formats are an ideal way to meet the exercise guidelines with high satisfaction. IMM may promote adherence in novice participants compared to AUD as HR intensity did not differ, RPE was less and enjoyment was greater.

**USE OF SIT-TO-STAND WORKSTATIONS: IMPACT ON PHYSICAL ACTIVITY**

Shiann Wickham, Catherine Patrick, Larissa Boyd, Melissa Powers. University of Central Oklahoma, Edmond, OK. (No relationships reported)

Sitting is associated with several health risks and health benefits. Prolonged sitting affects daily total physical activity. Standing in order to break long periods of sitting may be beneficial to an individual’s health. **PURPOSE:** The purpose of this study was to determine whether four workstations including sitting, walking on a treadmill at 1.0 mph, 1.3 mph and 1.7 mph affected typing speed, typing accuracy, and cognitive function in college students. Additionally, this study aimed to determine optimal speed for treadmill desk users.

**PURPOSE:** The purpose of this study was to determine whether four workstations including sitting, walking on a treadmill at 1.0 mph, 1.3 mph and 1.7 mph affect typing speed, typing accuracy, and cognitive function in college students. Additionally, this study aimed to determine optimal speed for treadmill desk users.
of this pilot study was to determine whether physical activity would change when using a sit-to-stand workstation in a workplace environment. METHOD: Volunteers from the faculty of the University of Central Oklahoma included apparently healthy male and female adults (N = 11, M = 39.09±10.445 years). Participants were asked to use sit-to-stand workstations for a minimum of three hours per workday. The International Physical Activity Questionnaire (IPAQ) was used to measure self-reported daily physical activity. RESULTS: Dependent t-tests were used to analyze changes in self-reported physical activity over 5 months. Non-significant (p>0.05); meaningful improvements were seen in METmin/wk for walking (d=1.9), total physical activity (d=1.4), moderate activity (d=0.1), and vigorous activity (d=0.2). Total minutes of sit time per week (d=2.5) and average daily minutes sitting (d=2.5) decreased (p<0.05). CONCLUSION: Sit-to-stand workstations do provide an increase in daily physical activity levels. Although the results were non-significant, they do indicate a small decrease in time spent sitting along with small improvements in walking and total physical activity. Decreasing employee sit time can increase the amount of physical activity achieved throughout the day. Future research should evaluate the use of sit-to-stand workstations in a larger, more diverse group of employees.

### Table 1

<table>
<thead>
<tr>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Total PA (met·min·wk)</td>
<td>3333.18 (908.30)</td>
</tr>
<tr>
<td>MPA (met·min·wk)</td>
<td>1567.27 (1637.81)</td>
</tr>
<tr>
<td>VPA (met·min·wk)</td>
<td>1341.82 (1479.50)</td>
</tr>
<tr>
<td>Weekly ST (min·d)</td>
<td>2119.10 (1147.42)</td>
</tr>
<tr>
<td>Daily ST (min·d)</td>
<td>302.73 (163.92)</td>
</tr>
<tr>
<td>t</td>
<td>-63</td>
</tr>
<tr>
<td>p</td>
<td>55</td>
</tr>
<tr>
<td>95% CI</td>
<td>[3491.25]</td>
</tr>
<tr>
<td>[1418.87, 6109.77]</td>
<td>[1500.91, 2138.02]</td>
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<tr>
<td>[.05, .96]</td>
<td>[.72, .97]</td>
</tr>
<tr>
<td>1590.91 (1303.82)</td>
<td>[227.50, 2969.32]</td>
</tr>
<tr>
<td>[1418.87, 6109.77]</td>
<td>[1422.68, 2253.68]</td>
</tr>
<tr>
<td>1370.91 (2379.25)</td>
<td>[.72, .97]</td>
</tr>
<tr>
<td>[.72, .97]</td>
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<tr>
<td>1838.18 (618.48)</td>
<td>[.72, .97]</td>
</tr>
<tr>
<td>[203.34, 321.95]</td>
<td>[1422.68, 2253.68]</td>
</tr>
</tbody>
</table>

Note. MET = metabolic equivalent; min = minutes; wk = week; d = day; PA = physical activity; MPA = moderate physical activity; VPA = vigorous physical activity; ST = sit time; SD = standard deviation; CI = confidence interval.

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

### Purpose

To compare FF and SE in relation to exercise tests and self-reported questionnaires in sedentary men and women before and after regularly participating in interactive video game play (n = 12, 56±4 yrs, 162±10·9 cm, 79.2±19.1 kg, 39.6±7.7% fat mass).

### Methods

All subjects were initially screened and underwent a battery of FF tests and SE questionnaires. Subsequent observations took place in a monitored laboratory setting where subjects engaged in self-selected, low-to-moderate-intensity exergaming involving aerobic, resistance, flexibility, or neuromotor training for 20 min/3d/wk between August 2015 and June 2016. After 8 weeks, FF and SE were retested.

### Results

Exercise using interactive video game technology significantly increased 30-second Sit-To-Stand repetitions (14.2 ± 16.8, p < 0.05). Additionally, all participants reported with 100% confidence they would continue to exercise for at least 20 min/3d/wk for up to 6 weeks post-study if they owned an interactive video game system within their home.

### Conclusions

Exergaming improved lower extremity functional strength and endurance as well as participants' confidence in their ability to continue exercising beyond this study in previously sedentary middle-aged adults. Interactive video game systems should be considered a viable option for convenient, enjoyable, within-the-home exercise programs to assist individuals in meeting ACSM physical activity guidelines.

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

**Board #46**

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

**Exergaming Intervention in Sedentary Middle-Aged Adults Improves Lower Extremity Functional Fitness and Exercise Self-Efficacy**

Daniel M. Rosney, Sr, Dmitry V. Belous, Mingmei Tian, Courtney E. Miller, Katherine T. O’Donnell, Sabrina M. Daniels, Peter J. Horvath. State University of New York at Buffalo, Buffalo, NY. (Sponsor: Luc E. Gosselin, FACSM)

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(No relationships reported)

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

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**Board #47**

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

**Association between Increased Activity and Wellbeing under Weight Stable Conditions**

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(No relationships reported)

The increasing prevalence of physically inactive adults within the United States continues to be a health burden, as inactivity is linked to several non-communicable diseases. Even modest increases in activity can improve health benefits, even without weight loss. However, little is known about the psychosocial outcomes of exercise in weight stable conditions.

**Purpose**

The purpose of this research is to evaluate the effects of time spent in aerobic activity on self-reported psychosocial outcomes in previously sedentary young adults when weight is maintained.

**Methods**

65 previously sedentary/obese adults (54% male, 31.3 ± 7.3 years), were randomized into a high flux (35 kcal/kg/week) or low flux (17.5 kcal/kg/week) exercise group for a 6-month aerobic intervention. All sessions were on site and consisted of 3-5 sessions per week for approximately 1 hour (dependent on body weight). Additionally, weight maintenance (±3%) was required for the entire 6 months. Exercise trainers monitored heart rate (HR) every 5 minutes to ensure intensity.
between 70-75% of maximal HR and all sessions were timed and recorded. To evaluate wellbeing, participants completed assessments relating to mood (POMS) and health status (SF-36) at baseline and at intervention completion.

RESULTS: The average exercise time in the high (n=32) and low (n=33) flux group was 220 ± 54.6 minutes and 155.9 ± 28.6 minutes per week, respectively. Quintiles were created based off average time per week of aerobic exercise (±SD) (mean values for least time to most time: 137.3 ± 19.2, 175.6 ± 8.8, 249.4 ± 39.4 minutes). There was a linear trend towards higher %sed in children (p<0.05) across quintiles for SF-36 (Role Emotional) subscale for time spent in routine activities due to emotional wellbeing, after adjusting for age and sex. No other significance was seen across the 6-month psychosocial wellbeing assessments.

CONCLUSION: These results indicate that an increase in time spent exercising will allow for less time spent in routine tasks due to emotional wellbeing. No other significance was found within the POMS or SF-36 evaluations. While these results are consistent with previous findings, more research is necessary to determine if exercise duration contributes to spending less time on daily activities in weight stable adults.

Parents are key for promoting physical activity (PA) in children. Family Gym provides a free, 90 minute weekly opportunity for families with young children (ages 3-8) to be active together. Family Gym is located in a community center in a Boston, MA low-income, minority neighborhood.

PURPOSE: To examine the PA levels of parents and children during Family Gym sessions and to determine the effect of varying lengths of structured activity sessions for parents and children.

METHODS: Twelve children (4.8 ± 1.9 yrs) and their parents (27.2 ± 9.4 yrs) participated in group sessions which included free play followed by staff structured activities that were either short (S) (n = 8, averaging 4.4 ± 1.4 minutes per session) or extended (E) (n = 9, averaging 18.9 ± 3.5 minutes per session) in duration. PA levels of each participant were measured using an Actigraph GT9X accelerometer worn at the waist. Percent of time spent in sedentary behaviors (%sed), and in light (%LPA), and in moderate-to-vigorous (%MVPA) PA were estimated using the Troiano cut points for each participant were measured using an Actigraph GT9X accelerometer worn at the waist.

RESULTS: Parents and children did not differ in %sed (p=0.05). Compared to children, parents had significantly more %LPA during the S and E sessions for children’s %sed, %LPA, and %MVPA. There were no differences between the E and S sessions for %sed (E, 24.1 ± 14.5 vs. S, 14.2 ± 10.4; p = 0.215) or %MVPA (E, 16.3 ± 5.3 vs. S, 60.9 ± 10.5; p = 0.421). There were no differences between E and S sessions for children’s %LPA, %MVPA.

CONCLUSIONS: Parents are not as active as their children in an open play environment. However, open play appears to be as effective as structured activity for increasing %MVPA in children. Organized but unstructured programming is needed to increase PA in parents in group play settings with their children. Funded by the Creative Economy Initiatives Fund, UMass
Exercise-related mobile apps and wearable movement detection devices have become popular tools for active lifestyle promotion. Behavioral modification theories such as goal setting, stimulus control, incentive scheme, and self-determination theory could be easily integrated into mobile apps program design so as to make these exercise motivational strategies more interesting and appealing. Limited studies have evaluated these strategies for promoting better exercise compliance. PURPOSE: To evaluate factors that contribute to a better exercise compliance in a mobile-app based exercise promotion program called the Virtual Trainer (VT) project. METHODS: A VT mobile app that integrated various lifestyle modification theories, such as goal setting (exercise prescription module), know-how (educational materials dissemination), stimulus control (constant exercise reminding messages and health tips), incentive (exercise credit-points accumulated for prize redemption), feedback system (online health & fitness assessment), and self-determination theories (personalized exercise training scheduling), was designed and prescribed to 126 Chinese adults (age=29.08 +/- 5.35 yrs.) for a 8-12 weeks exercise intervention program. Exercise compliance was computed from ratio of completed exercise session that recorded from the VT system against planned exercise session at the beginning. At end of intervention a questionnaire was completed by participants to report ratings that they perceived as useful for encouraging exercise participation. Responses were compared between the high compliance group (100% compliance) and low compliance group (<70% compliance). RESULTS: High compliance group accounted for 67% of total whereas low compliance group 15%. Mean compliance rate for low compliance group was 44.9%. Regarding VT built-in psychological factors the high compliance group reported significantly higher rating in educational contents (p<.01), feedback system (p<.05), stimulus control (p<.05), whereas other factors were not different between groups. CONCLUSION: Among various behavioral modification theories the stimulus control, know-how, and feedback system are more effective strategies in promoting exercise compliance when integrated with mobile technology.
Purpose: The objective of this study was to investigate whether MyPlate, used as a nutritional assessment and an educational platform, can improve nutritional knowledge, eating attitudes and physical activity levels compared to food records.

Methods: One hundred twenty university students (18-22 years old) with a normal Body Mass Index (BMI) were recruited and randomly yet equally assigned into one of three groups after signing an IRB approved informed. The groups were: MyPlate group (MG), food records group (FG), and control group (CG). All participants attended two nutritional seminars and completed a modified and validated general nutrition knowledge questionnaire (GNKQ). Eating attitude test (EAT-26) at the beginning and the end of the 4-week study period. A detailed exercise log was also obtained from each participant for the entire period of study.

Results: Participants in the MG group showed a significant improvements in their nutritional knowledge (p<0.05), eating attitude (p<0.05) and physical activity (p<0.05) compared with other groups. Vegetable consumption elevated from start to finish in the MG (p<0.05) along with a trend towards elevated wholegrain consumption. Males tended to show a more positive eating behavior compared with females in all groups. No significant differences were observed in eating attitude, and physical activity in MG compared with CG.

Conclusion: MyPlate appears to be an effective tool to improve physical activity, nutritional knowledge and promote positive eating behaviors and therefore wellness.

Purpose: Mindfulness and slow eating techniques are commonly recommended to aid in weight loss within behavioral weight management programs; yet, the role of these eating strategies on acute energy intake (EI) and satiety are not clear. The purpose of this study was to investigate the effects of mindful and slow eating strategies on acute EI and satiety.

Methods: 24 subjects (median BMI: 29.1 (24.3 – 36.7), median age: 24.0 (21.0 – 31.8)) were randomized to one of three eating conditions (EAT, SLOW, or MIND). For the EAT condition, subjects were instructed to eat as they normally would for their first test meal session and to slow their eating for their second test meal session. For the MIND condition, subjects were instructed to eat as they normally would during their first test meal session and were given brief instructions on mindful eating for their second test meal session. For each condition, subjects were provided ad-libitum access to a test meal and EI was calculated based upon food consumed during this period. Subjects rated their level of satiety following each meal.

Results: There were no significant differences in EI between eating strategy conditions (EAT: 848 (704-1071) kcal, MIND: 673 (485-846) kcal, SLOW: 756 (611-1076) kcal) (p = 0.786). There was a trend toward a decrease in energy intake in the MIND condition (mean change in energy intake: -64.4 ± 178.4 kcal) compared with the EAT (mean change in energy intake: 98.3 ± 169.0 kcal) condition and a prevention of increased intake in the SLOW (mean change in energy intake: 2.6 ± 107.9 kcal) condition (p = 0.133). There were no significant differences in ratings of satiety between conditions.

Conclusion: Neither mindful nor slow eating strategies significantly decreased acute EI or satiety, although a decrease in EI achieved through a brief mindfulness practice and prevention of increased intake through slow eating may be clinically meaningful for weight management. Future studies should aim to investigate the potential benefits of slow eating and mindfulness for weight management.

Purpose: The high-intensity interval training (HIIT) has recently been advocated as a time efficient alternative to combat physical inactivity related morbidities. Previous studies have demonstrated the physiological health benefits of HIIT, but relatively little is known about the adherence related psycho-perceptual responses to this form of exercise in physically inactive individuals. PURPOSE: To compare the adherence-related psycho-perceptual responses after a single session of HIIT versus moderate-intensity continuous exercise (MICE) and vigorous-intensity continuous exercise (VICE) in physically inactive middle-aged adults. METHODS: Using a repeated measures randomized cross over design, twelve middle-aged apparently healthy physically inactive males (mean age: 46.8 ± 7.5 years; BMI: 23.4 ± 2.1 kg m⁻²; VO₂max, 39.5 ± 5.6 mL kg⁻¹ min⁻¹) undertook three main trials (7-days apart) consisting of: HIIT (10 x 1-min run at 100% VO₂max interspersed with 1-min active recovery at 50% VO₂max), MICE (40-min run at 65% VO₂max) and VICE (20-min run at 80% VO₂max). Participants’ adherence-related psycho-perceptual responses including: (i) Self-efficacy assessed via a 5-item task-specific questionnaire; (ii) Perceived enjoyment responses measured via the Physical Activity Enjoyment Scale (PACES) and (iii) exercise modality preference were assessed upon completion of the trials. One-way repeated measures ANOVA was used to identify within-subject differences. Pairwise comparison was conducted with LSD corrections. RESULTS: There was a significant main effect between the trials. Participants displayed significantly lower exercise task self-efficacy scores towards HIIT (42.7 ± 25.3) and VICE (49.2 ± 23.9) than MICE (63.4 ± 18.3, both P < 0.01) based upon pairwise comparison. Additionally, only 17% of participants (2 out of 12) reported a preference to engage in HIIT as opposed to either MICE and VICE. No significant difference was found for perceived enjoyment responses between the trials. CONCLUSION: Our finding suggests that HIIT does not promote self-efficacy and may not be an adherable exercise strategy for health promotion in physically inactive middle-aged individuals. Future research examining the long-term adherence to HIIT in this population is warranted.
CONCLUSIONS

The preliminary results suggest that bicycle lane must be at least 140 cm broad to accommodate a ‘comfortable’ passing distance (for the cyclist). The equivalent passing speeds equates to a car speed of approximately 40 km/h. If the car is passing the bicycle at this speed, the object-proximity variable ordered closest first and moving outward from the track will be observed by the driver. The question is, however, whether the passing distance on one side is sufficient for the approaching car. Does the passing distance depend on the passing speed?

Inferences can be made by studying the results of one of the experiments. The cycling speed and heart rate during the first and last week of participation are given in Table 3: The average heart rate during the last week was 168.8 ± 5.7 bpm while the average speed was 24.7 ± 2.2 km/h. The average heart rate during the first week was 173.8 ± 8.9 bpm while the average speed was 25.3 ± 2.7 km/h. The average speed during the last week was less than the average speed during the first week, which suggests that the participants were more tired during the last week of participation. The average heart rate during the last week was higher than the average heart rate during the first week, which suggests that the participants were more fatigued during the last week of participation.

In conclusion, the preliminary results suggest that bicycle lane must be at least 140 cm broad to accommodate a ‘comfortable’ passing distance (for the cyclist). The equivalent passing speeds equates to a car speed of approximately 40 km/h. If the car is passing the bicycle at this speed, the object-proximity variable ordered closest first and moving outward from the track will be observed by the driver. Does the passing distance depend on the passing speed? Inferences can be made by studying the results of one of the experiments. The cycling speed and heart rate during the first and last week of participation are given in Table 3: The average heart rate during the last week was 168.8 ± 5.7 bpm while the average speed was 24.7 ± 2.2 km/h. The average heart rate during the first week was 173.8 ± 8.9 bpm while the average speed was 25.3 ± 2.7 km/h. The average speed during the last week was less than the average speed during the first week, which suggests that the participants were more tired during the last week of participation. The average heart rate during the last week was higher than the average heart rate during the first week, which suggests that the participants were more fatigued during the last week of participation.
RESULTS: After 30 days of Whole 30 program, there was a significant reduction on the sum of 9 skinfolds (67.7±12.21 vs 53.89±16.32, p<0.0001), total fat (23.25±16.73 vs 19.66±6.37, p=0.0001) and total fat and trunk fat (47.07±16.14 vs 36.51±11.91, p=0.0001); and a significant gain of body fat-free mass (76.76±6.73 vs 80.34±6.37, p=0.0001). When subgroup analyses were performed by sex, it was found that the relative loss of body fat (sum of 9 skinfolds, total fat and trunk fat) was similar. Regarding performance, a time reduction to perform the Crossfit workout was observed (14’18” vs 12’33””, pre and post dietetic intervention, respectively).

CONCLUSIONS: The Whole 30 dietary program promoted body fat reduction and fat-free mass gain in trained Crossfit individuals. Additionally, after 30 days of dietary program, there was observed improvement in performance by reducing the time taken to perform the CrossFit workout.

Previous studies have reported that healthy middle-aged adults spend less time on physical activity during the weekend than during the weekday. However, there are few reports about this topic that include older Japanese adults.

PURPOSE: To examine variation in the amount of daily physical activity during an exercise intervention for older Japanese adults. Variations between the sexes were also examined in this study.

METHODS: Forty-one healthy adults (female: n = 24; male: n = 17; age: 73.2 ± 8.88 years) participated in an exercise intervention (UMIN00020678). The exercise program was conducted once a week for 3 months. Daily physical activity was measured using three-axis accelerometers (OMRON: HJA-750C). Physical activity data were categorized into two types: locomotive or household activity. For each day of the week, we compared locomotive and household activity between male and female participants using one-way ANOVA. Statistical significance was set at P < 0.05.

RESULTS: For all participants, physical activity amounts for each day of the week (Monday-Sunday) was 21.7-23.0 Mets∙h/day. There were no significant (P < 0.05) differences among the days of the week. The average total amount of daily physical activity through all 7 days of the week was higher for female subjects (24.2 ± 4.5 Mets∙h/day) than for male participants (20.0 ± 3.9 Mets∙h/day). The average amount of locomotive activity was higher for male participants (5.42 ± 1.81 Mets∙h/day) than for female participants (4.8 ± 2.0 Mets•h/day). However, the average amount of household activity was higher for female participants (19.3 ± 3.7 Mets∙h/day) than for male participants (14.6 ± 3.5 Mets∙h/day).

CONCLUSIONS: The results suggest that there is no significant variation in daily physical activity amounts in older Japanese adults during our exercise intervention. Furthermore, female participants in this intervention had higher total amounts of daily physical activity because of higher household physical activity amounts, even though male participants had higher locomotor activity.

Exercise has been shown to alter blood parameters depending on the intensity, duration and type of activity. However, most of the documented changes stem from research using aerobic training with little exploration in resistance training (RT). PURPOSE: To determine the effects of 12 w of either 3 consecutive (C) or non-consecutive (NC) d/w of RT on erythrocyte responses. METHODS: Thirty healthy and recreationally active men (25 SD 2 y) were randomly assigned to either C or NC for 12 w. Both groups performed 3 sets x 10 repetitions at pre-determined 10 repetition-maximum of leg press, latissimus pulldown, leg curl, shoulder press and leg extension for each RT session. Blood was sampled in untrained state pre (UT Pre), immediately post 3rd day of RT (T 0 h), 24 h post 3rd day of RT (T 24 h) in week 12. Whole blood was analyzed for red blood cell (RBC) counts, hemoglobin (Hb), hematocrit (Hct), mean cell volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), mean plasma volume (MPV), and red cell distribution width (RDW). Analysis was conducted using Generalized Estimating Equations. RESULTS: Both groups were similar in age, weight (65 ± 10 kg), height (1.72 ± 0.06 m), BMI (22.2 ± 2.7 kg/m²), systolic and diastolic blood pressures [114 (5)/69 (8) mm Hg], fasting glucose [4.5 (3.3) mmol/L] and physical activity level [2144 (1428) MET-min/w] pre-RT. No interaction was found for all measures (p = .350-.944). There were no group differences except for Hb, MCHC, and RDW (p = .001-.022). Differences were due to the means (SE) of Hb [15.20 ± 0.94] > NC: 14.32 ± 0.72] (MET: C: 35.071 (217) > NC: 34.060 (231) g/dL, and RDW [C: 12.553 (163) < NC: 13.530 (338)] % being lower in one group than the other at baseline. C and NC showed similar profile across respective time points. Hct, MCV and MCH increased at UT 0 h (p = .001-.033) but Hct lowered at UT 24 h (p = .006) while MCH remained elevated at UT 24 h (p = .042) compared to UT pre. RBC and Hb lowered at UT 24 h compared to UT Pre (p = .002-.029). MCV and MPV increased (p = .001-.037) while MCHC lowered (p = .022) at T 0 h compared to T Pre. CONCLUSION: Both groups demonstrated similar post-RT responses in erythrocyte profile.

Supported by: NIE AcRF R-5/14 YFF

PURPOSE: Health authorities worldwide recommends 2-3 d/w of resistance training (RT) for health, preferably spread 48-72 h apart. However, it is common among fitness buffs, top athletes and weekend warriors to RT on consecutive days. Yet, effects of recovery period in between RT sessions on many physiological variables are unclear. Therefore, the purpose of this study is to determine the effects of 12 w of either 3 consecutive (C) or non-consecutive (NC) d/w of RT on body composition and strength.

METHODS: Thirty young, healthy and recreationally active men [25 (SD 2) y] were randomly assigned to either C or NC for 12 w. Body composition using dual-energy X-ray absorptiometry and 10RM for the RT exercises were determined pre- and post-RT. Differences were analyzed using 2x2 mixed design repeated measures ANOVA (with aligned rank transformation for nonnormal data with or without equal variances).

RESULTS: Both groups were similar in age, weight [65 ± 10 kg], height [1.72 ± (0.06 m), BMI [22.2 (2.7) kg/m²], systolic and diastolic blood pressures [114 (5)/69 (8) mm Hg], fasting glucose [4.5 (3.3) mmol/L] and physical activity level [2144 (1428) MET-min/w] pre-RT. No interaction was found for all measures (p = .350-.944). There were no group differences (p = .143 to .948) except bone mineral density (BMD), which was higher in C (11.81 kg/m²) than NC (11.08 kg/m², p = .025). However, C and NC improved their BMD similarly following RT [+ 1.9 kg/m²; 95% CI of gain (11, .28), p < .001]. Both groups also gained weight (p < .001; C: 65.7 to 67.0 kg; NC: 63.8 to 65.7 kg) due to lean body mass (p < .001; C: 50.5 to 52.0 kg; NC: 48.6 to 50.6 kg) and bone mass gains (p < .003; C: 2.50 to 2.53 kg; NC: 2.30 to 2.32 kg) with an insignificant fat loss (p = .438). Body fat % reduced similarly for both groups (p = .029; C: 18.7 to 18.0%; NC: 19.8 to 18.9%) with no change in fat distribution in the limbs and trunk (p = .172 to .898). Both groups improved 10RM similarly for all exercises (p = .001 for all; 55 kg for LP, 22 kg for LAT, 13 kg for LC, 6 kg for SP and 20 kg for LE). CONCLUSIONS: Both groups improved body composition and strength similarly post-RT. Supported by: NIE AcRF R-5/14 YFF

PURPOSE: Evaluate the efficacy of a mobile health promotion application (app) to improve gait characteristics related to increased fall risk in older adults. METHODS: Community-dwelling older adults (N=38; age 72.42 ± 12.58) were recruited and randomly assigned to experimental (n=20; app with exercise) or control (n=18; app without exercise) conditions. Pre/post gait analysis at self-selected (SS) and fast walking speeds was measured using the GAITRite® Electronic Walkway. Gait variables included ambulation time (AT), velocity, cadence, step length and width, base of support, cycle time, single and double support time. Statistical analysis included a
Nurses face multiple negative stressors and report the greatest stress of all health care workers. The stress can have a negative effect on the health of nurses (e.g., obesity, fatigue, decrease in quality of life and satisfaction with life, and burnout). Stress is common among nurses with negative impacts on a nurse’s health as well as the quality of care patients receive. It is important for nurses to implement self-care strategies techniques (e.g., physical activity) to lower feelings of stress.

**PURPOSE:** To examine the relationship between physical activity levels and measures of health among nurses in eastern NC.

**METHODS:** Nurses (n = 176) of a sample of health care workers in eastern North Carolina were recruited for the study by their respective healthcare administrators. The International Physical Activity Questionnaire (IPAQ) was administered to participants. Using the IPAQ, nurses were categorized into one of three activity levels: low, moderate, and high. Data were analyzed using SPSS (version 24). Results: Data were analyzed and interpreted to understand the relationship between physical activity and measures of health among nurses in eastern NC. Nurses reported burnout, stress, and fatigue were significantly correlated with physical activity (r = -0.30, p < 0.01). In addition, nurses reported body mass index (BMI) was significantly correlated with moderate-to-vigorous physical activity (r = 0.33, p < 0.01). A multiple regression analysis was conducted to examine the relationship between physical activity and burnout. The model was significant (R = 0.53, F (2, 173) = 18.92, p < 0.01). The model explained 28% of the variance in burnout. Conclusions: The relationship between physical activity and measures of health among nurses in eastern NC was supported. Nurses with higher physical activity levels reported lower burnout, stress, and fatigue. The findings of this study highlight the importance of promoting physical activity among nurses in eastern NC to improve their health and well-being.
Logistic regression analyses showed the odds for FI risk were 55% lower among families reporting higher readiness to provide and support structured PA opportunities (p<0.001).

**CONCLUSIONS:** FI risk is associated with rural families’ readiness to provide PA and support structured PA opportunities for their children. A better understanding of factors relating to readiness and ability to provide structured PA and its relationship to FI may inform future obesity prevention efforts for at-risk families.

Supported by a grant from the National Institute of Food and Agriculture, USDA, award # 2011-68001-30020.

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**Board #71 May 31 3:30 PM - 5:00 PM**

**Impact of Visual Feedback on Exercise Intensity and Motivation**

Kelsey Reynolds, Dale D. Brown, FACSM, Daniel Dodd, Kelly R. Launor. Illinois State University, Normal, IL.

(No relationships reported)

**PURPOSE:** Determine if visual feedback motivates college-aged students to maintain a higher exercise intensity during an indoor cycling class and to ascertain the favored type of visual feedback.

**METHODS:** Thirty participants took part in a within-subject design experiment. Participants were assigned a heart rate monitor and identification number to record and monitor exercise intensity during each class session. Participants completed three cycling classes that were randomly assigned as a no visual feedback (NF), individual feedback (IF), or group feedback condition (GF). A Spielberger Trait Anxiety survey was completed before the first session and the Spielberger State Anxiety survey was completed before every cycling session. For each condition, participants stated if they enjoyed the heart rate feedback received and using the heart rate monitors. At the end of the study, participants specified the visual feedback condition they preferred.

**RESULTS:** The group feedback condition spent a higher percentage of time above 80% of their age-predicted heart rate maximum. Participants spent 17.5% of their time in the 80-90% heart rate zone and 2.8% in the 90-100% zone. No feedback and individual feedback groups spent 13.2% and 15.1% in the 80-90% heart rate zone and 0.9% and 2.7% in the 90-100% zone. A one-way repeated measures ANOVA indicated a statistically significant difference between the three conditions and heart rate zone between the three conditions. The group feedback condition had the highest average heart rate (138.1 bpm), maximal heart rate (174.4 bpm), and heart rate predicted caloric expenditure (293.5 kcal). A positive correlation was found between the group feedback RPE and enjoyment of group feedback (r=0.55, p<0.01). The RPE of individual feedback was positively correlated with working harder due to wearing a heart rate monitor (r=0.54, p=0.01) and receiving individual feedback (r=0.57, p=0.01). Twenty-one (70%) participants preferred group feedback, 4 participants (13.3%) favored the individual feedback, 1 participant (3.3%) chose no feedback, and 4 participants (13.3%) had no preference.

**CONCLUSIONS:** Participants favored group feedback over individual feedback and no feedback. Visual feedback was associated with higher exercise intensity and greater enjoyment of the exercise session.

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**Board #72 May 31 3:30 PM - 5:00 PM**

**Impact Of Sit-to-stand Workstation Use On Physical Fitness: A Pilot Study**

Catherine Patrick, Shianne Wickham, Larissa Boyd, Melissa Powers. University of Central Oklahoma, Edmond, OK.

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(No relationships reported)

Recent studies indicate sedentary lifestyles have a negative impact on physical fitness. Modifying sedentary daily activities could maintain and improve optimal health. The introduction of sit-to-stand workstations within the workplace provides sedentary employees an opportunity to alternate between sitting and standing positions.

**PURPOSE:** To determine if visual feedback motivates college-aged students to maintain a higher exercise intensity during an indoor cycling class and to ascertain the favored type of visual feedback.

**METHODS:** A within-subject design experiment. Participants were assigned a heart rate monitor and identification number to record and monitor exercise intensity during each class session. Participants completed three cycling classes that were randomly assigned as a no visual feedback (NF), individual feedback (IF), or group feedback condition (GF). A Spielberger Trait Anxiety survey was completed before the first session and the Spielberger State Anxiety survey was completed before every cycling session. For each condition, participants stated if they enjoyed the heart rate feedback received and using the heart rate monitors. At the end of the study, participants specified the visual feedback condition they preferred.

**RESULTS:** The group feedback condition spent a higher percentage of time above 80% of their age-predicted heart rate maximum. Participants spent 17.5% of their time in the 80-90% heart rate zone and 2.8% in the 90-100% zone. No feedback and individual feedback groups spent 13.2% and 15.1% in the 80-90% heart rate zone and 0.9% and 2.7% in the 90-100% zone. A one-way repeated measures ANOVA indicated a statistically significant difference between the three conditions and heart rate zone between the three conditions. The group feedback condition had the highest average heart rate (138.1 bpm), maximal heart rate (174.4 bpm), and heart rate predicted caloric expenditure (293.5 kcal). A positive correlation was found between the group feedback RPE and enjoyment of group feedback (r=0.55, p<0.01). The RPE of individual feedback was positively correlated with working harder due to wearing a heart rate monitor (r=0.54, p=0.01) and receiving individual feedback (r=0.57, p=0.01). Twenty-one (70%) participants preferred group feedback, 4 participants (13.3%) favored the individual feedback, 1 participant (3.3%) chose no feedback, and 4 participants (13.3%) had no preference.

**CONCLUSIONS:** Participants favored group feedback over individual feedback and no feedback. Visual feedback was associated with higher exercise intensity and greater enjoyment of the exercise session.

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**Board #73 May 31 3:30 PM - 5:00 PM**

**Soccer Training Improves Metabolic and Cardiovascular Health in 50-70-yr olds with pre Type 2 Diabetes**

Magni Mohr1, May-Britt Skordal1, Iann Mortensen2, Pål Welhe1, Peter Krustrup1, 1University of the Faroe Islands, Tórshavn, Faroe Islands. 2The Faroese National Hospital, Tórshavn, Faroe Islands. 3The Faroese Hospital System, Tórshavn, Faroe Islands. 4University of Southern Denmark, Odense, Denmark.

Email: magnim@setur.fo

(No relationships reported)

Type 2 Diabetes Mellitus is a pathological condition, which partly is provoked by an inactive lifestyle. **PURPOSE:** To examine effects of soccer training vs. dietary advice on glucose control, metabolic and cardiovascular health status in patients with pre-T2DM.

**METHODS:** Fifty 50-70-yr-old untrained participants (26 women and 24 men; age: 61±1 yrs; height: 171±1 cm; weight: 85.7±2.3 kg; VO2max: 22±10.8 ml·min⁻¹·kg⁻¹; mean arterial pressure (MAP): 103±2 mmHg) suffering from pre-T2DM were randomized into a soccer training (SOC; n=26) and control (CON; n=24) group. Both group received standardized dietary advice during a 16-wk intervention period. Additionally, SOC completed two sessions/wk of soccer training. Training consisted of small-sided games being increased progressively from 30 to 60 min per session during the 16-wk intervention period. Pre and post-intervention, the participants completed a maximal oxygen uptake (VO2max) bike test, an oral glucose tolerance test (OGTT), a DXA-scan, as well as assessments for blood lipid profile, blood pressure and resting heart rate. **RESULTS:** Post-intervention plasma glucose at rest and at 120 min in the OGTT were lower (P<0.05) in SOC and CON, with a greater effect (P<0.05) in SOC compared to CON (+2.3±0.3 vs. -1.2±0.4 mmol·L⁻¹). After 16 wks VO2max was improved (P<0.05) by 4.3±0.5 ml·min⁻¹·kg⁻¹ in SOC, which was more than in CON (-0.6±0.5 ml·min⁻¹·kg⁻¹). In SOC, body fat content and plasma triglycerides were lowered by -3.4±0.6 kg and -0.3±0.06 mmol·L⁻¹, respectively, and with changes scores greater (P<0.05) compared to CON. Moreover, SOC improved (P<0.05) resting heart rate, lean body mass and waist circumference to a greater degree than CON. **CONCLUSIONS:** Soccer training in combination with dietary advice improves glucose control, as well as metabolic and cardiovascular health to a greater degree than dietary advice alone in 50-70 yr old patients with pre-T2DM. **Supported by a grant from the Faroese Research Council.**
Free Communication/Poster - Aging in Skeletal Muscle and Bone

**Wednesday, May 31, 2017, 1:00 PM - 6:00 PM**
Room: Hall F

**896 Board #75**
May 31 3:30 PM - 5:00 PM
**Chronic Systemic Inflammation, Physical Activity and Skeletal Muscle in Elderly**
Fawzi Kadi, Andreas Nilsson, Britta Wählín-Larsson, Oscar Bergens. Örebro University, Örebro, Sweden.

(No relationships reported)

**PURPOSE:** It is hypothesized that chronic systemic inflammation is influenced by physical activity level and is involved in the age-related decline in muscle function. The impact of physical activity behaviour on the level of C-reactive protein (CRP) and tumour necrosis factor alpha (TNF-α) in elderly women is investigated. The impact of chronic systemic inflammation on muscle mass and the cellular and molecular mechanisms behind the putative inflammation-mediated action on human muscle cells are explored.

**METHODS:** Total amount of sedentary time, 30-minute periods of sedentary time and breaks in sedentary behaviour and time spent in moderate-to-vigorous physical activity (MVPA) were assessed using accelerometer in a cohort of 89 elderly women. Serum hsCRP and TNF-α are measured. The proliferative and metabolic capacity of human muscle cells obtained from vastus lateralis and exposed to CRP are assessed.

**RESULTS:** No variables of sedentary behaviour were significantly associated with the level of CRP or TNF-α. In contrast, time spent in MVPA was inversely associated with the level of CRP and TNF-α. Bone mineral density (BMD) of the total hip, femoral neck and lumbar spine, and biomarkers of bone turnover (OC, BALP, PINP, CTX) were measured. General linear models, adjusted for baseline values of the outcome and gender, were used to examine intervention effects.

**RESULTS:** Mean age of participants was 70.1±3.8 years. 78% were female, 78% were Caucasian, and baseline BMD was 35.3±2.9 kg/m². Average weight loss was 11.2±4.3 kg and 11.0±5.9 kg in the D+V and D groups (p=0.94), and average weight lost was 6.7±2.3 hrs/day. No significant differences were noted for total hip BMD and BALP. Loss in total hip BMD was greater in the D group compared with D+V (±0.27±0.19 with D+V vs. -0.35±0.25 with D, p=0.048). BALP increased in the D+V group by 3.8% (∆: 0.59 [-0.33, 1.50] /U/L) and decreased by -4.6% in the D group (D: -0.70 [-1.70, 0.31] /U/L, p=0.07).

**CONCLUSIONS:** Weighted vest use during weight loss may attenuate loss of hip BMD and increase bone formation.

Funding for this study was provided by the Arthritis and Musculoskeletal Disease Research Center, and Center for Integrated Medicine at Wake Forest School of Medicine, and the Translational Science Center of Wake Forest University. An in-kind product donation was made by Jason Pharmaceuticals, Inc.

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**897 Board #76**
May 31 3:30 PM - 5:00 PM
**Biomarkers of Senescence in Aging Skeletal Muscle**
Dongmin Kwak¹, Cory W. Baumann², LaDora V. Thompson³. Boston University, Boston, MA. University of Minnesota, Minneapolis, MN.

(No relationships reported)

**PURPOSE:** Cells enter into a state of senescence in response to certain stressors, such as aging and age-related diseases. It is proposed that senescent cells drive pathogenesis (e.g., atherosclerosis). Hence, it is possible that senescent cells underlie sarcopenia. Biomarkers of senescence include p53, p21, p16, IL-6, and senescence associated beta-galactosidase (SA β-gal). These biomarkers have been extensively investigated using in vitro cell culture experimentation. The purpose of this study was to explore the role of senescence as a potential driver of age-associated sarcopenia. We hypothesized that biomarkers of senescence will be increased in aging skeletal muscle and it is highly associated with sarcopenia.

**METHODS:** To identify biomarkers of senescence in aging skeletal muscle, the extensor digitorum longus (EDL) and tibialis anterior (TA) muscles were excised from male C57BL/6 adult (<12 months, N=11) and elderly (>28 months, N=11) mice. The EDL was then used to assess ex vivo whole muscle physiology while the TA was used for histological and biochemistry analyses. Western blotting was performed to determine the expression of p53, p21 and p16, and an ELISA was performed to detect IL-6 content. Senescent cells were determined by SA β-gal staining.

**RESULTS:** Muscle wet weight and absolute force production were significantly reduced in the elderly group. Aging resulted in a significant increase in p21 and IL-6, but did not alter p53 or p16 expression. Because the identification of senescent cells by SA β-gal staining was very low the statistical comparison between adult and elderly was not performed.

**CONCLUSIONS:** Taken together, selective biomarkers of senescence are present in muscles from elderly mice. Because p21 and IL-6 both increased in the elderly muscle, it is possible that these proteins play a role in the development of age-associated sarcopenia.

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**898 Board #77**
May 31 3:30 PM - 5:00 PM
**The Effect of Weighted Vest Use During Caloric Restriction on Bone Health in Obese Older Adults**
Jessica L. Kelleher¹, Dan P. Beavers², Rebecca M. Henderson², Jessica Kiel³, Barbara J. Nicklas³, Kristen M. Beavers³. Wake Forest University, Winston-Salem, NC. Wake Forest School of Medicine, Winston-Salem, NC. Medifast, Inc., Owings Mills, MD. (M. Sponsor: Peter Brubaker, FACSM)

(No relationships reported)

**PURPOSE:** To explore the effects of weighted vest use during caloric restriction on bone density and turnover.

**METHODS:** 37 obese older adults underwent a 5.5 month dietary weight loss intervention (1000-1300kcal/d) with (D+V, n=20) or without (D, n=17) weighted vest use (10+ hrs/d). Bone mineral density (BMD) of the total hip, femoral neck and lumbar spine, and biomarkers of bone turnover (OC, BALP, PINP, CTX) were measured. General linear models, adjusted for baseline values of the outcome and gender, were used to examine intervention effects.

**RESULTS:** Mean age of participants was 70.1±3.8 years. 78% were female, 78% were Caucasian, and baseline BMD was 35.3±2.9 kg/m². Average weight loss was 11.2±4.3 kg and 11.0±5.9 kg in the D+V and D groups (p=0.94), and average weight lost was 6.7±2.3 hrs/day. No significant differences were noted for total hip BMD and BALP. Loss in total hip BMD was greater in the D group compared with D+V (±0.27±0.19 with D+V vs. -0.35±0.25 with D, p=0.048). BALP increased in the D+V group by 3.8% (∆: 0.59 [-0.33, 1.50] /U/L) and decreased by -4.6% in the D group (D: -0.70 [-1.70, 0.31] /U/L, p=0.07).

**CONCLUSIONS:** Weighted vest use during weight loss may attenuate loss of hip BMD and increase bone formation.

Funding for this study was provided by the Arthritis and Musculoskeletal Disease Research Center, and Center for Integrated Medicine at Wake Forest School of Medicine, and the Translational Science Center of Wake Forest University. An in-kind product donation was made by Jason Pharmaceuticals, Inc.
**901 Board #79**
May 31 3:30 PM - 5:00 PM

**Regression Equation To Predict Body Fat In Elderly Women Using Body Circumference Measures**

Eliane Cunha GONCALVES, DRA. Faculdade ESTácio de Vitória, VITORIA - ES, Brazil.

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(No relationships reported)

**PURPOSE:** The purpose of this study was to develop and validate an equation to estimate body composition in elderly women above 60 years of age using body circumference measures. **Methods:** The sample consisted of 60 women individuals with an average age of 68.23 ± 5.84 years, body weight (64.23 ±11.11%), relative body fat 1.53±0.11%; and percent body fat 41.73±5.69%. The validation group had the following descriptive metrics: 71.3± 8.5 years, body weight 62.49±8.34kg, 1.55±0.53m; and percent body fat 41.75±4.04%. Body circumferences variables were used to develop equations to predict body fat. Using the stepwise selection criteria, the following equation was developed: % body fat = 0.343 (hip) + 0.289 (waist) - 0.0714 (handle). Several parameters validated the strength of the equation: R² = 0.977, PFE= 3.29, PFE ≤ 3.5%; and validation of the model based on the partial significance (F) of the subset of variables that showed the strongest effect.

**Conclusion:** It is possible to develop an accurate and specific equation to estimate body fat percent in elderly women using circumference measurements. The more important is that is easy to use by health professionals.

**902 Board #81**
May 31 3:30 PM - 5:00 PM

**IGF-1 Response In Middle-aged And Older Men During Continuous And Intermittent Cycling At Lactate Threshold**

Kenji Narazaki1, Yukiya Tanoue2, Yoichi Hatamoto3, Yasuki Higaki2, Hiroaki Tanaka2, Fukuoka Institute of Technology, Fukuoka, Japan. 1Fukuoka University, Fukuoka, Japan.

(No relationships reported)

Insulin-like growth factor-1 (IGF-1) is a trophic factor promoting growth and survival in various types of cells including muscle cells and neurons. In our recent study, young men showed comparable IGF-1 responses in continuous and intermittent exercise at lactate threshold, whereas stress responses were smaller in the intermittent exercise. It is yet unclear if the exercise format affects the IGF-1 response in older individuals.

**PURPOSE:** To compare changes in the circulating level of IGF-1 in middle-aged and older men during continuous and intermittent cycling at lactate threshold. **METHODS:** Six men, middle-aged and older (57.8±11.6 years), randomly performed two cycling tests at lactate threshold load (108.8±27.3 W) and a control test with rest on separate days. The cycling tests comprised a 20-min continuous cycling (CC) and an intermittent cycling (IC) consisting of 20 repetitions of 1-min bouts separated by 30-sec rests. The control test was administered with a schedule identical to CC. During each session, blood samples were drawn via peripheral cannulation at rest, at 25, 50, and 100% of cycling time, and 10 min after cycling. A blood concentration of IGF-1 and those of lactate, cortisol, and catecholamines were measured at each time point. Two-way analyses of variance for repeated measures with post-hoc tests, if appropriate, were performed to mainly compare changes between CC and IC.

**RESULTS:** Significant interactions were found in all the indices (p<0.05). Changes in IGF-1 concentration were comparable between CC (102.0±29.3 to 116.0±30.2 ng/ml, p<0.05) and IC (104.2±33.6 to 112.0±38.6 ng/ml, p<0.05). In contrast, although concentrations of lactate and norepinephrine increased in both CC and IC (p<0.05), the effect was greater for CC (p<0.05). Furthermore, dopamine concentration increased only in CC (p<0.05) while cortisol concentration decreased in IC (p<0.05) but not in CC.

**CONCLUSIONS:** As previously shown in young men, intermittent cycling at lactate threshold evoked an IGF-1 response comparable to its continuous counterpart in men middle-aged and older, but the two cycling formats induced different stress responses. These results suggest that moderate intermittent exercise has the potential to stimulate the IGF-1 pathway without considerable stress in older individuals. Supported by JSPS 25242065.

**903 Board #82**
May 31 3:30 PM - 5:00 PM

**Ageing Affects Cell Cycle Regulation In Human Skeletal Muscle Undergoing Atrophy And Regrowth**

Ulrik Frandsen1, Tatjana Prokhorova1, Line Jensen1, Lars G. Hvid1, Peter Scherling1, Per Aagaard1, Michael Kjaer2, Charlotte Suetta1. 1Faculty of Health, University of Southern Denmark, Odense, Denmark. 2Faculty of Health, University of Copenhagen, Bispebjerg Hospital, Copenhagen, Denmark. 3Rigshospitalet, University of Copenhagen, Copenhagen, Denmark.

(No relationships reported)

Cellular senescence is an irreversible arrest of cell division, which could influence the regenerative potential of skeletal muscle stem cells (satellite cells) during aging. The molecular mechanism of senescence is complex and involves epigenetic control of the Polycomb repressive complexes, as well as CDKN2A (p16) and TP53 tumor mediated repression of cell cycle dependent kinases and G1 cell cycle arrest. **PURPOSE:** To investigate the effect of ageing on satellite cell cycle regulation in human skeletal muscle undergoing atrophy and regrowth induced by short-term immobility and subsequent reloading. **METHODS:** Myoblast atrophy was induced by application...
of a knee-brace for a period of 4 days in young (Y, ~20 yrs, n=9) and aged (O, ~70 yrs, n=9) individuals. Muscle regrowth after atrophy was induced by 6 days of re-ambulation supplemented by one session of supervised unilateral resistance training for the disused leg 3 days after brace removal. Muscle biopsies (VL) were collected pre and at 1, 2d, 4d and 10d of immobility and after additional 6 days of de-mobilization (10d). Protein and mRNA expression levels of CDN2K2a (p16), CDN1K (p21), CDN1B (p27), TP53 and PCNA were determined using real-time RT-PCR and Western blotting, respectively. Muscle cell proliferation was determined by in situ detection with a murine antibody to Ki-67. The level of α-OGG1 was significantly lower in E (0.990±0.080, P<0.01), and the level of COX IV was significant lower in E (0.807±0.072) than in C (0.990±0.080, P<0.01), and the level of COX IV was significant lower in C (0.790±0.052) than in C (0.990±0.080, P<0.01), and the level of COX IV was significant lower in C (0.790±0.052) than in C (0.990±0.080, P<0.01). The rate of mutation and deficiency (ultraviolet spectroscopy and gel-imaging) was significantly lower in E (0.089±0.007, P<0.001) and CR-E (0.081±0.004, P<0.01) than in C (0.186±0.062, P<0.01). In red muscle, the level of COX IV (Western-blotting) was significant higher in E (0.126±0.043, P=0.01). COX-E (P=0.090) was not different between the groups and therefore the runners were not placing greater stress on the bone response.

CONCLUSIONS: Although further study is needed to validate the findings in this study, these data indicate that a history of running does not result in a higher BMD or lower BP in MEN women. This may have been partially because body composition was not different between the groups and therefore the runners were not placing greater stress on the bone response.

906 Board #85
May 31 3:30 PM - 5:00 PM
Does Running And Bone Mineral Density Affect Blood Pressure In Non- And Post-menopausal Women
Doris J. Morris, Inbar Naor-Maxwell, Anjuly Dav, Christina St. Martin, L. Jerome Brandon, FACSM. Georgia State University, Atlanta, GA.
(No relationships reported)

The literature is mixed as to the benefits of weight bearing activities such as running on osteogenic responses for non- (N-MEN) and postmenopausal (MEN) women. PURPOSE: Therefore, this study was designed to compare bone mineral density (BMD) in N-MEN and MEN women with a running (RUN) history and those who were not runners (N-RUN). METHODS: A repeated measures design was employed as 100 Women (30 N-RUN/N-MEN; 12 N-RUN/MEN; 42 RUN/N-MEN; 16 RUN/ MEN) were evaluated for differences and relationships between BMD, blood pressure (BP) and body composition. RESULTS: Although the MEN women were older (MEN 55.6 yrs. vs N-MEN 36.2 yrs.) the MEN women did not differ for body fat% (MEN 38.5%; N-MEN 34.5%, p = 0.05) but did differ for BMI (MEN 1.11 vs N-MEN 1.23). Age was the only factor that produced a difference (p = 0.05) in BMD in the N-MEN and MEN. The RUN/MEN had a trend toward a higher BP than the other groups and this may have contributed to their BMD response not being higher than the N-RUN. CONCLUSIONS: Although further study is needed to validate the findings in this study, these data indicate that a history of running does not result in a higher BMD or lower BP in MEN women. This may have been partially because body composition was not different between the groups and therefore the runners were not placing greater stress on the bone response.
Adiponectin is a fat tissue-derived adipokine, and it has beneficial effects on lipid metabolism, and plays a protective role in the development of metabolic syndrome. Adiponectin is inversely associated with insulin resistance, and low levels of adiponectin are correlated with visceral adipose tissue (VAT). Age-induced intramuscular fat accumulation is implicated in insulin resistance and type 2 diabetes. Therefore we hypothesized that intramuscular fat is also associated with adiponectin.

**PURPOSE:** The present study aimed to determine the relationship between adiponectin and estimated intramuscular fat index in middle-aged and elderly adults.

**METHODS:** Twenty-two physically active middle-aged and elderly adults (mean age 68.7±4.4 years, mean body mass index 22.2±2.2 kg/m²) participated in this study. We assessed echo intensity as the intramuscular fat content index by using ultrasonography. Echo intensity of the vastus laterals at the mid-thigh was measured, which was calculated based on the mean of grey scale. Blood samples were collected for the measurement of adiponectin. Waist circumference was measured at the level of the navel as the VAT index.

**RESULTS:** Adiponectin was inversely correlated with echo intensity (r=-0.43, p<0.016; 5D: P = 0.004) muscles. Relative to aging rats, aging mice exhibit modest changes in contractile properties did not differ with age or muscle. However tetanic rates of force contraction were determined for each muscle. Ex vivo analyses recapitulate all aspects of aging human muscle. Future studies should make efforts to examine muscles other than the EDL and SOL to determine if other muscles more closely model aging human muscle.

**CONCLUSIONS:** Adiponectin is inversely associated with estimated intramuscular fat index in middle-aged and elderly adults. Waist circumference was measured at the level of the navel as the VAT index.
CONCLUSIONS: These data suggest a trend that vitamin D, when combined with exercise, may potentiate the metabolic benefits of exercise by affecting muscle lipid deposits and altering tissue-level VO₂. These data also provide an indication of effective metabolic response to a dietary supplement and exercise intervention. Future work will examine muscle mitochondrial function as a potential target of action of vitamin D + exercise on muscle metabolism.

<table>
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<tr>
<th>Board #91</th>
<th>May 31 3:30 PM - 5:00 PM</th>
<th>Relationships of Muscle Quality among Back, Lower and Upper Limbs in Older Individuals</th>
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<tr>
<td>Akito Yoshiko¹, Takashi Kaji², Hiroki Sugiyama³, Teruhiko Koike⁴, Yoshitomo Oshida⁵, Hiroshi Akima⁶. Nagoya University, Nagoya, Japan. ²Kajiro Medical Clinic, Gifu, Japan. (Sponsor: Katsumi Asano, FACSM)</td>
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<td>Email: <a href="mailto:yoshiko@nagoya-u.jp">yoshiko@nagoya-u.jp</a> (No relationships reported)</td>
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The ratio of fat tissue within a skeletal muscle (i.e. intramuscular fat) is accessed as muscle quality. It is well known that muscle quality becomes worse with aging by increasing of intramuscular fat and/or decreasing of muscle tissue. It is shown that intramuscular fat is related to physical dysfunction and insulin resistance. However, this result was given from only a selected region such as quadriceps femoris. It is not well understood that the relationships may also be found the other regions of muscle such as posterior of the thigh, low back or upper limb. **PURPOSE:** The purpose of this study was to assess the relationships of muscle quality among low back, anterior and posterior region of the thigh, and upper limbs in older men and women. **METHODS:** Seven men (age, 74 ± 5 years; height, 161 ± 7 cm; weight, 60 ± 7 kg) and fifteen women (age, 80 ± 8 years; height, 147 ± 5 cm; weight, 48 ± 8 kg) participated in this study. B-mode transverse ultrasonographic images were taken from rectus femoris (RF), biceps femoris (BF), semimembranosus (SM) and triceps brachii (TB). Echo intensity (EI) as an index of muscle quality was calculated in these muscles. We measured physical performance tests, i.e. isometric knee extension peak torque, functional reach, one-leg stand, 30-sec chair stand, hand grip strength, 5-m normal/maximal walk, and timed up and go, and blood biochemistry. **RESULTS:** There was significantly different in EI in MF between men and women (men, 48 ± 7.3 a.u. vs. women, 59.5 ± 10.3 a.u., P = 0.05) but not in the other regions. Significant relationships were confirmed among EIs in RF, BF, and TB (r = -0.46 to 0.50, P < 0.05) but not in MF and other muscles (r = 0.23 to 0.39). Mean EI of upper and lower limbs (~[EI in RF] + [EI in BF] + [EI in TB])/3 as a dependent variable was explained by leptin and insulin as a result of stepwise regression analysis (R = 0.55, adjusted R² = 0.45, P < 0.01), and EI in MF as another dependent variable was explained by age and 30-sec chair stand (R = 0.81, adjusted R² = 0.61, P < 0.01). **CONCLUSIONS:** These results suggest that the pattern of muscle quality is inconsistency between limbs and trunk. Furthermore, the factor to explain muscle quality may be different depending on the regions of the muscle.

CONCLUSIONS: These results suggest that functional ability and greater muscle size are essential factors in the maintenance of muscle quality; however, an age effect was present only in men.

A growing body of research has highlighted the benefits of high-intensity exercise. However, concern exists that such high-intensity training, especially in resistance training, is potentially deleterious at advanced age. Recently, we have addressed this issue in part by demonstrating in a rat model of resistance-type training, that training with maximally activated stretch-shortening contractions (SSCs) has no detrimental effect on performance and increases muscle mass at advanced age provided the frequency of training is moderated (i.e. 80 SSCs 2 days per week rather than 3 days per week). A major question remained from this research - whether reducing or altering other parameters when training with high-intensity contractions would also demonstrate similar outcomes at old age. **PURPOSE:** To determine whether decreasing repetition numbers (i.e. 40 SSCs 3 days per week) and/or changing contraction mode (i.e. 4 SSCs 3 days per week and 8 SSCs 2 days per week) induces muscle mass and performance gains in young (3 months old) and old (30 months old) male Fischer Brown Norway hybrid rats. **METHODS:** Dorsiflexor muscles (9-10 per group) were exposed to 1 month of training using a custom-built dynamometer. Dynamic performance was monitored, tibialis anterior muscle mass was normalized to tibia length, and muscle quality determined by dividing performance by normalized muscle mass. ANOVA was used for statistical analysis; significance was set at p < 0.05. **RESULTS:** Independent of training protocol, peak force increased by ~20% for young rats while peak force was not significantly altered for old rats. In contrast with performance, muscle mass gains were dependent on the training protocol. For young rats, the normalized muscle mass increase of 14 ± 2% after 40 SSCs 3 days per week training was greater than the increases of 7 ± 2% and 11 ± 1% after 4 SSCs 3 days per week or 8 SSCs 2 days per week training, respectively (p < 0.05). For old rats, only 40 SSCs 3 days per week training induced a muscle mass gain, 12 ± 3% (p < 0.001), without a decrease in muscle quality relative to values for the other training protocols. **CONCLUSIONS:** These findings demonstrate the extreme adaptability of muscle to various training protocols at a young age and the selectivity at old age especially in regards to muscle mass gain.

CONCLUSIONS: These results highlight the importance of dietary nitrate supplementation during prolonged exposure to hypobaric hypoxia. **PURPOSE:** Several studies have demonstrated that dietary nitrate supplementation reduces O₂ consumption (VO₂) during steady-state exercise and enhances endurance performance in young healthy subjects, both in normoxia and acute hypoxia. No data have been provided during acclimatization to high altitude, a condition that affects exercise tolerance and may change nitric oxide bioavailability. Aim of this study was to investigate the effects of dietary nitrate supplementation on oxygen cost of exercise and exercise tolerance during a prolonged sojourn at high altitude.

**RESULTS:** 6.2 cm; weight, 60.6 ± 6.8 kg) and women (n=37; age, 71.5 ± 5.3 years; height, 152.8 ± 6.3 cm; weight, 66.9 ± 7.4 a.u.). QF echo intensity was significantly correlated with QF muscle thickness and age and sit-to-stand test in men (R = 0.875, adjusted R² = 0.734), and QF muscle quality and sit-to-stand test in women (R = 0.648, adjusted R² = 0.383), to be significant independent variables.

### Board #92 May 31 3:30 PM - 5:00 PM Relationship Between Quadriceps Femoris Echo Intensity And Functional And Morphological Characteristics In Older Men And Women

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| Email: akima@nagoya-u.jp (No relationships reported) |

The age-related decrease in human skeletal muscle mass; i.e. sarcopenia, has received much attention, but an age-related decrease in muscle quality; i.e. the ratio of adipose tissue to muscle tissue, has received noticeably less. A few studies have shown that muscle quality, as determined by ultrasonographic echo intensity, is negatively associated with functional capacity, but the best parameters by which to predict muscle quality have not yet been established for older individuals. **PURPOSE:** The purpose of this study was to assess the relationships between quadriceps femoris (QF) echo intensity and demographic, functional and morphological characteristics of older men and women. **METHODS:** Sixty-four healthy men (n=27; age, 72.9 ± 5.0 years; height, 164.1 ± 6.2 cm; weight, 66.0 ± 6.8 kg) and women (n=37; age, 71.5 ± 5.3 years; height, 152.8 ± 4.8 cm; weight, 50.8 ± 6.8 kg) aged 62-88 years participated in this study. The echo intensity and muscle thickness of the QF at the mid-thigh were calculated using ultrasonography. Sit-up, supine-up, sit-to-stand, 5-m maximal walk and 6-min walk tests were performed. **RESULTS:** As expected, QF muscle thickness in men was significantly larger than women (men, 3.1 ± 0.6 mm; women, 2.7 ± 0.6 mm, P < 0.01); however, no significant differences were observed in QF echo intensity between sexes (men, 63.0 ± 8.7 a.u.; women, 69.9 ± 7.4 a.u.). QF echo intensity was significantly correlated with QF muscle thickness as a result of simple linear regression analysis (men, r = -0.734, P = 0.001; women, r = -0.565, P = 0.001). Stepwise multiple regression analysis with QF echo intensity as a dependent variable revealed QF muscle thickness, age and sit-to-stand test in men (R = 0.875, adjusted R² = 0.734), and QF muscle quality and sit-to-stand test in women (R = 0.648, adjusted R² = 0.383), to be significant independent variables.

### Board #94 May 31 2:00 PM - 3:30 PM “Beet On Alps”: Ergogenic Effects Of Dietary Nitrate Supplementation During Prolonged Exposure To Hypobaric Hypoxia

| SIMONE PORCELLI¹, Letizia Rasca¹, Desy Salvadogo¹, Simona Mkrak-Sposto², Fabrizio Gelmini², Giangiacomo Beretta², Mauro Marzorati¹. ¹Italian National Research Council, Segrate (MI), Italy. ²University of Studi di Milano, Milan, Italy. ³University of Udine, Udine, Italy. |
| Email: simone.porcelli@ibfm.cnr.it (No relationships reported) |

**RESULTS:** Multiple regression analysis; significance was set at p < 0.05. **RESULTS:** Independent of training protocol, peak force increased by ~20% for young rats while peak force was not significantly altered for old rats. In contrast with performance, muscle mass gains were dependent on the training protocol. For young rats, the normalized muscle mass increase of 14 ± 2% after 40 SSCs 3 days per week training was greater than the increases of 7 ± 2% and 11 ± 1% after 4 SSCs 3 days per week or 8 SSCs 2 days per week training, respectively (p < 0.05). For old rats, only 40 SSCs 3 days per week training induced a muscle mass gain, 12 ± 3% (p < 0.001), without a decrease in muscle quality relative to values for the other training protocols. **CONCLUSIONS:** These findings demonstrate the extreme adaptability of muscle to various training protocols at a young age and the selectivity at old age especially in regards to muscle mass gain.
METHODS: In a double-blind randomized crossover study, fourteen young (29±4 yr) healthy subjects were supplemented for three days with beetroot juice (2x70mL/day, 8.4 mmol nitrate [BEET-IT]) or nitrate-depleted juice (PLA). At the end of each supplementation period, subjects performed on a cycle ergometer after an 8 min moderate-intensity constant work rate (MOD) exercise and a high-intensity (HIGH) constant work rate exercise up to exhaustion. Experimental sessions were conducted in a refuge at 3269m a.s.l. after 7 and 14 days of exposure to hypobaric hypoxia.

RESULTS: Nitrate and [nitrite] were significantly higher in BEET-IT than in PLA. In MOD, oxygen cost of exercise was significantly reduced in BEET-IT vs. PLA (12.7±1.8 vs. 11.8±1.4 mL*min^-1*, p=0.01). In HIGH, VO2 was significantly lower in BEET-IT than in PLA after 6 min of exercise (2.588±0.424 vs. 2.686±0.438 L*min^-1*, p=0.01) whereas no difference was observed at exhaustion (2.728±0.450 in BEET-IT and 2.763±0.467 L*min^-1* in PLA). Time to exhaustion during high-intensity exercise was significantly improved (9%) by dietary nitrate supplementation. Interestingly, two subjects with the higher aerobic fitness level became "non-responders". CONCLUSION: From the findings of this study, it appears that the oxygen cost of exercise at a given level of exertion is reduced by nitrate/nitrite supplementation. Further research should be conducted to elucidate mechanisms to improve both memory and mood in normobaric hypoxia.

918 Board #98 May 31 2:00 PM - 3:30 PM
Inspiratory Muscle Training and Endurance Performance in Hypoxia
Daniel G. Hursch, Chad C. Wiggins, Shane A. Bielko, Marissa Baranauskas, Timothy D. Mickleborough, FACSM, Joel M. Starger, FACSM, Robert F. Chapman, FACSM. Indiana University, Bloomington, IN. (Sponsor: Robert F. Chapman, FACSM)
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Ventilation is higher at any submaximal workload in hypoxia as compared to normoxia. Whether or not training the respiratory muscles helps to improve exercise performance in hypoxia is unclear. PURPOSE: To determine if improvements in ventilatory strength with chronic inspiratory muscle training (IMT) improves 20km cycling time trial (TT) performance in hypoxia (FIO2 = 16.1%). METHODS: Ten highly-trained men were pair-matched based on pre-exercise values of maximal inspiratory pressure (MIP) and randomly placed into either a sham (n = 5, VO2max = 61.7 ± 4.1 ml*kg^-1*min^-1) or an IMT group (n = 5, VO2max = 61.5 ± 6.8 ml*kg^-1*min^-1) subject. Subjects completed 6 weeks of flow resistive IMT (80% of MIP) or a sham protocol (30% of MIP), with each session consisting of up to 6 sets of 8 MIP maneuvers performed to failure with descending rest intervals 3 times per week. Pre- and post-training, subjects performed tests of pulmonary function, lung volume, MIP, maximal inspiratory pressure (MEP), lung diffusion capacity (DLCO), and a 20km cycling TT in hypoxia (FIO2 = 16.1%). RESULTS: After 6 weeks of IMT or sham, the IMT group significantly improved MIP (145.3 ± 27.9 cmH2O vs 171.7 ± 38.7 cmH2O, P < 0.05), while MIP in the sham group remained unchanged. MEP, DLCO, lung volumes, and pulmonary function values remained unchanged in both groups post-training. 20km TT mean.

919 Board #97 May 31 2:00 PM - 3:30 PM
The Effects Of Cold-Water Hand Immersion On Executive Function, Mood, and Memory In Normobaric Hypoxia
Ellen L. Glickman, FACSM1, Jeremiah Vaughan1, Brittany Followay2, Jacob E. Barkley2, Ellen L. Glickman, FACSM. 1Indiana University of Pennsylvania, Indiana, PA. 2Kent State University, Kent, OH. (Sponsor: Ellen L. Glickman, FACSM)
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Purpose: The present study was to investigate the effects of cold-water hand immersion (CWI) on changes in executive function, mood, and memory during normobaric hypoxia and normoxia. METHODS: Ten apparently healthy men (23±3 years) volunteered for this study. The two experimental trials (13% O2, 21% O2) were counterbalanced and blinded from the participant. The non-dominant limb was exposed to 5°C water for 15 min after a passive acclimation to the randomized experimental condition. Executive function (Stroop), total mood disturbance (TMD), and memory (RMCPT) were recorded during the final 8 min. of the following time points: baseline, acclimation, and CWI. RESULTS: Condition (13% O2, 21% O2) by time (baseline, acclimation, CWI) ANOVA's revealed no significant interaction or main effects of time or condition for any score of executive function (p = 3.12, p = 0.069) or mood (p = 0.773, p = 0.477). A significant time by condition interaction exists for throughput score (F = 3.19, p = 0.039), a measure of RMCPT. The score during CWI in the 13% O2 condition was significantly lower compared to the 21% O2 condition (p = 0.05), as well as when compared to acclimation of the 13% O2 condition (p = 0.02). The worsening TMD trend led to positive associations between skin temperature during CWI and TMD scores at baseline (r = 0.753, p = 0.012), acclimation (r = 0.653, p = 0.041), and CWI (r = 0.657, p = 0.039) at the 13% O2 condition. In the 21% O2 condition, TMD at acclimation was significantly associated with skin temperature during CWI (r = 0.716, p = 0.02). CONCLUSION: Despite no effect on executive function in both normoxia and normobaric hypoxia, it appears CWI impairs measures of memory. Decreased skin temperature observed during CWI relates to reduced mood throughout all time points in a hypoxic state. Further research is necessary to elucidate mechanisms to improve mood and memory in normobaric hypoxia.
ventilation was higher post-IMT (98.9 ± 15.9 l/min vs 92.5 ± 21.6 l/min; p = 0.055) and unchanged in sham group (p = 0.65). In the IMT group, 20km TT performance time pre-training was 37:46 ± 4:39 min:sec and post-training was 37:16 ± 4:02 min:sec (-1.2 ± 2.2%, p = 0.14). 20km TT performance time was unchanged in the sham group (p = 0.90). 20km TT heart rate and SpO2 were unchanged in both groups post-training. Conclusion: In a small cohort, IMT-induced improvements respiratory muscle strength resulted in greater ventilation and oxygen uptake during a 20km time trial in hypoxia. IMT should be explored as a useful strategy for improving the quality of cycle exercise training and/or endurance exercise performance at altitude.

**920 Board #99**  
May 31 2:00 PM - 3:30 PM  
The Effect of Inspiratory Resistance on Exercise Performance in Moderate Normobaric Hypoxia  
Yongsuk Seo1, Jeremiah Vaughan2, Raymond Robbere1, Jung-Hyun Kim1, Ellen L. Glickman, FACSM3  
1Centers for Disease Control and Prevention, Pittsburgh, PA. 2Kent State University, Kent, OH. 3(No relationships reported)

Various inspiratory resistors are used to protect workers against toxic airborne substances and pathogens. However, the use of inspiratory resistors in normobaric hypoxia can be useful in preventing respiratory muscle weakness due to inspiratory muscle disuse. However, little is known about the effect of added inspiratory resistance to normobaric hypoxia on physical performance and subjective comfort during exercise in normobaric hypoxia. METHODS: Nine healthy men (Age: 25 ± 2 years; Height: 181 ± 6.1 cm; Weight: 92 ± 5.2 kg) participated in this study. Subjects breathed through a respiratory mask outfitted with one of four different inspiratory resistors (R) (0, 1.5, 4.5, 7.5 cm H2O L−1·s−1) while exercising in normobaric hypoxia (17% O2) for 10 minutes each at 50, 150 Watts followed by incremental exercise to maximal exertion (VO2max). RESULTS: At exhaustion, added inspiratory resistance in hypoxia significantly decreased the maximal power output (0R=272±44 W, 1.5R=263±41 W, 4.5R=255±62 W, and 7.5R=241±75 W, respectively, p=0.009), respiratory exchange ratio (0R=43±6, 1.5R=39±6, 7.5R=37±2 W/kg, and 7.5R=35±8.6 W/kg, respectively, p=0.009), and minute ventilation (0R=106±18.5, 1.5R=98±14±3, 4.5R=93±1,31±2, and 7.5R=86±7±12 W/l·min, respectively, p=0.002) during oxygen consumption (0R=31.8±4.1, 1.5R=31.7±3.4, 4.5R=30.4±3.4, and 7.5R=31.4±6.4 ml/kg/min, respectively, p=0.750) and heart rate (0R=174±10.9, 1.5R=173±11.9, 4.5R=177±11.0, and 7.5R=179±14.3 bpm, respectively, p=0.265) were not significantly changed. Breathing comfort (0R=3.1±1.8, 1.5R=2.7±1.3, 4.5R=4.2±1.9, and 7.5R=4.1±2.0, respectively, p=0.014) and breathing effort (0R=3.7±1.6, 1.5R=3.9±1.5, 4.5R=5.4±1.2, and 7.5R=5.7±1.1, respectively, p=0.001) were significantly increased with additional inspiratory resistance, but the rate of perceived exertion (RPE) was not significantly increased (0R=17.8±1.7, 1.5R=18.1±1.6, 4.5R=18.2±1.8, and 7.5R=18.1±1.6, respectively, p=0.664). CONCLUSIONS: Low-to-moderate inspiratory resistance in normobaric hypoxia did not have a detrimental effect on oxygen consumption and RPE at maximal work rates. However, added inspiratory resistance significantly decreased maximal power output and increased perception of breathing discomfort and breathing effort.

**921 Board #100**  
May 31 2:00 PM - 3:30 PM  
Impact of Inspiratory Resistance on Cognitive Function in Normobaric Hypoxia After Exercise  
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(No relationships reported)

**Purpose:** To determine the effects of added inspiratory resistance on cycling in normobaric hypoxia on cognitive function. METHODS: Nine healthy adult males (mean ± SD: age = 25 ± 2 years, height = 1.81 ± 0.06 m; mass = 92.5 ± 21.6 kg; BMI = 28.0 ± 5.3 kg/m2, VO2 = 46.32 ± 9.01 ml/kg/min) were analyzed. The protocol consisted of a counterbalanced design involving four visits involving a normoxic (Normox0) and 3 hypoxic (Hypox0, Hypox1.5, and Hypox7.5) condition with zero added inspiratory resistance (Normox0) and 3 hypoxic (Hypox0, Hypox1.5, and Hypox7.5) condition with added inspiratory resistance (Hypox1.5) and zero inspiratory resistance (Hypox0). Also, a main effect of time (p = 0.001: base = 62 ± 11; rest = 67 ± 11; max = 69 ± 9; recovery = 70 ± 11) existed on word-color association for SWCT. CONCLUSION: No significant interactions between time or condition was demonstrated on cognitive function with added inspiratory resistance in hypoxia after cycling performance. It appears from these data that the respirators do not impair cognitive function during work at the selected levels of resistance in normobaric hypoxia. Further research may be performed on this device to elucidate other markers of cognitive function in more extreme environmental conditions.
passive rest, a 5-min maximal time-trial (5-minTT) was performed to determine peak physiological and response performance. Combining these measures allowed a modified 2x2+1 protocol to be used to calculate the lactate thresholds (LT1, LT2) using customized software (ADAPT).

**RESULTS:** VO2 decreased by 5.5 ± 1.1%, 15.9 ± 1.5% and 26.3 ± 1.4% at LT1 and by 6.5 ± 1.2%, 13.4 ± 1.3% and 23.2 ± 1.8% at LT2 at 1,200, 2,200, and 3,200 m compared with 200 m respectively, P<0.05. Mean PO declined by 5.4 ± 1.1%, 17.7 ± 1.7% and 30.1 ± 1.9% for LT1 and by 5.2 ± 3.0% and 25.7 ± 1.8% at LT2 at 1,200, 2,200 and 3,200 m compared with 200 m respectively, P<0.05. HR and [La] at these thresholds remained unchanged. 5-min TNT VO2 and PO both followed the same pattern of decline with increasing altitude, P<0.05.

**CONCLUSIONS:** A dose response effect of acute hypobaric hypoxia on VO2 and PO was found at both submaximal (LT1 and LT2) and maximal (5-minTT) intensities. No such effects were seen for HR or [La] at any intensity.

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**Board #103**

**May 31 2:00 PM - 3:30 PM**

**Resistance Exercise In Hypoxia Combined With Blood Flow Restriction**

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The use of blood flow restriction (BFR) or systemic normobaric hypoxia (NH) during resistance exercise to increase metabolic stress and the subsequent muscular development is increasingly popular. However, the extent to which local and systemic hypoxic conditions in combination influence resistance exercise and accompanying physiological responses remains undetermined.

**Purpose:** To determine separate and combined effects of BFR and NH during resistance exercise on performance, perceptual cues, as well as muscle activation and oxygenation.

**Methods:** 14 physical education students were tested for 1 repetition maximum (1-RM) in the barbell biceps curl (biceps) and dumbbell pull over (triceps). On separate visits, they performed 6 separate randomized trials of 4 sets at 70% 1-RM to failure of each exercise (90-s and 10-min rest between sets and exercises, respectively) in normoxia (FiO2 = 21%), normoxia (FiO2 = 44.6%) and hyperoxia (FiO2 = 63.6%, respectively, all P<0.001) and triceps (-39.10%, -56.7% and -62.7%, respectively, all P<0.001), independently of the conditions (P=0.065). Arterial oxygen saturation, heart rate, and perceptual responses were assessed following each set. Muscle activation and oxygenation were monitored via surface electromyography (EMG) and near-infrared spectroscopy, respectively.

**Results:** Compared to set 1, the number of repetitions before muscular failure decreased in sets 2, 3, and 4 for both the biceps (-44.6%, -59.7% and -63.6%, respectively, all P<0.001) and triceps (-39.10%, -56.7% and -62.7%, respectively, all P<0.001), independent of the conditions (P=0.065). Arterial oxygen saturation was lower with NH (P<0.001), but not BFR, while heart rate (P=0.341) did not differ between conditions. Significant main effect of time was observed for overall perceived discomfort, difficulty breathing and limb discomfort (all P<0.001), but no difference between conditions (all P=0.235). Overall, markers of metabolic stress (tissue saturation index during exercise and subsequent recovery, all P<0.05) and muscle activation (Root Mean Square value; all P=0.026) remained unaffected by environmental conditions.

**Conclusion:** Local and systemic hypoxic stimuli, or a combination of both, during resistance exercise to failure did not alter performance, perception of strenuous exercise, nor trends of muscle activation or oxygenation.  

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**Board #104**

**May 31 2:00 PM - 3:30 PM**

**Effects of Hypobaric and Normobaric Hypoxia on Mitochondrial Related Gene Expression**

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Environmental stimuli such as temperature and hypoxia can influence cellular signaling in the skeletal muscle. Previously we have noted changes in gene expression related to mitochondrial development with acute exposure to normobaric hypoxia. However, exposure to hypobaric hypoxia may elicit different physiological responses. **Purpose:** To determine the response of skeletal muscle mitochondrial related gene expression after 4-h exposure to normobaric hypoxia (NH), hypobaric hypoxia (HH) and normobaric normoxia (NN) after exercise. **Methods:** Recreationally trained participants (n=15, age: 24 ± 4 y, height: 178 ± 12 cm, weight: 72.47 ± 13.84 kg, body fat: 14 ± 7%, VO2peak = 3.60 ± 0.83 L · min⁻¹, Wmax = 274 ± 72 W) each completed three trials of 1-h cycling at 70% of Wmax. Following exercise, participants sat in an environmentally controlled chamber for a 4-h recovery period in NH (4,420 m), HH (4,420 m), or NN (975 m) environmental conditions. Blood oxygen saturation was measured using pulse oximetry at baseline, 30 min into exercise, immediately after exercise, and 30 min into each hour of recovery. Muscle biopsies were taken from the vastus lateralis pre-exercise and after a 4-h recovery period. Samples were analyzed using qRT-PCR to assess gene expression related to mitochondrial development. **Results:** Arterial oxygen saturation was lower in HH and NH trials compared to the NN trial (p<0.001) and lower in the HH compared to NH (p<0.001). PGC-1α, GABPA, ERRα, and NRF1 mRNA were not different between the three conditions or from pre-exercise (p = 0.804, 0.650, 0.956, 0.563, respectively). TFAM mRNA increased in NN from pre-exercise to post-exercise (p = 0.036) and was higher than NH (p = 0.011). **Conclusion:** These data indicate that gene expression related to mitochondrial development is only marginally affected (TFAM) by the type of hypoxic environment after a 4-h treatment despite differences in arterial oxygen saturation. Funding provided by the Department of Defense United States Army Medical Research and Materiel Command (DOD USAAMRMC: W81XWH-15-2-0075).
using mixed ANOVA. RESULTS: Following the NST plasma IL-6 (+9.6, 95% CI 0.3 - 0.9 ng/mL) and IL-10 (+11.6, 95% CI 2.8 - 10.4 ng/mL) increased significantly when compared to the pre-NST values (p < 0.05). TNF-α was unaltered throughout the study. IL-6 (+5.9, 95% CI 2.8 - 0.49 ng/mL) and IL-10 (+26.2, 95% CI 15.0 - 37.3 ng/mL) were elevated following HST1 (p < 0.01), with no main effect for acclimation group (p > 0.05). A similar trend was observed after acclimation (HST2), with IL-6 (+3.1, 95% CI 2.5 - 3.7 ng/mL) and IL-10 (+22.7, 95% CI 721 - 1753 ng/mL) increased (p < 0.01), and no main effect for trial or acclimation group observed (p > 0.05). CONCLUSIONS: Neither prior heat nor hypoxic acclimation attenuated the systemic cytokine response following acute exercise in hypoxia. Future work investigating the effectiveness of different acclimation modalities on improving inflammatory outcomes to hypoxic stress is recommended.

928
Board #107
May 31 2:00 PM - 3:30 PM
Validity of the Load Velocity for Power Resistance
Training Adjustment at Real Moderate Altitude
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The relationship between muscle power and hypoxia represents a new way to improve the potential benefits of altitude training, especially in sports involving explosive movements. Monitoring workload through velocity (mean propulsive velocity, MPV), appears significant since both the neuromuscular demands and the training effect itself largely depend on the velocity at which loads are lifted. PURPOSE: To study whether the MPV could be used to adjust the workload during an oriented resistance training program (RT) at moderate real altitude. METHODS: 23 collegiate-men volunteers (23±3 yr) followed 4 weeks RT oriented to optimize muscle power development in either normoxia (N) or intermittent hypoxia (IH, 2320 m living at sea level). The RT (2 sessions/wk, 8 in total) was the same for both groups and the training load (TL) was weekly adjusted to elicit 1RM of MPV. The TL was controlled by a linear velocity transducer, and the session loss-velocity in % (L) was estimated. Maximal isometric handgrip (Din) and SaO2 were monitored before and after each session (s).

929
Board #108
May 31 2:00 PM - 3:30 PM
Effects Of Supplemental Oxygen On Submaximal And Maximal Cycling Performance At Altitude
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No relationships reported

Purpose: Reduced partial pressure of oxygen (PO2) at altitude reduces maximal oxygen consumption (VO2). When O2 is supplemented, maximal exercise performance at altitude has been shown to improve. We questioned whether supplemental oxygen (O2) would increase performance at submaximal and maximal intensities exercised at 1890m. METHODS: Twelve (7 male) 26.6±6.7 year-old healthy participants (height, 174.8±9.7 cm; weight, 71.4±8.4 kg) performed a familiarization trial and two experimental trials (double blind, cross over) while breathing either room air or supplemental O2 to simulate sea level (FIO2=0.265). Tests 2 and 3 were performed at 1890m and were identical to tests 1 and 2, respectively, with VO2max and power output (16±8 Watts) and VO2 (0.28±0.16 L/min) at maximal intensity (all P>0.02). Subjects were not able to correctly identify the FIO2 (P range: 0.25 to 1.00). CONCLUSIONS: Although supplemental oxygen improved maximal exercise performance at 1890m, it had little effect on short-duration, moderate-intensity exercise, such as might be performed during a warm-up for a competitive event.

930
Board #109
May 31 2:00 PM - 3:30 PM
Cerebral and Skeletal Muscle Oxygen Response
During Exercise With and Without an Altitude Simulation Mask
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Altitude as well as hypoxic chambers cause a greater exercise-induced decrease in both cerebral oxygen response (COR) and skeletal muscle oxygen response (SMOR) when compared to exercise in normoxic conditions. Altitude simulating masks (ASM) such as restrictive breathing devices have promoted their products as respiratory muscle trainers that also expose the body to hypoxic conditions.

PURPOSE: To determine if a significant difference in COR and SMOR measured by near-infrared spectroscopy (NIRS) exists during maximal exercise under normoxic conditions with and without an ASM. METHODS: Thirty healthy individuals (P=3, M=10, 24.2 ± 2.7 yr) completed three separate bicycle ergometer maximal exercise tests. Test 1 consisted of respiratory gas analysis to identify VO2max ventilatory threshold 1 (VT1), and the respiratory compensation point (RCP). Tests 2 and 3 were performed at 1890m and were identical to tests 1 and 2, respectively, with VO2max and power output (16±8 Watts) and VO2 (0.28±0.16 L/min) at maximal intensity (all P>0.02). Subjects were not able to correctly identify the FIO2 (P range: 0.25 to 1.00). CONCLUSIONS: Although supplemental oxygen improved maximal exercise performance at 1890m, it had little effect on short-duration, moderate-intensity exercise, such as might be performed during a warm-up for a competitive event.

931
Board #110
May 31 2:00 PM - 3:30 PM
Influence of Exercise Modality on Hypoxia-Mediated
Decrements in Endurance Exercise Performance
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No relationships reported

Low oxygen environments, such as high altitude, impair endurance exercise performance. The magnitude of performance decrements are highly variable and may in part be explained by the exercise modality and volume of active muscle mass. For example, it is unclear if an exercise modality engaging both the upper and lower body, such as cycling, would have a positive effect on exercise performance. The magnitude of performance decrements are highly variable and may in part be explained by the exercise modality and volume of active muscle mass. For example, it is unclear if an exercise modality engaging both the upper and lower body, such as cycling, would have a positive effect on exercise performance.
CONCLUSIONS: Endurance exercise performance is attenuated in hypoxia. Our preliminary data suggest the magnitude of decrements may not be appreciably different between exercise modalities engaging upper and lower body, such as rowing, compared with modalities relying predominantly on lower body, such as cycling.

Oxygen consumption (VO₂) that remains elevated above the baseline after exercise termination is known as excess post-exercise oxygen consumption (EPOC). Arrival at altitude decreases maximal oxygen uptake, however studies are mixed with respect to the effect of altitude on resting metabolic rate (RMR). To our knowledge, the EPOC response has not been studied with altitude as an independent variable. PURPOSE: To observe the EPOC to constant-load cycle exercise performed under acute simulated altitudes of 3353 m and 6401 m.

METHODS: Subjects (N = 7 female, 7 male) reported to the laboratory between 0600 and 0830 hours and RMR was obtained. Constant workload cycle exercise was then performed (10-min at 100 W) while breathing air from an altitude simulator under one of the following conditions: control (CON), 3353 m (MID), 6401 m (HI). Subjects returned to complete the remaining conditions in a counterbalanced order. Upon completion of the exercise bout, participants were reconnected to the metabolic system and rested until a running 5-min average of VO₂ values returned to or below baseline (EPOC duration). Magnitude was determined by summing the net oxygen consumption for each minute during the EPOC period. Data were analyzed using 2 x 3 repeated measures ANOVA.

RESULTS: Since no sex differences were detected, data were collapsed and analyzed using one-way repeated measures ANOVA. There was no difference between condition for RMR (CON=3.9±0.5, MID=3.9±0.3, HI=3.9±0.4 ml/kg/min), or cycle performance variables including average power (CON=98±4, MID=100±4, HI=95±9 W). EPOC duration was significant at each altitude increase (CON=15±2.1 vs MID=20±7.1 min, p=0.002) (MID vs HI=28±1.2±6.6 min, p=0.006). Likewise, EPOC magnitude was significant at each altitude (CON=73.5±9.9 vs MID=99.1±9.3 ml O2, p=0.002) (MID vs HI=139.7±14.3 ml O2, p=0.001).

CONCLUSIONS: Determining the EPOC response to altitude is important because it represents a source of elevated carbohydrate consumption that must be accounted for given that carbohydrates are preferentially utilized with altitude exposure. This has an influence on recovery from exercise as well as future bouts of work. Thus, individuals who are active at altitude must account for this increased caloric deficit despite a loss of appetite that is common with altitude exposure.

Environmental conditions pose additional threats to the health of soldiers during military operations. Missions conducted at high altitude increase the relative workload for military personnel and unacclimatized warfighters may endure performance decrements.

PURPOSE: To examine the effects of normobaric intermittent hypoxic training (NIHT), when compared to normobaric normoxia (NN) training, on peak aerobic capacity (VO₂peak) in hypoxic hypoxia (HH). METHODS: Eleven male Reserve Officers’ Training Corps (ROTC) cadets (age 19.55±1.4 yrs, mass 75.80±8.82 kg, stature 177.45±6.67 cm) completed the 6 week training intervention in either the NIHT (EXP, n=6) or NN (CON, n=5) conditions. Pre- and post-assessment of VO₂peak were averaged in order to reduce measurement error. In order to control for the effect of body mass on VO₂peak and RMR, these variables reveal a potential practical significance was achieved via increases of 7.37%, 15.99%, and 14.71% for the EXP group, respectively. Supported by NSCA Foundation Doctoral Research Grant.

While it is generally agreed that maximum oxygen consumption (VO₂max) declines upon acute ascent to altitude, there has been some disagreement about the effects of acclimatization on VO₂max. Some of the disagreement reflects a small sample size and lack of control of physical activity during the stay at altitude. To our knowledge, no studies with a large subject pool that controls for physical activity have looked at VO₂max after acute exposure, acclimatization and upon return to sea level in the same study. PURPOSE: Therefore, the purpose of this study was to determine the effect of moderate altitude exposure on maximum oxygen consumption acutely, after acclimatization, and upon return to sea level. Methods: Over the course of a 6-week period, eighty-eight active subjects (age = 23.3 ± 3.5 yrs, weight = 78.5 ± 17.5 kg, VO₂max = 42.4 ± 5.7 ml/kg/min) completed a graded-exercise test on a cycle ergometer at sea level (SL1), upon acute exposure to 3417 m (ALT1), two weeks following acclimatization at 3417 m (ALT2), and upon return to sea level (SL2). Workloads were increased every two minutes following a two-minute warmup until volitional fatigue. Maximum oxygen consumption was measured using a Parvo TruOne 2400 Metabolic cart. Subject’s activity levels were assessed during the 2-week period and were unchanged relative to sea level. Results: Maximum oxygen consumption significantly declined (P=0.05) from SL1 to ALT1 (3.48+0.39 l/min vs. 3.04+0.32 l/min). However, ALT2 VO₂max was not different from SL1(3.48+0.39 l/min vs. 3.31+0.51 l/min). Maximum oxygen consumption was slightly, but not significantly higher upon return to sea level (SL2 = 3.65+0.66 l/min). While body weight changes occurred in some subjects, overall there was no difference in average body weight between any of the testing points. Conclusions: These data suggest that exposure to acute altitude results in a reduction in maximum oxygen consumption. However, after two weeks of acclimatization maximum oxygen consumption returns to pre-sea level values in a large multi-year study.

Total hemoglobin mass (Hb) is a well-established, key predictor of maximal oxygen uptake (VO₂peak) across aerobic fitness levels. Arterial oxyhemoglobin saturation (S₂O), has the potential to modify this relationship, especially in populations that experience exercise-induced acute desaturation. PURPOSE: To examine how variability in S₂O at VO₂peak modifies the relationship between Hb and VO₂peak at moderate altitude (1625m) in highly trained athletes. METHODS: 16 male and 17 female competitive, highly trained (>10 hr training per week) cyclists/triathletes took part. On visits one and four VO₂peak was measured using the optimized carbon monoxide rebreathing method. Visit two and three were identical: 16 male and 17 female competitive, highly trained (>10 hr training per week) cyclists/triathletes took part. On visits one and four VO₂peak was measured using the optimized carbon monoxide rebreathing method. Visit two and three were identical.

RESULTS: VO₂peak was significantly higher for the second GXT ( +0.06 ± 0.17 l/min, p=0.05) and the difference in VO₂peak was related to the difference in S₂O (r = -0.42, p = 0.02), so results from the second GXT were used. VO₂peak ranged from...

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WEDNESDAY, MAY 31, 2017

Board #111
May 31 2:00 PM - 3:30 PM
Effect of Acute Simulated Altitude Exposure on Excess Postexercise Oxygen Consumption
Email: james.navalta@unlv.edu

Board #112
May 31 2:00 PM - 3:30 PM
Efficacy of Normobaric Intermittent Hypoxia Training to Improve VO₂peak During Acute Hypobaric Hypoxia Exposure
John H. Sellers, Taylor M. Monaghan, Jessica A. Schnaiter-Brasche, Michelle M. Miller, Mitchell A. Magrini, Bert H. Jacobson, FACSFM. Oklahoma State University, Stillwater, OK.
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Board #113
May 31 2:00 PM - 3:30 PM
Maximum Oxygen Consumption Returns to Sea Level Values after Two Weeks of Altitude Acclimatization in a Large Multi-Year Study
John E. Davis, Alma College, Alma, MI.
Email: davisj@alma.edu

Board #114
May 31 2:00 PM - 3:30 PM
Does Arterial Oxyhemoglobin Saturation Influence the Hemoglobin Mass-VO₂Peak Relationship in Endurance Athletes at Moderate Altitude?
Jesse A. Goodrich, Benjamin J. Ryan, William C. Byrnes, FACSFM. University of Colorado Boulder, Boulder, CO.
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Abstracts were prepared by the authors and printed as submitted.
Changes in inspired oxygen concentration will affect the peak oxygen uptake compared with normoxia. These underlying mechanisms are not fully understood, but peripheral and central mechanisms have been proposed. PURPOSE: Our study focuses on the effect of acute moderate hypoxia and hyperoxia on cardiopulmonary responses, brain and muscle oxygenation during exercise. METHODS: Seven healthy male subjects performed on incremental maximal exercise test under normoxia (Norm: 20.9 FIO₂, 98.6±8.8 mmHg) and hypoxia (Hyper: 14.5% FIO₂, 90.3±9.3 mmHg) conditions. We measured cardiopulmonary measurements (VE, VO₂, HR and Q) and blood gas (PO₂ and PCO₂) on incremental exercise. Near-infrared spectroscopy (NIRS) was also used to monitor concentration (μM) changes of oxy- and deoxymyoglobin (Δ[AHb], Δ[HHb]) in left frontal cortex region of the forehead and ipsilateral vastus lateralis muscle. Changes in total HB and STO₂ were calculated and used as index of change in regional blood volume. Repeated-measures ANOVA were performed across treatments. RESULTS: VO₂peak decreased in Hypo (38.5±3.1 ml/kg/min, p<0.05) and no difference in Hyper (42.6±3.4 ml/kg/min) compared with Norm (42.2±3.9 ml/kg/min). But PO₂ at rest and moderate exercise was low in Hypo (57.7±3.1 and 52.2±5.5 mmHg) when high in Hyper (98.6±8.8 and 105.3±9.3 mmHg, p<0.05) compared with Norm (79.3±12.6 and 84.3±7.4 mmHg). Muscle oxygenation dropped progressively during Hyper, and also changes in muscle oxygenation during Hyper were similar to Norm. Interestingly, Brain oxygenation (Δ[AO₂Hb]) was slightly increased and deoxygenation (Δ[AHHb]) was increased during exercise under each three conditions, respectively. Furthermore, changes brain and muscle oxygenation was also greater in Hype compared with Norm and Hyper (p<0.05). CONCLUSIONS: Acute hypoxia decrease oxygen uptake with decreased muscle oxygenation and slightly increased brain oxygenation. But it is unlikely that changes in brain and muscle oxygenation was related with oxygen uptake in hyperoxia, despite a similar difference absolute PO₂ in inspired oxygen and blood from hypoxia and/or hyperoxia to normoxia.

Acute hypoxia reduces arterial oxygen content, thereby increasing cardiac work to maintain oxygen delivery. Hypoxia may be accompanied by impairments in cardiac function which may be subject to sex differences, although this remains inadequately described in the literature. PURPOSE: To explore the differences in the cardiac response to acute hypoxia. METHODS: Thirty healthy participants (15 men, 22±4 yrs, BMI 25.3±3.0 kg/m²; 15 women, 20±3 yrs, BMI 22.6±1.2 kg/m²) underwent echocardiographic measurements with simultaneous 1-Lead electrocardiogram-gating following ~1.5 hour sham condition (20.0% O₂) and normobaric hypoxia (12.5% O₂) exposure on two separate days, in a randomized order. Systolic function (M-mode, tissue Doppler imaging (TDI) and diastolic function) were measured during filling velocities which were measured in triplicate. Systolic function was assessed using fractional shortening (FS), ejection fraction (EF) from 2D Teicholz M-mode (parasternal short-axis), and S-wave velocity from tissue Doppler Imaging (TDI, apical 4-chamber). Diastolic function was assessed in triplicate.
METHODS

with IHT can further enhance MART. The purpose of the present study

However, it is unclear whether additional overnight hypoxic exposure in combination

improved performance in the maximal anaerobic running test (MART) (ACSM 2015).

IHT and IHE+IHT trained in a normobaric hypoxic room (FIO2

VO2

110.2±3.6, Control: 112.1±3.0 vs. 111.5±3.9 ml/kg/min). No significant change in

running test.

results were measured breath-by-breath (KbO2, Comed), and heart rate (HR, ECG), arterial

oxygen saturation (SpO2; pulse oximeter) and beat-to-beat blood pressure (finometer)

were measured continuously at rest and during exercise. Data are mean ± SD and

significant condition by sex interactions were noted.

CONCLUSION: Hypoxia resulted in greater systolic function but impaired diastolic function compared to the

sham condition. Although men tended to have greater cardiac systolic function vs

women there were no sex differences in the cardiac systolic or diastolic response to acute hypoxic exposure.

Supported by a Foundation Research Grant from ACSM

Table 1: Myocardial function in sham condition and acute hypoxia in males and

females (means ± SD)

Sham Hypoxia P value

Men Women Men Women Condition Sex CxS df

Systolic Function

EF (%) 57.7 ± 3.4 63.5 ± 4.9 66.1 ± 6.1 0.01 0.02 0.25 26

FS (%) 36.5 ± 5.5 35.5 ± 4.6 36.1 ± 5.5 0.01 0.06 0.33 26

Tissue Doppler velocities

Lateral S (cm/s) 11.3 ± 1.9 11.8 ± 2.6 12.6 ± 2.5 11.8 ± 2.5 0.12 0.85 0.14 23

Septal S (cm/s) 8.4± 1.1 8.5± 1.2 9.0± 1.2 9.2± 1.1 0.01 0.68 0.86 22

Diastolic Function

Mitril E/A 2.0± 0.4 2.0± 0.5 1.6± 0.3 1.7± 0.4 <0.01 0.60 0.93 24

Tissue Doppler velocities

Lateral E'/A" 2.92± 0.75 2.71± 0.91 2.38± 0.60 2.19± 0.38 <0.01 0.42 0.91 23

Lateral E" 3.50± 0.63 3.77± 0.68 3.32± 0.58 3.76± 1.00 0.55 0.16 0.62 23

Septal E'/A" 2.92± 0.75 2.71± 0.91 2.38± 0.60 2.19± 0.38 <0.01 0.42 0.91 22

Septal E" 5.03± 0.86 5.06± 0.87 4.79± 0.71 4.86± 1.15 0.39 0.86 0.92 22

CxS, condition x sex interaction; EF, ejection fraction; FS, fractional shortening

Effect Of Additional Hypoxic Exposure In Combination With Intermittent Hypoxic Training On MART

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(No relationships reported)

We previously demonstrated that 7 days of intermittent hypoxic training (IHT) improved performance in the maximal anaerobic running test (MART) (ACSM 2015). However, it is unclear whether additional overnight hypoxic exposure in combination with IHT can further enhance MART. PURPOSE: The purpose of the present study was to compare the physiological adaptations in well-trained 400m or 800m runners following either 7 days of intermittent hypoxic overnight exposure (IHE), IHT, or a combination of IHE and IHT (IHE+IHT).

METHODS: Thirty-two well-trained university female 400m or 800m runners were assigned to either IHE (n=9), IHT (n=9), IHE+IHT (n=6) or Control (n=8) groups. IHE and IHT were kept in a normobaric hypoxic room (E(0)=16.4%; 2000m; 10 h/d) and IHE+IHT trained in a normobaric hypoxic room (FIO2=14.4%; 3000m; 4 h/d). Control, non-IHE hours, and non-IHT hours were spent in ambient normobaric normoxia (60%). Subjects trained for 7 days and performed MART and an incremental maximal running test before and after the 7 days training period. Training consisted of high intensity interval training (5 x 30s maximal effort pedaling) and endurance training (30min incremental running and 30min steady pedaling). VO2max and the velocity equivalent to 4nmlactate (V4mM) were measured in the incremental running test.

RESULTS: Maximal power in the MART increased significantly (P<0.05) in IHT (109.5±1.4 vs. 111.7±2.8 ml/kg/min). However, there were no significant changes in IHE, IHE+IHT or Control (IHE: 111.0±4.2 vs. 111.6±4.0, IHE+IHT: 109.4±3.5 vs. 110.2±3.6, Control: 112.1±3.0 vs. 111.5±3.9 ml/kg/min). No significant change in VO2max in any groups was found. V4mM increased significantly (P<0.05) in IHT and

IHE+IHT (IHT: 248.4±13.7 vs. 255.3±15.6, IHE+IHT: 221.8±16.1 vs. 237.8±9.9 ml/min), whereas there were no significant changes in IHE or Control (IHE: 253.1±24.2 vs. 251.6±22.8, Control: 246.7±16.9 vs. 250±21.0 ml/min). CONCLUSIONS: These results suggest that 7 days of IHT (3000m) enhances maximal anaerobic capacity (MART) in well-trained female middle distance runners, which supports our earlier findings (ACSM 2015). However, there does not appear to be further enhancement of anaerobic running performance with the addition of overnight hypoxic exposure to IHT.

Losartan Does Not Affect Maximal Exercise Performance at High Altitude (5000 m)

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(No relationships reported)

Exposure to high altitude induces hypertension that likely exacerbates arterial hypoxia via pulmonary vasoconstriction and ventilation-perfusion mismatching. Research has shown that inhibition of the renin-angiotensin–aldosterone system (RAAS) via an inhibitor provides an antihypertensive effect at rest during acute exposure to high altitude. Such effects may have benefits for exercise performance given the potential for improved arterial saturation, but has not been studied.

PURPOSE: To assess the effects of the RAAS inhibitor losartan on maximal exercise performance at 5000 m.

METHODS: Eighteen lowlanders were paired-matched for age, ACE gene status, previous altitude exposure and sex, with each of the pair randomly assigned to a group (men:losartan: 6.3, placebo 6.3; age 40 ± 18 years; height 175 ± 9 cm; body mass 72.4 ± 12.4 kg; BMI 23.7 ± 2.2 kg/m2). A 100 mg once daily dose of either losartan or placebo (starch) was administered in a double-blind manner for 21 days, which included a slow 8-day ascent to 5000 m (Wynnum Hut, Chimborazo, Ecuador). At sea-level and within 48 h of arrival at 5000 m, participants performed a graded exercise test (GXT) to exhaustion on a supine cycle ergometer (Alticycle, BMRES). Ventilation (VE) and end-tidal gases are typically measured breath-by-breath (KbO2, Comed), and heart rate (HR, ECG), arterial oxygen saturation (SpO2; pulse oximeter) and beat-to-beat blood pressure (finometer) were measured continuously at rest and during exercise. Data are mean ± SD and group differences at peak power output were analyzed using independent t-tests, with significance set at p<0.05.

RESULTS: At 5000 m, resting measures of SpO2 between losartan and placebo groups were not significantly different (79.5 ± 76 ± 6%, p=0.40). Peak power was similarly

Abstracts were prepared by the authors and printed as submitted.
Reduced relative to sea level (p<0.01) in both groups (100 ± 29 vs. 91 ± 28 W, p=0.55), while SaO2 (70 ± 6 vs. 70 ± 5%, p=0.96), VO2peak (31.3 ± 4.6 vs. 34.0 ± 7.2 mL·kg⁻¹·min⁻¹), and HR (146 ± 21 vs 149 ± 24 b·min⁻¹, p=0.78) were similar between groups at peak power, as was the increase in BP from rest to peak power (increased by 31 ± 17 vs. 25 ± 16 mmHg, p=0.71).

Conclusion: Lactic acidosis (100 mg) taken daily for 21 days had no observable effect on exercise performance at 3000 m.

**Purpose:** Acute mountain sickness (AMS) is a syndrome commonly experienced in non-acclimatized mountaineers when ascent is too high and too rapid. Ischemic preconditioning (IPC) is a noninvasive experimental technique that has been shown to protect remote organs from ensuing hypoxic damage. In this study we sought to determine if IPC would 1) mitigate the effects of altitude on arterial O2 saturation (SpO2) and 2) attenuate the symptoms of AMS.

**Methods:** Ten (6 men and 4 women) physically active individuals (Age: 26±7.1 yr; 65±13.2 kg·m⁰⁵·min⁻¹) who were acclimatized to 2350 m were randomized to either a treatment (IPC) or control (CON) group. An IPC protocol consisting of 3.5 min bilateral leg occlusion/reperfusion bouts at 200 mmHg was administered to the IPC group. The CON group was administered a protocol identical in time and frequency, but with an inflation pressure of 40 mmHg. To examine the potential late phase protective effects of IPC on SpO2, and symptoms of AMS, 36 hours post-IPC or CON, all participants hiked 9km at a standardized pace to an elevation of 3800 m. Symptoms of AMS were evaluated by Lake Louise score (LLQ).

**Results:** It was found that SpO2 was significantly higher (p<0.05) in the IPC group when compared to the CON group (IPC 89.6 ± 3.9 % vs. CON 86.9 ± 4.2 %). A LLQ score of less than 3 is considered mild AMS, whereas a score of 3 or more is considered severe AMS. Incidence of severe AMS was significantly lower (p<0.05) in the IPC (0%) vs. CON (50%) group. Moreover, the IPC group (when compared to CON group) had significantly (p<0.05) lower incidence of dizziness/lightheadedness (IPC=0% vs. CON=50%), fatigue/weakness (IPC=25% vs. CON=40%), gait unsteadiness (IPC=0% vs. CON=15%), and ataxia (IPC=0% vs. CON=16.6%). Conclusion: Our findings suggest that IPC may be a strategy to increase SpO2 and decrease AMS symptoms at high altitude.

**Purposes:** To determine if acute exposure to normobaric hypoxia alters locomotor-respiratory coupling (LRC) patterns typically observed in trained runners, and to determine if any changes in LRC influence running economy (RE) and/or perceptions of ventilatory effort.

**Methods:** Trained male distance runners (n=13) with VO2max of 943±94 mL·kg⁻¹·min⁻¹ completed two laboratory visits, each in a different inspired gas condition, either normoxia (NORM) or hypoxia (HYP) (FIO2=10%). To examine the potential late phase protective effects of IPC on SpO2, and symptoms of AMS, 36 hours post-IPC or CON, all participants hiked 9km at a standardized pace to an elevation of 3800 m. Symptoms of AMS were evaluated by Lake Louise score (LLQ). During each visit, subjects ran for 5 min at each of three constant submaximal speeds of 12.9, 14.3, and 16.1 km·h⁻¹ with 4 min standing rest between speeds. Following the third stage, an incremental incline ramp protocol was used to determine VO2peak, RE and LRC measures were taken during the 4th min of each speed (3:00-4:00), while ratings of perceived exertion (RPE) and dyspnea (DYS) were taken during the first 30 seconds of each minute at each speed (4:00-4:30), and again at the conclusion of the test. The degree of LRC was calculated as the highest number of inspirations or expirations of the final minute at each speed (4:00-4:30), and again at the conclusion of the test.

**Results:** Compared with NORM, the degree of LRC was not significantly different at any of the three constant submaximal speeds with exposure to HYP, however it was increased at VO2max (43.8 ± 3.4% vs. 37.1 ± 3.8%, p<0.05). Breathing frequency (breaths·min⁻¹) was significantly increased at each submaximal speed in HYP compared to NORM (30.3 ± 1.3 vs. 27.4 ± 1.2, 34.8 ± 2.0 vs. 39.2 ± 2.2, 40.4 ± 2.0 vs. 45.2 ± 1.9, p<0.05), but was not significantly different at VO2max. Stride frequency-to-breathing frequency quotients were significantly lower at each submaximal speed in HYP (2.91 ± 0.20 vs. 2.45 ± 0.17, 2.53 ± 0.17 vs. 2.21 ± 0.14, 2.22 ± 0.14 vs. 1.95 ± 0.09; p<0.05) due to increases in breathing frequency while maintaining stride frequency. RE and RPE were not significantly different at any speed. DYS was only significantly different between NORM and HYP at 16.1 km·h⁻¹ (p<0.05).

**Conclusion:** Trained distance runners are able to maintain LRC in hypoxia, even when breathing frequency is increased at any submaximal pace. It is possible that within this unique population, years of training enhance and optimize the ability to make adjustments to LRC in order to minimize metabolic costs.

**Purposes:** To determine the effect of intensified training and tapering during different doses of Live High Train High (LHTH) altitude on sea level performance and Hb_e in elite runners.

**Methods:** Twenty one runners completed one of three LHTH altitude camps following 4 weeks of sea level training; 22 days at 1720 m (MOD22; n=7; VO2max = 71 ± 4 mL·min⁻¹·kg⁻¹), 22 days at 2100 m (HID2; n=4; 67 ± 3 mL·min⁻¹·kg⁻¹) or 30 days at 2100 m (HID30; n=10; 70 ± 4 mL·min⁻¹·kg⁻¹). Hb_e was assessed via CO rebreathing immediately pre and post LHTH, and sea level performance was measured in competitive races completed pre and within 2 weeks post. For each training session, Training Load (TL) was calculated using the session RPE method. Training Stress Balance (TSB) was calculated as the ratio between 7 and 28 day exponentially weighted moving averages. Differences between groups were assessed using one-way ANOVA, with the Kruskal-Wallis test used when assumptions were violated (TSB).

**Conclusion:** It has been shown recently that acute hypoxia (AH) exacerbates fatigue through both muscular and neural mechanisms. At a supraspinal level, the voluntary drive from the motor cortex during fatiguing efforts was impaired compared to normoxia (NM). However, it is currently unknown whether hypoxia acutely affects motor neuron properties and their contribution to fatigue. PURPOSE: To examine motor neuron responsiveness and voluntary activation (VA) during fatiguing contractions in AH and NM. METHODS: On separate days, 11 males (31 ± 8 years) completed a 16-minute fatigue protocol composed of submaximal (25% maximal torque; MVC) intermittent (10s contraction, 5s rest) isometric elbow flexions in NM (F = 21%) and AH (F = 11%). For the last contraction of each minute, participants matched the integrated electromyographic activity (EMG) to that recorded during brief contractions at 25% MVC prior to fatigue; motor neuron responsiveness was measured by delivering cervicomedullary stimulation in the silent period evoked by transcranial magnetic stimulation (TMS) of the motor cortex (100ms inter-stimulus interval). Every 2 minutes, VA was measured by delivery of TMS during contractions at 100, 75 and 50% MVC, separated by 3s. RESULTS: Prior to fatigue, arterial saturation and cerebral tissue oxygenation index were significantly lower in AH compared to NM (98 ± 1 vs. 97 ± 3% and 5 ± 7 vs. 48 ± 12%, respectively; p<0.01). MVC torque was equivalent (76.2 ± 9.5 vs. 80.6 ± 13.0Nm, respectively; p>0.05) but VA was significantly lower in AH compared to NM (90.4 ± 5.0 vs. 93.5 ± 5.4%, respectively; p<0.05). At the end of the fatigue protocol, the reductions of MVC torque and VA (relative to control values) were greater in AH compared to NM (20.5 ± 8.2 vs. 11.6 ± 9.8% and 14.4 ± 12.3 vs. 4.0 ± 7.1%, respectively; p<0.05). Conversely, the reduction in motor neuron responsiveness (area of the cervicomedullary motor evoked potential normalized to the maximal compound muscle action potential) was not significantly greater during AH compared to NM (47.6 ± 3.8% vs. 31.2 ± 37.2%, p<0.05). CONCLUSION: While AH elicited a marked effect in the CNS, such impairment was only confined to the cortical compartment (a greater reduction in VA), without affecting the responsiveness of motor neurons to a fatiguing task.

**Supported by:** NSERC, CFI and BCKDF.
RESULTS: Race performance improved by 0.6 ± 1.5 % overall, with similar improvements in HI22 (0.9 ± 0.5 %) and HI30 (0.9 ± 0.9 %); however these were not significantly different to MOD22 (0.1 ± 2.3 %). Performance improvements were achieved by all 4 participants in HI22, 9 of 10 in HI30 and 4 of 7 in MOD22 (4.7 and 3 lifetime bests respectively). Hbmass increased from baseline in all groups (MOD22 = 4.4 ± 4.6 %; HI22 = 6.0 ± 2.1 %; HI30 = 4.0 ± 3.1 %). Weekly TL during the first 2 weeks of LIHTH was significantly increased in all groups compared to preceding sea level training (+29 ± 7 % to 72 ± 27 %). TSb at the start of LIHTH in MOD22 (132 ± 21) was significantly higher (p = 0.03) than HI22 (94 ± 11) but not HI30 (95 ± 11; p = 0.10). TL for the final week of LIHTH was reduced significantly less (p = 0.03) from weeks 1 and 2 in MOD22 (23 ± 13 %) than in HI22 (44 ± 5 %) or HI30 (41 ± 10 %).

CONCLUSIONS: Lifetime best sea level performances were achieved following various doses of LIHTH. Substantial increases in training load were observed within the first 2 weeks at altitude, and tapering concluding LIHTH appeared beneficial for optimal performance.

947 Board #126 May 31 2:00 PM - 3:30 PM Performance and Muscle Damage Responses during Repeated Sprint Exercise in Hypoxia among Athletes Nobukazu Kasai, Chihiro Kojima, Daichi Sumi, Akihiko Ikutomoto, Kazushige Goto. Ritsumeikan University, kusatsu, Japan. (Sponsor: Robert Kraemer, FACSM) Email: nobunbus10@gmail.com (No relationships reported)

The influence of repeated sprint exercise in moderate hypoxia on muscle damage and inflammatory responses in athletes has not been fully elucidated. PURPOSE: The purpose of the present study was to determine the effects of repeated sprint exercise in moderate hypoxia on performance and muscle damage responses among competitive athletes. METHODS: Ten sprinters (height: 175 ± 1 cm, body weight: 67.3 ± 2.0 kg, BMI: 21.7 ± 0.2 kg/m2) participated in this study. They performed two trials under each hypoxic (HYP, FiO2: 14.5 %, a simulated altitude of 3000m) or normoxic (NOR, FiO2: 20.9%) conditions. The exercise trial in each consisted of three sets of repeated maximal sprints (5 × 6-s sprint) with a 30-s rest period between sprints. All subjects were exposed under hypoxic or normoxic conditions during exercise and 3h of post-exercise period. Time-course changes in percutaneous oxygen saturation (SpO2), power output during exercise, blood lactate, glucose, serum myoglobin (Mb) and plasma interleukin-6 (IL-6) concentrations, and respiratory variables were evaluated. RESULTS: During exercise, a significant interaction was observed for mean power output (trial × number of sprint, P<0.001). However, no significant difference in total power output over all sprints was observed between the two trials. There were significant interaction (trial × time, P<0.001) and main effect for trial (P=0.001) for blood lactate concentration. The post-hoc test revealed that blood lactate concentrations immediately after exercise was significantly higher in the HYP than in the NOR (P<0.001). Serum Mb concentration increased significantly after exercise (main effect for time, P=0.001), but no significant interaction (P=0.804) or main effect for trial (P=0.268) was observed. Accumulated VO2 during exercise was significantly lower in the HYP (P<0.001), whereas average RER values during exercise were significantly higher in the HYP than in the NOR (P<0.001). There was no significant difference between trials for any respiratory variables during post-exercise period. CONCLUSIONS: Repeated sprint exercise in hypoxia elicited blood lactate elevation compared with the same exercise in normoxia. However, magnitude of exercise-induced muscle damage response (elevation of serum Mb) was not affected.

948 Board #127 May 31 2:00 PM - 3:30 PM Factors Predicting Performance during a High Altitude Hike Allison Brown1, Nicole Deel1, John E. Davis1, Eric Achatz2, Michael Miller1, Jeremy Reitinger2, Elaine Reno1, Luke Yaeger2, Robert Roach, FACSM3,4. Alma College, Alma, MI. 1CU School of Medicine, Aurora, CO. 2Altitude Research Center CU School of Medicine, Aurora, CO. (Sponsor: Andrew Subdun, FACSM) Email: brown.alac@alma.edu (No relationships reported)

Civilian and military personnel often endure heavy exercise loads at high altitude. To improve performance at high altitude, it is important to understand what factors predict human performance in that setting. PURPOSE: To assess whether a physical fitness test at sea-level can be used to predict exercise performance at high altitude. METHODS: Subjects were recruited from mid-Michigan (sea level) and were required to pass a medical screening and achieve a high score on the Army Physical Fitness Test (APFT) in order to participate. The APFT performance trial consisted of a pushup test (maximum number of pushups in 2 min), a sit-up test (maximum number of sit-ups in 2 min), and a timed two-mile run. Ninety-nine subjects completed APFT testing at sea-level before being transported to Breckenridge, Colorado (9,075 ft; 2766 m) to undergo APFT testing immediately upon arrival. On day two in Colorado, subjects wore a 35-pound rucksack during a timed, 3.7-mile uphill hike from 10,627 feet (3239 m) to 12,595 feet (3840 m). Multivariable regression analysis was performed to predict which variable(s) (height, weight, push-up score on APFT, sit-up score on APFT, 2 mile run time at the performance trial and at altitude) were most important in determining hike time. RESULTS: One multi-variable linear regression model indicated a significant correlation (p<0.05) between subjects’ weight and two-mile run time at the APFT performance trial at sea level relative to hike time (r2=0.33). These findings indicate that as body weight increases hike time was slower, and that a faster 2-mile run time resulted in a faster hike time. A second multi-variable linear regression analysis indicated a significant relationship between the 2-mile run time, sit-ups, and push-ups at high altitude, and subjects’ weight relative to hike time (r2 = .52). CONCLUSIONS: Overall, the APFT high-altitude trial was a better predictor of hike performance given that the model accounted for 52% of the variance relative to hike performance. Furthermore, in both the sea level and high-altitude trials, subjects’ weight and two-mile run time had the greatest influence on hike performance.

B-64 Free Communication/Poster - Blood Flow Wednesday, May 31, 2017, 1:00 PM - 6:00 PM Room: Hall F

949 Board #128 May 31 3:30 PM - 5:00 PM Prolonged Improvement In Hemodynamic Parameters At Rest And During Stress Testing After High-Intensity Interval Training Sascha Ketelhut1, Florian Milatz2, Walter Heise1, Reinhard G. Ketelhut, FACSM4. 1Martin-Luther-University Halle-Wittenberg, Halle (Saale), Germany. 2German Rheumatism Research Center, Berlin, Germany. 3Charité Universitätsmedizin Berlin, Berlin, Germany. 4Medical Center Berlin, Berlin, Germany. (Sponsor: Reinhard G. Ketelhut, FACSM) Email: sascha.ketelhut@sport.uni-halle.de (No relationships reported)

Purpose: As demonstrated earlier, one bout of aerobic exercise has been shown to result in a prolonged lowering of peripheral and central blood pressure (BP) and pulse wave velocity (PWV) in normotensive and hypertensive individuals. Therefore, a study was initiated to evaluate if faster and more intense forms of exercise, such as HIIT, can also bring about similar blood pressure and PWV reductions. Since cardiovascular hyper-reactivity to stress has a higher prognostic value than measurements conducted at rest, the responses during a following cold pressor test (CPT) were studied as well. Methods: In 39 healthy men (34±8 years, BMI 24±2 kg/m2) peripheral BP (pBP), central BP (cBP) and PWV were measured non-invasively at rest and at the end of a 2-minute CPT using a 24 PWA monitor. Following a HIT (6 x 1 min., 98% of previously determined maximum workload, 4 min. rest between intervals) pBP, cBP and PWV were measured throughout 60 minutes of rest and thereafter during a CPT. Results: Even 45 minutes after HIT, there was a significant reduction in systolic pBP (127±9 mmHg to 124±10 mmHg; p=0.009), systolic cBP (116±8 mmHg to 112±9 mmHg; p=0.003) and PWV (5.9±0.7 m/sec to 5.84±0.7 m/sec; p=0.037) compared with pre-exercise. Furthermore there were significant reductions in diastolic pBP (81±8 mmHg to 79±7 mmHg; p=0.031) compared to pre-exercise as well. Moreover, pBP (144±13/96±12 mmHg to 137±12/93±11 mmHg), cBP (130±13/98±12 mmHg to 125±12/94±11 mmHg) and PWV (6.4±0.7 m/sec to 6.2±0.8 m/sec) during CPT after HIT were significantly lower (p<0.01) lower when compared with pre-exercise measurements. 60 minutes after exercise, there were no more significant differences compared with pressures at rest before exercise. In contrast, 60 minutes after HIT the increases in systolic pBP (Δ = 16±2/10 mmHg vs. Δ = 11±8/11 mmHg; p=0.019), systolic cBP (Δ = 14.5±11 mmHg vs. Δ = 9.8±11 mmHg; p=0.017) and PWV (Δ = 0.47±0.36 m/sec vs. Δ = 0.29±0.42 m/sec; p=0.026) due to CPT were still significantly lower when compared with measurements during CPT before exercise. Conclusion: HITT leads to a reduction in pBP, cBP and PWV, which was still established 45 minutes after completion of the training. Moreover, pressures and PWV during a CPT increased less after HIT, indicating attenuated hemodynamic response to stress testing after a single HIT-session.
**Purpose:** The aim of the study was to assess the effects of acute aerobic exercise with and without blood flow restriction on arterial compliance in pre-hypertensive males.

**Methods:** Ten pre-hypertensive male subjects (age: 23 ± 1.3 years) performed two randomised exercise sessions. Anthropometric measurements, questionnaires, and Bruce protocol were completed at screening. Baseline measurements were obtained each testing day following subjects reaching a normal hydration status. Subjects then ran at 65% VO2 max at 0 and 20 min at 40% VO2 with blood flow restriction (BF). Arterial elasticity was assessed at 0, 10, 20, and 40 min and pulse wave velocity (PWV) was measured at 5, 15, 25, and 35 min post-exercise.

**Results:** There were no significant condition×time interactions or main effects for condition and time for carotid to radial, carotid to femoral, femoral to distal PWV, small arterial elasticity (SAE) or large arterial elasticity (LAE). Significant condition×time interaction (p<0.03) and time main effect (p<0.01) were found in systolic blood pressure (SBP) (p<0.03). There were also significant condition×time interaction (p<0.03) and condition main effect (p<0.03, BFR higher) in diastolic blood pressure (DBP) (p<0.03). Significant condition×time interaction (p<0.01) and condition (p<0.01, 60 min higher) and time main effects (p<0.01) were found in heart rate (HR). Significant condition×time interaction (p<0.01) and condition (p<0.05, BFR higher) and time main effects (p<0.01) were found in stroke volume (SV). Significant condition×time interaction (p<0.01) and time main effects (p<0.02) were found in cardiac output (CO). Significant condition×time interaction (p<0.01) and condition (p<0.01, 60 min lower) and time main effects (p<0.02) were found in systemic vascular resistance (SVR). A significant condition main effect for total vascular impedance (TVI) was detected (p<0.05, 60 min lower).

**Conclusions:** Since subjects were in supine position for post-testing, significantly lower SV values could be due to lower venous return and/or sweat-related blood volume loss and lower SV and TVI could be because of endothelium derived nitric oxide decreasing the 60 min session. The findings also indicate that the 20 min with BFR session may not be intense and/or long enough to cause significant changes in variables tested.

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**Purpose:** To investigate the acute effects of a 20-minute walk/run at 40% VO2 max with and without blood flow restriction on pulse wave velocity (PWV).

**Methods:** Seventeen female subjects, between the ages of 18 and 40, signed informed consent and were familiarized with the study protocol, on the same day measurements were assessed: height, weight, body composition, and thigh circumference. Followed by each subject performing the Bruce Protocol on a treadmill. Subjects were asked to come back to the lab hydrated and 8 hours fasted on two different days (separated by at least 48 hours). After reaching hydration, participants were asked to lie down in the supine position for a minimum of 10 minutes and baseline hemodynamics and measurement of PWV using SphygmoCor® CPV Pulse Wave Analyzer. The sites tested were carotid to radial (C-R), carotid to femoral (C-F), and femoral to posterior tibial (F-PT). The randomized testing sessions consisted of two 20-minute walk/run sessions at 40% VO2 intensity with BFR cuffs inflated (BFR), and the BFR cuffs uninflated (CON). Tightness of the cuffs was set at 55-60 mmHg for BFR, and the cuffs were placed snug enough that they didn’t move during exercise for the CON session. The final cuff pressures were achieved by starting at 120 mmHg and increasing progressively by 20 mmHg with 10 rest in between increments. Upon completion of exercise, post-exercise PWV was assessed at immediately, 15, 25, and 45 minutes.

**Results:** No condition×time interaction or condition and time main effects were observed for C-R and C-F sites (p>0.05). There were no significant condition×time interaction or time main effect for the F-PT site (p>0.05), but a significant condition main effect was detected at the 15 minute mark post exercise following the BFR session (p<0.01).

**Conclusion:** The results suggest that the BFR session resulted in an improved arterial compliance at the F-PT site. This may have been caused by the increased shear stress from blood pooling during the BFR session resulting in a greater release of nitric oxide through vasodilation in the lower body. There may be a practical application of this exercise training for improving cardiovascular health. Since this was an acute study, future training studies should look at the chronic effects on pulse wave velocity using these settings.

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**Purpose:** Exercise improves cardiovascular health. However, only 45% of the mechanisms for its beneficial effects for cardiovascular diseases are known. Blood flow patterns and endothelial shear stress during exercise may explain part of the remaining unknown cardiovascular protective mechanisms.

**Methods:** To identify blood flow patterns of the brachial artery at specific lactate levels of 0-2, 2-4, and 4+ mmol/L to help standardize exercise intensities in cardiac rehabilitation.

**Results:** For healthy subjects (Age 18-35) (9 males and 6 females) were recruited to perform two exercise tests on a cycle ergometer in fasting and exercise-free conditions for at least 10 hours prior to the tests. The first test was a maximal, graded exercise test. The second one, performed 48-72 hours after the first exercise test, was a 3-workload steady state test at lactate levels of 0-2, 2-4, and 4+ mmol/L determined during the first exercise test. Oxygen consumption (VO2), blood pressure, blood lactate levels, and ultrasound imaging of the brachial artery (assessing vessel diameter and blood flow direction and velocity) were continuously monitored during both tests. Repeated measurements ANOVA comparing all three intensities for all variables were performed at alpha=0.05.

**Results:** No change was observed for A1x, R%M, arterial PWV, or microvascular perfusion across all handgrip bouts (P>0.05). **Conclusions:** These preliminary findings indicate that unilateral, handgrip exercise performed with and without BFR produces an intensity-dependent increase in HR and central MAP with no change occurring in aortic wave reflection, vascular stiffness or leg vasocconstriction.
mmol/L (anatge rate shear = 178±18 s to 260±22 s to 309±24 s, baseline vs. 0-2 mmol/L vs. 2-4 mmol/L, respectively, p=0.01; retrogade shear rate = 425±5 s to 84±9 s vs. 0-2 mmol/L vs. 2-4 mmol/L, respectively, p=0.05). No significant difference was observed between the 2.4 and 4 mmol/L intensities.

CONCLUSIONS: The data shows that exercise-induced blood flow patterns are exercise intensity-dependent. However, high intensity exercise (lactate > 4.5 mmol/L) appears to offer little changes in blood flow patterns in comparison with moderate exercise (lactate 2.4-4 mmol/L).

954 Board #133 May 31 3:30 PM - 5:00 PM

Autoxidation After an Acute Bout of Bench Press With and Without Blood Flow Restriction

Olivia Gilmour, Alaina Glasgow, Erica Marshall, Yu Lun Tai, J. Derek Kingsley. Kent State University, Kent, OH. (Sponsor: Ellen L. Glickman, FACSM)

(No relationships reported)

Traditional resistance exercise may decrease vascular tone up to 30 minutes, which may increase the risk of cardiovascular events. However, the effects of resistance exercise with blood flow restriction (BFR) on autonomic modulation are unclear. PURPOSE: To evaluate autonomic modulation after exercise with and without BFR in active men. METHODS: Sixteen resistance-trained men volunteered for the study. Autonomic modulation was assessed at rest, 15 (Rec1), and 25 (Rec2) minutes after three 10-repetition sets of bench press with BFR (LI-BFR) consisting of 4 sets of 30, 15, 15, and 15 repetitions at 30% 1-repetition maximum (1RM) with 30 second rest between sets. The traditional high-intensity bench press (HI) consisted of 4 sets of 8 repetitions at 70% 1RM with 60 seconds rest between sets, and control (CON) consisted of supine rest. Autonomic modulation was expressed as natural logarithm (Ln), and included total power (LnTP), high-frequency power (LnHF), low-frequency power (LnLF), and sympathovagal balance (LnLF/LnHF ratio). A repeated measures ANOVA was used to evaluate conditions (LI-BFR, HI, and CON) across time (Rest, Rec1, and Rec2) on autonomic modulation. RESULTS: There was a significant condition by time interaction for LnTP (LI-BFR: Rest: 8.6±0.9%; Rec1: 7.9±1.0%; Rec2: 7.9±1.2%; HI: Rest: 8.6±1.6%; Rec1: 7.3±1.0%; CON: Rest: 8.7±0.8%; Rec1: 8.7±0.7%; Rec2: 8.5±0.8%, p<0.05), LnHF (LI-BFR: Rest: 7.3±1.1%; Rec1: 5.1±1.2%; Rec2: 6.6±1.5%; HI: Rest: 7.4±1.2%; HI: Rest: 7.3±1.1%; Rec1: 5.5±1.2%; Rec2: 6.6±1.5%, p<0.05), and LnLF (LI-BFR: Rest: 7.3±1.1%, Rec1: 6.4±0.8%, Rec2: 6.6±1.2%; HI: Rest: 7.4±1.2%); CON: Rest: 7.3±1.1%, Rec1: 7.1±1.8%, Rec2: 7.1±1.10%, p<0.05) such that they were reduced at Rec1 and Rec2 after LI-BFR and HI compared to Rest and CON. There was a significant (p<0.05) effect of time for LnLF/LnHF ratio (Rest: 1.0±0.1%; Rec1: 1.0±0.2%; Rec2: 1.0±0.1%) such that it was not significant for any of the pressor responses (p>0.05), although there was a significant main effect for time. When compared to rest there were significant immediate post-exercise for SBP, DBP, and MAP (p<0.05), and a significant increase in DBP at 60 minutes post-exercise (p<0.05). CONCLUSION: CL1-BFR, HI, CL1 were not capable of inducing PEH in young obese adults up to 60 min post-exercise.

956 Board #135 May 31 3:30 PM - 5:00 PM

Hemodynamic Response to Resistance Blood Flow Restriction Exercise at Different Degrees of Arterial Occlusion Pressure

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(No relationships reported)

Although resistance exercise involving the application of an external arterial occlusion pressure (AOP) have been widely discussed in the literature, the hemodynamic response to this type of exercise when performed at different degrees of AOP remains unclear. PURPOSE: To investigate the hemodynamic response to resistance exercise performed at different degrees of AOP. METHODS: Twelve healthy trained males (2.67 yrs, 73.46 ± 7.89 kg, 1.81 ± 0.07 m, and 22.50 ± 1.66 kg/m²) were randomly assigned to four exercise conditions: CON (no occlusion), AOP-50 (50% of AOP), AOP-75 (75% of AOP), and AOP-100 (100% of AOP) in a within subjects cross-over design. A standard 15 cm wide cuff was placed on the thigh, inflated to the target pressure, and four sets of 10 repetitions of unilateral knee extension at 20% of IRM were executed with 30 sets between both conditions. Subjects performed the same protocol for the CON condition but without occlusion. There was an interval of 7 days between each trial. Total AOP was set as the amount of pressure needed to fully occlude the auscultatory pulse in the lower limbs. Systolic (SBP) and diastolic blood pressure (DBP), mean arterial pressure (MAP), heart rate (HR), and cardiac product (DP) were assessed at rest, between the second and the third set (during), immediately post-exercise, and every 15 minutes until 60 minutes post-exercise. RESULTS: SBP and DP significantly (p<0.05) increased from rest, during and immediately post-exercise for each condition. Significant (p<0.05) elevations from rest were observed in DBP for all experimental conditions during exercise. MAP significantly (p<0.05) increased during exercise from rest for all experimental conditions and for AOP-50, and AOP-100 immediately post-exercise. HR was significantly (p<0.05) increased during exercise only for CON and for all conditions immediately post-exercise. All these parameters returned to baseline 15 minutes post-exercise, and remained unchanged up to 1 h post-exercise. CONCLUSION: Similar hemodynamic responses were observed for the AOP conditions during, immediately post-exercise, and until 60 minutes post-exercise, regardless of the amount of pressure applied.

957 Board #136 May 31 3:30 PM - 5:00 PM

Importance of Venous Return for Muscle Metaboreflex-mediated Stroke Volume and Cardiac Output Responses

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It has been shown in animals that activation of the muscle metaboreflex during dynamic exercise increases cardiac output (CO) via rises in heart rate (HR) with sustained stroke volume (SV). In addition, to maintain CO at higher level, venous return also needs to increase, decrease in venous return abolishes the muscle metaboreflex-induced rise in CO. However, importance of venous return for the muscle metaboreflex-mediated SV and CO responses has never been examined in humans. PURPOSE: We aimed to investigate the influences of decreases in venous return from exercising limbs on the muscle metaboreflex-mediated SV and CO responses in humans. METHODS: We studied 9 healthy male volunteers. After resting measurements, the subjects performed cycling exercise for 8-min at 30% and 60% of VO2peak (EX30 and EX60, respectively). Beginning 3 min after the start of the exercise, inner pressure of the occlusion cuffs placed on the both thighs were increased by 80, 100, 120, and 140 and then 160 mmHg in stepwise fashion with 1-min step durations. The purpose of the progressive application of thigh cuff pressure was to reduce venous return from exercising limbs as well as to decrease arterial blood flow (i.e., oxygen supply) to exercising skeletal muscles to activate the...
Treatment of low back pain by inverting one's body on a tilt table permits unloading of bone, joints and discs of the low back. This traction force through the spine has been theorized to decrease low back pain. Randomized controlled studies to evaluate the efficacy of this practice for low back pain are limited. Although the gravitational traction is short lived, patients with hypertension, glaucoma, or cardiovascular disease are cautioned to avoid the inversion treatment because of excessive elevations in blood pressure, heart rate and intraocular pressure.

PURPOSE: To examine the influence of player position on the agreement between hemodynamic measures of cardiovascular function.

METHODS: 12 subjects (age 22.6±1.8 years, ht 170.4±9.2 cm, body mass 74.0±13.0 kg; 7 right-handers) were assessed at six assessments in the following positions: seated (S), 45º head up (45H1), horizontal [H], modified Trendelenburg (-30º head down) [T], -60º head down [60HD], and -90º inversion [I]. METHODS: Baseline measures of hemodynamic function (cardiac output [O], stroke volume [SV], heart rate [HR], systemic vascular resistance [SVR] and cardiac index [CI]) were obtained with an impedance cardiography system, and blood pressure [BP] by auscultation in a seated position [S], followed by a 5 minute assessment in each of the 6 aforementioned positions. Reliability was ensured with repeat trials separated by 48 hours. ANOVA with repeated measures (p<0.05) was applied to the data. RESULTS: Total mean BP (mmHg), EDV (mL) & SVR [dyn.s/cm] were 114.6±70.5, 129.7±116.6, respectively, with NSD among trials. Q (L/min) of (6.6, 6.9, 6.1, 5.9, 5.8, & 6.2; SV [mL/b] of (87.7, 87.9, 88.1, 86.2, 85.1, & 83.8; HR [b/min] of (73.5, 78.8, 86.6, 65.9, 68.3, & 74.7; SVR [dyne.s/cm] of (1030, 986, 1248, 1280, 1265, & 1212; and CI (L/m2) of 3.5, 3.7, 3.2, 3.1, 3.1, & 3.3 were obtained for S, 45H1, H, T, 60HD, and I, respectively. Although statistical analysis revealed differences among several conditions (p<0.05), they do not appear clinically significant. CONCLUSION: Postural changes induced by acute exposure to tilt table inversion did not provide clinically significant changes in measures of cardiovascular hemodynamics, 12 subjects (age 22.6±1.8 years, ht 170.4±9.2 cm, body mass 74.0±13.0 kg; body mass index=30.1±4.2) participated in this study. Player positions included: offensive linemen (OL; n=7), tight ends (TE; n=4), wide receivers (WR; n=9), defensive linemen (DL; n=6), defensive backs (DB; n=8), linebackers (LB; n=6), and kicking backs (RB; n=4). Total and segmental body composition was measured using multi-frequency BIA and compared with values obtained using DXA. Paired t-tests with a Bonferroni-adjusted p-value of 0.007 examined differences between the two methods and Bland-Altman analyses evaluated agreement. ANOVA assessed effect of position on total and segmental differences between methods and Tukey’s HSD determined differences between each position. RESULTS: Compared with DXA multi-frequency BIA significantly underestimated BF% (3.0±3.8%), total FM (2.5±1.4 kg), leg FM (2.8±0.2 kg), and leg LM (3.6±2.3 kg) (all p<0.001) and significantly overestimated total LM (6.9±4.5 kg) (p=0.001). Limits of agreement (1.96*SD of the mean difference) were ±7.39% (BF%), ±1.04kg (total FM), ±3.83kg (leg FM), ±2.23kg (leg LM), and ±8.89kg (total LM). No significant differences were found between the two devices for trunk FM (±0.33kg, p=0.56) and trunk LM (1.0:2.4kg, p=0.009) measures, with limits of agreement ±5.92kg for trunk FM and ±4.71kg for trunk LM. Player position had a significant effect on the mean difference of all measures, including BF%, total FM and LM, leg FM and LM, and trunk FM and LM (adjusted p<0.05). OL demonstrated the greatest effect on the mean difference of each variable.

CONCLUSIONS: Compared to DXA, multi-frequency BIA does not appear to be a valid way to assess segmental measures of body composition in collegiate football players. BIA may thus be limited by non-traditional body types (e.g. football players) indicating between-player comparisons should be limited. Further research in other athletic populations is warranted.
Estimating body fat percent (BF%) is an important fitness assessment for determining health status, monitoring weight loss and improving athletic performance. Women have a unique advantage when assessing BF% due to possible fluid retention, weight gain, and hormonal fluctuations that are happening throughout the menstrual cycle, and it has been questioned as to whether or not men could negatively impact the accuracy of BF% assessments. PURPOSE: To identify whether or not body composition results would be affected by a woman during menses and to investigate the effects of birth control on the accuracy of body composition results. METHODS: 40 women (26.1 ± 1.7 yrs) had their BF% estimated with dual energy x-ray absorptiometry (DXA), air displacement plethysmography (ADP), and 3 different subcutaneous fat thickness measurement devices before the cadavers were dissected and site-specific thickness was measured. Subcutaneous fat thickness was measured immediately post-exercise (PE15), 10 minutes post-exercise (PE30), 45 minutes post-exercise (PE45) and 60 minutes post-exercise (PE60). Repeated measures ANOVA (2 x 6) were used to determine if water consumption and moderate intensity exercise influenced body composition measures for each device. Where appropriate, pairwise comparisons with Bonferroni adjustment were performed to locate differences among the post-exercise time points. RESULTS: All devices showed a significant effect of time (P<0.01) and O5 was the only device to demonstrate a significant interaction of group and time (P<0.05). ADP showed no significant differences among the time points during either condition. PreE was significantly greater than all other time points (P<0.01) for T and O5 and was significantly greater than PE10, PE15, PE30, and PE45 for O3 (P<0.01). Conclusion: Moderate intensity exercise can impact body composition to varying degrees. Ingestion of water post exercise does not appear to impact most measurements of body composition. Investigators should consider limitations of the device(s) which could impact the interpretation of data.
Mapping body composition patterns of those hired as police officers has implications not only to the health of officers during their careers but also in their ability to perform in emergency situations.

**Purpose:** To evaluate body composition changes that occur in police recruits from 1990 to 2013 with gender comparisons. **Methods:** During the first week of police recruit training in a large southeastern metropolitan area, physical fitness levels were evaluated in 2,468 recruits. This study’s variables of interest are: body mass (kg), lean mass (kg), and % body fat. ANOVA and Bonferroni post hoc procedures were used to evaluate data. **Results:** The initial ANOVA shows significance for males in all three variables at p<0.05. Males tended to increase in body mass and lean mass from 1990 to 2000 (80.6±1.2 kg to 87.3±1.2 kg, p<0.05) (68.9±0.8 kg to 73.4±0.8 kg, p<0.05), respectively. These values remained relatively constant between 2000 and 2013. No discernable pattern was seen in female lean mass nor body mass. Males tended to increase in % body fat from 1994 to 2010 (13.6±5.0 to 16.7±7.2, p<0.05). Although not significant, female % body fat means increased from 1990 to 2013 (22.9±10.5 to 26.2±1.2). **Conclusions:** Even though there was an increase in body mass, pre lean mass and % body fat over time in males, these increases were low. In addition, these increases were lower in females.

**Background:** Body composition (BC) analysis is increasingly available to consumers in the form of wifi-connected bioelectrical impedance analysis (BIA) bathroom scales. However, the accuracy of current generation scales to criterion methods is not known.

**Purpose:** To determine the accuracy and precision of BC measurements using scales for men and women compared to dual-energy X-ray absorptiometry (DXA). Additional tests were used to evaluate the use of scales for quantifying residual respiratory mass (RMR). **Methods:** We recruited a sample of healthy adults to undergo a series of BC measurements. Height and weight was assessed using a Seca 284. BC was assessed using whole-body DXA (Horizon A), a clinical tetrapolar multifrequency BIA (InBody770), and 7 bathroom scales: Tanita BF-684W, Weightwatchers WW701Y, Taylor 7226SF, Withings Smart Body Analyzer WS-50 and Body Cardio WBS04, Fitbit Aria, and QardioBase. Duplicate measures were taken on the scales to evaluate the test-retest precision. RMR was calculated using Nelson RMR equations for DXA and BIA measures, and Harris-Benedict (HB) using weight. **Results:** In total, 22 participants were recruited (12 male) with an average age of 29.6 (±7.3 years), weight of 70.0 (±13.4 kg) and height of 170.0 (±10.1 cm). BPF was highly correlated between the 770 and DXA for both men and women (r=0.9) but less correlated between the scales and DXA (0<r<0.65). However, all BIA devices underestimated PBF by 2 to 11 units. There was poor obesity classification between the scales and DXA as well (kappa < 0.2). RMR was highly correlated between DXA and several scales for both men and women (r=0.5 to 0.99). RMR was most highly correlated by all scales compared to DXA from 21 to 148 kcal but in all cases were improvements over the HB RMR estimate (HB-DXA 260 kcal). The test-retest precision (% coef of var, standard deviation) for PBF and RMR varied by model for men and women (0.2 to 0.5 %, NA) and (0.2 to 0.6 %, 2 to 9 kcal) respectively. Overall, we found the Tanita to have the best correlation to DXA measures, Taylor and Weight Watchers to have the best precision. **Conclusions:** We conclude that the use of bathroom scales may provide a more accurate assessment of RMR than the HB equation, and that the precision is comparable to previously-reported DXA values. However, our results varied substantially by make.

**Purpose:** The purpose of this study was to examine the relationships between body composition measures derived from air displacement plethysmography (BodPod) and several field methods of body composition in a population of National Association of Intercollegiate Athletics (NAIA) athletes. **Methods:** Twenty-three NAIA athletes visited the lab for a single visit. Percent body fat and lean mass were assessed in all subjects using the BodPod (BP), handheld bioelectrical impedance analysis (HBIA), standing bioelectrical impedance analysis (SBIA), and skinfolds using the 3-site Jackson and Pollock equation. Body mass index (BMI), upper arm circumference (AC), waist circumference (WC), and hip circumference (HC) were also assessed. Relationships between percent body fat as assessed by BP and all field non-lean mass assessments as well as relationships between BP lean mass and all field non-percent body fat assessments were examined using Spearman’s correlation coefficients. **Results:** Percent body fat (19.1 ± 8.4 %) as assessed by BP was significantly related to BMI (29.8 ± 8 kg/m²; r = 0.515; p = 0.012), percent body fat calculated from skinfolds (14 ± 7 %; r = 0.855; p < 0.001), percent body fat from HBIA (17.9 ± 6.2 %; r = 0.855; p < 0.001), percent body fat from SBIA (14.1 ± 3.7 %; r = 0.748; p < 0.001), AC (33 ± 4 cm; r = 0.563; p = 0.005), WC (90 ± 10 cm; r = 0.720; p < 0.001), and HC (102 ± 18 cm; r = 0.788; p < 0.001). Lean mass as assessed by BP (73.3 ± 8.7 kg) was significantly related to BMI (29 ± 8 kg/m²; r = 0.483; p = 0.020), lean mass calculated from skinfolds (76 ± 10 kg; r = 0.817; p < 0.001), lean mass from HBIA (72.7 ± 8.6 kg; r = 0.851; p < 0.001), lean mass from SBIA (76.5 ± 11.7 kg; r = 0.802; p < 0.001), AC (33 ± 4 kg; r = 0.596; p = 0.003), WC (90 ± 10 kg; r = 0.496; p < 0.016), and HC (102 ± 18 kg; r = 0.570; p = 0.005). **Conclusions:** Skinfolds, HBIA, and SBIA appear to be most related to both percent body fat and lean mass in this population of NAIA athletes. Thus, when testing these athletes in a field setting, these tests could be performed to provide useful body composition information. If it were not possible to perform these tests, BMI, UAC, WC, and HC could also be used although these tests did not correlate as strongly as did skinfolds, HBIA, and SBIA with BP assessments.
BACKGROUND: Similar to the general US population, the rate of cardiovascular disease, sedentary lifestyle, and obesity in military populations is growing. Android obesity, a type of obesity where excess fat accumulates around the thoracic and abdominal cavities, is associated with an increased risk of cardiovascular and metabolic deficiencies. Military populations are confronted with high physiological demands therefore it is crucial for them to be in good physical condition and minimize excess body fat in the thoracic and abdominal areas.

PURPOSE: This research investigated the effects of a 7-week periodized training program on body composition of ROTC cadets. METHODS: Subjects consisted of 23 Army and Air Force ROTC cadets (male/female=18/6). Age (yr)=22.6±5.96, Height (cm)=172.8±6.8, Weight (kg)=72.98±12.91. The intervention group (IG n=14) trained for 1 hour/day, 4 days/week and the control group (CG n=9) participated in traditional military training protocol for 1 hour/day, 3 days/week. RESULTS: Findings revealed that both groups demonstrated a significant decrease in overall body fat percentage (p<0.005) pre to post training, but only the IG demonstrated a significant training effect evidenced by decreases in the abdominal area (p=0.009) and mid-axillary (p=0.025).

CONCLUSION: Although this research demonstrated that periodized resistance training reduces abdominal body fat among ROTC cadets, it is important that future studies address certain limitations (small sample size and length of training period) this study encountered. Due to the health risks associated with android obesity, including increased cardiovascular and metabolic disease risk factors, implementing a periodized training program may be beneficial in diverse military populations.

CONCLUSIONS: The 3D body scanner consistently underestimated BF% despite being highly correlated with other established methods. Further research is needed to validate 3D scanning as a reliable method for measuring body composition.

PURPOSE: The accuracy of a three-dimensional (3D) body scanner in determining body composition was compared against other laboratory methods (i.e., hydrostatic weighing, bioelectric impedance analysis (BIA)). METHODS: A total of 176 (males/females= 83/93) young adults [mean:SD: age=22.2±2.9 years, body mass index (BMI)=[24.5±3.8 kg/m²]) were recruited. Subjects had muscle mass estimated from the 3D body scan, waist circumference, skinfolds, circumference measurements and BIA. The Jackson and Pollock equation was used to estimate body fat percent (BF%) from the sum of three skinfolds (males: chest, abdomen and thigh; females: triceps, suprailium, and thigh). The Navy circumference-based equation estimated from the 3D body scanner, hydrostatic weighing, skinfolds, circumference and circumference measures (28.4±9.3% \( p \leq 0.016 \)) and circumferences (13.8±4.4% \( p \leq 0.002 \), skinfolds (11.8±5.1% \( p \leq 0.007 \)), and circumferences (21.3±9.5% \( p \leq 0.001 \), skinfolds (19.8±9.6% \( p \leq 0.001 \), BF% from hydrostatic from the 3D scanner (10.6±4.0%) was significantly less than BF% from hydrostatic weighing (12.3±4.1%) which served as the criterion estimate. Subjects were 162 (75 males, 87 females) physically active college students [age 21 (3) yrs. height 1.73 (0.1) m, body mass 76.09 (15.74) kg, and BMI 25.4 (4.1) kg/m²]. RESULTS: The validity of the IBC BF% estimate was based on a comparison to the criterion value from the DXA by calculating the mean, SD, coefficient of determination \( r^2 \), 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 IBC estimate. Paired t-tests determined paired-wise differences between measurements with significance set at p<0.005. The mean BF% was significantly lower for the IBC [23.0 (9.3)]% estimate than the DXA [25.9 (11.5)%] estimate (p<0.001). The r² value was 0.669; SEE was 6.6 %fat; and total error (TE) was 7.2 %fat. When separated by sex, the IBC BF% estimate was still significantly lower for both male [-1.6 (5.9) %fat, \( r^2 0.456, \text{SEE}=6.6 \%fat, \text{TE}=6.16 \%fat]\ and female [-4.0 (6.9) %fat, \( r^2=0.462, \text{SEE}=6.9 \%fat, \text{TE}=7.9 \%fat]\ participants. CONCLUSIONS: In this study the IBC did not provide a valid estimate of body composition and underestimated BF% compared to the DXA estimate. Based on this preliminary analysis, this method cannot be recommended for estimating BF% in college aged students.

PURPOSE: Body composition (BC) is a frequently assessed component of health-related fitness. Recently, a portable joint diameter-based body composition assessment system, sold by Integrative Body Composition Assessment (IBC) has become commercially available for estimating BC. This method involves measuring both right and left wrist diameters using calipers, waist circumference, height and weight. These measurements are entered into the IBC software together with age and gender and the average amount of both cardiorespiratory and resistance training exercise the subject has done on average per week for the past six months. However, little is known how IBC BF% estimates compare to the dual-energy X-ray absorptiometry (DXA) estimate of body composition in college aged students. The purpose of this study was to determine the accuracy of the IBC as a way to estimate BC. METHODS: Participants percent body fat (%fat) was estimated using IBC and dual-energy X-ray absorptiometry (DXA), which served as the criterion estimate. Subjects were 162 (75 males, 87 females) physically active college students [age 21 (3) yrs. height 1.73 (0.1) m, body mass 76.09 (15.74) kg, and BMI 25.4 (4.1) kg/m²]. RESULTS: The validity of the IBC BF% estimate was based on a comparison to the criterion value from the DXA by calculating the mean, SD, coefficient of determination \( r^2 \), 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 IBC estimate. Paired t-tests determined paired-wise differences between measurements with significance set at p<0.005. The mean BF% was significantly lower for the IBC [23.0 (9.3)]% estimate than the DXA [25.9 (11.5)%] estimate (p<0.001). The r² value was 0.669; SEE was 6.6 %fat; and total error (TE) was 6.17 %fat. When separated by sex, the IBC BF% estimate was still significantly lower for both male [-1.6 (5.9) %fat, \( r^2 0.456, \text{SEE}=6.6 \%fat, \text{TE}=6.16 \%fat]\ and female [-4.0 (6.9) %fat, \( r^2=0.462, \text{SEE}=6.9 \%fat, \text{TE}=7.9 \%fat]\ participants. CONCLUSIONS: In this study the IBC did not provide a valid estimate of body composition and underestimated BF% compared to the DXA estimate. Based on this preliminary analysis, this method cannot be recommended for estimating BC in college aged students.

Rugby Union is a physically demanding sport requiring a variety of anthropometric and physiological characteristics to maximize performance. Factors such as muscular power, speed, agility, maximal aerobic power, mobility, and body composition all factor into player performance. PURPOSE: To determine changes in body composition, height, speed, muscular power, maximal aerobic power, mobility, and agility of collegiate rugby union players throughout a competitive season. METHODS: Participants included 29 (20.2 ± 1.49yrs) men from a collegiate rugby club. Muscle power (vertical jump), speed (10m and 20m sprint), agility (L-drill), mobility (FMS active straight leg raise and shoulder mobility) maximal aerobic power (VO2max) via 20m multi-stage shuttle run (SSR), height, body mass, fat mass (ADP), and body fat levels (ADP and sum of 7 skinfolds (SKBF%)). were assessed during the pre-season (PRE) and mid-season (MID). Training and match loads were estimated for each player by multiplying each player’s rating of perceived exertion (RPE: 6-20) by the amount of training/playing time. RESULTS: PRE and MID variables were compared using a Paired-Sample T-test with an alpha level of p<.05. The mean PRE SKBF% of 16.57 ± 6.29 was significantly higher than the mean MID SKBF% of 13.77 ± 7.61 (t(19) = -4.782, p<.001). The mean PRE 10m sprint time was 1.81 ± .12s and was significantly faster than the MID mean 10m sprint time 1.94 ± .11s (t(19) = -4.155, p<.001). The mean PRE 20m sprint time 1.81 ± .12s and was significantly faster than the MID mean 20m sprint time of 3.3 ± 1.81s (t(19) = -4.155, p<.001). The mean PRE VO2max was 44.65 ± 5.43l/min. and was significantly lower than the mean MID VO2max of 46.97 ± 6.43l/min. (t(19) = -2.26, p<.036). CONCLUSION: Maximal aerobic power increased from PRE to MID while the estimated body fat levels decreased from PRE to MID. Improvements in both
variables are likely due to conditioning during training and increased activity levels of participating in sport. Speed may have decreased from PREE to MID due to fatigue from the first-half of the season with accumulating training and match loads.

The accurate measurement of percent body fat (%BF) is very important in the determination of a wrestler’s minimum wrestling weight under the National Collegiate Athletic Association Wrestling Weight Management Program. Skinfold measurements (SF), air displacement plethysmography (ADP), and hydrostatic weighing remain as the only three approved methods. Dual energy x-ray absorptiometry (DXA) is considered a criterion method while type-A ultrasound (US) serves as a less expensive, field alternative; however, a dearth of literature has examined the influence of hydration status on DXA and US determined %BF. PURPOSE: To determine the effect of hydration status on fat mass, lean body mass, and %BF using SF, ADP, US, and DXA. METHODS: Sixteen college-aged men (20.8 ± 1.6 yrs) participated in this study. Participants reported to the lab on two separate occasions in either a euhydrated state (Usg < 1.020) or a hypohydrated state (Usg > 1.020) using a randomized crossover design. Usg was assessed in order to verify hydration status and %BF was determined using SF, ADP, DXA, and US methods. RESULTS: Usg and body mass (BM) measurements were significantly different between the euhydrated (Usg=1.014 ± 0.006; BM=79.1 ± 14.3kg) and hypohydrated (Usg=1.026 ± 0.004; BM=78.4 ± 14.2kg) states. However, hydration status had no significant effect on %BF observed in the euhydrated or hypohydrated states (p=0.730) although significant differences were observed between the different assessment methods (SF=10.3 ±1.1%; ADP=13.0 ±1.1%; US=12.1 ± 2.1%; DXA=19.5 ±1.8%; p<0.001). Pairwise comparisons identified significant differences between all methods (p<0.001) except for the comparison between ADP and US (p=1.000). %BF measured by DXA was significantly greater than all of the other methods (2.8-9.2%; p<0.004). CONCLUSION: Hydration status did not have an effect on %BF measurements when using SF, ADP, US, or DXA. The significant differences among these four methods remain a concern. The difference between two approved methods (SF and ADP) suggests that a wrestler may lose additional weight when using SF, thus potentially allowing for certification at a lower weight class.

### RESULTS

In 1921 Matiegka proposed a strategy for estimating adipose tissue mass by calculating the half of average of some skinfoldsthickness and multiplying it by body surface area (BSA), but this strategy has not been evaluated with modern body composition methods.

**PURPOSE:** To examine the correlation between physical activity (PA) level, total cholesterol (TC), high-density lipoprotein (HDL), and fasting blood glucose (FBG) among college-aged Hispanic males.

**CONCLUSIONS:** Results from this study show clear differences in FP across ranked BC groups. Furthermore, these differences were not consistent across BC method and not consistent across sex groups. Practitioners using BC data to predict FP should be aware of these inconsistencies.
METHODS: Thirty-five (35) Hispanic males (age= 23.2 ± 2.8) volunteered to participate in the study. Each subject read and signed the consent form prior to any measurement to take place. PA level objectively measured via Actigraph accelerometers. Each subject wore an accelerometer for 7 consecutive days -5 weekdays and 2 weekend days. At the end of 7 days, the subjects returned to the lab fasted for at least eight hours and gave blood sample to measure TC, HDL, and TG. The ratio of TC to HDL and non-HDL were also calculated. Air-displacement plethysmography was used to determine percent body fat (BF)

RESULTS: Very vigorous PA was positively correlated with levels of HDL (r=0.557, p<0.01) and negatively correlated with TC-HDL ratio (r=0.453, p<0.01). A positive correlation was found between minute length of sedentary bouts and levels of glucose (r=0.459, p<0.01). There was also a strong negative correlation occurred between max length of sedentary time and non-HDL (r=-0.438, p<0.01).

CONCLUSIONS: The results indicate that the use of accelerometers can be useful for obtaining higher levels of HDL cholesterol and a lower TC-HDL ratio. The findings also suggest that longer durations of sedentary state correlated with an increased FBG and breaks from prolonged sedentary bouts may decrease the risk of developing non-HDL cholesterol related health problems for college-aged Hispanic males. Future studies should be performed to determine the minimum amount of vigorous exercise and length of breaks in sedentary time to improve variables tested in this study.

Validation and Reliability of a Consumer Bioelectrical Impedance Analysis Scale

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No relationships reported

PURPOSE: Bioelectrical impedance analysis (BIA) scales have gained popularity in monitoring fitness progress at home, yet their accuracy is unknown. We assessed the validity and reliability of body fat percentage (BF%) measurements from a consumer bioelectrical analysis (cBIA) scale compared to the “gold standard” of hydrostatic weighing (HW). METHODS: Forty-three [male (n=22); female (n=21)] healthy volunteers [age: 27.9±5.6y; height: 170.0±8.6cm; mass: 69.0±13.7kg; body mass index (BMI) range: 16.8-33.1] arrived at the laboratory 3h fasted after 12h without exercise and underwent measures of residual lung volume (for HW calculations), hydration status, and BF% via cBIA scale compared to the “gold standard” of hydrostatic weighing (HW). We assessed cBIA scale validity using Bland-Altman Plots (identifying Mean Biases: Limits of Agreement) and reliability using intra-class correlation coefficients (ICC). RESULTS: With HW as the validity criterion, mean BF% was 22.3±1.6% for all participants (range: 5.3-35.8%; male mean: 20.8±6.4%; female mean: 23.9±5.5%). Compared to HW, the cBIA scale in ‘Lean’ mode underestimated BF% by -5.3±9.1% for all participants (males: -7.9±6.9%; females: -2.6±8.0%; p<0.05) (in ‘Regular’ mode, the cBIA scale agreed with HW for all participants (BF% -0.8±9.3%; p=0.27) and females (BF% 0.4±10.8%; p=0.73); however, there was a significant difference for males (BF% -2.0±7.1%; p<0.05). The cBIA was reliable when comparing day-to-day (‘Lean’ mode: 0.5±1.0%; ICC=0.99; ‘Regular’ mode: 0.4±1.0%; ICC=0.99) and week-to-week (‘Lean’ mode: -0.4±1.4%; ICC=0.98; ‘Regular’ mode: -0.2±1.5%, ICC=0.97) BF% for all participants. CONCLUSIONS: Compared to HW, the cBIA underestimated BF% in ‘Lean’ mode, and this discrepancy was more pronounced in males. However, the cBIA scale agreed with HW when analyzing BF% in ‘Regular’ mode for all participants and females, signifying the “mode” chosen on consumer BIA devices greatly impacts validity. The cBIA was reliable when comparing day-to-day and week-to-week BF% measures for all participants, suggesting this can be a reliable-at-home BF% analysis scale.

Interuter Reliability For Dxa And Bia Analysis For Measuring Total And Regional Lean Mass

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No relationships reported

Dual-energy X-ray absorptiometry (DXA) and bioelectrical impedance analysis (BIA) are capable of assessing total and regional body composition using different technologies. DXA is considered more reliable than BIA to evaluate body composition, while BIA is a more cost-efficient and portable option. The agreement between these two measurements has not been determined in Rugby athletes. PURPOSE: To assess the interuter reliability between two devices that are capable of assessing total and regional lean mass in rugby athletes. METHODS: Body composition was measured in sixteen male rugby players (21.1 ± 1.6 years; 88.3 ± 14.2 kg; 1.78 ± 0.06 m) prior to the onset of their competitive season. Total body estimates of percent fat (%FAT), fat mass (FM), and lean mass (LM) were determined by DXA (Lunar iDXA) and BIA (InBody 770). Regional LM estimates were also determined for the arms and legs from both devices. To assess the agreement between DXA and BIA on these measures, intraclass correlation coefficients (ICC), 95% limits of agreement (95% LOA), and coefficients of variation (CV%) were calculated. RESULTS: The agreement between DXA and BIA for total body estimates of %FAT (ICC = 0.81, 95% LOA = 0.91 - 1.34%, CV% = 10.5%), FM (ICC = 0.48, LOA = -0.63 - 0.92 kg, CV% = 10.1%) and LM (ICC = 0.67, LOA = 0.02 - 1.04kg, CV% = 5.6%) was acceptable. However, there was a significant difference for males (ICC = -0.91, 95% LOA = 0.93 - 1.06%, CV% = 3.3%) and lean leg mass (ICC = 0.89, 95% LOA = 1.05 - 1.15%, CV% = 2.4%) agreement was consistent. CONCLUSION: These data suggest that the interuter reliability between DXA and BIA is high when estimating total and regional lean mass, but not for estimating fat mass or body fat percentage. Although limited by the cross-sectional nature of the study design, our findings suggest it may be possible to use these devices interchangeably for tracking total and regional lean mass.

Body mass differs widely across the sports spectrum. While some sports are dominated by large athletes, other sports participants benefit from a small size or weight class restrictions. Perhaps the most prevalent measurement of body composition (BF%) with less emphasis on the major components of body composition, fat-free mass (FFM) and fat mass (FM). FFM is the functional component as it is closely associated with maximal voluntary strength, while FM plays an important role in energy balance. With the ever increasing emphasis on control and manipulation of the different training variables, perhaps there should be greater focus on the relationship between FFM and FM. PURPOSE: To determine the relationship of FFM and FM to height and body mass across the wide range of size typically observed in college athletes. METHODS: Two hundred and sixty-seven NCAA D-II male athletes (age = 20.2 ± 1.2 y, height =180.6 ± 7.9 cm, body mass = 87.3 ± 16.9 kg) volunteered to serve as subjects. Body composition was assessed using dual-energy x-ray absorptiometry (DXA). This allowed compartmentalization and regional estimates of lean (bone, muscle, etc.) and fat tissue from which FFM and FM are determined.

RESULTS: The relationship between height and body mass are curvilinear and moderately correlated (r=0.61). FFM and FM were significantly related to height.
Body composition (BC) assessments focus predominantly on fat mass, however lean mass (LM) measurements also provide useful information on clinical and nutritional status. LM measurements have been shown to be predictive of health outcomes, including sarcopenia, which has been associated with frailty and reduced quality of life. Dual energy x-ray absorptiometry (DXA) is an established technique used to assess BC, including total and regional LM. Reference values for LM derived from DXA are necessary for interpretation and detection of LM deficits and its associated health issues. Recently reference values for LM measures specific to Hologic DXA systems were developed, however it is known that BC, including LM measures differ by DXA manufacturer. There currently are no LM reference values available for GE-Healthcare DXA systems. PURPOSE: To develop reference values for age and sex for LM measurements using with GE-Healthcare DXA systems.

METHODS: A de-identified sample, considered exempt from IRB review, was obtained from Ball State University’s Clinical Exercise Physiology Laboratory and University of Wisconsin-Milwaukee’s Physical Activity & Health Research Laboratory. DXA scans of 2,076 women and 1,251 men were completed using a GE Lunar Prodigy or iDXA. Variables of interest included total LM and appendicular lean mass index (ALMI; leg lean mass + arm lean mass / height (m²)). Percentiles (%ile) were calculated and a factorial ANOVA was used to assess differences for each variable between age groups and sex, as well as the interaction between age and sex. RESULTS: Men had higher mean total LM and ALMI than women (p<0.01), across all age groups. Total LM and ALMI decreased over the 5 decades in men and women (p<0.01). The 50th %ile for total LM of men and women aged 20-29 years decreased from 63.9 and 42.5 kg to 54.2 and 39.1 kg for ages 70-79 years, respectively. The rate of decline in total LM during a 5 decade period was approximately 3% and 2% for men and women per decade, respectively.

CONCLUSIONS: These age and sex-specific LM reference values are the first developed specifically for use with GE-Healthcare DXA systems. These reference values provide for a more accurate interpretation of DXA-derived LM measurements providing an initial resource to aid in the early detection and assessment of LM deficits.

Several research studies have examined the belief of freshman 15 myth as it is well known that an amount of weight gained during a student’s first year at college in the United States and Canada. However, mixed results have been found that freshman gain as much as 15 pounds, whereas other studies suggest minimal weight gain. There is still limited information available to systematically examine the weight gained in Kinesiology/Exercise Science major senior college students. PURPOSE: The present study was to examine the senior college student’s body weight compared to the ideal body weight. METHODS: Two hundred and thirty-two exercise science major students were participated in the study (age = 21 ± 6.72 yrs; Height = 170.8 ± 12.2 cm; body weight = 77.8 ± 14.8 kg. Body mass index = 26.8 ± 5.0 kg/m²; Body Fat% = 19.2 ± 8.2%; ideal body weight = 69.8±14.2 kg) and the ideal body weight was calculated based on using the body fat % obtained by the bio-electrical impedance device. Descriptive for all variables were calculated and Pearson product-moment correlations were calculated to test the association between the actual weight and the ideal body weight. Independent t-tests were performed to examine the statistically significant difference between the actual weight and the ideal body weight and also examine the ideal body weight differences between the male and female students. RESULTS: The difference between the actual weight and the ideal weight was 5.88 kg for male

The Importance Of Body Composition In The National Hockey League Testing Combine

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No relationships reported

The National Hockey League (NHL) combine was designed to draft-eligible players based on speed, power, strength, and physical size. Body composition (anthropometric measures and skin fold valus) were recorded for all players, with the belief that it may play a role in physical performance. PURPOSE: To examine the role of body composition in the battery of physical tests and to compare differences in combine results based on position. METHODS: Over two seasons, thirty-seven elite male Canadian university hockey players (age = 22.86 ± 1.55 years, weight = 87.21 ± 6.52 kg; height = 181.69 ± 6.19 cm, body fat percentage = 16.06 ± 3.93%) participated in the study at the beginning of their hockey seasons. 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 (iDXA) scan to measure body composition. RESULTS: Pearson product correlations were used to explore the relationship among anthropometric measures (body fat percentage, visceral fat (kg), height, weight, leg lean mass per kg, upper lean mass per kg, and wingspan) with NHL fitness tests (bench press, maximum pull ups, grip strength, long jump, and Wingate anaerobic test). Multiple linear regression was used to explore the association among regional body composition and NHL combine tests. Upper body lean mass/kg (R² = 417) explained the most variance in the bench press while height (R² = 506) explained the most variance in the long jump.たくさんの情報は、健康のためのトレーニングプログラムを提供することに役立つ可能性が高い。エリートホッケー選手。
students and 10.79 kg for female students. A strong correlation was observed between the actual weight and the ideal body weight, r = -0.852 (p < 0.01) and r = -0.829 (p < 0.01) for male and female rock wall students, respectively. The one-tailed t-test indicated that there are significant differences between the actual body weight and the ideal body weight for both male (t(133) = -9.1, p < 0.01) and female (t(97) = -14.49, p < 0.01). CONCLUSIONS: This finding demonstrates that even exercise science major students were heavier than their ideal body weight and female students are heavier than male students. Future researchers should focus on the mechanisms of college student weight gain to initiate the college level interventions to prevent unhealthy weight gain.

Purpose: The purpose of this study was to determine if there is a relationship between mechanical efficiency (ME) and body fat percentage (BF%) in rock climbers. The secondary aspect was to determine if there is a difference in ME between male and female rock climbers. Years of experience and frequency of climbing was analyzed to correct for variability.

Methods: 10 experienced rock climbers (7 males, 3 females) mean age of 25.5 ± 5.8 years volunteered to participate in the study. Each participant climbed up a 30 ft. indoor vertical rock climbing wall at a self-selected pace. VO2 was analyzed at rest and during the climb using a portable COSMED device. BF% was measured using bioelectrical impedance (BIA) and years of climbing and climbing frequency was self-reported. Participants were separated in two groups based on whether they fell above or below the median BF%. Males and female participants were also analyzed by group. Correlation and independent t-tests were ran using Microsoft Excel 2016.

Results: A negative correlation (r = -0.37) was found between ME and body fat percentage. No significant difference in ME was seen between groups (p = 0.086). No significant was found between ME and years or frequency of climbing. There was no significant difference in ME between males and females although the difference in BF% was significant (p = 0.00698).

Conclusions: Individuals with higher BF% tend to have lower ME but this difference is not significant. Previous studies have shown that training state has the CONCLUSIONS: No relationships reported.

Purpose: To examine changes in area-specific lean mass and body fat among female, division I college basketball players before and after pre-season training.

Methods: Body composition was measured before and after pre-season training using a dual-energy x-ray absorptiometry (DXA) scan. Total and area-specific (arms, trunk, legs, android, and gynoid) lean mass and body fat were analyzed. Preseason training lasted 1 month and consisted of 8 hours per week of a combination of weight training, high-intensity interval sprint training, and skill workouts. Paired-sample t-tests were used to examine change pre- and post-intervention. Pearson correlations were conducted to examine potential associations among variables.

Results: Female athletes (N = 11) completed this study. Total body mass significantly increased (p = 0.001) after pre-season training from 152.8 ± 15.6 lbs. to 155.6 ± 17.3 lbs. Total and area-specific fat did not significantly change after pre-season training. Lean mass significantly increased (p = 0.004) from 56.5 ± 11.9 lbs. to 59.0 ± 13.4 lbs. However, for area-specific lean mass, only lean mass in the trunk (p = 0.01) and in the android region (p = 0.013) significantly increased from 51.2 to 52.3 lbs. and from 6.8 to 6.9 lbs., respectively. Individual lean mass responses to training varied widely. Specifically, changes in total lean mass ranged from +0.2 to +7.9 lbs. Changes in total lean mass also varied widely between individuals, ranging from a loss of 2.2 lbs. to a gain of 3.5 lbs.

Conclusions: Because there were significant increases in total body mass and lean mass but not body fat, it is important to directly measure body composition to examine effects of training. In addition, these data demonstrate that athletes’ responses to training can vary widely thus highlighting the potential utility of individualized training programs.

Purpose: Basketball requires a multifaceted list of skills and athletic abilities in order to be successful. This varies even further depending on the player’s role within the team, such as pitchers and hitters. There is currently little data seen within the realm of basketball depicting the relationships between athlete body composition and their performance.

Methods: Athletes from a NCAA division I collegiate baseball team were recruited for this study (n = 28). The athletes were measured for height, weight, and body composition. Body composition was measured utilizing air displacement (Cosmed, USA). The players were broken into two categories, allocated by their role as a pitcher or catcher. They were also noted for their earned run average (ERA) and batters for their batting average (BA). Statistics were accessed from season performance data.

Results: The pitchers within this squad had a mean body weight of 186 ± 12.3 lbs. (Mean ± SD) and a mean BF% of 17.3 ± 4.6, and a mean ERA of 7.31 ± 4.9. The batters had a mean body weight of 194 ± 23.7 lbs., a mean BF% of 16.4 ± 8.2, and a mean BA of 0.270 ± 0.1. Correlations between body fat percentages and BA were non-significant, and so were correlations between body fat percentages and ERA.

Conclusions: From these results, no significant difference appeared to show how body fat percentage alone with total body weight would play a major role in determining the overall ability of the pitchers or the batters. This research shows that variety of body weight and body composition can be successful when playing baseball since no clear trend was identified. Further research should be conducted with baseball with comparisons at the professional level.
Body composition can be used as an indicator of health in the general population and athletes alike. Men’s college basketball players are encouraged to make healthy (body composition, aerobic and anaerobic markers, etc.) changes between Post-season and Pre-season, often overseen with a strength and conditioning staff intervention. The ability to measure percent fat, and track those changes during an athlete’s career, including the off-season, is a vital measurement for strength and conditioning coaches.

**PURPOSE:** To compare changes in body density (BD), body fat percentage (BF%) and fat-free mass (FFM) obtained from skinfolds (SKF) using calipers and BodPod values in men’s basketball players from Post-season to Pre-season during an off-season college-level strength and conditioning intervention.

**METHODS:** Certified Strength and Conditioning (CSCS) staff supervised the off-season (April to October) training intervention. SKF were performed by a single, experienced technician on 7 Division II men’s basketball players (21.0 ± 0.6 yrs, 1.91 ± 0.11 m, 94.9 ± 11.7 kg) following ACSM Guidelines. BD via SKF was calculated via Jackson-Pollock seven-site formula. For SKF, the BD to BF% conversion utilized either BF% = (4.866D) – 4.39 or BF% = (4.056D) – 4.50, based on age, sex, and ethnicity. BodPod was performed in accordance with manufacturer’s directions. A dependent, t-test was used to determine differences in BD, BF%, and FFM obtained from SKF and BodPod.

**RESULTS:** Changes in BD did not differ between the two groups (SKF 0.002 ± 0.002 kg/L, BodPod 0.004 ± 0.007 kg/L). The change in BF% did not differ significantly between skinfold and BodPod (SKF 1.2 ± 1.2%, BodPod 2.4 ± 2.2%). Changes in FFM did not differ significantly between the two assessment methods (SKF 1.1 ± 0.9 kg, BodPod 1.4 ± 0.6 kg). Body weight did not change significantly in the off-season (April 94.9 ± 11.7 kg, Oct 94.2 ± 14.5 kg).

**CONCLUSION:** The changes in body composition were accounted for equally by SKF and BodPod. While SKF and BodPod values may vary in the actual measurement of BD, BF%, and FFM, the absolute change in BD, BF%, and FFM from Post-season to Pre-season was assessed equally by both modes of testing. Regardless of the body composition assessment tool, its variation can be presumed accurate as long as the same mode of testing was used at both time points.

Aesthetic sport athletes may believe that they can achieve a higher score from judges if their body contours conform to an ideally perceived body image. These athletes may follow extreme diets and training loads based on body composition measurements. The purposes of this study were to describe anthropometric (height, weight, %fat) and aerobic fitness (VO2max) characteristics of collegiate ice hockey players and to understand the actual work being performed. Based on the observed variance in physiological response to similar TTL, future studies should examine relative loads based on body mass and composition.

**CONCLUSION:** Data from this study suggests that adjustments of TTL influences the interpretation of positional differences. Given that TTL is estimated based on changes in acceleration, the amount, and composition, of the athlete’s mass is critical to understanding the actual work being performed. Based on the observed variance in physiological response to similar TTL, future studies should examine relative loads based on body composition measurements.

**Table 1: Total Workload and Relative-Adjustments mean (SD)**

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<td>BF% (AU)</td>
<td>398.5 (769.0)</td>
<td>317.7 (332.2)</td>
<td>362.8 (482.1)</td>
<td>453.4 (512.7)</td>
<td>470.5 (521.8)</td>
<td>401.6 (407.4)</td>
<td>467.9 (395.5)</td>
<td>594.1 (565.7)</td>
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<td>BMI (AU)</td>
<td>20.8 (1.2)</td>
<td>21.0 (1.2)</td>
<td>21.7 (1.2)</td>
<td>25.2 (3.2)</td>
<td>593.0 (521.8)</td>
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<td>TULLR (AU)</td>
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*If values do not share a letter in each row they are significantly different from one another*
Anthropometric Evolution Of Professional Basketball Positions: A 20-year Retrospective View Of NBA Players
Christopher W. Bach, Jack W. Ransone, FACSM. University of Nebraska - Lincoln, Lincoln, NE.
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Coaches and management should constantly monitor long-term development of both current and prospective athletes in order to ensure proper fit into their system. Longitudinal analysis of player development and changing physical requirements of specific player positions can help to further evaluate player characteristics and allow for more effective comparison within their organization. PURPOSE: To identify whether the anthropometric characteristics of professional basketball positions have changed over the past 20 years (1997-2016).

METHODS: Anthropometric assessments (height, weight, body fat, wingspan, and wingspans:height ratio) were taken by staff from multiple NBA settings (combines, individual team tryouts, etc.) over the course of 20 NBA seasons (1997-2016) and pooled together in order to evaluate changes in anthropometric characteristics of each of the following positions: point guard (PG), shooting guard (SG), small forward (SF), power forward (PF), and center (C). All players included in the analysis were either current NBA players or prospective NBA players selectively chosen by the NBA and its respective organizations. Multilevel modelling was used to explore trends in anthropometric variation over time using linear regression analysis. RESULTS: With the exception of PG (2.626 cm), average height decreased for all positions over the course of 20 years (SG: -1.072 cm; SF: -0.335 cm; PF: -0.625 cm; C: -1.646 cm). Weight decreased for the PF position over time (-2.549 kg), while all other positions reported increases in weight (PG: 1.089 kg, SG: 1.301 kg; SF: 0.368 kg; C: 0.017 kg). Wingspan increased for all positions (PG: 2.306 cm; SG: 2.322 cm; SF: 2.581 cm; PF: 1.991 cm) with the exception of C (-0.655 cm). Improved body composition was observed over time with increased emphasis on fitness training did not appear to affect athletes’ relative aerobic fitness levels.

CONCLUSION: While average player heights and weights fluctuated over time, increased emphasis on fitness training did not appear to affect athletes’ relative aerobic fitness levels.
For prostate cancer survivors (PCS) on androgen deprivation therapy (ADT), the loss of skeletal muscle and increase in adiposity, together called sarcopenic obesity, is a common adverse effect. Sarcopenia is also associated with decreases in strength and mobility. No studies to date have concomitantly improved sarcopenic obesity and physical function in PCS on ADT. This study attempts to improve on existing interventions by employing periodization to optimize physiological and performance adaptations.

**PURPOSE:** This ongoing pilot trial investigates the effects of 12 weeks of periodized resistance training on sarcopenic obesity and physical function in PCS on ADT.

**METHODS:** Eighteen PCS (65.6 ± 8.3 yr) on current or previous ADT were recruited from the USC Norris Comprehensive Cancer Center and randomized to periodized resistance training (PRT; n=9) or an attention control stretching program (CS; n=9). Outcomes were assessed at baseline and after the 12-wk intervention.

Body composition was measured through dual-x-ray absorptiometry, estimated 1 RM strength was tested on leg press and seated row, and mobility was assessed through timed up and goular physical activity using a pedometer. For PCS on ADT. Patients with androgen deprivation therapy (ADT).

**RESULTS:**

- In PCS on ADT, a 12-wk periodized resistance training program improved skeletal muscle mass and strength. Future work is warranted to determine if adiposity can be attenuated and improvements sustained beyond the 12-wk intervention. Supported by an NSCAF doctoral grant.

**Exercise programs for cancer survivors improve endurance, strength, and quality of life. Survivors exercising during cancer treatment tend to show smaller improvements, or performance maintenance, compared to those who have completed treatment. Adapting exercise to the day-to-day status of survivors during and after treatment is recommended and may improve program efficacy.**

**RESULTS:**

- Participants undergoing treatment (N=58) did not significantly differ from those who had completed treatment (N=61) in age (57±12 years; Mean±SD), sex (71% women), or BMI (26.4±5.6 kg/m²). The number of exercise sessions completed was not different between groups (18±5 out of a possible 24, p=0.05). The main effect of Exercise was significant for all measures (p<0.01), with improvements seen from baseline to program completion (estimated VO2peak: 3.1±4 ml/min/kg, grip strength: 1±3 kg, PFS: -1±2, HDI: -3±6), while the main effect of Treatment and Treatment-Exercise interactions were not significant (p>0.05). These results were replicated when only breast cancer survivors were analyzed (N=48, 24 undergoing treatment).

**CONCLUSIONS:** Cardiorespiratory fitness, strength, fatigue, and depressive symptoms improved significantly with exercise, regardless of treatment status. These results suggest that cancer survivors currently undergoing treatment can experience benefits equal to those of survivors who have completed treatment through an adaptive exercise program.
accelerometer (daily steps: EG 2,247 ± 1. UCG -1,204.3 steps/day, p < .027; moderate to vigorous physical activity: EG 85.6 ± UCG -12 min/day, p = .008), muscle strength using hand grip dynamometer and ADV cancer was defined based on NCCN guidelines. Mean steps/day, minutes of resistance training/day and serum protein levels of IL-6, IL-1β, IFN-γ, IL-10, IL-8, and TNFR1 were measured at baseline and post-intervention.

RESULTS: Attrition was minimal, with no significant difference between ERL and ADV patients (5 total withdrawals). No adverse events (AEs) were attributed to exercise and there were no significant differences between ERL and ADV patients in number of AEs. Results also showed no significant difference in the number of steps walked or minutes of resistance exercise between ERL and ADV patients in the exercise arm. (Steps Walked: ERL 6,859 ± 899; ADV = 8,939 ± 1339; p < 0.05; Minutes of Resistance Training per Session ERL = 13 ± 4 (3 days/week); ADV = 19 ± 13 (3 days/week); p < 0.03). Changes in levels of IL-1β, IFN-γ, IL-10, IL-8, and TNFR1 were similar among ERL and ADV (all p > 0.05), however changes in IL-6 did significantly differ between groups (p < 0.05).

CONCLUSIONS: Findings suggest exercise is feasible and safe, and may have positive effects on chronic inflammation in ADV prostate cancer patients. R25 CA106216, DOD PC061518.

While there is extensive evidence connecting exercise to a reduction in psychological fatigue, the effect of exercise on objectively measured muscular fatigue has yet to be studied in cancer patients. Evaluating how exercise modulates physiological and psychological fatigue dimensions either similarly, or independently, could aid in our understanding of how exercise reduces cancer-related fatigue. PURPOSE: To evaluate the effect of exercise on self-reported psychological fatigue measures and objectively measured muscular fatigue in cancer survivors.

METHODS: A total of 21 cancer survivors (62 ± 14 years of age) were asked to complete both physiological and psychological measures of fatigue prior to, at midpoint, and following a 24-week exercise intervention. Participants completed the revised Piper Fatigue Scale (PFS), a subjective and psychological measure of fatigue. The PFS produces a total score (PFST) and four subscale scores: behavioral/severity (PFSB), affective (PFSA), sensory (PFSS), and cognitive/mood (PFSC). For the measurement of objective, physical fatigue, a handgrip fatigue index (HFI) was determined for each participant by repetitively squeezing a handgrip dynamometer 15 times with maximal force for each repetition. Participants also completed 15 maximal force knee extensions at a joint angular velocity of 60°/s and a quadriceps fatigue index (QFI) was computed. Following testing, participants completed 24 weeks of supervised exercise training.

RESULTS: Significant main effects were found for PFST and all four subscales (p < .05). Results indicate significant decreases in PFST (-30%; p < .001), PFSB (-32%; p = .015), PFSA (-33%; p = .001), PFSS (-32%; p = .001), and PFSC (-25%; p = .004) following 12 weeks of the exercise intervention. Testing following 24 weeks of the intervention resulted in significant decreases in PFST (-30%; p = .003), PFSA (-32%; p = .023), and PFSS (-31%; p = .016). CONCLUSION: Improvements in psychological fatigue did not mirror the changes in physiological fatigue, indicating that exercise may be a more powerful modulator of emotional fatigue as opposed to muscular fatigue. Clinicians may find utilizing subjective evaluations of cancer-related fatigue more assistive and informative when prescribing exercise interventions in the cancer population.
activities. PURPOSE: To assess the validity of predicted VO\textsubscript{2peak} from the 6MWT compared to the UNCCRI treadmill protocol in CS. METHODS: 128 CS completed a UNCCRI treadmill protocol and a 6MWT one week apart in randomized order to obtain \( \text{VO}_{2\text{peak}} \) (mL/kg/min). \( \text{VO}_{2\text{peak}} \) values from the UNCCRI treadmill protocol were compared against four common 6MWT \( \text{VO}_{2\text{peak}} \) prediction equations. RESULTS: All 4 6MWT prediction equations significantly (\( p<0.001 \)) underestimated \( \text{VO}_{2\text{peak}} \). Equations 1, 2, 3 and 4 yielded \( \text{VO}_{2\text{peak}} \) values of 18.9 ± 3.0, 14.2 ± 4.6, 8.3 ± 5.8, and 16.4 ± 2.3, respectively, while the UNCCRI treadmill yielded a much higher \( \text{VO}_{2\text{peak}} \) of 24.7 ± 7.4. A positive strong correlation occurred between the UNCCRI treadmill protocol and 6MWT prediction equation 1 (\( r=0.83 \)). A moderately strong correlation occurred between the UNCCRI treadmill protocol and 6MWT equation 3 (\( r=0.70 \)). Maximum heart rates were significantly higher (\( p<0.001 \)) during the UNCCRI treadmill protocol compared to the 6MWT (150 ± 21 bpm vs. 109 ± 21 bpm, respectively). CONCLUSION: These findings suggest that the 6MWT is not a valid test for predicting \( \text{VO}_{2\text{peak}} \) in CS due to its underestimation of all four equations. The UNCCRI treadmill protocol is much more accurate for assessing \( \text{VO}_{2\text{peak}} \) in CS in order to correctly prescribe an individualized exercise rehabilitation program.

Cancer is one of the major public health problems in Puerto Rico, especially breast cancer. There is evidence that suggests that engaging in physical activity (PA) during and after cancer treatment improved fatigue, body composition, cardiorespiratory fitness, psychological health, and quality of life. Thus, it is important to assess PA level in breast cancer survivors. PURPOSE: To assess: 1) the level of PA in a group of breast cancer survivors; and 2) the relationship between survivorship time and PA level. METHODS: 21 breast cancer survivors participated. PA was assessed: 1) using the International Physical Activity Questionnaire—Long Version (IPAQ-L); and 2) pedometer that the participants wore for a week (OMRON-HJ320). RESULTS: The participants average age was 54 years, height 62.2±2.5 inches, weight 148.1±22.6 pounds, estimated basal metabolic rate 1607±132.9 calories. The average survivurlife time was 4.24±3.9 years, distributed as follows: 0-11 months; n=4; 1-2 years; n=5; 3-5 years, n=4; and >5 years, n=8. The average scores of the IPAQ-L were: Work 393.9±927.4 METS-mins/week, Transportation 976±1068.1 METS-mins/week, Home Chores 2369.7±731.112 METS-mins/week, Leisure activities 752.6±1184.4 METS-mins/week, Sitting time Week 201.4±176.8 minutes, Sitting time Week End 157.1±151.6 minutes. The average daily steps was 4,870.8 ±2,612.5. No MAE occurred.

A Spearman Correlation analysis did not show significant relationship between survivurlife time and physical activity. The participants did not meet the recommendation of 10,000 steps/day. The results from the IPAQ-L showed that the participants engaged in moderate physical activity in some of the domains of the questionnaire such as transportation, home chores and recreational activities.

POURE: An increased risk of cardiovascular disease (CVD) and mortality is apparent in breast cancer survivors (BCS). Remnant cholesterol, defined as a product of partially catabolized chylomicrons and very-low-density lipoprotein, is a recently identified novel blood marker for increased CVD risk. In fact, the risk for CVD is two-fold greater in patients with high remnant cholesterol possibly due to higher density of remnant cholesterol per particle than LDL-C. The combination of aerobic and resistance exercise has been recommended to reduce cholesterol levels and risk of CVD in BCS, but it is unclear as to whether combined exercise improves remnant cholesterol level. This study sought to examine the effects of a 16-week progressive aerobic and resistance exercise intervention on remnant cholesterol in BCS.

METHODS: Thirty sedentary BCS diagnosed with Stage I-III breast cancer who completed cancer-related treatment within 6 months prior to enrollment were randomized to the Control (CON; n=15) or the Exercise (EX; n=15) group. The EX group underwent supervised aerobic and resistance exercise sessions 3 times a week for 16 weeks at a moderate-vigorous intensity. The CON group was asked to maintain their current level of activity. Remnant cholesterol was calculated as total cholesterol-HDL-LDL. Paired t-test and two-way repeated measures ANOVA were used to examine the effects of exercise training on remnant cholesterol.

RESULTS: Prior to the intervention, the EX and CON did not differ by age (52.7±7.9 yr), body mass index (33.9±6.4 kg/m²), waist circumference (99.8±4.2 cm), total cholesterol (196.4±37.5 mg/dL), LDL-C (101.9±31.2 mg/dL), HDL (42.7±5.7 mg/dL), and remnant cholesterol (51.7±28.8 mg/dL). Following the 16-week intervention, mean remnant cholesterol levels were significantly reduced (45.2±13.8 to 9.9±5.2 mg/dL; 78% mean decrease) in the EX group compared to CON group (\( p<0.05 \)). No mean change occurred in the CON group.

CONCLUSIONS: A 16-week supervised progressive aerobic and resistance exercise intervention is an effective approach to reduce remnant cholesterol in BCS. Participation in combined exercise during cancer survivorship should be considered to reduce the risk for CVD morbidity in BCS.
1008 Board #187
May 31 2:00 PM - 3:30 PM
The Effects of Exercise Program on Quality Of Life and Fatigue Level During Autologous Hematopoietic Stem Cell Transplantation
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PURPOSE: The purpose of the study was to investigate the effects of exercise program on quality of life (qol) and fatigue among the patients who undergo autologous hematopoietic stem cell transplantation (AH SCT). METHOD S: Twenty two patients with different diagnosis (9 multiple myeloma,10 lymphoma,3 other cancer type) participated in this study. The mean age was 47±13 years. All patients underwent AH SCT. The exercise program started before this procedure and continued until discharge day (mean 15 days). The program included breathing, range of motion, and resistive exercises focusing large muscle groups and brisk walking duration 5-10 minutes in corridor. The Borg Rating of Perceived Exertion was used to estimate the intensity of the program to light to moderate intensity exercise prescription was based on a rating of “somewhat hard” (10-13). The fatigue was evaluated with Fatigue Impact Scale. The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) was used to assess qol. RESULTS: The mean score of Fatigue Impact Scale was 32±32 points before the procedure and 23±17 points at discharge day, but there was not statistical significantly difference. Global health status, functional scale and symptom scale scores which are the sub-tests of the EORTC QLQ-C30 were 47±31, 65±18, 31±18 points before the treatment and 41±25, 69±18, 31±17 points at the discharge day. There were not statistical significantly differences between two time points in qol scores. CONCLUSIONS: As a result of our study exercise program was effective in reducing fatigue levels and raising qol in AH SCT patients, however the results were not statistically significant. It was thought because of the clinical status of the patients is not recover completely at the discharge day and two week is not enough to show the effects of the exercise program, we could not determine effectiveness of the exercise program statistically.

B-67 Free Communication/Poster - Carbohydrate Metabolism and Exercise
Wednesday, May 31, 2017: 1:00 PM - 6:00 PM
Room: Hall F

1009 Board #188
May 31 2:00 PM - 3:30 PM
Metabolic Differences Between A Bout Of Eccentric, Concentric And Traditional Resistance Exercise
Stephen M. Fischer, Jon Stavres, John McDaniel. Kent State University, Kent, OH.

Eccentric, concentric and traditional resistance exercises that incorporate both eccentric and concentric phases are often used to improve musculoskeletal fitness. Although there is evidence that indicates concentric contractions are metabolically more costly than eccentric contractions, the extent to which this translates to whole body metabolism during an entire resistance workout is less clear. PURPOSE: To determine the extent to which metabolic variables such as VO2(ml/kg/min), RER, and HR as well as blood glucose and lactate vary between resistance workouts comprised of only eccentric, concentric or traditional bouts. METHODS: N=12 men and women completed a traditional (TRAD), concentric (CONC), and eccentric (EC) full-body resistance workout at 65% of a pre-determined 1 repetition max with each condition matched for work. The traditional condition required 3 sets of 10 repetitions on each exercise (6 total). 3 sets of 20 repetitions were required for the eccentric and concentric conditions. During each condition, the subject was fitted to a metabolic cart and the aforementioned metabolic variables were recorded through indirect calorimetry and heart rate monitor. Blood glucose and blood lactate were taken using the ACCU-Chek glucose monitor and Lactate Pro (both devices different manufacturer, Roche Diagnosties Inc., USA) 5, 10, 15, 20, 25, 30 min Post, and 60 min Post). RESULTS: Both the TRAD (9.26 ± 1.83 ml/kg/min) and CONC (10.03 ± 1.63 ml/kg/min) conditions resulted in significantly (p < 0.001, and p < 0.001 respectively) greater VO2 values when compared to the ECC condition (6.67 ± 1.25 ml/kg/min). TRAD (1.03 ± .04) and CONC (1.00 ± .03) conditions also resulted in significantly (both p < 0.001) greater RER compared to the ECC (0.88 ± 0.09) for the breast cancer, in particular non-anthracine-containing protocols and more recent completion, are associated with lower VO2peak, but resting and exercise metabolic parameters are not. Better recent exercise behaviour and cardiovascular function are associated with higher VO2peak.

1010 Board #189
May 31 2:00 PM - 3:30 PM
The Influence of a Single Bout of High-Intensity Interval Exercise on Postprandial Lipemia and Glycemia
James Rowe, Stephen Decke r. Stephen F. Austin State University, Nacogdoches, TX.

PURPOSE: Examine the effects of high-intensity interval exercise (HIIE) on postprandial (PP) triglyceride (TG), glucose, and insulin concentrations following a mixed meal (MM). METHODS: Physically active men (n=10; age=22±2.1 yrs; body mass = 82.7±13.2 kg; body fat% = 13.3±3.1) completed two trials in random order: 1) Rest and 2) A single bout of high-intensity interval exercise (HIIE). Both trials were performed at 0800 hours. HIIE consisted of performing eight (15-second) maximal effort sprints on a stationary bicycle. Each sprint was followed with approximately 3 minutes of passive cycling with no resistance. Rest consisted of sitting quietly for 30 minutes. Approximately 30 minutes following the completion of each trial, a fasting (12hr) blood sample was collected followed by the consumption of the MM providing 7:5:1.2 kcal/kgBM (body mass) with a macronutrient composition of 35% carbohydrate (CHO), 5% protein, and 60% fat. The MM was blended with whole milk, ice cream, and whipping cream. Blood was collected again at 0.5, 1, 2, and 3 hours post-MM and analyzed for TG, insulin, and glucose concentration. Postprandial responses were quantified via the incremental area under the curve (AUC) using the trapezoidal method. Significant differences (p<0.05) between trials were determined using a one-way, repeated measures ANOVA and Bonferroni post hoc test. RESULTS: The duration of the HIIE was 24 minutes (not including a 5-minute warm up). HIIE expended 90.1±11.8 kcal. HIIE significantly reduced the glucose AUC, (Rest: 9.9±43.1mg·dl⁻¹·3h⁻¹; HIIE: -39.9±37.0mg·dl⁻¹·3h⁻¹; p=0.035) with no significant effect on TG AUC, (Rest: 57.2±52.8mg·dl⁻¹·3h⁻¹; HIIE: 78.7±46.0mg·dl⁻¹·3h⁻¹; p=0.20). C ONCLUSIONS: HIIE blunted the postprandial glucose and insulin response to high-fat mixed meal in young physically active men. The lack of change in the TG concentration might be explained by the lower energy expenditure of the HIIE due to its short duration. Future investigations should evaluate the applicability of HIIE within an at-risk populations (i.e. obesity, diabetes). This study was supported by the Stephen F. Austin State University Research Pilot Study Grant and the Texas ACSM Student Research Development Grant.

1011 Board #190
May 31 2:00 PM - 3:30 PM
Effects of Acclimatization to High Altitude on Exogenous Carbohydrate Oxidation During Steady-State Exercise
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In a previously reported study, oxidation of exogenous glucose consumed before and during exercise was the same in acute hypoxia as normoxia, despite higher endogenous carbohydrate (CHO) oxidation. However, how altitude acclimatization affects exogenous CHO oxidation is unknown. PURPOSE: To determine how altitude acclimatization affects exogenous CHO oxidation during exercise. METHODS: Male sea level (SL) residents (n = 17, mean ± SD, age, 23.4 ± 5.6 y; body mass, 81.9 ± 13.9 kg; 65% VO2peak). Univariate linear regressions were performed with adjustment for age and BMI. RESULTS: Group was a significant predictor (p<0.01), resulting in β coefficients of -7.5 ± 2.5 ml/kg.min for BC1 and BC2 relative to CON. In BC1 and BC2 combined, receipt of non-anthracine but not anthracine-containing chemotherapy protocols relative to CON was predictive of a lower VO2peak (β= -8.8, p<0.01). The amount of moderate intensity exercise self-reported in the past month (hours/week) (β=1.5, p=0.03), and surrogates of cardiovascular function, including O2 uptake at rest, VO2max, and peripheral lactate output, also predicted VO2peak significantly (p < 0.001). The RR and HR as well as blood glucose and lactate vary between resistance workouts comprised of only eccentric, concentric or traditional bouts. METHODS: N=12 men and women completed a traditional (TRAD), concentric (CONC), and eccentric (EC) full-body resistance workout at 65% of a pre-determined 1 repetition max with each condition matched for work. The traditional condition required 3 sets of 10 repetitions on each exercise (6 total). 3 sets of 20 repetitions were required for the eccentric and concentric conditions. During each condition, the subject was fitted to a metabolic cart and the aforementioned metabolic variables were recorded through indirect calorimetry and heart rate monitor. Blood glucose and blood lactate were taken using the ACCU-CHEK glucose monitor and Lactate Pro (both devices different manufacturer, Roche Diagnosties Inc., USA) 5, 10, 15, 20, 25, 30 min Post, and 60 min Post). RESULTS: Both the TRAD (9.26 ± 1.83 ml/kg/min) and CONC (10.03 ± 1.63 ml/kg/min) conditions resulted in significantly (p < 0.001, and p < 0.001 respectively) greater VO2 values when compared to the ECC condition (6.67 ± 1.25 ml/kg/min). TRAD (1.03 ± .04) and CONC (1.00 ± .03) conditions also resulted in significantly (both p < 0.001) greater RER compared to the ECC (0.88 ± 0.09) for the breast cancer, in particular non-anthracine-containing protocols and more recent completion, are associated with lower VO2peak, but resting and exercise metabolic parameters are not. Better recent exercise behaviour and cardiovascular function are associated with higher VO2peak.
kg; VO\textsubscript{2max} = 4.17 ± 0.65 L/min at SL and 2.77 ± 0.46 at HA) performed metabolically-matched 80-min exercise bouts (~1.7 L/min, ~55% of HA VO\textsubscript{2max}) in SL, within 6 h of arrival at ~3700 m (acute HA) and after 21-d altitude exposure at 4300 m. Immediately before and every 20 min during exercise, volunteers consumed either a CHO beverage (n = 9, 4.9 g fructose/L + 55 g glucose/L; 0.8% fructose/glucose ratio, CHO ingestion rate = 1.8 g/min) or a flavor-matched, non-nutritive placebo beverage (PLA, n = 8). Total, endogenous and exogenous CHO oxidation rates were determined during the last 40 min of exercise by indirect calorimetry and 13\textsuperscript{C}-C glucose. Exogenous CHO oxidation efficiency was the ratio (expressed as %) of exogenous CHO oxidation rate to the CHO ingestion rate. RESULTS: Exogenous CHO oxidation rate of volunteers consuming PLA was zero during all trials. For volunteers consuming CHO, exogenous CHO oxidation rate (g/min) during exercise was lower (P < 0.05) at acute HA (0.39 ± 0.22) than at SL (0.47 ± 0.16). After altitude acclimatization, oxidation rate (0.62 ± 0.18) was higher (P < 0.05) than with acute HA, and not different from SL. Efficiency of CHO oxidation (%) followed the same pattern (SL = 41% acute HA > 22% chronic HA = 34%), but efficiency did not reach SL values after acclimatization. For those consuming CHO, endogenous CHO oxidation rate at acute HA (1.35 ± 0.48) tended to be lower than that at SL (1.05 ± 0.53). After altitude acclimatization, endogenous CHO oxidation rate (0.67 ± 0.45) was lower (P < 0.05) than either SL or acute HA. CONCLUSION: Acute hypoxia impairs exogenous CHO oxidation, but adaptations with altitude acclimatization alleviate that impairment, and contribute to a reduction in endogenous CHO oxidation. Supported by U.S. Army Medical Research and Material Command; authors’ views not official U.S. Army or DoD policy.

Previous studies demonstrated that carbohydrate feeding 30-45 min before exercise results in transient hypoglycemia shortly after onset of exercise in some but not all subjects. However, it remains unclear whether the transient hypoglycemia after pre-exercise carbohydrate intake is more likely to occur under fed or fasted condition. PURPOSE: The purpose of this study was thus to directly compare the effects of fasting vs. feeding on plasma glucose kinetics following pre-exercise carbohydrate ingestion and to elucidate the contributing factors of the transient hypoglycemia in each condition. METHODS: Sixteen subjects performed 60-min cycle ergometer exercises at 75%VO\textsubscript{2max} in overnight fasted and fed (3 h after breakfast) states in random order. In both conditions, they consumed 500 ml of a beverage containing 150 g of glucose 30 min before the start of exercise. Plasma glucose and serum insulin levels are determined before and during the exercise. RESULTS: In the fasted state, plasma glucose levels dropped transiently below 4.0 mmol/l in 5 subjects, who showed substantially higher serum insulin level at the onset of exercise, while plasma glucose levels remained above this level in the other subjects. On the other hand, 7 subjects developed transient hypoglycemia in the fed state and their VO\textsubscript{2max} (3285 ± 286.6 L/min) was significantly higher than that in the other subjects who did not demonstrate a decline in plasma glucose (2915 ± 282.7 L/min). CONCLUSIONS: Subjects with higher aerobic fitness and enhanced insulin secretory capacity seem to be more prone to transient hypoglycemia following pre-exercise carbohydrate ingestion under fed and fasted conditions, respectively.

The oral glucose tolerance test (OGTT) is a commonly used method for the diagnosis of insulin resistance. Currently the only level of control prior to an OGTT is an 8-10 hour fast. Physical activity is known to influence glucose uptake kinetics. Thus, our purpose was to determine if varying the level of physical activity, the day prior to an OGTT, influenced the blood glucose and insulin responses to an OGTT. We hypothesized that higher levels of physical activity the day prior to an OGTT would result in attenuated blood glucose and insulin responses to an OGTT. METHODS: Ten healthy adults (6 m/4 f, age = 21 ± 5.03 yr; BMI= 24.15 kg/m\textsuperscript{2}) participated in three OGTT trials the morning after performing 50%, 100%, or 150% of their habitual physical activity in randomized order. Habitual physical activity as average steps/day (12,318±1310 steps/day) was determined using 7-day pedometry. Pedometers were worn for 24 hrs prior to each OGTT trial and used to confirm steps/day for the 50%, 100%, and 150% conditions. Trials were separated by at least one week and subjects were asked to follow a similar diet the day prior to each OGTT trial. For each OGTT trial, plasma glucose and insulin were measured after an overnight fast and at 30 min intervals for two hours following ingestion of the glucose beverage (1-gm glucose kg\textsuperscript{-1} body mass). Area under the curve (AUC) for glucose and insulin for each OGTT was calculated using the trapezoidal method. Between trial differences for these variables were analyzed using a general linear model with repeated measures. Significance was set to p< 0.05. RESULTS: Subjects successfully achieved the desired percentage of habitual steps prior to each trial: 52±1%, 98±2%, and 146±3%. Fasting plasma glucose (50%: 95±2 mg dL\textsuperscript{-1}; 100%: 91±2 mg dL\textsuperscript{-1}; 150%: 91±2 mg dL\textsuperscript{-1}), plasma glucose-AUC (50%: 12,932±769 mg min dL\textsuperscript{-1}; 100%: 13,236±1,008 mg min dL\textsuperscript{-1}; 150%: 13,016±471 mg min dL\textsuperscript{-1}), and insulin-AUC (50%: 5.56±1810 pIU min m\textsuperscript{-1}; 100%: 5,181±1,839 pIU min m\textsuperscript{-1}; 150%: 4735±1776 pIU min m\textsuperscript{-1}) did not differ between trials. CONCLUSIONS: Our data suggests that varying the physical activity level (from 50 to 150% of habitual activity) the day prior to an oral glucose tolerance test does not influence the blood glucose or insulin responses to this commonly utilized diagnostic test.

A fructose-rich, mixed-meal macronutrient meal rapidly increases carbohydrate oxidation and decreases fat oxidation during the post-prandial period. An acute substantial bout of weight-lifting exercise has been shown to elevate fat oxidation for many hours following cessation of exercise. Purpose: To determine whether or not a single resistance exercise bout performed approximately 15 hours before consumption of a high-fructose, mixed-meal could attenuate the meal-induced shift from fat oxidation to CHO oxidation. METHODS: Seven apparently healthy men who were recreational weight lifters (Mean ± SEM; age = 27 ± 2 yrs, BMI=24.15 kg/m\textsuperscript{2}) completed three separate two-day conditions in a random order: (1) EX-COMP: a full-body superset weightlifting workout (12 different exercises x 4 sets x 10 reps) with the provision of additional kilocalories to compensate for the energy expended during exercise on day 1, followed by the consumption of a high-fructose, mixed-macronutrient test meal (kcal = 600 + 8 kcal; 0.75 fructose/kg body weight) the next morning (day 2) and the determination VO\textsubscript{2}, VCO\textsubscript{2}, and respiratory exchange ratio (RER) for determination of fat and carbohydrate oxidation during a six-hour post-prandial period; (2) EX-NoCOMP: same as EX-COMP condition but without energy.
intake compensation for the exercise on day 1; and (3) CON: no exercise control. Results: Post-prandial RER was significantly lower in the EX-NoCOMP (0.78±0.01) condition compared to CON (0.809±0.01) (p<0.001). CHO oxidation was significantly higher in the EX-NoCOMP (0.094±0.009 g/min) compared to CON (0.084±0.009 g/min) (p=0.001). CHO oxidation was significantly lower in the EX-NoCOMP (0.09±0.011 g/min) compared to CON (0.108±0.011 g/min) (p=0.037). For the EX-COMP condition, postprandial RER (0.78±0.09), fat oxidation (0.095±0.008 g/min) and CHO oxidation (0.09±0.011 g/min) were almost identical to EX-NoCOMP, but these values compared to CON did not quite reach statistical significance. Conclusion: A single acute bout of high intensity resistance exercise completed 15 hours prior to a high-fructose, mixed-macronutrient meal results in greater post-prandial fat oxidation than does lack of exercise followed by the same meal.

1016 Board #195 May 31 2:00 PM - 3:30 PM Differential in Aerobic Capacity Among Collegiate Distance Runners Consuming a Low Carbohydrate Diet

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Although current sports nutrition recommendations advocate for a high carbohydrate (CHO) intake among endurance athletes, recent research has suggested that training with low CHO availability may augment adaptations to aerobic training. When adopted during the competitive season, when training intensity and the demand for glycogen replenishment is high, low CHO diets may be detrimental to training adaptations by preventing adequate recovery between concurrent high-intensity endurance sessions. Purpose: To observe the dietary habits of collegiate distance runners and to investigate the effects of habitual CHO intake on aerobic performance (PostVO2max) during a competitive season. Methods: During an 8-week trial period, 12 collegiate track athletes (males, n=8; females, n=4) recorded their self-selected dietary intake via 24-hr recall. Analysis of CHO intake was conducted by a registered dietitian using NutriCalc software. Pre (PreVO2max) and post season aerobic capacity (PostVO2max) were measured using a standard Bruce treadmill protocol. Dietary intake was assessed pre-season (Pre) and seasonally (Post) using a validated 7-day dietary record. Analysis of dietary intake via 24-hr recall. Results: Results compared to the CTL. DEXA fat mass did not alter between groups (p=0.20). No between-group differences in delta scores for 1RM Squat (p=0.15), 1RM overhead press (p=0.37), 400 m sprint times (p=0.09) and VO2max (p=0.57).

CONCLUSIONS: Ketogenic dieting improves body composition without negatively impacting muscle mass and/or aerobic, anaerobic or strength performance in recreational cross-trained subjects.

1018 Board #197 May 31 2:00 PM - 3:30 PM 7,12-dimethylbenz(a)-anthracene (DMBA) & High Fat High Sugar Diet Decrease Physical Activity in Female Mice

Jorge Z. Granados1, Ayland C. Letsinger1, Heather L. Vellers1, Victor A. Garcia1, Jeremiah D. Velasco1, Nicholas R. Walker1, Madison Spier2, Isabel Lambertz2, Robin Fuchs-Yong1, J. Timothy Lightfoot, FACSM1. 1Texas A&M University, College Station, TX. 2Texas A&M University Health Science Center, College Station, TX. (Sponsor: J. Timothy Lightfoot, FACSM)

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BACKGROUND: Regular exercise has been shown to diminish the risk of certain cancers. DMBA, (7, 12-dimethylbenz(a)-anthracene) is a complete carcinogen that is used to induce tumors in mice. It has yet to be established whether DMBA has an effect on voluntary wheel running (WR) in mice, and whether these effects may be exacerbated via consumption of a high fat high sugar (HFHS) diet.

PURPOSE: Determine if DMBA treatment altered voluntary WR in female SENCAR mice, and whether a HFHS diet exacerbated treatment effects on voluntary WR.

METHODS: Offspring of SENCAR breeder pairs were weaned at 3 weeks (wks) of age onto either an ad lib fed HFHS (20% protein, 45% fat/24% sucrose >10% fructose water) or a diet restricted (DR) (12% kcal restriction, 20% protein, 10% fat, 57% cornstarch) diet. Animals were double-housed and randomly assigned to either a DMBA (n=40) treatment with HFHS (n=20) and DR (n=20) diets; or a control (CNTL) (n=18) treatment with HFHS (n=10) and DR (n=8) diets. At 4 wks of age, two plastic running wheels were mounted inside standard rat cages, and connected to a computer to record WR duration and distance. At 7-9 wks of age, mice were gavaged with DMBA dissolved in corn oil (20 µg/mouse/day) or with corn oil vehicle only (CNTL) for 5 days/wk for 6 weeks. A two-way ANOVA was employed to determine the effect of DMBA on activity with factors of treatment and diet for wks 9-20.

RESULTS: Compared to CNTL, DMBA significantly decreased distance (7.41±0.45 vs. 11.08±0.68 km/day; p=0.0002), and duration (175.19±8.24 vs. 261.23±12.36 min; p=0.0001). CHO oxidation was significantly lower in the EX-NoCOMP (0.09±0.012 g/min) compared to CON (0.809±0.01 g/min) (p<0.01). Fat oxidation was significantly lower across the 12 weeks of ketogenic dietary while cross-training in cross-trained individuals.

METHODS: Volunteers were divided into a control group (CTL; n=9) and a ketogenic group (KD; n=9). Pre and post-testing involved body composition assessment via dual x-ray absorptiometry (DEXA), vastus lateralis (VL) thickness using ultrasound, resting energy expenditure (REE), phosphotyolysis to determine serum health biomarkers, an aerobic capacity evaluation, one repetition maximum (1RM) testing, and 400 m sprint time assessments. All subjects were instructed to follow a cross-training routine for 12 weeks. The KD group was given dietary guidelines to follow for 12 weeks, while the CTL group continued their normal diet. Blood ketone bodies were measured weekly to ensure nutritional ketosis was reached by the KD but not CTL.

RESULTS: KD blood ketone levels were significantly higher than the CTL at each week following intervention (p<0.05) except week 9 (p=0.09). DEXA fat mass declined in the KD (-3.47±1.06 kg) compared to CTL (-0.06±0.45 kg) (p<0.01).
The efficacy of compression garment (CG) application in exercise performance and recovery remains controversial, as limited information exists on the physiological mechanisms of CG action, specifically its effect on vessel morphological and systemic hemodynamic responses.

**PURPOSE:** To investigate the effect of thigh-length compression tights (CG) on leg vessel morphological and systemic hemodynamic responses in healthy participants.

**METHODS:** Leg vessel caliber in thirty-two participants (16 males and 16 females) was measured, using 0.25T MRI, at four leg positions: calf, knee, lower-thigh and mid-thigh level. Contracted pressure (EP) from three CGs (Low: G1; Medium: G2; High: G3) were measured at the four leg positions on the right leg during standing. Systemic hemodynamic variables including cardiac output (CO), stroke volume (SV), heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and systemic vascular resistance (SVR) were monitored using non-invasive Doppler ultrasound, in a supine and upright position.

**RESULTS:** The average EP from G1, G2 and G3 were 2.2 ± 1.3, 1.2 ± 0.7, and 2.7 ± 8.1 mmHg, respectively. The EP at the calf was higher than in the other leg positions (P <0.001). CO, SV, HR, DBP and SVR were lower in the upright than in supine position (P <0.001). There were no differences in CO, SV, and HR at calf level (P >0.05). SV was highest in G3 compared to G1 and G2 (P <0.05). Deep vein and great saphenous vein (GSV) calibers were larger at all leg positions in the upright than in supine position (P <0.001). Furthermore, G3 elicited smaller superficial vessels caliber than G1 and G2, but the largest deep vessels caliber at calf level (P <0.001) only. The G3 also elicited the smallest GSV caliber followed by G2 and G1 respectively, at knee level (P <0.001). The G1 elicited the largest but similar GSV caliber, among G2 and G3, at lower-thigh and mid-thigh level (P >0.05).

**CONCLUSIONS:** Leg vessel morphological and systemic hemodynamic responses to compression garment application were greatest in compression garments with a higher exerted pressure and were most pronounced at the calf level.

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**Table 1. Time in each HR zone**

<table>
<thead>
<tr>
<th>HR Zone</th>
<th>Absolute (min/sec)</th>
<th>Relative (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>2.05 - 19.07</td>
<td>15.3</td>
</tr>
<tr>
<td>Moderate</td>
<td>3.08 - 37.34</td>
<td>23.6</td>
</tr>
<tr>
<td>Heavy</td>
<td>8.00 - 35.00</td>
<td>50.2</td>
</tr>
<tr>
<td>Very heavy</td>
<td>0.00 - 13.08</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**CONCLUSIONS:** We observed high cardiovascular strain. SP classes were performed usually on heavy or very heavy intensity (50.3%), which deserves safety considerations. The cool down period was effective in reestablishing HR to its initial pattern since HRin and HR2C were similar.

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**Table 2. Comparison between the CGs**

- **Light:** G3 > G2 > G1 (P <0.05).
- **Moderate:** G3 > G2 > G1 (P <0.05).
- **Heavy:** G3 > G2 > G1 (P <0.05).
- **Very heavy:** G3 > G2 > G1 (P <0.05).

**CONCLUSIONS:** The efficacy of compression garment (CG) application in exercise performance and recovery remains controversial, as limited information exists on the physiological mechanisms of CG action, specifically its effect on vessel morphological and systemic hemodynamic responses. The results of this study showed that thigh-length compression tights (CG) on leg vessel morphological and systemic hemodynamic responses in healthy participants. Further studies are needed to investigate the long-term effects of CG application on cardiovascular health.

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**Table 3. CV variables during TS-SWE**

- **CO:** 7.5 ± 2.0 vs 5.2 ± 1.6 (P <0.05, main effect bout).
- **DBP:** 94.6 ± 2.8 vs 86.7 ± 2.5 (P <0.05, main effect bout).
- **SV:** 110.5 ± 2.8 vs 103.2 ± 2.4 (P <0.05, main effect bout).
- **SVR:** 770.3 ± 22.4 vs 852.3 ± 19.7 (P <0.05, main effect bout).
- **HR:** 170 ± 7 vs 181 ± 7 (P <0.05, main effect bout).
- **Lactate:** 2.5 ± 0.2 vs 2.0 ± 0.3 (P <0.05, main effect bout).

**CONCLUSIONS:** The results of this study showed that TS-SWE elicited cardiometabolic and psychophysical responses for both males and females. The results also showed that TS-SWE was a more effective workout for both males and females, as it elicited greater cardiovascular and metabolic responses compared to traditional tabata-style workouts. The results suggest that TS-SWE may be a promising exercise modality for improving cardiovascular health and fitness.
BMI <25 kg/m². Exercise groups trained 3×wk during the weight loss period and were encouraged to exercise 2×wk for one yr following the initial weight loss. Body weight, % body fat, abdominal fat, resting blood pressure (BP), insulin sensitivity, total cholesterol (TC), high-density lipoprotein (HDL) cholesterol, and triglycerides (TG) were measured. Two-way repeated measures ANOVA was used to analyze dependent variables at baseline, post-intervention, 1 yr post intervention, and 3 yrs post intervention. Post hoc paired sample t-tests were used to examine changes from baseline to 3 yrs post intervention. Significance was accepted at p≤0.05. RESULTS: Mean weight loss for all subjects was 11.92 kg. Significant group × time interactions were found for weight loss, % body fat, systolic BP, TG, HDL, and TC:HDL ratio, with no significant interactions for any other variable. Three yrs after weight loss, body weight (74.9±4.5 to 71.1±6.9 kg), body fat (39.7±9.3 to 39.5±6.2 %), systolic BP (120.0±13.0 to 111.4±8.0 mmHg), HDL (42.0±13.4 to 51.1±11.9 mg/dL), and TC:HDL ratio (4.2±1.6 to 3.3±1.2 mg/dL) were significantly improved from baseline. CPOmax was measured in AT. TG (87.5±32.2 to 74.3±27.0 mg/dL), HDL (41.2±8.9 to 49.4±13.4 mg/dL), and TC:HDL ratio (3.9±0.8 to 3.5±0.8 mg/dL) significantly improved from baseline in RT. C had no differences. CONCLUSIONS: Three yrs after initial weight loss, several CVD risk factors were more favorable in women who exercise trained compared to non-exercisers. Further longitudinal research examining the effects of exercise on the maintenance of improved CVD risk factors is warranted.

Increasing evidence indicates adherence to exercise throughout life is concurrent with improved health. World masters games (WGM) have more participants than any other international sporting competition and is under investigated, particularly with regard to indices of cardiovascular disease (CVD) risk. PURPOSE: This investigation selected CVD risk factors in WGM participants. METHODS: This was a cross-sectional, observational study which utilized a web-based questionnaire to survey cardiovascular risk factors of WGM participants. The survey consisted of three sections: basic demographics, medical history and physiological parameters which included body mass index (BMI), waist circumference (WC), resting blood pressure (BP) and lipids (total cholesterol (TC), high density lipoprotein (HDL) and low density lipoprotein (LDL)). RESULTS: A total of 1,435 participants (567 female & 868 male), aged 27-91 years participated in the study. Key findings included significant differences between genders where females were significantly lower in BMI (5.3%, p<0.001), WC (10.6%, p<0.01), resting SBP (5.5%, p<0.01), resting DBP (8.4%, p<0.01), significantly higher in HDLs (15.2%, p<0.001) and significantly lower in both the TC:HDL ratio (12.6%, p<0.001) and LDL:HDL ratio (19.0%, p<0.001). Significant differences (p<0.001) were also identified when comparing WGM lipid results to the Australian general population (AGP). WGM demonstrated healthier TC (4.47±1.11 mmol/L), HDLs (1.75±0.79 mmol/L) and LDLs (2.92±0.96 mmol/L) when compared to AGP participants (TC: 5.07 mmol/L, HDL: 1.34 mmol/L, LDL: 3.31 mmol/L). CONCLUSIONS: WGM participants demonstrated improved values in a number of CVD risk factors when compared to the general population with female WGM participants presenting healthier CVD risk factors when compared to males. Hence, within the parameters of this study, masters athletes exhibit evidence of superior health when compared to the general population within Australia.

High intensity, endurance exercise increases maximal cardiac power output (CPO) in young, healthy adults. It is less clear whether such gains are realized among sedentary adults who begin such a program during middle-age. PURPOSE: To determine whether a progressive, high-intensity endurance exercise program will increase CPO in healthy, middle-aged adults. METHODS: We studied 51 middle-aged adults (22 males; 52.7 ± 5.5yrs). 23 (10 males) were randomized to a non-aerobic exercise group (Control). The remaining 28 (12 males) were assigned to an endurance training group (Exercise), all of whom completed a 24 month exercise training program. This progressive regimen was gradually expanded from 3×30min moderate intensity sess./wk to 1×230 min and 1×60 min moderate intensity (55-70% of VO2 max) sess./wk + 2× high intensity aerobic interval (~95%peakHR) sess./wk; and 1× low intensity recovery sess./wk. After nine months, the exercise participants plateaued their training to one high intensity interval sess./wk. Endurance training sessions were monitored via both Polar heart rate monitoring and manual data logs. VO2max was measured using the Douglas Bag method via an incremental treadmill protocol. Cardiac output (Qc) was measured by a non-invasive acetylenre breathfathening method. Blood pressure was measured with SunTech Tango+ electrophysymomanometry. Arterial pressure (MAP) was calculated by MAP=(SBP-DBP)/3+DBP, where DBP is diastolic blood pressure and SBP the systolic blood pressure. CPO was calculated as follows: CPO=W×MAP/Qc, where W is the conversion factor (2.22 L·min⁻¹) to watts. RESULTS: Endurance training increased VO2max 19.5% (28.8 to 34.4 mL/kg/min) and maximal Qc 14.2% (14.5 to 16.4 mL/min) among the Exercising group, while MAP remained constant (114 to 114 mmHg), resulting in a 18.1% increase in CPOmax (3.68 to 4.28 W, p<0.01). VO2max (29.5±27.0 mL/kg/min, Qcmax (14.8 to 15.2 L·min⁻¹), MAP (114 to 131 mmHg) and CPOmax (3.80 to 3.84 W) were all unchanged in the control group. CONCLUSION: Healthy, previously sedentary middle-aged adults who complete a progressive endurance exercise training program realize a significant increase in CPO during maximal exercise.
Purpose: To determine the relationships between maximal oxygen uptake (VO2 max), 1500-meter run time (1500-R), and field endurance tests and aerobic fitness level in Korean young men.

Methods: Ninety-nine young men (19.5 ± 0.9 yr; 175.6 ± 5.6 cm; 67.8 ± 8.8 kg; 22.0 ± 2.4 kg/m2; 16.3 ± 4.9 % fat) participated in three randomly ordered testings. In one occasion, they ran on a treadmill with an incremental workload to determine their VO2 max. In other occasions, they ran on a track for 1500-R time trial and performed field endurance tests.

Results: The average VO2 max was 42.8 ± 1.6, 47.2 ± 1.5, 51.9 ± 1.3, and 59.4 ± 3.1 ml/kg/min in A, G, VG, and E, respectively. The best record of 1500-R was 429 ± 44, 405 ± 35, 390 ± 31, and 359 ± 30 sec, respectively. The field endurance tests were highly correlated with each other, but not with VO2 max in all fitness levels.

Conclusion: Records of both 1500-R and MS-R appear to increase progressively by fitness level, but the outcome of field endurance tests only differentiate the maximal aerobic capacity between the average and the excellent aerobic capacity groups. Two field tests were highly correlated with each other, but not with VO2 max in all fitness levels.
RESULTS: The isotonic and isometric fatigue protocols showed similar results, significant differences were found between the SD1 values of BF and AF (p < 0.01). Also, the difference in the SD1 values of BF and AF (p < 0.01) and HR were significantly different between the fatigue protocols (p < 0.05). Anaerobic and aerobic fatigue protocols depicted a significant difference between the SD1 mean values of BF and AF, and BD and R (p < 0.05).

CONCLUSIONS: Findings demonstrated that the effects of fatigue on the HRV could be assessed by the non-linear Pointcaré SD1 feature. Additionally, it seems that the behavior of HRV depends on the fatigue protocol used. Therefore, the non-linear HRV analysis could be a promising method to assess different types of fatigue present in sports.

Sprint interval training protocols have been shown to significantly improve aerobic capacity and select markers of health in both healthy individuals and in diseased patients, and in some cases, have been shown to be superior to traditional aerobic training. PURPOSE: The purpose of the current study was to investigate the metabolic and cardiovascular effect of 3 sprint interval training protocols using an elliptical cross trainer. METHODS: Twelve healthy (Male = 6, Female = 6; Weight = 70.52 ± 13.47 kg; Height = 1.71 ± 0.11 m) college-aged participants (ages 19 - 28 years) volunteered. After giving written consent, each participant performed an individualized maximal aerobic capacity test on a cycle ergometer for the determination of VO2 max (40.53 ± 5.94 ml/kg/min). Each participant then performed 3 different high-intensity interval protocols in a randomized fashion: ten 30/30 sec, 30/60 sec or 30/90 sec work-to-rest ratio bouts for a total of 10, 15 or 20 min. Oxygen consumption and heart rate were continuously collected and monitored during each training protocol. A one way repeated measures ANOVA (SNPS v22; p < 0.05) with post-hoc Bonferroni adjustment was used to examine differences between protocols. EXPERIMENTS: VO2 (mean of 15 sec averages of 30.1 ± 4.6, 29.5 ± 4.0, 28.2 ± 2.6 ml/kg/min), RER (1.0 ± 0.06, 0.95 ± 0.09, 0.98 ± 0.05) and average peak heart rate (177 ± 13, 176 ± 11, 171 ± 16) illustrated no significant statistical difference across the 30/30 sec, 30/60 sec and 30/90 sec protocols, respectively (p > 0.05). Total caloric expenditure was, however, significantly higher in the 30/60 (240.44 ± 34.30 kcal) and 30/90 (277.22 ± 57.78 kcal) protocols as compared to the 30/30 (182.64 ± 25.35 kcal) protocol (p = 13.97, p < 0.01). CONCLUSION: Under such work-to-rest ratios, varying rest duration between 30 and 90 seconds had limited impact on metabolic responses during repeated 30-sec high-intensity exercise bouts. These data suggest that a 30/60 sec or 30/90 sec approach may be advocated as a preferred strategy for producing higher caloric expenditure in a college-aged population. Future studies examining the minimum duration and frequency of HIIT bouts are warranted if HIIT is to be used as an alternative to current physical activity recommendations.

Purpose: The benefits of resistance training (RT) on cardiac function are well acknowledged but usually no effects of moderate load of RT on resting cardiac vagal modulation have been found in healthy subjects. Therefore, the aim of this study was to investigate the effects of moderate load of RT on nocturnal heart rate variability (HRV).

Methods: Young, recreationally trained, healthy men (n = 15, age 24 ± 2 yrs, height 176 ± 6 cm, body mass 81 ± 5 kg, body fat 18 ± 5 %) performed a two-week intensive RT period (ITP) with five hypertrrophic whole-body exercise sessions per week and a two-week taper period (TAP) with two exercise sessions per week. Lower-body strength tests were performed before and after ITP and after TAP. Nocturnal RR-intervals were measured during three consecutive nights before and at the end of both training periods. A mean of all three nights were used in the analysis.

Results: Subjects were retrospectively divided to responders (Resp) and non-responders (Nonresp) according to the responses in strength tests in ITP. 1RM leg press (90%) in Resp improved 16.9% (P < 0.01) after ITP when compared to baseline (296 ± 59 kg) with no further change after TAP. 1RM in Nonresp did not change after ITP (-5.3%, ns) or TAP when compared to the baseline (361 ± 90 kg). The root mean square of successive differences (RMSSD) in Resp decreased 14.1% (p = 0.05) after ITP when compared to baseline (52 ± 21 ms) with no further change after TAP. RMSSD in Nonresp did not change significantly either after ITP or TAP when compared to baseline (43 ± 7 ms).

Conclusion: An intensive two-week RT period improved performance and decreased nocturnal HRV in Resp but not in Nonresp. As previously reported in intensive endurance training, also the present increased RT load could be detected in resting HRV. It is plausible that a very high RT load is needed to achieve changes in HRV, as earlier studies with moderate load have not found changes in HRV in contrast to the usual findings in endurance training, improved strength performance was not related to improved cardiac vagal modulation in the present study. It may be speculated that changes in the neuromuscular system may explain the improved performance despite the disturbed autonomic modulation, i.e. increased stress, detected as decreased resting HRV.

Purpose: The purpose of this study was to examine cardiovascular disease risk factors among university employees, and to compare these results with standardized norms based on age and gender from the National Health and Nutrition Examination Survey (NHANES) data and the American College of Sports Medicine (ACSM) recommendations. METHODS: Health and wellness assessments were performed on N = 47 public university employees aged 26 to 65 years. The assessments included body compositional analysis, blood lipid and glucose panels, dietary recalls, and blood pressure and then compared with the results of current NHANES data and ACSM recommendations using a multiple independent t-tests (p < 0.05). Results:Descriptive statistics indicated that the sample’s means were above recommended values for male age, body fat percentage, low density lipoprotein cholesterol, and a diet too high in sodium and too low in calcium, fiber, and vitamin D. Results indicated that the sample also had significantly higher diastolic blood pressure (p = .0008) and High Density Lipoprotein (p = .0005) and significantly lower blood glucose (p = .00001) than the national average. CONCLUSION: These results

Sprint Interval Training Protocols on an Elliptical Cross Trainer

Purpose: The effect of temperature and experience on acute musculoskeletal and cardiovascular responses to a series of Hatha yoga postures performed at room temperature and in a hot environment by novice (N) and experienced (E) yoga subjects were recruited. Subjects completed 2- 60 minute yoga sessions within two weeks separated by 1 week. Each session was divided into a standing series and a floor series. Pre and post musculoskeletal (low back flexi bility, shoulder mobility) and cardiovascular (heart rate, blood pressure) analyses could be a promising method to assess different types of fatigues present in sports.

CONCLUSIONS: The findings of this study demonstrate acute effects of yoga are greater when yoga is performed in a hot environment as compared to room temperature. Furthermore, these benefits are not dependent upon the experience level with yoga.

The Effect of Temperature and Experience on Acute Musculoskeletal and Cardiovascular Responses During Yoga.

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No relationships reported.
indicate that the university employees were at significant risk for some cardiovascular disease risk factors and dietary choices, which indicates that they would benefit from health promotion programs that target those specific risk factors.

B-69 Free Communication/Poster - Cellular/ Molecular
Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall F

Blood clots cause the majority of adverse cardiovascular events, such as heart attack and stroke, and fibrinolysis, the capacity to dissolve blood clots, is recognized as an independent predictor of cardiovascular morbidity and mortality. Aerobic exercise training is theorized to enhance fibrinolytic potential, but studies have yielded inconclusive results. High intensity interval training (HIIT) is a novel exercise training strategy that has been shown to improve several components of health in various populations, but the effect of a HIIT regimen on fibrinolytic potential is unknown.

PURPOSE: The purpose of this study was to examine potential fibrinolytic adaptations in healthy men following four and eight weeks of HIIT.

METHODS: Healthy, sedentary participants in a HIIT program three days/week for eight weeks. Training bouts were modeled after the traditional Wingate test, consisting of repeated, 30-second bouts of maximal intensity cycling separated by 4.5-minute rest intervals. Training began with three bouts per day and an additional bout/day was added to the regimen every two weeks, progressing up to six bouts per day in the final two weeks. Plasma concentrations of total tissue plasminogen activator (tPA) and plasminogen activator inhibitor-1 (PAI-1) were assessed at baseline, after four weeks (4w), and after eight weeks (8w). Statistical comparisons across the three time points were done using repeated measures ANOVA. Significance was set to p<0.05.

RESULTS: 21 men (age: 25±5 yrs, BMI: 26.7±6 kg/m²) completed the study. No significant changes were observed for tPA during training (baseline: 9.8±3.1, 4w: 9.7±2.9, 8w: 8.9±2.7 ng/ml, p>0.05). Likewise, PAI-1 did not change with training (baseline: 17.7±6.8, 4w: 18.8±6.1, 8w: 18.0±6.8 ng/ml, p>0.05). Conclusion: Though it has been suggested that HIIT may be superior to traditional, aerobic training for the purpose of enhancing one’s cardiovascular health, results of the present study do not indicate HIIT influences fibrinolytic potential in healthy young men. Future research should explore the benefits of HIIT in populations that may be characterized by diminished fibrinolytic potential.

1034 Board #213 May 31 3:30 PM - 5:00 PM
High-Intensity Interval Training Does Not Promote Fibrinolytic Adaptations in Healthy Men
Paul R. Nagelkirk, James Sackett, Dan Farrell. Ball State University, Muncie, IN.
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Angiogenesis is induced by endurance exercise training and improves cardiovascular function. Exercise training also influences blood-borne factors, such as circulating microRNAs (ci-miRNAs), which can affect endothelial cell functions.

PURPOSE: To determine differences in the angiogenic response of human umbilical vein endothelial cells (HUVECs) to serum of young individuals with no risk factors for cardiovascular disease (CVD), who differ only by habitual aerobic exercise level. In addition, ci-miRNAs were compared as potential candidates responsible for differences in HUVEC responses.

METHODS: Serum was isolated from fasted, peripheral blood of endurance trained (n=10) and inactive (n=10) men and women aged 20-39. Exercise habits and VO2max were determined, and groups were matched by age, BMI, and blood chemistry. Serum was applied to HUVECs in a radius well migration assay, fluorometric proliferation assay, and tube angiogenesis assay at concentrations of 10%, 20%, and 7.5%, respectively. Ci-miRNA was isolated from serum and reverse transcribed. Using real-time quantitative PCR (qPCR), a subset of three samples per group were first compared for an array of 84 CVD-related miRNAs. Targets showing at least a 4-fold difference, as well as a priori chosen miRNAs, were validated using qPCR and compared for all subjects. RESULTS: HUVECs exposed to serum from trained subjects migrated 8% more in the first 4 hours (p=0.05) and 13% more after 8 hours (p=0.058) compared to those exposed to serum from inactive subjects. Following 12 and 24 hours, migration was 20% (p=0.055) and 21% (p=0.08) greater respectively, with serum of trained subjects. Following 36 hours, serum of trained individuals resulted in greater proliferation of HUVECs compared to serum of inactive individuals (P=0.04). There were no differences in tube length or complexity between the groups. PCR array data indicated nine ci-miRNAs with ≥4-fold difference. One ci-miRNA was more highly expressed in the trained sample, while eight were higher in the inactive sample. Of the ci-miRNAs chosen for validation, none exhibited different expression between groups.

CONCLUSION: Serum of endurance trained individuals induces faster migration and greater proliferation compared to serum of inactive men and women, even in a young, healthy population.

1037 Board #216 May 31 3:30 PM - 5:00 PM
Both Exercise And Calorie Restriction Increase Mitochondrial Membrane Potential Of Myocardium In Aged SD Rats
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(Co-authors: None)

Exercise and calorie restriction have function to relieve the increase of oxidative damage in the myocardium. Mitochondria are the main cellular location to produce the reactive oxygen species (ROS). It is still unknown whether exercise or calorie restriction reduce the production of reactive oxygen in myocardial mitochondria.

PURPOSE: The purpose of this study is to explore the positive effects from exercise and calorie restriction on the membrane potential of myocardial mitochondria, the ROS level in mitochondria, the relief of myocardial oxidative damage and the improvement of the myocardial function.

Method: Twenty-one months-old male SD rats were divided into four groups: control aged group (CA), calorie aged with calorie restriction group (CRA, 60% calorie of CA group), aged exercise group (EA, running on treadmill with the speed of 15m/
min, 5% at 64% VO_2max for 60 min/day, 5 days a week for 12 weeks) and exercise combined with calorie restriction group (CREA). In addition, 20 of 9 months-old SD male rats were set as the young control group (YC). In order to assess the effect of sex on exercise-induced metabolism, hyperglycemia, and cardiovascular disease risk in adults with pre-diabetes, the experiment was performed using automatic linear exchange/cold injection mass spectrometry. Metabolomics enables us to identify interacting networks of cellular metabolites activated by exercise. Our exploratory data revealed that exercise induced a shift in the metabolic profile indicating global cellular metabolic/energetic stress and sex dimorphism not previously observed. Supported by NIH Grant P01HD048721 and PECR System Biology Fund

Matrix metalloproteinase (MMP)-2, an enzyme that is integral in regulating vascular structure and vascular homeostasis, is constitutively expressed in endothelial cells (EC). MMP-2 has been associated with arterial stiffness and hypertension in African Americans (AA). While exercise improves biomarkers of vascular dysfunction in AA with pre-hypertension and hypertension, the mechanism(s) related to exercise-induced improvements in EC health and MMP-2 activity is unknown. PURPOSE: To determine the extent of EC dysfunction of MMP-2 activity, and its responsiveness to a physiological exercise mimetic, laminar shear stress (LSS), in human umbilical vein endothelial cells (HUVEC) isolated from Caucasian (CA) and AA donors. METHODS: The present work evaluated expression and activity of MMP-2 and related peptides in 4 AA and 4 CA HUVEC with gender split under basal conditions with LSS (20 dynes/cm²). RESULTS: In AA HUVEC, we report that basal MMP-2 gene expression was significantly higher (2.13-fold increase, \textit{t}_{14}=0.01) while relative MMP-2 activity was significantly lower (CA: 0.7758 ± 0.1944; AA: 0.1324 ± 0.1135, \textit{t}_{14}=0.02), compared to CA HUVEC. Importantly, LSS did not regulate MMP-2 expression and activity (\textit{F}_{1,14}=3.92; \textit{p}=0.03) by increasing the relative expression in AA HUVEC. CONCLUSIONS: These \textit{in vitro} data highlight an inherent endothelial dysfunction in AA HUVEC and imply that MMP-2 dysfunction likely contributes to early vascular dysfunction and subsequent hypertension risk in AA. Further, exercise (e.g., LSS) normalized this dysfunction, in \textit{vivo}, and highlights the potential mechanism by which exercise improves endothelial and vascular function in AA, \textit{in vivo}.
In a study to evaluate self-detection of cold injury in the field, thermal sensitivity was measured in 58 subjects using three rewarming techniques. The techniques included donning a sleeping bag and rewarmed for 60 min by either donning a sleeping bag (n = 13), or completing a set exercise program (n = 12). Core (Tcore) and mean skin temperature values have been analyzed to support a rewarming technique that is most effective. The three rewarming techniques were not physiologically or perceptually different after the 60-min rewarming period. Within the limitations of this study, participants, environment, and equipment, any of these three techniques would appear to be suitable for rewarming in the field.

**Background:** We have developed a prototype of a thermochromic latex coated glove designed for the early prevention of frostbite in cold environments. The thermochromic latex coated glove was calibrated to detect contact temperature and change color accordingly at temperatures of 8°C and below. The purpose of this study was to evaluate the reliability and efficacy of the glove as a tool for the early detection of frostbite and adverse outcomes secondary to cold environments. The study involved two short-term tasks: IV insertion following a cold water immersion, and to identify the most beneficial technique for rewarming warfighters in the field.

**Methods:** Thirty-eight military personnel participated in the MCMWTC hypothermia lab (mean ± SD age: 26 ± 5 yrs; height: 1.8 ± 0.09 m; weight: 83.2 ± 10.9 kg). Students immersed their bodies in cold water (0.3°C) and remained at neck-high level for 10 min. Post-immersion, students changed into a dry set of clothing and rewarmed for 60 min by either donning a sleeping bag (n = 13), donning a sleeping bag while drinking 1 liter of warm liquids (SBWL, n = 13), or completing a set exercise program (n = 12). Core (Tb), mean skin temperature (Tsk), thermal sensation (TS, –4 very cold to +4 very hot), and shivering sensation (SS, 0 no shivering to 3 vigorous shivering) were recorded.

**Results:** The glove demonstrated a consistent sensory difference after the 60-min rewarming period. Within the limitations of this study, participants, environment, and equipment, any of these three techniques would appear to be suitable for rewarming in the field.
82 ± 17, pre 70 ± 12, post 168 ± 45, and rewarm 73 ± 14. IV insertion success rates were similar among baseline (76%), pre (71%), and rewarm (84%) stations; however, post-rewarm, IV success trended downward (47%). CONCLUSION: Results were consistent with the expected loss of manual dexterity following cold water immersion. When given one hour of rewarming, performance returned to baseline. It is essential that military personnel are educated and trained on the effects of accidental cold exposure, the impact it may have on their performance as medical providers, and appropriate extremity rewarming techniques.

Recreational swimming in cold, open-water without a wetsuit continues to grow in popularity, attracting individuals with a wide variety of athletic backgrounds. Different than a polar bear plunge, cold-water swimming involves consistent swimming throughout the winter months. PURPOSE: To determine if cold-water swimmers have substantial differences in body mass index (BMI) vs. North American and International masters pool swimmers and International masters athletes from different sports. It appears that cold-water swimming abilities cannot be attributed to unique body composition; other factors such as acclimatization, heat production while swimming, and limiting time in cold water may be keys to preventing hypothermia and one might assume that higher BMI (kg/m^2) could protect swimmers from hypothermia during cold-water swimming.

Comparisons To U.S. And Regional Populations

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(No relationships reported)

The BMI of cold-water swimmers is similar to North American and International masters pool swimmers (mean age: 54 years; 76 men, 27 women), who swam consistently throughout the winter months in the San Francisco Bay, without wetsuits (median water temperature: 11°C [52°F]). Swimmers’ values were compared to data from North American Masters pool swimmers (mean age: 54 years; 76 men, 27 women) from different sports (age range: 42-57 years), International masters pool swimmers (mean age: 54 years), and International masters athletes from different sports (age range: 42-57 years). RESULTS: The average BMI values for cold-water swimmers in our study (25.9 kg/m^2) were not significantly different that the average BMI of North American Masters pool swimmers (25.1 kg/m^2; p=0.17) or International masters pool swimmers (25.3 kg/m^2; p=0.16). On average, San Francisco cold-water swimmers had slightly higher BMI (kg/m^2) (p<0.05) than ultramarathon runners (23.0), track and field athletes (24.1), soccer players (24.5), and volleyball players (24.9), and lower (p<0.05) BMI (kg/m^2) than softball players (27.3). CONCLUSIONS: The BMI of cold-water swimmers is similar to North American and International Masters pool swimmers; and in general, is slightly higher than masters athletes from different sports. It appears that cold-water swimming abilities cannot be attributed to unique body composition; other factors such as acclimatization, heat production while swimming, and limiting time in cold water may be keys to preventing hypothermia.

Higher body mass contributes to protection from hypothermia and one might assume that swimmers who swim consistently in cold water have more adipose tissue than average individuals. PURPOSE: To determine if cold-water swimmers have substantial differences in body mass index (BMI) which might have a protective effect against heat loss during swims in cold water without wetsuits. METHODS: BMI was measured in a group of 103 open-water swimmers (mean age: 54 years; 76 men, 27 women), who swam consistently throughout the winter months; in the San Francisco Bay, without wetsuits (median water temperature: 11°C [52°F]). Swimmers’ values were compared to U.S., California, and San Francisco values, which were obtained through the National Health and Nutrition Examination Survey (NHANES) and the California Health Information Survey (CHIS). RESULTS: Average BMI values for cold-water swimmers in our study (25.9 kg/m^2; range = 19 - 39) were significantly lower than U.S. (28.7 kg/m^2) and California state BMI (27.3 kg/m^2) averages (P<0.001 for both comparisons). When comparing unadjusted averages, cold-water swimmers had a slightly higher BMI (25.9 kg/m^2) than San Franciscans (25.1 kg/m^2) (P=0.2); however, after appropriately matching for age and sex, the adjusted average BMI of cold-water swimmers (25.9 kg/m^2) was lower than the adjusted San Francisco average BMI (26.6 kg/m^2) (P=0.047). 10.7% of the cold-water swimmers were classified as obese (BMI > 30 kg/m^2) vs. 35.7%, 24.8% and 11.3% in the U.S., California, and San Francisco populations, respectively; and 53.4% as overweight/obese (BMI > 25 kg/m^2) vs. 68.8% in the U.S., 61.8% in California, and San Francisco populations, respectively. CONCLUSIONS: The BMI of cold-water swimmers is lower or similar to the BMI of U.S., California, and San Francisco general populations. Protection from hypothermia in cold-water swimmers is likely related to other factors such as acclimatization, heat production while swimming, and limiting time in cold water.

The degree to which temperature affects endurance performance and exercise metabolism in trained athletes is not fully known. PURPOSE: In the present study, we investigated the impact of cold and neutral environmental temperatures on subcutaneous abdominal adipose tissue (SCAAT) lipolysis and whole-body substrate oxidation during submaximal steady-state cycling in trained cyclists. Additionally, we assessed subsequent session time (TT) performance. METHODS: Ten trained male cyclists (age = 22.80 ± 2.76 yr; height = 178.58 ± 6.55 cm; mass = 74.82 ± 10.95 kg; body fat = 18.35 ± 3.37%; peak oxygen consumption (VO2peak) = 60.60 ± 4.67 ml kg^-1 min^-1; power output in Watts (W) at lactate threshold (LT) = 234.00 ± 35.00 W) participated in a randomized, crossover designed study that consisted of baseline testing to determine LT and VO2peak, two familiarization trials, and two experimental trials. The experimental trials consisted of 25 min of cycling at 70% LT, followed immediately by 25 min at 90% LT in either cold (3.06 ± 1.78°C; 41.63 ± 5.60°F) and thermoneutral (19.43 ± 0.98°C; 67.00 ± 2.33°F) conditions. Following a 15-min break, subjects then completed a 20km thermoneutral ride. SCAAT interstitial glycerol concentrations were measured in situ throughout the trial via the microdialysis technique. Two-way (group × time) repeated measures analysis of variance tests and student t-tests (where appropriate) were used to identify differences between measured variables with significance set at p ≤ 0.05. RESULTS: A significant time effect was observed for HR (p < 0.001), core temperature (p < 0.001), interstitial glycerol (p < 0.001), blood lactate (p < 0.028), carbohydrate oxidation (p < 0.0001), fat oxidation (p < 0.0001), and VO2 (p < 0.0001). No significant differences were observed between conditions for any measured variable including TT performance (cold, 189.92 ± 24.64 W; neutral, 187.52 ± 27.4 W; p = 0.858). CONCLUSION: SCAAT lipolysis increases during steady state exercise. However, metabolism and performance are not impacted by ambient conditions. This study was funded by the National Strength and Conditioning Association and Florida State University.

Obesity can result from a lack of energy expenditure or excessive energy intake. The appetite-regulating hormones leptin, adiponectin, and ghrelin may help decrease energy intake by affecting appetite. Exercise and exposure to extreme temperatures can independently affect these hormones. However, less is known on how exercise and temperature interact to affect appetite. PURPOSE: To determine the effect of exercise in different temperatures on the circulating concentrations of leptin, adiponectin, ghrelin, and adiponectin/grelin ratio (A/G). METHODS: Eleven recreationally-trained male participants completed three separate 1 h cycling bouts at 60% Wmax in different environmental temperatures (Hot 33 °C, Cold 7 °C, Room Temperature 20 °C), followed by 3 h recovery at room temperature. Blood was drawn pre-exercise, post-exercise, and 3 h post-exercise from the antecubital vein. Hemocrit and hemoglobin were measured to account for changes in plasma volume. Results: Leptin concentrations were lower at post and 3 h post-exercise compared to pre-exercise, with and without correcting for plasma volume shifts, regardless of...
temperature (p = 0.05). Adiponectin was higher post-exercise than pre-exercise (p = 0.021) and then returned to pre-exercise levels by 3 h post-exercise (p = 0.084) without correction for plasma volume shifts. However, plasma concentration were not different at any time point when plasma volume shifts were accounted for (p = 0.05). Ghrelin and acylated ghrelin concentrations were not affected at post and 3 h post-exercise compared to pre-exercise, with and without correcting for plasma volume shifts, regardless of temperature (p = 0.05). No differences in leptin, adiponectin, ghrelin or acylated ghrelin were found between trials (p > 0.05). CONCLUSION: Temperature does not effect the circulating concentrations of leptin, adiponectin, or ghrelin during an acute bout of endurance exercise.

Supported by the University of Nebraska-Omaha University Committee on Research and Creative Activity and the National Institute for General Medical Science (5P2GM103427).

An effective method to treat and prevent a multitude of low-grade inflammatory diseases is to reduce inflammation through regular exercise. The anti-inflammatory effect of exercise is predominantly influenced by the production of Interleukin-6 (IL-6) from the active skeletal musculature. The pro-inflammatory effects of IL-6 production derived from adipose tissue is reduced during exercise. However, the effect of IL-6 when exercising in different environmental conditions is currently unknown.

PURPOSE: Determine the effects of exercise in hot, cold, and room temperature environments on plasma IL-6. METHODS: Eleven recreationally trained males (age = 25 ± 4 y, height = 178 ± 5 cm, weight = 79.4 ± 13.5 kg, 14.7 ± 3.6 % body fat, VO2 peak = 4.29 ± 0.86 L·min−1, Wmax = 277 ± 41 W) performed a 1 h cycling bout in hot (HI), cold (CI), and room temperature (RT) environments (33 °C, 7 °C, 20 °C, respectively) followed by 3 h of supine recovery at room temperature. Expired gases were measured every 15 minutes during exercise and once every hour during recovery. Heart rate (HR) was continuously measured throughout trial. Blood samples were obtained from the antecubital vein pre-exercise, immediately post-exercise, and 3 h post-exercise. Blood samples were analyzed for plasma concentrations of IL-6 using a commercial ELISA kit. RESULTS: Plasma IL-6 concentrations were higher immediately post-exercise (14.8 ± 1.6 pg·ml−1, p = 0.008) and 3 h post-exercise (14.8 ± 0.9 pg·ml−1, p = 0.018) compared to pre-exercise (11.4 ± 2.4 pg·ml−1) regardless of trial. There were no differences in plasma IL-6 concentrations (p = 0.207) between HI, CI, and RT. VO2 and HR were higher and RER was lower in the hot compared to other conditions (p < 0.05). CONCLUSION: These data indicate that temperature does not affect the acute exercise response of IL-6, despite differences in metabolic state. Funded by UCRC Grant and NIGMS 5P20GM103427.

Fibronectin type III domain-containing 5 (FNDC5) is a skeletal muscle membrane-bound precursor to the myokine irisin. Irisin is involved in stimulating adipose tissue to become more metabolically active in order to produce heat. It is unknown how exercising in different temperature environments affects the response of FNDC5 gene expression and blood irisin concentration.

PURPOSE: To determine the effects of exercise in a hot (33 °C), cold (7 °C), and room temperature (RT, 20 °C) environment on the skeletal muscle gene expression of FNDC5 and the blood concentrations of irisin. METHODS: Twelve recreationally trained males completed three separate, 1 h cycling bouts at 60% of Wmax in a hot, cold, and RT environment followed by three hours of recovery at room temperature. Blood samples were taken from the antecubital vein and muscle biopsies were taken from the vastus lateralis pre-, post-, and 3 h post-exercise. RESULTS: Plasma concentrations of irisin did not change from pre (9.23 ± 2.68 pg·ml−1) to post-exercise (9.6 ± 0.2 pg·ml−1, p = 0.068) and decreased from post-exercise to 3 h post-exercise (8.9 ± 0.5 pg·ml−1, p = 0.047), regardless of temperature. However, when plasma volume shifts were considered, no differences were found in irisin at pre-, post-, or 3 h post-exercise (p = 0.086). There were no differences between trials for irisin plasma concentrations (p = 0.984). No differences in FNDC5 mRNA were observed between the hot, cold, and RT trials or between pre-, post-, and 3 h post-exercise time points (p > 0.05). CONCLUSION: These data indicate that the temperature in which exercise takes place does not influence FNDC5 skeletal muscle transcription or circulating irisin in a human model.

Funding provided by the University of Nebraska at Omaha Graduate Research and Creative Activity Grant and the National Institute for General Medical Science (NIGMS, 5P20GM103427).

Future space missions beyond low earth orbit will require deconditioned astronauts to perform occupationally relevant tasks while confined within a spacesuit of significant mass. The prediction of task performance times under these conditions will be critical for crew safety, autonomous operations, and mission success.

PURPOSE: Determine if the addition of task specific upper body strength testing to current National Aeronautics and Space Administration’s (NASA) standard lower body testing would enhance the prediction of time-to-completion in a task based simulation of an astronaut related occupational tasks. METHODS: Eight, healthy participants of astronaut age (34.9 ± 3.7 years) completed six occupationally relevant tasks while wearing a 42-kg weighted suit designed to emulate the weight distribution of the NDX-2 planetary spacesuit. The six tasks performed were: hatch opening, hand drilling, construction wrenching, half-mile walk, collecting weighted samples, and dragging an unresponsive crewmember to safety. The time-to-complete each task was recorded and summed to obtain a total time for the test battery. In addition to the standard knee extensor-flexor strength and endurance tests employed at the NASA Johnson Space Center for crew health testing, task specific isometric strength was collected prior to each task for hatch opening, hand drilling, and wrenching. Linear regression was used to predict the dependent variable of total time-to-completion with two independent variable models 1): NASA upper leg standard measures alone and 2): NASA upper leg standard measures + task specific isometric testing for wrenching and hand drilling. RESULTS: Total time-to-completion of the test battery ranged from 20.2-44.5 minutes. NASA upper leg standard measures alone accounted for 61.5% of the variability in time-to-completion (p = 0.15). The addition of hand drilling and wrenching testing to NASA upper leg standard measures accounted for 99.6% of the variability in time-to-completion (p = 0.047). CONCLUSION: Adding occupational specific strength tests (hand drilling and wrenching) to NASA’s standard lower extremity tests successfully predicted time-to-completion of a performance test battery within a weighted suit in 1G. Supported by ND NASA ESPC0.
Carbon dioxide (CO₂) retention occurs during water immersion. The peripheral chemoreceptors contribute to ventilatory control and the rise in ventilation (V̇E) during hypercapnia. However, it is unclear if peripheral chemoreceptor control of V̇E is altered during water immersion.

**METHODS:** We tested the hypothesis that peripheral chemosensitivity (PCS) is blunted during head out water immersion (HOWI). We hypothesized a decrease in neuromuscular performance will occur between HOWI and DRY (baseline: 0.07 ± 0.04 vs. 0.06 ± 0.03; 10 min: 0.06 ± 0.03 vs. 0.06 ± 0.03; 60 min: 0.08 ± 0.04 vs. 0.06 ± 0.03; and 120 min: 0.08 ± 0.02 vs. 0.07 ± 0.02). Peripheral chemosensitivity (PCS) was higher during HOWI vs. DRY at 10 (45.9 ± 2.2 vs. 43.9 ± 2.3 mmHg, p = 0.04). PCS was not different between HOWI and DRY (condition main effect: p = 0.20). PCSO₂ was not different between HOWI and DRY (condition main effect: p = 0.05). No significant mean difference was observed pre to post exercise protocol for IGF-I (Sponsor: Raoul F. Reiser II, FACSM). A low intensity BFR modality may be beneficial to employ to astronauts while in spaceflight or post spaceflight to help promote muscular tissue growth.**

**RESULTS:** V̇E was not different between HOWI and DRY (condition main effect: p = 0.12). PETCO₂ was higher during HOWI vs. DRY at 10 (45.9 ± 2.2 vs. 43.9 ± 1.7 mmHg, p = 0.01), 60 (46.0 ± 2.6 vs. 43.7 ± 1.8 mmHg, p = 0.005), and 120 min (45.9 ± 2.5 vs. 44.0 ± 2.4 mmHg, p = 0.01). PCS was not different between HOWI and DRY (baseline: 0.41 ± 0.3 vs. 0.69 ± 0.44, 10 min: 0.40 ± 0.3 vs. 0.71 ± 0.57, 60 min: 0.33 ± 0.17 vs. 0.57 ± 0.59, and 120 min: 0.57 ± 0.29 vs. 0.73 ± 0.70 L/ min×mmHg; respectively, condition main effect: p = 0.29). PCS was not different between HOWI AND DRY (baseline: 0.07 ± 0.04 vs. 0.06 ± 0.03; 10 min: 0.06 ± 0.03 vs. 0.06 ± 0.01; 60 min: 0.08 ± 0.04 vs. 0.06 ± 0.03; and 120 min: 0.08 ± 0.02 vs. 0.07 ± 0.02 L/min×mmHg; respectively, condition main effect: p = 0.63).

**CONCLUSION:** These data indicate that PCS₆ and PCS₀₂ are not blunted during thermoneutral HOWI vs. DRY. Therefore, CO₂ retention during HOWI does not appear to be due to alterations in PCS.
first. Three acceptable trials were collected in each condition. Suspension chair trials needed to be within 0.5 sec (on average) of the matched rigid chair trials. A tri-axial accelerometer was mounted to the rear of the wheelchair seatpan with signals sampled at 2kHz. Peak resultant accelerations were analyzed from surface 1, root mean square (RMS) resultant accelerations were analyzed from surfaces 2-4. RESULTS: Peak accelerations when the rear wheel traversed the door threshold and expansion seems of section 1 were significantly reduced from 47-79% in the suspended chair (p = 0.011). Peak accelerations at the front wheel were also reduced with rear suspension, but not to the same extent (p not consistently < 0.050). RMS accelerations were significantly reduced by 50% over surfaces 2 & 3 (p = 0.013 and p = 0.050, respectively), and 56% over surface 4 (p = 0.002) with rear suspension. CONCLUSION: Aftermarket rear suspension significantly reduces vibration and impact transmission of rough surface conditions to the users of manual tilt-in-space wheelchairs. The reduced accelerations most likely improve both comfort and health outcomes of users (e.g., low-back pain, neck pain, muscle ache and fatigue).
and determine if a simple cardiovascular indicator (i.e., resting heart rate, HR) can be used to predict total time-to-completion during an astronaut related test array. METHODS: Eight, healthy participants were a 49-kg weight suit and completed six occupationally relevant tasks. Tasks included hatch opening (HO), hand drilling (HD), construction wrenching (CW), a half-mile walk (HM), sample collection (SC), and dragging a crewmember to safety (DC). Total completion time for the array was calculated by summing each tasks’ completion time. The metabolic demands of each task were recorded using a metabolic cart. One-way ANOVA was used to identify differences in VO2, VCO2, RER, VE, and RR between HO, HD, CW, and HM, as well as differences in post HR between all tasks. Tukey Post-Hoc tests were used to distinguish specific task differences. Linear regression was used, with an enter method, to predict total time-to-completion from resting HR values. RESULTS: The peak VO2 of HD was significantly lower than both CW (p = .002) and HM (p = .001). The peak VCO2 of HD was significantly lower than both CW (p = .025) and HM (p = .004). Mean RER for HO was significantly higher than both CW (p = .024) and HM (p = .022). No significant differences were observed for VE (p = .082) and RR (p = .941), and post HR (p = .087). Resting HR was a significant predictor (p = .027) of total time-to-completion. CONCLUSIONS: Occupational tasks in a weighted suit showed a variety of metabolic characteristics and alterations in fuel sources. The resting HR of subjects significantly predicted the total time-to-completion of an astronaut relevant test array performed within a weighted suit in 1G. Resting HR can be easily monitored in novel environments and may be useful to determine an astronauts’ physical activity readiness for space relevant tasks.

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1062 Board #241
May 31 3:30 PM - 5:00 PM
Heart Rate and Blood Pressure Regulation before and after 60 Days of Bed Rest
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(Purpose: To test the hypothesis that the regulation of heart rate (HR) and mean blood pressure (mBP) in response to moderate work rate (WR) changes differs before and after 60 days of bed rest. METHODS: Twenty-two male subjects (mean ± SD): 29 ± 6 years, 181 ± 6 cm, 77 ± 7 kg) were tested using a moderate WR protocol with pseudo-random binary sequences (PRBS) between 30W and 80W on an upright cycle ergometer before and after 60 days of 6’ head down tilt (HDT) bedrest. Eleven of the twenty-two subjects participated in a near-daily reactive jump training intervention during bed rest, using a horizontal sledge jump system (TRAIN). The other 11 subjects served as a control group (CTRL). The test was performed 9 days before the HDT period (BDC-9) and 2 days after (R+2) reambulation. HR and mBP were measured beat-to-beat during the cycle ergometer test and kinetics responses were calculated via time-series analysis. Higher maxima of the cross correlation function between HR and the respective parameter (CCF) indicate faster kinetics responses. ANOVA with the factors ‘group’ and ‘point in time’ combined with LSD post hoc tests were applied to calculate differences in kinetics between sessions as well as absolute values of HR and mBP during the PRBS. RESULTS: Significant effects were identified for point in time for the parameters CCF(ΔHR) (BDC-9: 0.328 ± 0.093, R+2: 0.273 ± 0.062; P = 0.020) and CCF(mBP) (BDC-9: r = 0.237 ± 0.060, R+2: r = 0.338 ± 0.134; P = 0.009), but not for point in time x group or group. Absolute values of HR during the PRBS (point in time: P = 0.001, point in time x group: P = 0.002, group: n.s.) were significantly higher at R+2 compared with BDC-9 (101 ± 12 min vs. 115 ± 12 min; P < 0.001), but only in the CTRL group. For the absolute mBP values a significant effect for ‘point in time’ (100 ± 12 mmHg, P = 0.029) but not for point in time x group or group was found. CONCLUSION: 60 days of bed rest affected the kinetics response to moderate WR changes during upright cycling, but differently for HR and mBP kinetics. As indicated by the higher absolute HR values during the PRBS, sympathetic nervous system activity might have increased after bed rest. This could have slowed HR kinetics and, as a result of the baroreceptor reflex, accelerated mBP kinetics.

1063 Board #242
May 31 3:30 PM - 5:00 PM
Baroreceptor Unloading Attenuates the Increase in Blood Pressure Elicited by Prolonged Face Cooling
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(Sponsor: Robert Kraemer, FACSM)
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Having a family history of diabetes (FH+) increases type 2 diabetes (T2D) risk, and is associated with metabolic flexibility, and mitochondrial dysfunction. However, the mechanisms underlying these differences remain elusive. Exercise has a protective effect on metabolic health and mitochondrial function, and we have shown resistance training (RT) can improve fasting glucose in FH+ and those with no family history of T2D (FH-) similarly. However, little is known about the impact of RT on lipid metabolism in the FH+ population.

Purpose: To evaluate markers of lipid metabolism in FH+ and FH- before and after 6 weeks of RT. Methods: 10 healthy FH- and 13 healthy FH+ age and gender matched men and women participated in 6 weeks of RT for triglycerides (TG), non-esterified fatty acids (NEFA) and fasting glucose. Results: Though, FH+ displayed lower circulating NEFA (276 ± 37 vs 412 ± 44 mM for FH+/FH-), NEFA and fasting glucose declined (32.1 and 6.8% respectively) overall with RT. NEFA and fasting glucose declined (32.1 and 6.8% respectively) overall with RT. CONCLUSIONS: RT. NEFA and fasting glucose declined (32.1 and 6.8% respectively) overall with RT.
Conclusions: Healthy young FH+ display a fasting AC profile different than FH-, suggesting alterations in fat metabolism that may contribute to increased T2D risk. These disparities in AC profiles were diminished after RT, suggesting that 6 weeks of short RT bouts normalizes lipid metabolism in FH+. RT may protect against impaired lipid metabolism in FH+, thereby protecting against T2D.

1065 Board #244 May 31 3:30 PM - 5:00 PM Caffeine and Sprint Cycling Performance: The Influence of Torque Factor and Sprint Duration
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(No relationships reported)

PURPOSE: The aim of this study was to investigate the effects of caffeine supplementation on sprint cycling performance and how those effects are influenced by torque factor and sprint duration. METHODS: 13 recreationally active men (age: 20 ± 2 years; height: 1.78 ± 0.06 m; body mass: 75.3 ± 7.6 kg) completed nine trials on an electromagnetically-braked cycle ergometer. In Trial 1, participants completed a series of 6 s sprints (separated by 5 min passive recovery periods) at progressively increasing torque factors (0.4 - 1.25 N∙m∙kg⁻¹), to determine the torque factor (for each individual) which elicited the highest peak power output (TPEAK). The remaining trials followed a counterbalanced randomised design in which torque factor (0.8 N∙m∙kg⁻¹ versus TPEAK), sprint duration (10 s duration versus 30 s), and supplementation (caffeine versus placebo) were manipulated such that all possible combinations of conditions were experienced by each participant. One hour before trials 2 - 9, participants ingested a gelatine capsule containing 5 mg∙kg⁻¹ of either caffeine or placebo (maltodextrin).

RESULTS: There was a significant effect of torque factor on peak power output (PPO) (F1,12 = 188.3; p < 0.001), with higher values at TPEAK (mean difference: 168 W; 95% likely range: 142 - 195 W) There was also a significant effect of sprint duration on PPO (F1,12 = 11.4; p = 0.006), with values being higher in 10 s sprints (mean difference: 52 W; 95% likely range: 18 - 86 W). However, there was no effect of supplementation on PPO (F1,12 = 4.5; p = 0.056). Nevertheless, there was a significant torque factor × sprint duration × supplement interaction (F1,12 = 5.5; p = 0.036), with post hoc tests revealing that caffeine produced a significantly greater PPO (mean difference: 76 ± 75 W; 95% likely range: 19 - 133 W) only when the sprint duration was 10 s and the torque factor was TPEAK. CONCLUSIONS: The results of this study confirm previous reports of significant effects of torque factor and sprint duration on PPO. Moreover, when torque factor and sprint duration are optimised to allow participants to express their highest PPO there is a clear effect of caffeine on sprinting performance.

1066 Board #245 May 31 3:30 PM - 5:00 PM Caffeine’s Effects on an Upper Body Resistance Exercise Strength Workout
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(No relationships reported)

Purpose: The purpose of this study was to examine the effects of caffeine on an upper body resistance training strength workout using the barbell bench press.

Methods: Fifteen men (M ± SD, age: 23.1 ± 1.9 years; body mass: 89.1 ± 13.9 kg; height: 175 ± 6.1 cm) volunteered for three laboratory visits. During visit one, 1RM values were determined. For visit two, subjects consumed either 800 mg caffeine, or a placebo. Subjects then completed three sets of the barbell bench press to failure at 80% 1RM. Visit three was the same as visit two; however, participants consumed the opposite treatment as visit two.

Results: Participants completed significantly more average repetitions per set for the barbell bench press in the caffeine condition (M ± SD = 4.80 ± 2.66 repetitions) compared to the placebo condition (M ± SD = 4.42 ± 2.56 repetitions).

Conclusions: These results suggest that caffeine has a positive ergogenic effect on upper body strength workout performance.
Prior studies suggest that the -163 C > A polymorphism of the Cytochrome P450 (CYP1A2) gene influences the ergogenic effect of caffeine. Although this polymorphism has been known to influence the inducibility of hepatic CYP1A2 and the rate of caffeine metabolism, levels of caffeine and/or metabolites were not reported. Thus, a mechanistic link between the polymorphism and the ergogenic effect of caffeine is lacking. **Purpose:** The purpose of the present study was to determine if the CYP1A2 polymorphism (A/A homozygotes and C allele carriers) affected caffeine metabolism and subsequent performance. **Methods:** Twenty subjects participated in two 3-km cycling time trials with placebo (all-purpose flour) and caffeine (6mg/kg body weight) supplementation. ‘Slow metabolizers’ were characterized as possessing a ‘C’ allele (grouped AC heterozygotes and CC homozygotes), and ‘fast metabolizers’ as possessing the A allele. **Results:** C allele carriers had significantly higher serum caffeine after one hour (C allele carriers = 14.2 ± 1.8 ppm, AA homozygotes = 11.7 ± 1.7 ppm). While there was a main effect for caffeine ingestion on time trial performance, there was no caffeine x genotype interaction (C allele carriers: Placebo = 297 ± 20 sec, Caffeine = 292 ± 20 sec; AA homozygotes: Placebo = 318 ± 35 sec; Caffeine = 278 ± 22 sec). **Conclusions:** Results from this study suggest that C allele carriers have higher serum caffeine after one hour than AA homozygotes, consistent with the assertion that C allele carriers exhibit slower caffeine metabolism. These findings do not support a genetic influence on the ergogenic effect of caffeine in a 3km cycling trial.

**Body Mass Impacts Results of Caffeine Intervention**

**Expression of Strength and Power Relative to Lean Body Mass Impacts Results of Caffeine Intervention**

Geoffrey M. Hudson1, Kyle Sprow1, Tara Hanning2, Loretta DiPietro, FACSM4, 1The George Washington University, Washington, DC. 2La Salle University, Philadelphia, PA. (No relationships reported)

Differences in performance tests for strength or power could be attributed to the amount of lean body mass (LBM). So it may be important to report results of such tests not only relative to weight, but also relative to LBM. Depending on their proposed ergogenic mechanism(s), discriminating between absolute and relative strength may be even more important in dietary supplement research. **Purpose:** Previously, our lab examined effects of caffeine withdrawal and acute caffeine ingestion, while this current study demonstrates that the consumption of energy drink slightly improves the power performance. Other moderating variables should be considered so that the effects of energy drink intake can be explored further.

**Effects Of Energy Drink On Power Performance: Meta-analysis**

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Energy drinks have been consumed often in the field of sports to enhance power performance. However, the effects of energy drinks are inconsistent in previous studies. **Purpose:** To assess the effects of energy drinks on power performance using meta-analysis. **Methods:** Published English language studies were located from computerized searches of following databases: Academic Search Complete, Education Source, ERIC, MEDLINE, PsycINFO, SPORTDiscus, and Google Scholar. Studies meeting inclusion criteria were: 1) included caffeine containing energy drinks, 2) reported a quantitative measure of power, 3) reported on supplement intervention, 4) published in peer reviewed journals and/or forms of thesis and dissertation from January 2000 to May 2016. Keywords included ‘energy drink or red bull or caffeine drink’ and ‘power or performance’. Two investigators independently collected data from the search engines and coded data for verification. The studies were coded for methodological, participant and study characteristics. The Comprehensive Meta-Analysis version-3 software was used to compute effect sizes (ES) and 95% confidence interval (CI) using a random effects model. Subgroup analyses were conducted to identify moderators (gender, subject type, and dosage of caffeine). **Results:** A total of 30 ESs were derived from the 10 selected studies for meta-analysis. The overall mean ES was small, but significant (Cohen’s d (ES) = 0.163, 95% CI = 0.04, 0.29). Subgroup analyses showed that ESs were not affected by any moderator variables. **Conclusions:** Results of the present analysis indicated that the consumption of energy drink slightly improves the power performance. Other moderating variables should be considered so that the effects of energy drink intake can be explored further.

**Combined Carbohydrate and Caffeine Muffins Enhance Anaerobic Power Output in a Reduced Glycogen State**

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Caffeine (CAF) is the most consumed psychoactive substance in the world. About 74% ofathletes during international competitions use CAFF to improve performance. However, its effect on muscle endurance (ME) is still controversial. Placebo (PLA) effect may also increase performance and interact with CAFF.

**PURPOSE:** To analyze the physiological and placebo effect of CAFF supplementation on ME using a balanced placebo design (BPD)

**METHODS:** 16 young men, age 21.4±2.9 yrs, body fat 17.2±4.0%, underwent six exercise sessions: one for familiarization, one as control and four experimental (BPD). At the first session, they were submitted to anthropometric measurements, CAFF consumption questionnaire and one repetition maximum test (IRM) in the parallel squat. At the second session they performed the ME test - 3 sets until exhaustion with 3 min interval between sets with 60%IRM. The last four sessions were: Session C/C: Subject told CAFF and given CAFF; Session C/P: Subject told CAFF but given PLA; Session P/C: Subject told PLA but given CAFF; Session P/P: Subject told PLA and given PLA. Subjects waited 1h20min to execute the ME test after receiving CAFF (5 mg/kg of body weight) or PLA. Work was considered as a product of the weight lifted and repetitions performed. Blood samples were collected for lactate (LA) analysis - at rest, 2, 4 and 6 min after the last set. ANOVA (told x given) was performed with a Bonferroni post hoc - 5% level of significance.

**RESULTS:** Caffeine was 93.9 ± 88.2 mg/day, IRM was 134.7 ± 24.1 kg. CAFF did not increase the number of repetitions or total work (p>0.05) - table 1, nor a particular set or work performed during a set. Use of CAFF and expectation of CAFF increased LA (p>0.05).

**CONCLUSION:** CAFF did not increase ME in men. LA was affected by both the use of CAFF and the expectation of it. This finding reinforces the need of the BPD when studying CAFF, even when examining physiological variables, because they may be affected by expectation (PLA effect).

**Table 1. Sum of repetitions, total work and LA of each session.**

<table>
<thead>
<tr>
<th>Session</th>
<th>Sum of repetitions</th>
<th>Total work (kg)</th>
<th>LA 2nd min (mmol/L)</th>
<th>LA 4th min (mmol/L)</th>
<th>LA 6th min (mmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C/C</td>
<td>36.5±7.8</td>
<td>2998±884.1</td>
<td>10.9±1.5</td>
<td>11.7±1.7</td>
<td>11.8±1.9</td>
</tr>
<tr>
<td>P/C</td>
<td>36.6±7.8</td>
<td>2949±741.2</td>
<td>9.9±1.1</td>
<td>11.1±2.1</td>
<td>11.3±1.9</td>
</tr>
<tr>
<td>C/P</td>
<td>37.3±8.3</td>
<td>3025±847.1</td>
<td>9.7±1.8</td>
<td>10.9±1.6</td>
<td>10.6±1.9</td>
</tr>
<tr>
<td>P/P</td>
<td>35.0±7.7</td>
<td>2836±795.0</td>
<td>8.9±1.4</td>
<td>9.9±1.7</td>
<td>9.6±1.7</td>
</tr>
</tbody>
</table>

LA: Lactate; #: Lower than C/C; Lower than P/P.

Studies on the benefits of caffeine to anaerobic exercise have varied designs and equivocal results. Previous work in our lab has demonstrated positive effects of caffeine on muscular strength and endurance, and reaction time. METHODS: Physically active, habitual caffeine consumers (n=50; 40 female, 10 male; age: 22.3±3; mass: 63.9±10.0 kg; average caffeine: 258±128mg) participated in a placebo-controlled intervention. All subjects abstained from caffeine for 4 days prior to withdrawal testing (T1). supplementation with 5mg kg of caffeine for 3 days and on the final testing day (T2) consumed 6mg kg of caffeine or placebo (insoluble folk) one hour before testing. Power was assessed using peak vertical jump height, while muscular strength and endurance were assessed using a handgrip dynamometer. Subjects performed three handgrip trials to determine their maximal voluntary contraction (MVC). They then performed an isometric hold to volitional failure at 40% of their respective MVC. Reaction time was measured using a commercial application for a tablet computer. Data are presented as means ± standard deviation and were analyzed with SPSS 22.0 using either independent or paired t-tests with an alpha of 0.05. RESULTS: Following four days of caffeine withdrawal, peak vertical jump height decreased from 17.49±3.70 in to 17.00±3.56 in (p<0.001). There was a trend for an increase in power output (calculated from vertical jump) in caffeine.
The effect of metabolic alkalosis on fibre-specific maximal force production and rates of force development (RFD) has been previously investigated in animal models, with evidence suggesting an improved capacity to rapidly develop force in fast- compared to slow-twitch muscle. To date, the fibre-type dependent findings related to pH and rapid force generation have not been replicated in the exercising human. PURPOSE: To model in vivo the fatigue profile of voluntary and involuntary maximal force and rate of force development in the triceps’ surae and brachii after sodium bicarbonate (NaHCO₃) ingestion. METHODS: In a double-blind, 3-way repeated measures design participants (n=10) ingested either 0.3 g·kg⁻¹ NaHCO₃ (ALK) or equivalent calcium carbonate (PLA) prior to 2-min of continuous (1 Hz) supramaximal stimulation (300 ms at 40 Hz) of the triceps’ surae or brachii, with maximal voluntary efforts (MVT) coupled with direct muscle stimulation also measured at baseline, 1-min and 2-min. RESULTS: Metabolic alkalosis was achieved in both ALK trials but was not different between muscle groups. Regardless of condition, involuntary torque declined nearly 60% in the triceps brachii (p < 0.001) and ~30% in the triceps surae (p < 0.001). In all trials there was a significant decline in normalised involuntary RFD (p < 0.05). MVT declined nearly 28% but was not different between conditions (p < 0.01), and although declining nearly 21% in voluntary RFD (p < 0.05) there was no difference between PL and ALK in either muscle group (p = 0.93). CONCLUSION: NaHCO₃, exhibited no effect on the fatigue observed between representative fibre-type muscle groups on maximal voluntary and involuntary torque or rates of torque development during and after 2-min of tetanic stimulation.
B-72 Exercise is Medicine®/Poster - EIM - Health Professionals and Vital Signs

Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall II

1081 Board #260 May 31 2:00 PM - 3:30 PM
Evaluation of Exercise is Medicine From The Perspective Of Fitness Professionals

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(No relationships reported)

PURPOSE: Exercise is Medicine (EIM) promotes physicians prescribing exercise and referring patients to fitness professionals (FP). Early focus in research has been on improving the knowledge of physicians on how to prescribe exercise and encouraging physicians to refer patients to FPS, however the receiving end of the referral procedure has not been examined. This mixed method pilot study aimed to identify level of awareness for FPS regarding EIM initiatives and whether a brief educational session enhanced that level of awareness. The second aim was to engage FPS in dialogue to indicate barriers to and enablers of the exercise prescription and referral procedure.

METHODS: Twelve certified personal trainers employed at a university campus recreation facility with an active EIM on campus group, were recruited to participate in an EIM information session and focus group. Persons trainers completed a pre-information session questionnaire on EIM goals, mission, and contents of the exercise prescription pad. A 15 minute EIM information session was provided and then the same questionnaire was completed again. Immediately after the information session personal trainers participated in a focus group to indicate if problems exist and discuss solutions regarding the EIM goal of engaging FPS and physicians to implement exercise prescription and referrals in the health care system.

RESULTS: Average score on the pre-information questionnaire (7 questions) was 30% which significantly improved to 82% (p=0.05) after the information session. Thematic analysis of the focus group identified four suggestions: increase communication opportunities between physicians and FPS, increase promotion of EIM to both physicians and FPS, add progression and follow-up details to the EIM prescription pad and increase educational opportunities about EIM for all staff employed at a recreational facility.

CONCLUSION: EIM should consider increasing opportunities to educate FPS about the EIM initiative so they are better prepared to receive patients referred to exercise and can engage with physicians to promote EIM. Furthermore, by incorporating the suggestions of FPS to enhance the exercise prescription and referral procedure, the effectiveness of EIM for increasing physical activity levels in all populations can improve.

1082 Board #261 May 31 2:00 PM - 3:30 PM
Physical Activity Levels and Counseling Practices of Physicians & Patients in a Chilean Sports Medicine Clinic

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(No relationships reported)

PURPOSE: Promoting physical activity (PA) among physicians and patients is one of the main pillars of Exercise is Medicine® (EIM). The purpose of this study was to evaluate the PA levels of physicians and their patients in a private sports medicine clinic in Santiago, Chile, in which a printed PA prescription and a small box recommending PA as a “medicine”, are delivered to all patients.

METHODS: This study examined responses from 65 physicians (75% orthopedic surgeons) and 2,688 patients. Physicians answered the short IAPAQ and questions regarding how often, and how, they recommend PA to their patients. Patients (59.5% men; 40.5% women, between 25-65 years of age) answered an online survey with questions regarding the frequency and duration of their weekly PA levels.

RESULTS: A small percentage of patients (26.5%) reported practicing PA five or more days per week with 86.7% reporting 30-90 minutes per day. Results from the physicians showed that just 26.1% reached the recommendation of at least 150 min/week of PA, and 59.5% reported not performing any resistance exercise. The median time sitting and attending patients was 6.1 hours per day. Median frequency of moderate and vigorous PA was 2 days/week for a duration of 45 minutes and 2 days/week and 30 minutes/day, respectively. In regards to their PA counseling attitudes and practices, 66% of the physicians considered it their responsibility to help their patients become physically active; 55% agreed that if they were physically active themselves they will have better capacity to counseling PA, and 40% of the physicians evaluating

the PA levels of their patients and always recommending PA for them. Although 89% of the physicians in the clinic agreed to use PA prescription with their patients, just 50% delivered a written PA prescription.

CONCLUSIONS: From this study, we conclude that physicians who are regularly involved with patients in a sports medicine clinic are aware of the importance of evaluating the PA levels of their patients, but that they need to improve their regular practice of prescribing PA to their patients.

1083 Board #262 May 31 2:00 PM - 3:30 PM
Physician Assistant Students’ Perceptions of the Fitness Industry and Lifestyle Medicine

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(No relationships reported)

INTRODUCTION: With nearly two-thirds of all chronic disease having a lifestyle cause, there is spurred interest in curricular changes for Physician Assistants (PA) and other medical providers to learn Lifestyle Medicine (LM) - the therapeutic use of lifestyle changes to prevent, treat and reverse disease. A key competency in LM practice involves an interdisciplinary approach, including aid from fitness professionals. Yet, perceptions of the fitness industry might hinder such a relationship.

PURPOSE: To assess PA students’ knowledge of LM and perceptions of the fitness industry, to guide course content and implementation efforts. METHODS: An online survey was advertised to all PA students at Baylor College of Medicine. Students’ competence in assessing and prescribing physical activity and diet, knowledge of LM, current curriculum time spent on LM, and desire to learn more about LM were assessed. Students were also asked to share their attitude of both health clubs and personal trainers, alongside referral perceptions. RESULTS: 76% (84%) of students (25.57 ± 4.86 years; 22.77 ± 4.20 kg/m²) completed the survey, self-reporting moderate competence (range: 1-6) in conducting a physical exam to approve an exercise program (4.22 ± 1.22), determining caloric and nutritional needs (3.80 ± 1.34), and designing an exercise prescription (3.57 ± 1.35). However, only 18%, 6%, and 6% self-rated full competence in each, respectively. 31% of students had heard of the discipline of LM, with 43% self-reporting inadequate or poor knowledge. 0% felt they spent enough time on LM in their program, and 78% rated their time spent on LM was either poor or inadequate. Yet, 100% wanted to learn more. Perceptions of health clubs and personal trainers were positive (8.16 ± 1.68; range: 1-10), with them being appropriate exercise venues for patients (7.78 ± 1.76). However, only 6% - 16% believed that health clubs and personal trainers were fully qualified, effective, smart, and concerned about patient health. CONCLUSIONS: Despite the role of lifestyle on chronic disease, PA students had limited competence and knowledge in LM, but held a unanimous desire for more in their educational training. Perceptions of the fitness industry were generally positive; yet educational efforts might be needed to encourage a team-approach to chronic disease care.

1084 Board #263 May 31 2:00 PM - 3:30 PM
Effectiveness of the Exercise is Medicine Canada Training Workshops on Physician Counselling and Prescription Practice

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(No relationships reported)

PURPOSE: Comparing perceptions and practices around physical activity counselling and exercise prescription in physicians initially and three-months following Exercise is Medicine Canada training. METHODS: Initially, physicians (n=113) from 7 provinces completed self-reflection questionnaires. Of that sample, (n=46) physicians completed questionnaires again at three months following the workshop. RESULTS: At baseline, physicians reported low confidence (46%) and rated the impact of primary barriers that prevent physical activity and exercise (PAE) counselling and prescription as (scale out of 4): patient interest (2.77), resources (2.65), and time (2.62). The majority of physicians (85%) provided a written prescription for exercise in <10% of appointments. At follow-up, the workshop increased physicians’ confidence (% score) to: assess patient physical activity/exercise (PAE) (44 to 69; p=0.005); provide PAE information to patients (55 to 79; p<0.001), answer patient PAE questions (54 to 75; p<0.001), and appropriately refer to qualified professionals (52 to 77; p=0.002). Confidence composite score increased from 251±119 to 376±66 (p<0.0001) at 450. At follow-up, physicians perceived barriers’ impact decreased, including: patient interest (2.75 to 2.25 out of 4; p=0.04), lack of resources (2.59 to 2.00 out of 4; p<0.001), and lack of time (2.41 to 2.14 out of 4; p=0.017). Initially, the vast majority (n=98/113; 86.7%) of physicians proposed at
Abstracts were prepared by the authors and printed as submitted.
CONCLUSIONS: We conclude that self-reported PA is strongly correlated with the likelihood of suffering a new diagnosis of depression. For this reason, any patient presenting with symptoms suspicious for depression should be asked about their exercise habits and a low EVS should add to the clinical suspicion for depression.

Background: It is well established that >150 minutes of weekly physical activity significantly improves health. Kaiser Permanente Southern California (KPSC) has pioneered the use of an Exercise Vital Sign (EVS) to record Physical Activity (PA). However, there is less data on exercise and impact on healthcare utilization.

Purpose: To evaluate the correlation of EVS and healthcare utilization, in our SCKP patient population. Specifically, do those patients who report consistent exercise for >150 minutes per week have lower utilization of the health care system.

Methods: KPSC Electronic Health Record data was abstracted to determine 3 cohorts of adults (18-65yrs) (N=2,534,895) who were Consistently Sedentary (CS) (EVS=0min/wk consistently), Insufficiently Active (IA) (EVS=1-149min/wk), or Consistently Active (CA) (EVS=150min/wk consistently), meeting the World Health Organization recommendations. Each cohort had at least 3 encounters and self-reported EVS data was consistent. Each cohort was then compared to their health care utilization over a 1, 3, and 5 year period. Because KPSC is a closed system we were able to accurately capture utilization of pharmacy, hospital, radiology, laboratory and outpatient departments. Data was adjusted for age, gender and ethnicity.

Results: Compared to CS patients, CA patients have consistently lower use of the KPSC health care system. This relationship held true across the 1, 3, and 5 year analysis. Of note patients who were CA were 75% less likely to be hospitalized (OR 0.23-0.26), 43% less likely to use the ER (OR 0.55-0.58) and 45% less Urgent Care (OR 0.23-0.26), 43% less likely to use the ER (OR 0.55-0.58) and 45% less Urgent Care (OR 0.23-0.26) and 27% less laboratory blood draws (OR 0.73-0.74), and 27% less pharmaceuticals fills (OR 0.71-0.74). Other factors that were associated with lower health system utilization were female gender, caucasian ethnicity, and age.

Conclusion: Based on EVS data, and analysis of health utilization we conclude that older adults who are CA individuals have significantly lower utilization of the health care system than those who are CS.

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B-73 Free Communication/Poster - Exercise Psychology - Cognition and Emotion

Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall F

1090 Board #269 May 31 2:00 PM - 3:30 PM Correlates Among Physical Activity, Physical Function, and Cognitive Function in Older Adults Victoria E. Warren, Megan C. Rigot, Kelsey D. Loss, Colleen A. Osburn, Kyle L. Timmerman, Miami University, Oxford, OH. (Sponsor: Helaine Alessio, FACSM)

Email: warrenve@miamioh.edu

(No relationships reported)

Current adverse components of aging include the increase in both cognitive impairment and the incidence of dementia. Previous studies have shown positive associations between physical activity and the prevention and treatment of cognitive impairment and dementia. The PURPOSE of the present study was to identify correlates among physical activity, physical function, and cognition in independent older adults. METHODS: In 77 older adults (77.7±7.8 years), self-reported physical activity (Community Healthy Physical Activities Model Program for Seniors, CHAMPS), cognitive function (Addenbrooke's Cognitive Examination-Revised, ACE-R), and physical function (Six Minute Walk Test, 6MWT; Short Physical Performance Battery, SPPB; and Grip Strength) were measured. Partial correlations were run between the variables while controlling for age and sex. Significance was set to p < 0.05. RESULTS: The mean ± standard error (SE) for the physical function variables were: CHAMPS: 202.0±190 kcal·wk⁻¹ of moderate-to-vigorous physical activity; 6MWT (distance): 417±14 m; and grip strength: 27.0±1.1 kg. The average score on the ACE-R was 91.6±0.5 out of 100 (≤88 = 94% specificity for dementia). Age was correlated with ACE-R (r = -0.59, p < 0.05). When controlling for age and sex, ACE-R was correlated with SPPB performance (r = 0.33, p < 0.05), 6MWT performance (r = 0.25, p < 0.05), and grip strength (r = 0.25, p < 0.05). ACE-R was not correlated with self-reported physical activity (r = 0.14, p > 0.05). CONCLUSIONS: Although previous research has shown positive associations between physical activity and cognitive function, our preliminary data do not support these previous findings. However, indices of physical function, as measured by these three standard clinical tests, were associated with cognitive function in this population of independent older adults.

1091 Board #270 May 31 2:00 PM - 3:30 PM Psychological Factors of Burnout in Former/Retired Elite-Level Race Walkers in the United States Joseph H. Rayner, IV, Juan Gonzalez, Lawrence Earl T. Pabalinas, Monica P. Santos, Nelson Galloso, Eduardo Arambula. University of Texas Rio Grande Valley, Edinburg, TX. (Sponsor: Alexis Ortiz, FACSM)

Email: jhrayner18@gmail.com

(No relationships reported)

PURPOSE: The study aims to determine and extrapolate the causation of psychological factors of burnout in former/retired female and male elite-level race walkers (N=75) in the United States (U.S.). The results of this project will assist in identifying influential factors of burnout, hence improving the future of the sport of race walking in the U.S. METHODS: Seven factors of burnout were derived and analyzed based on the subjects’ responses to a validated anonymous online survey. This research was analyzed through exploratory analysis with an eigenvalue set at 1.00 using varimax rotations. These seven factors retained 75.99% of total variance which were accounted for and explained by the factors success (1), accomplishment (2), fatigue (3), apathy (4), awareness (5), appreciation (6), and lack of marketing (7). An independent t-test and a one-way ANOVA were conducted to determine a significant difference in responses between genders. RESULTS: Profile analysis/one way repeated measures analysis of variance of the seven factors indicate statistical significance and efficacy based on the Partial eta² of 0.489 using the Lower-bound being 49% of the total variance explaining the differences among the seven factors. Across all factors, factors 5 and 7 scored the highest means, which indicated the most significant impact of burnout while factors 1 and 2 demonstrated the least impact. Both the independent t-test and the one-way ANOVA found no significant (p>0.05) differences in responses to factors 1 (6.15), 2 (8.11), 3 (8.20), 4 (6.33), 5 (7.60), 6 (8.54), and 7 (3.69) between genders. CONCLUSIONS: Based on the profile analysis, the common underlying factors in this research investigation narrowed down to “AWARENESS” and “Lack of Marketing” in U.S. race walking. This represents crucial components to the declining state of elite-level race walking as well as the most significant impact of burnout in former/retired female and male elite-level race walkers in the U.S. The results of this project will assist in identifying influential factors of burnout, hence improving the future of the sport in the U.S. The continuation of research on elite-level race walking burnout is imperative for the growth of the sport and the well-being of these athletes.
Acute Effect of Exercise on Cognitive Function Changes by Exercise Mode
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NO RELATIONSHIPS REPORTED

Purpose: To assess the differences of influence of acute bouts of aerobic, resistance and badminton on the cognitive control measured by Stroop task.

Methods: Twenty-five men (age: 20.8 +/- 1.0 yrs, height: 173.8 +/- 3.9 cm, weight: 73.8 +/- 11.7 kg) and 20 women (age: 20.3 +/- 1.0 yrs, height: 156.6 +/- 4.0 cm, weight: 50.1 +/- 6.0 kg) performed an incremental treadmill running test to determine peak oxygen consumption (VO2peak). On subsequent days, the participants underwent four counterbalanced an intervention consisting of 10 min of either walking, resistance exercise, badminton and seated rest control. A matching type Color-Word Stroop test (writing) consisting of a neutral condition and an incongruent condition was completed before and after each session. Oxygen consumption (VO2) was measured during 4 sessions. Stroop task performance (scores) in both of the neutral and the incongruent condition were compared by 2-way ANOVA model in mixed model, two factors were sessions (4 levels) and time (2 levels), respectively.

Results: Intensities of walking, resistance exercise, badminton and seated rest control were 45+/-10%, 41+/-7%, 74+/-11% and 9.7+/-1.7 VO2peak, respectively. For the neutral condition scores, the interaction was not significant (P = 1.08) although the main effect of time was significant (P < 0.001). For the incongruent scores, ANOVA model indicated significance in the main effect of time (P < 0.001) and the interaction (P = 0.012), badminton significantly improved scores larger than seated rest control (P = 0.021). Differences between walking, resistance exercise and seated rest control were not significant (P > 0.477).

Conclusion: These results indicate that complex and high-intensity exercise, such as badminton appear to improve cognitive function relative to low-intensity simple aerobic exercise and anaerobic exercise.

Although previous studies have demonstrated that regular participation in open- and closed-skill exercise could produce distinct benefits on neurocognitive performances in the elderly; these cross-sectional studies cannot establish causality and obviate the facilitation overall neurophysiological effects and produce distinctive neuropsychological effects when performing the task-switching paradigm at baseline and after either a 24-week exercise intervention or control period. All independent variables were separately analyzed with a repeated-measures ANOVA.

Results: Both the exercise groups exhibited significantly larger P3 amplitudes after the exercise intervention relative to baseline when performing the task-switching paradigm (open-skill: 3.93±2.19 vs. 5.97±2.55 μV, p<0.05; close-skill: 3.82±1.61 vs. 5.30±1.68 μV, p<0.05). Although two exercise groups relative to the control group showed significantly faster reaction times (RTs) in the switch trials after the exercise intervention, only the open-skill group showed RT facilitation in the non-switch (pre vs. post: 1185±414±44 vs. 1026.19±126.18 ms, p<0.001) and switch (pre vs. post: 1396.99±301.51 vs. 1159.11±190.46 ms, p<0.001) trials after the exercise intervention when performing the cognitive task.

Conclusion: Regular participation in open- or closed-skill exercise could facilitate overall neurophysiological effects and produce distinctive neurophysiological performance in the elderly.

WEDNESDAY, MAY 31, 2017

Effect of an 8-Week Moderate-Intensity Aerobic Exercise Intervention on Episodic Memory and Cognitive Control
Anthony J. Boccinne1, Ryan L. Olson2, Christopher J. Brush3, Peter J. Elman4, Brandon L. Alderman5, Rutgers, The State University of New Jersey, New Brunswick, NJ. University of North Texas, Denton, TX.
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NO RELATIONSHIPS REPORTED

Although the effects of exercise on global cognitive function are well documented, there have been few randomized trials of aerobic exercise that focus specifically on select aspects of cognition, including episodic memory and cognitive control processes. Understanding these cognitive processes may be particularly important for individuals with major depressive disorder (MDD), as deficits in both memory and cognitive control are well recognized in MDD.

Purpose: The primary aim was to assess the effects of an aerobic exercise intervention on episodic memory and cognitive control in individuals with and without MDD.

Methods: 48 participants (24 healthy, 24 MDD) were randomly assigned to either 8-weeks of aerobic exercise (AE) or a control group of time-matched light stretching. AE and stretching groups over time (p = 0.005). Follow-up simple effects tests revealed differences for time in the training (pre-test = 24.20 ± 6.27 vs. post-test = 26.53 ± 5.07) and poomsae (pre-test = 22.53 ± 4.72 vs. post-test = 26.47 ± 2.75) groups. No differences were observed in the control group (pre-test = 23.11 ± 6.51 vs. post-test = 22.67 ± 6.74). Cohen’s d effect size was considered high in poomsae (Δ = 0.83) and moderate in the training (Δ = 0.40) group. No between-group interactions were found on DFT (p = 0.674) and DBT (p = 0.206) scores.

Conclusions: Taekwondo training improves working memory in sedentary Costa Rican children; poomsae has higher positive effect than fighting exercises.
of cognitive function, in addition to reducing depressive symptoms. These benefits occurred without a change in fitness, suggesting other psychobiological mechanisms of action.

Physical arousal coinciding with periods of memory consolidation facilitates long-term memory storage. Unknown is the role of exercise type on long-term memory.

**PURPOSE:** To evaluate the effects of two types of acute exercise on young adults’ immediate and delayed psychomotor learning.

**METHODS:** 30 young adults (22±9.9 yrs, F=73.3%) were assigned to one of three conditions: Control, Simple Step Dance, or Complex Step Dance. Participants practiced a manual pursuit-rotor tracking task for 5 blocks of 10 trials and then engaged in 10-min of either seated rest, a simple Dance-Dance Revolution (DDR) type exercise, or a complex DDR exercise. Psychomotor learning was assessed in a single block of 10 trials administered immediately, 24 hours, and 7- and 7-days following exercise or rest. Exercise intensity was measured by the Borg Perceived Exertion Scale, administered at minute 3, 5, 7 and 10.

**RESULTS:**

For each participant, difference scores were calculated based on average time-on-target during the last block of training and during each retention test. A 3 (Group: Rest, Simple DDR, Complex DDR) X 3 (Time: Immediate, 24-hr, 7-day) analysis of variance revealed a significant Group X Time interaction (F(2,54) = 3.11, p = 0.02). Planned contrasts revealed that at 24-hr, both exercise types significantly increased time-on-target performance (Simple DDR = 2.62 sec; Complex DDR = 2.84 sec), compared to rest (2.03 sec); at 7 days, performance improved for those in the complex DDR condition (4.46 sec) compared to the simple DDR condition (2.30 sec) and rest condition (1.67 sec). Ratings of perceived exertion differed between the exercise groups only at the end of exercise.

**CONCLUSION:** The results support prior research showing that psychomotor memory is enhanced when practice is followed by acute exercise and suggest that physical arousal enhances memory consolidation. The results add to the research findings by showing that the type of exercise differentially affects memory consolidation, with exercise involving complex cognitively-demanding movements producing greatest benefits.

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®

**1097 Board #276 May 31 2:00 PM - 3:30 PM**

**Effects of Two Types of Acute Exercise on Young Adults’ Psychomotor Learning**


(No relationships reported)

**CONCLUSIONS:** Strenuous prolonged running increases muscle pain. Compared with whey protein, alpha-lactalbumin elevates PPT in muscle and potentially enhances the feeling of vigor during short term exercise recovery.
Physical activity appears to have negative effects on affective states and cognitive function, whereas acute exercise has beneficial effects on them. Stretching is a common activity used in a physical fitness program. In the present study, we hypothesized that acute stretching is beneficial to affective states and cognitive function in physically inactive people. PURPOSE: To test the specific hypothesis that acute stretching improves affective states and cognitive function in physically inactive people.

METHODS: Nineteen sedentary young subjects participated in the present study. They were randomized to stretching condition (SC) and resting condition (RC) in a cross-over manner. The stretching program was 10-min whole body stretching using yoga techniques and poses. Before and after stretching or resting, they performed the Stroop task and completed the Short form of Profile of Moods Scale (POMS).

RESULTS: In the SC, we observed a reduction in depression-depression score (pre 3.32/-3.53 vs. post 2.05/-3.03, P = 0.02) and an increase in vigor score (pre 4.63/-4.38 vs. post 6.68/-4.50, P = 0.03). In the RC, we found no changes in depression-depression score (pre 2.63/-3.93 vs. post 2.58/-1.35) or vigor score (pre 5.21/-4.02 vs. post 5.05/-4.21). The Stroop-interference, which was calculated by subtracting reaction time (RT) in the neutral trials from RT in the incongruent trials, decreased in the SC (pre: 33 +/- 40 ms; post: -23 +/- 49 ms, P < 0.001). In contrast, the Stroop-interference did not change in the RC (pre: 11 +/- 38 ms; post: -2 +/- 43 ms). Stretching did not affect MCA Vmean during the cognitive task (SC: pre 52.2/-16.7 cm/s, post 51.2/-15.2 cm/s, RC: pre 50.7/-10.3 cm/s, post 48.2/-9.4 cm/s) or the salivary cortisol levels (SC: pre: 0.15 +/- 0.08 µg/dL, post: 0.13 +/- 0.05 µg/dL, RC: pre: 0.16 +/- 0.07 µg/dL, post: 0.14 +/- 0.04 µg/dL). CONCLUSION: Acute stretching improves affective states and cognitive function, but did not affect the measured physiological variables. Acute stretching seems to improve cognitive function in physically inactive individuals, possibly via improved affective states.

A/G ratio (r=-0.425; p=0.001). 70% of subjects in low PA group were vitD deficient (r=0.422; p=0.001). 70% of subjects in low PA group were vitD deficient (r=0.422; p=0.001). 70% of subjects in low PA group were vitD deficient (r=0.422; p=0.001). 70% of subjects in low PA group were vitD deficient (r=0.422; p=0.001). 70% of subjects in low PA group were vitD deficient (r=0.422; p=0.001).
INTRODUCTION: The U.S. Preventive Services Task Force and NIH emphasize the use of weight-related screenings as a means to increase motivation of overweight/obese individuals to manage body weight. Yet, little is known about individual responses to receiving such screenings, which could inform future research.

PURPOSE: To examine the acute, qualitative responses to a common body weight and composition screening in a sample of women classified as ‘overfat’ by a validated body fat percentage (BF%) cutoff.

METHODS: Of 14 volunteers responding to a study ad assessing personal experience to a weight screening, 10 women (30.21 ± 16.64 years; 39.39% ± 6.60%; 28.25 ± 6.15 kg/m²) were classified as ‘overfat’. Following DEXA testing, participants were provided with their weight and composition results, and then given 1-minute to evaluate. Participants were asked a series of questions guided by qualitative description regarding their experience. Interviews were digitally recorded, transcribed, and analyzed with open and axial coding to identify recurring themes.

RESULTS: Five themes, represented here as internalized questions, emerged to summarize the individual experience: (1) Is this a threat to me? (2) Why is this a threat? (3) How does this make me feel? (4) Am I motivated? (5) What am I motivated to do? Theoretically, the results support a novel confluence of self-regulation and coping theories, where a weight-related discrepancy produced by the screening triggered perceptions of threat to self, including the appraisal of what is at stake during a stressful encounter (self-esteem, survival/health, sex/attractiveness, social status, family, physical functioning), which guided the appraisal process. Subsequently, emotional and motivational responses varied, as did coping choices (physical activity, healthy/unhealthy dietary changes, heightened self-regulation, seeking social support).

CONCLUSIONS: The findings support the use of screenings to heighten awareness to one’s body weight, yet highlight the complexity of individuals’ responses and importance of ‘appraisal stakes’. This study challenges the belief that screenings always trigger healthy, weight control efforts, while highlighting difficulties and potential bias in recruiting overweight women to volunteer for such screenings.

CONCLUSION: The effects of acute exercise on attentional bias seem to depend on stimulus type. Results suggest that exercise has a greater impact on picture-based attentional bias pre- to post-exercise (Experiment 2) compared to word-based attentional bias (Experiment 1). Moderate intensity exercise improves measures of total mood disturbance, anger, confusion, state anxiety, vigor, and tension. This suggests that exercise may have a greater impact on subjective mood measures compared to the attentional processes associated with anxiety.

Background: Researching the effects of exercise on many health conditions requires the use of biochemistry laboratory techniques such as Enzyme Linked Immunosorbent Assay (ELISA). However, undergraduate Exercise Science programs often do not provide experiences in these kinds of biochemistry laboratory techniques. Purpose: This project evaluated undergraduate students’ knowledge of, experience with, and confidence in using biochemistry laboratory techniques before and after a laboratory exercise measuring salivary cortisol concentrations via ELISA. Methods: As part of the laboratory sessions in an undergraduate Exercise Physiology class the students (n=113) provided saliva samples before and after 40 minutes of moderate intensity aerobic or resistance exercise. On another occasion, in groups of 2-4 students, the saliva samples were analyzed for cortisol concentrations using a_Confirmatory ELISA kits. Before and after the laboratory experience the students completed a survey regarding their knowledge of, experience with, and confidence in biochemistry laboratory techniques. Results: 58% of the students completed the survey before and after the biochemistry laboratory experience. None of the students indicated any previous experience with or knowledge of what ELISA was, how to perform an ELISA, or what could be measured using ELISA. 62% of the students had never used a precision single or multichannel pipette, and 50% had no confidence, 26% had very low confidence, and 24% had moderate confidence in their ability to do so correctly. After the laboratory experience 100% of the students had used a precision single channel and multichannel pipette and 50% had moderate confidence and 70% had high confidence in their ability to do so correctly. As part of an open ended question the students indicated that they enjoyed the experience and frequently commented that they “felt like a real scientist” as while performing the ELISA. Conclusion: While many exercise science students in an undergraduate exercise physiology class had no prior laboratory experiences using precision pipettes or other biochemistry techniques,
B-74 Free Communication/Poster - Exercise Psychology - Neuroscience
Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall F

Yingzhi Lu, Xiawen Li, Jiacheng Chen, Chun Xie, Chenglin Zhou. University of Sport, Shanghai, China. (No relationships reported)

The task-preparation processes usually be affected by different factors, such as attentional demands, and skill levels. Researches in sport and motor field reported that skilled athletes are characterized by intense preparation of stimuli and employ highly developed strategies in the attention and motor domains, to respond to stimuli effectively.

PURPOSE: To investigate the effect of skilled level on the task-preparation strategy with varying level of attentional demands.

METHODS: 50 participants were grouped into Elites group (EG, n = 17), Amateur group (AG, n = 16) and Control group (CG, n = 17) based on the table tennis training years and skilled level. A modified cue-target paradigm was used in current study. It contains both cue stimuli (square means easy task, circle means hard task) and target stimuli (a ping-pang ball, may display on the left, right, up or down of the screen.). In the easy task, participants were asked to press the number key on corresponding position with the target, while in the hard task, the key on the opposite position needs to be pressed. Participants were asked to do a cognitive-motor task (release the "5" key, then press the target key and come back to hold the "5" key again.). Electroencephalograph was recorded during the task.

RESULTS: The accurate result showed the EG (0.99±0.01) performed better than CG (0.97±0.03, p < 0.05), and in both reaction time (ms) and choice time, the EG (RT: 336.22±39.05; CT: 470.01±48.27) was faster than both AG (RT: 391.83±58.71; CT: 582.85±77.08) (p < 0.001) and in both reaction time (ms) and choice time, the EG (RT: 336.22±39.05; CT: 470.01±48.27) was faster than both AG (RT: 391.83±58.71; CT: 582.85±77.08) (p < 0.001), and in both reaction time (ms) and choice time, the EG (RT: 336.22±39.05; CT: 470.01±48.27) was faster than both AG (RT: 391.83±58.71; CT: 582.85±77.08) (p < 0.001), and in both reaction time (ms) and choice time, the EG (RT: 336.22±39.05; CT: 470.01±48.27) was faster than both AG (RT: 391.83±58.71; CT: 582.85±77.08) (p < 0.001). In the contingent negative variation (CNV) (1200-1500 ms, umnt/μV), only the easy task elicited larger CNV amplitude on the left hemisphere (1.95±1.67) than right hemisphere (0.59±1.30)(p < 0.001) in the CG, while the AG showed such hemisphere differences on both easy (left: 1.39±1.48; right: 0.05±1.17) (p < 0.001) and hard task(left: 1.26±1.61; right: -0.17±1.53) (p < 0.001), and the EG didn’t show any difference on hemisphere in neither of the tasks.

CONCLUSIONS: Different task-preparation strategies were moderated by both the skilled level and task difficulty. It is likely that successful athletes in reactive sports are characterized by employing similar spatial preparation in the motor regions to respond to visual inputs effectively.

B-78 Exercise Training Rescues High Fat Diet-induced Neuronal Nitric Oxide Synthase Expression In Hippocampus And Cortex.
Yuki Tomiga, Saki Yoshimura, Ai Ito, Kentaro Kawanaka, Yoshinari Uehara, Hiroaki Tanaka, Yasuki Higaki. Fukuoka University, Fukuoka-shi, Japan. Email: tomiga0507@gmail.com (No relationships reported)

Western high-fat diet (HFD) consumption and being overweight induce hippocampal atrophy and deterioration of function. These alterations are associated with mental disorders, such as depression and anxiety. Exercise is an effective therapeutic treatment to combat obesity and enhance brain health. Numerous studies have demonstrated that neuronal nitric oxide synthase (nNOS) is a key regulator of affective behavior. Increased nNOS expression leads to anxiety, while reduced brain nNOS in an enriched environment that includes running exercise has anxiolytic effects. PURPOSE: We investigated whether HFD consumption and exercise training altered nNOS expression in the brain. METHODS: Twenty 4-week-old male C57BL/6 mice were used. After 2 weeks of acclimatization, mice were randomly assigned to a standard diet (SD, n = 5) or HFD group (n = 15). After 6 weeks, HFD-fed mice were further divided into either a non-exercise (HFD, n = 7) or a HFD (12 weeks) with exercise group (HFD+Ex; n = 8). The HFD+Ex group was allowed free access to a running wheel. Western blotting was performed to determine nNOS protein expression levels in the hippocampus (Hp), cortex (Cx) and cerebellum (Cc) from SD, HFD and HFD+Ex mice. RESULTS: Body weights were significantly increased in HFD-fed mice (SD: 25.0 ± 0.4 g; HFD: 36.6 ± 1.5 g; HFD+Ex: 29.1 ± 0.5 g, p < 0.001). Similarly, mesenteric fat weights were increased in the HFD group, while exercise training mitigated this effect (SD: 0.16 ± 0.04 g; HFD: 0.56 ± 0.10 g; HFD+Ex: 0.25 ± 0.03, p < 0.01). Compared with that of SD mice, Hp and Cx nNOS expression levels increased significantly with HFD feeding (Hp: 1.90 ± 0.28 fold increase, p < 0.05; Cx: 1.89 ± 0.49; p < 0.01). HFD-induced Hp and Cx nNOS expression was reduced in HFD+Ex mice to levels comparable to those of the SD group, though the difference in the Cx was not significant (Hp: 0.86 ± 0.16 fold increase, Cx: 1.48 ± 0.22; p = 0.1003). While Hp and Cx nNOS expression levels were susceptible to HFD consumption and exercise, those in the Cx were unchanged (p > 0.05). CONCLUSION: We conclude that exercise training restores HFD-induced nNOS expression in the Hp and Cx. Our results indicate that HFD-induced brain dysfunction is regulated by nNOS in the Hp and Cx, and exercise has therapeutic potential for mitigating HFD-induced depression and anxiety via the nNOS/NMDA pathway.
whether gender alone influenced recovery rates, findings suggest that males are more likely to recover at any time point when compared to their female counterparts (p ~ 0.0019).

CONCLUSIONS: History of at least one prior concussion in young athletes results in a higher initial symptom score and extended duration of post-concussive symptoms, thereby prolonging recovery time. According to our study, there are no gender-based differences in recovery time for those who sustain multiple concussions.

1113 Board #292 May 31 2:00 PM - 3:30 PM Neurotransmitter Concentrations Do Not Predict TMS Measures of Excitability and Inhibition in the Motor Cortex

(No relationships reported)

Transcranial magnetic stimulation (TMS) provides measures of motor cortex excitability and inhibition. Pharmacological studies suggest the involvement of the neurotransmitters glutamate and GABA in mediating TMS measures of excitability and inhibition, respectively. PURPOSE: The aim of this study was to determine the relationship between TMS measures of excitability and inhibition and proton magnetic resonance spectroscopy (1H-MRS) quantitation of excitatory and inhibitory neurotransmitter concentration in the primary motor cortex. METHODS: Thirteen (6 female, aged 20.6±1.0 years) healthy individuals were tested at three time points: Baseline, 2 Weeks, and 2 Months. Amplitude of the motor evoked potential (MEPamp) was calculated as a TMS measure of excitability, and the duration of the cortical silent period (CSP) was determined as a TMS measure of inhibition. Concentrations of glutamate and GABA were obtained at similar time points using 1H-MRS. RESULTS: MEPamp (p=0.30) and glutamate concentration in the primary motor cortex (p=0.73) were both similar across visits. However, glutamate concentration did not significantly predict MEPamp (R2=0.0002, p=0.93). CSP duration (p=0.47) and GABA concentration within the primary motor cortex (p=0.42), were also similar across visits. However, GABA concentration did not predict CSP duration (R2=0.0008, p=0.87).

CONCLUSION: No relationship between TMS measures of cortical excitability or inhibition and 1H-MRS measures of glutamate and GABA were reported. These results suggest that additional factors may be responsible for excitability and inhibition, as assessed by TMS.

1114 Board #293 May 31 2:00 PM - 3:30 PM The Effects Of An Eight Week Exercise Intervention On Brain Activity In Depressed And Non Depressed Individuals: A Fmri Pilot Study
Paul Yielder, Bernadette Murphy, Joanne Gourgouvelis, L1H 7K4. University of Ontario Institute of Technology, Oshawa, ON, Canada.
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(No relationships reported)

PURPOSE: Memory deficits is the most frequently reported cognitive symptom in people suffering with Major Depressive Disorder (MDD). Supporting clinical findings, neuroimaging studies investigating memory impairment in people with MDD have identified brain areas such as the prefrontal cortex and medial temporal lobe to be dysregulated during both memory encoding and retrieval. Exercise for brain health has been a common research theme for the past several years. Research has found that exercise protects against the development of neurodegenerative diseases, reverses brain volume loss in the elderly, upregulates neurogenesis in rodents and improves learning and memory. The aim of this study is to investigate the effects of an eight week exercise program on brain function during a memory task in people suffering with MDD and young healthy individuals.

METHODS: Eight medicated patients with a clinical diagnosis of MDD based on DSM-IV criteria and eight healthy controls completed an eight week supervised exercise intervention. Participants performed an associative memory fMRI task. A regression analysis was conducted to determine if the change in activity pre/post was related to improvement in depression scores. We found those who showed the greatest improvement in depression scores had a reduction in activity in the left occipital and right motor regions. This finding suggests an improvement in sensory and motor processing.
Abstracts were prepared by the authors and printed as submitted.

WEDNESDAY, MAY 31, 2017

1117 Board #296
May 31 2:00 PM - 3:30 PM
Acute High-intensity Interval Training And Moderate-intensity Continuous Exercises Differentially Facilitate Cognitive Control
Shih-Chun Kao1, Daniel Westfall1, Brendon Gurd1, Charles Hillman2. 1University of Illinois at Urbana-Champaign, Urbana, IL. 2Northeastern University, Boston, MA. 1Queen’s University, Kingston, ON, Canada.
Email: shihchunkao@gmail.com
(No relationships reported)

PURPOSE: The present study investigated the effects of a single bout of high-intensity interval training (HIIT) and continuous, moderate aerobic exercise (MAE) on inhibitory control. METHODS: The P3 component of an event-related brain potential was collected in 64 young adults during a modified flanker task following 20 minutes of seated rest, 20 minutes of MAE, and 9 minutes of HIIT on separate days in counterbalanced order. RESULTS: Shorter overall reaction time was observed following MAE (392.2ms) and HIIT (384.8ms) compared to seated rest (402.6ms), t(63) ≥ 2.8, p's ≤ .007. Response accuracy selectively improved following HIIT (93.2%) in the task condition requiring greater inhibitory control compared to seated rest (91.1%) and MAE (91.3%), t(63) ≤ 3.0, p ≤ .004. P3 amplitude was larger following HIIT (14.4µV) compared to seated rest (13.1µV) and MAE (11.6µV), t(63) ≥ 2.7, p ≤ .007. Decreased P3 amplitude and shorter latency were observed following HIIT (11.6µV; 393.6ms) compared to seated rest (13.1µV; 405.4ms), t(63) ≥ 2.6, p's ≤ .012. CONCLUSION: The current results indicated that MAE may facilitate cognitive control via increased neural resource allocation, whereas HIIT may have a larger facilitation on cognitive control beyond MAE via more efficient neural resource allocation. These findings demonstrate that both single bouts of MAE and HIIT may be feasible approaches to enhance cognitive performance, albeit via different mechanisms of neural activation.

1118 Board #297
May 31 2:00 PM - 3:30 PM
Comparing Before-and After-School Neurocognitive Performance in High School Athletes: Implications for Concussion Management
Morgan Anderson, Samantha Mohler, Melissa Anderson, R.J. Elbin. University of Arkansas, Fayetteville, AR.
Email: mnanders@uark.edu
(No relationships reported)

Sport-related concussion (SRC) requires a multifaceted assessment and management approach that relies on computerized neurocognitive testing (CNT) as an objective complement to subjective symptom reporting. Previous literature has identified several factors that negatively influence CNT performance and may complicate post-injury assessment. One factor that may negatively influence CNT performance is the cognitive fatigue associated with the academic school day. Consequentially high school athletes may be required to complete an academic school day following their injury. Oftentimes, sports medicine professionals may have to administer CNT before and/or after school depending on the sports medicine, academic, and athletic schedules. However, administering CNT after an academic school day may not be the optimal time to evaluate neurocognitive performance due to several confounding factors such as cognitive fatigue. PURPOSE: To compare before-and after-school CNT performance in non-concussed high school athletes.

METHODS: A randomized crossover design was used for this study. After receiving University IRB approval, 29 high school athletes (15 males, 14 females) completed CNT before-and after-school on separate days. The mean age of the sample was 15.72 ± 1.25 years old. A series of paired samples t-tests were conducted for each CNT outcome score (verbal and visual memory, reaction time, processing speed) for both time points. Statistical significance was set at a Bonferroni-corrected (α = .05).RESULTS: Significant differences for visual memory and reaction time were documented across both time points. Visual memory (p = .008) was significantly better before-school (86.14% ± 11.01%) than after-school (81.57% ± 12.14) and reaction time (p = .001) was significantly slower before-school (0.60 ± 0.07 sec.) than after-school (0.57 ± 0.06 sec.).

CONCLUSIONS: This study suggests that time of day and the demands of a school day should be considered when determining the optimal timing for CNT assessment. More research is needed to determine the mechanisms for which the time of day and cognitive fatigue may impact CNT assessment scores.
alteration in fMRI brain activation (p<.05, corrected) was found in the collar group in the cingulate gyrus and the angular gyrus (Figure 1), both of which are known to be associated with memory functions.

CONCLUSIONS: The current study explored the alteration of brain activation in female athletes after experiencing repetitive head impact during a high school soccer season. The significantly increased brain activation from pre- to post-season in the non-collar group suggested that greater effort was required for task completion. The absence of alteration of brain activation in the collar group suggests a potential protective effect, supporting the growing literature of mild jugular compression in brain injury protection in sports.

B-75 Free Communication/Poster - Instrumentation and Assessment Tools
Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall F

1121 Board #300 May 31 3:30 PM - 5:00 PM
Comparing Motion Capture Systems For Clinical Appropriateness In Lower Extremity Frontal Plane Measurements
Megan Philipp, Kenneth Jenkins, Connor Norman, Harrison Hall, Lauren Beres, Pat Sells, Kevin Robinson. Belmont University, Nashville, TN.
(No relationships reported)

Motion capture systems are used with increasing frequency in clinical settings to form treatment and referral decisions. While the systems provide a distinct advantage over visual observations, they are limited by a variety of technological features. Additionally, the systems are not equivalent for all uses, and require further investigation to determine clinical appropriateness.

PURPOSE: The purpose of this study was to compare four independent motion analysis systems for capturing frontal plane hip motion during double limb squat (DLS) and single leg squat (SLS) movements.

METHODS: 15 females with a mean age of 24.2±1.27 years provided consent and were screened before data collection. Each participant performed three trials of both DLS and SLS which were simultaneously captured on four motion analysis systems (Qualisys, Myomotion, Dartfish, Hudl). Following data collection, frontal plane hip angles were determined at the point of peak knee flexion. RESULTS: A one-way ANOVA of frontal plane hip angles between the four motion analysis systems demonstrated significant differences (p<0.05). Tukey post-hoc analyses were conducted to identify statistical significance. No significant difference was found between Qualisys and Myomotion or between Dartfish and Hudl for both right and left lower extremity during both DLS and SLS. A significant difference was found between Qualisys, Dartfish and Hudl during both DLS and SLS. A significant difference was found between Qualisys, Dartfish and Hudl during both DLS (7.62±21.71, -11.52±26.46, 12.7±6.75, 12.04±8.09) and SLS (-29.46±15.56 and SLS -12.04±8.09). CONCLUSION: 2-D and 3-D motion analysis systems demonstrated similarity within their specific domains but cannot be compared due to differences in measurement and calculation methods for hip abduction angles.
Ankle sprain is the most common sports-related injury. With high recurrence rate and residual symptoms, repeated ankle sprain may turn into chronic ankle instability (CAI), which affects sport efficacy and postural control ability. Recently, smartphones had become very popular and powerful devices, and been showed to have good validity and reliability on several clinical usages with built-in sensors. However, there is still not yet a smartphone application designed especially for subjects with CAI to assess their postural control ability.

**PURPOSE:** The purpose of this study is to evaluate the reliability of a smartphone-based postural control assessment application designed for subjects with CAI.

**METHODS:** 10 healthy subjects (1 male, 9 females; age=21.8 ± 1.6 y/o) were recruited in the study. HTC 10 smartphone was used to conduct the assessment by recording the data of built-in accelerometer with an app developed using Android Studio. Subjects were asked to execute a 40-seconds single leg stance test. The smartphone was fixed on the middle of shin with an exercise armband, and the acceleration data was recorded with 50Hz sampling rate. Each subject performed 3 times of the same test (2 tests in day 1 and 1 test in day 2) to evaluate the within- and between-day reliability. Data was analyzed with intra-class correlation (ICC) with SPSS 20, and statistical significance was set as alpha < 0.05. RESULTS: ICC of within-day reliability was 0.899, p < 0.001 (acceleration data: test 0.941±1.445 vs retest 0.785±1.252, unit: m/s²). ICC of between-day reliability was 0.655, p = 0.025 (acceleration data: test 0.941±1.445 vs next-day test 1.041±1.513, unit: m/s²). The within-day reliability was good and the between-day reliability was acceptable.

**CONCLUSIONS:** The study shows that the smartphone application has good reliability to be a convenient and easy-used tool for assessing postural control ability on CAI.

Modern smartphones are inexpensive, portable, user-friendly, and can obtain gyroscope information. Apps can be used to sample, store, and wirelessly transmit data. Although each test was conducted, field tests of sit-to-stand (STS) power provide good reliability with crude (timed or counted) outcome measure of physical performance. Expensive lab-based biomechanics equipment is required to obtain measures of leg power (LP) for individual repetitions during brief 5x STS tasks. PURPOSE: To determine the ability of the iPod to detect movement speed for each rep during a 5x STS test, and make comparisons with an electromechanical goniometer (eGONI) and force platform. METHODS: Young adults (22.9 ± 2.9yrs, 21 men, 21 women) performed a 5x STS task as rapidly as possible with strict form. Three trials were performed. A 5th generation iPod Touch was firmly attached (Velcro) to a strap around the lower thigh. An eGONI (Biometrics) was placed laterally across the knee joint. The feet were on a force platform (AMTI Accucraft) in front of the chair. Concurrently, iPod gyroscope data (rad), knee joint angle (rad), and ground reaction force (GRF, N) were sampled at 100Hz. The peak slope (0.1s time constant) of the iPod pitch signal, eGONI signal, and GRF was calculated for the rising phase of each rep. The peak GRF was also measured. The instantaneous slope was normalized to body mass to provide an index of power for each rep. For each device, the max, min and max-min across the 20 reps were calculated. Correlations were computed between the devices for all subjects combined. RESULTS: Within individual subjects, across the range of speeds, the iPod values were highly correlated with the eGONI values (all R²>0.97), and the iPod vs. GRF R² values ranged between 0.82 and 0.95. For 3,148 trials pooled across all subjects, the R² was 0.91 for iPod vs. GONI, 0.77 for iPod vs. GRF peak slope, and 0.72 for iPod vs. GRF peak. Across all subjects, the iPod vs. eGONI R² values ranged between 0.80 and 0.88 for max, min, and max-min. The iPod vs. peak GRF slope R² values ranged between 0.24 and 0.34, and between from 0.38 to 0.54 for iPod vs. GRF peak.

**CONCLUSION:** A large range of chair rising speeds can be detected with the iPod. The iPod is an adequate substitute for an electronic goniometer or force platform to assess changes in leg power during an extended sit-to-stand task.

**Smartphones are inexpensive, portable, user-friendly, and can obtain gyroscope information. Apps can be used to sample, store, and wirelessly transmit data. Although each test was conducted, field tests of sit-to-stand (STS) power provide good reliability with crude (timed or counted) outcome measure of physical performance. Expensive lab-based biomechanics equipment is required to obtain measures of leg power (LP) for individual repetitions during brief 5x STS tasks. PURPOSE: To determine the ability of the iPod to detect movement speed for each rep during a 5x STS test, and make comparisons with an electromechanical goniometer (eGONI) and force platform. METHODS: Young adults (22.9 ± 2.9yrs, 21 men, 21 women) performed a 5x STS task as rapidly as possible with strict form. Three trials were performed. A 5th generation iPod Touch was firmly attached (Velcro) to a strap around the lower thigh. An eGONI (Biometrics) was placed laterally across the knee joint. The feet were on a force platform (AMTI Accucraft) in front of the chair. Concurrently, iPod gyroscope data (rad), knee joint angle (rad), and ground reaction force (GRF, N) were sampled at 100Hz. The peak slope (0.1s time constant) of the iPod pitch signal, eGONI signal, and GRF was calculated for the rising phase of each rep. The peak GRF was also measured. The instantaneous slope was normalized to body mass to provide an index of power for each rep. For each device, the max, min and max-min across the 20 reps were calculated. Correlations were computed between the devices for all subjects combined. RESULTS: Within individual subjects, across the range of speeds, the iPod values were highly correlated with the eGONI values (all R²>0.97), and the iPod vs. GRF R² values ranged between 0.82 and 0.95. For 3,148 trials pooled across all subjects, the R² was 0.91 for iPod vs. GONI, 0.77 for iPod vs. GRF peak slope, and 0.72 for iPod vs. GRF peak. Across all subjects, the iPod vs. eGONI R² values ranged between 0.80 and 0.88 for max, min, and max-min. The iPod vs. peak GRF slope R² values ranged between 0.24 and 0.34, and between from 0.38 to 0.54 for iPod vs. GRF peak.

**CONCLUSION:** A large range of chair rising speeds can be detected with the iPod. The iPod is an adequate substitute for an electronic goniometer or force platform to assess changes in leg power during an extended sit-to-stand task.
on the S2 level. The summation of changed acceleration data was used to represent the balance performance, and the higher value indicated more instability. Data was analyzed with independent t-test with SPSS 20, and statistical significance was set as \( p < 0.05 \).

**Results and discussions:** Significant difference was found between subjects with chronic stroke and healthy adults under four assessment postures: SWS with E/C (stroke 0.040±0.013 vs. healthy 0.032±0.007; 76±0.48, unit: g; FTS with E/O (stroke 0.037±0.013 vs. healthy 0.032±0.006, 76±0.27, unit: g; FTS with E/C (stroke 0.050±0.023 vs. healthy 0.035±0.006, 76±0.00, unit: g; STS with E/C (stroke 0.099±0.075 vs. healthy 0.055±0.017, 76±0.48, unit: g). The result demonstrates that a smartphone with built-in accelerometer can be used to discriminate the different balance performance between subjects with chronic stroke and healthy adults.

**Conclusion:** The study shows that smartphones may be a convenient, easy-to-use and valid tool for balance assessment on subjects with chronic stroke.

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**Methods:**

The relationship between structure and function of the foot may play a role in lower extremity injuries. Three-dimensional scanning techniques of foot structure have recently been developed to automate anatomical foot measurements.

**Purpose:** To assess the reliability of foot morphology measures from a commercially available three-dimensional scanner in a young, female population.

**Results:**

Twelve measurements were calculated: foot length, foot width, heel width, arch height, arch length, ball circumference, waist circumference, instep circumference, heel circumference, ball height, and instep height for both feet. Inter-rater reliability was assessed between two different raters on the same test day. Between day test-retest reliability (intra-rater) was evaluated from three separate scans from the same rater. Intra-class correlation coefficients ICC (2,1) were computed for each measure. Standard error of measurement (SEM) was also calculated for each variable.

**Results:**

Between day test-retest reliability was excellent (ICC range=0.91-0.98) for left and right length and width measures (SEM 1.4±0.7mm). Between day height measures were lower with a range of 0.58-0.88 (SEM 1.6±0.5mm), with toe height exhibiting the lowest reliability, whereas, circumference measures ranged from 0.89-0.96 (SEM 2.7±0.4mm). Within day test-retest reliability was generally greater than between day reliability (range 0.75-0.99). Inter-rater reliability of height and width measures exhibited a range of 0.94-0.99 (SEM 1.1±0.5mm). The range of inter-rater reliability for height measures was 0.63-0.89 (SEM 1.7±0.5mm) and circumference measures were 0.90-0.97 (SEM 2.6±0.3mm).

**Conclusion:** The results indicate that height, width and circumference reliability were excellent for inter-rater, intra-rater, and within day test-retest. While generally acceptable, future work should investigate the lower reliability for height measures.

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**Methods:**

Subjects were recruited for this study over the course of two visits, foot-tapping speed for each leg was measured using the FTT. During each visit, the number of foot taps performed in 10 seconds was recorded for each leg, including 4 seconds per leg per subject over the course of two days. Each trial was video recorded and slowed down at varying speeds so as to allow each of the three raters to easily distinguish and count the individual foot taps, creating a total of 216 individual leg-test counts for analysis. **Results:** The FTT was found to have high inter-test reliability (Cronbach’s Alpha = 0.971) and immediate test-retest reliability (Pearson R Correlation = 0.918).

**Discussion:** This study indicates that the FTT exhibits high test-retest and inter-rater reliability using video analysis. However, going forward, more research must be done on the reliability of the FTT using “live” counting, across the many apparent variations in test administration methods, and of course within a larger and more diverse group of subjects.

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**Methods:**

A smartphone with built-in accelerometer can be used to discriminate the different balance performance between subjects with chronic stroke and healthy adults. Under the ROC Curve (AUC) analysis. The proprioceptive scores on the two occasions were used to calculate a reliability ICC (3, 1). A paired-sample t-test was used to examine test-retest differences. To evaluate test validity, Pearson’s correlations were calculated between scores of hip AMEDA and Step Test (ST) and 10 Meter Walk Test (10MWT).

**Results:** The ICC (3, 1) was 0.61 and there was no significant difference between the two occasions of testing (\( p = 0.18 \)). Both the left and right hip proprioceptive scores were significantly correlated with ST results (\( r = 0.52 \) and 0.45, both \( p < 0.05 \)). Only right hip proprioceptive scores were correlated significantly with the Comfortable and Fast forms of the 10MWT (\( r = 0.46 \) and -0.44, both \( p < 0.05 \)). Proprioceptive scores for the right and left hips were significantly correlated (\( r = 0.73, p<0.001 \)).

**Conclusions:** The novel hip sway AMEDA test showed an acceptable reliability for the measurement of hip proprioception in older people. The hip proprioceptive scores obtained showed a significant relationship with functional performance. These findings have implications for rehabilitation intervention during aging.

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**Purpose:** The ability to produce and sustain rapid and repetitive movements is a vital aspect of almost any act of daily living (ADL). Without such ability, seemingly simple tasks such as walking would be all but impossible. Though commonly overlooked, the ability to rapidly and repetitively dorsiflex and plantar flex the foot is a crucial constituent of proper gait. So to that end, researchers have identified a means of assessing a person’s ability to rapidly and repetitively dorsiflex and plantar flex the foot known as the 10-second foot-tapping test (FTT). Using the FTT, researchers have demonstrated that there is a marked decrease in foot tapping speed in clinical populations; e.g. multiple sclerosis, amyotrophic lateral sclerosis, cervical myelopathy, and Parkinson’s disease; as well as degradations with age regardless of disease. It is hypothesized that this decline in foot tap tapping speed is attributed to changes taking place in the motor neurons responsible for the contraction of the muscles of the lower limbs. Despite showing a diminished foot tapping speed with disease and age, very little is known about the reliability of the FTT. **Purpose:** Therefore, the purpose of this study was to evaluate the test-retest reliability and inter rater reliability measures of the FTT using video playback of the test. **Methods:** Nine subjects were recruited for this study. Over the course of two visits, foot-tapping speed for each leg was measured using the FTT. During each visit the number of foot taps performed in 10 seconds was tested twice for each leg, yielding 4 tests per leg per subject over the course of two days. Each trial was video recorded and slowed down at varying speeds so as to allow each of the three raters to easily distinguish and count the individual foot taps, creating a total of 216 individual leg-test counts for analysis. **Results:** The FTT was found to have high inter-test reliability (Cronbach’s Alpha = 0.971) and immediate test-retest reliability (Pearson R Correlation = 0.918).

**Discussion:** This study indicates that the FTT exhibits high test-retest and inter-rater reliability using video analysis. However, going forward, more research must be done on the reliability of the FTT using “live” counting, across the many apparent variations in test administration methods, and of course within a larger and more diverse group of subjects.
RMS value, between average mBESS score and diagnosis with a concussion, and between average RMS value and diagnosis with a concussion. RESULTS: The overall mean RMS value was 1.92±2.10 m²/s while subjects (n=43) committed a mean of 1.20±0.88 balance errors during BESS testing on a firm surface. The coefficient of determination between calculated means of RMS and total mBESS score for the subject pool was modest, however trended towards significant ($R^2=0.08$, $p<0.05$). The coefficient of determination between mean total BESS score and a positive concussion diagnosis was insignificant ($R^2=0.002$, $p>0.05$). A weak and inverse relationship was found between calculated mean RMS and positive diagnosis with a concussion compared to healthy controls ($R^2=0.009$, $p<0.05$). CONCLUSION: While our results did not show a strong correlation between mBESS score and the Opal’s measurement of postural stability, there was a trend toward statistical significance that may be influenced by sample size. This is promising given previously established validity and reliability values of the APDM, especially when using only a single sensor.

Multiple assessment methods exist to identify postural control deficits in both healthy and pathological populations. Though force platform technology is frequently used and validated in quiet stance conditions, few studies have explored the reliability of dual task assessments. Additionally, few studies have utilized non-linear metrics derived from ground reaction forces to determine differences in dual task conditions. PURPOSE: The purpose of this study was to determine test-retest reliability of three different postural control assessments using both linear and nonlinear methodology. METHODS: 24 healthy participants (3 male, 21 female, age 20.38 ± 1.46) attended a single testing session once a week for four weeks. Participants completed three trials of eyes open (EC) and eyes closed quiet standing (EO) and a sport-like postural task, the Wii Fit Soccer Heading Game (WFS). Raw Center of Pressure (CoP) was collected using a force platform (1000Hz) and further analyzed. 95% Confidence Ellipse (CE), along with Peak Excursion Velocity (PEV), and Sample Entropy (SampEn) in anteroposterior (AP) and mediolateral (ML) directions was calculated from the data. Test-retest reliability was assessed using multiple repeated-measures ANOVA for each CoP variable across each time point (Time 1, Time 2, Time 3, Time 4). RESULTS: Significant differences were observed in 95% CE in EO (p = 0.016) and EC (p = 0.032) conditions. However, post hoc assessments determined no significant differences between time points 1, 2, 3, or 4. No significant differences were observed for EC PEV in the AP ($p = 0.211$) and ML ($p = 0.403$) directions, EO in the AP ($p = 0.340$) and ML ($p = 0.239$) directions; and WFS in the AP ($p = 0.961$) and ML ($p = 0.122$) directions across time. No significant differences were observed for EC SampEn in the AP ($p = 0.961$) and ML ($p = 0.030$) directions or EO in the AP ($p = 0.434$) and ML ($p = 0.150$) directions. CONCLUSIONS: Results indicate that the postural assessment metrics used for EO, EC, and the WFS conditions are a reliable measure across multiple weeks and do not indicate significant variability or a learning effect over time. Use of both linear and non-linear CoP measurements such as SampEn, PEV, and 95% CE show to be reliable over multiple time points, and thus should be taken into consideration for future studies utilizing postural control assessment.

Excessive foot mobility has been identified as a risk factor for overuse injuries in runners. Existing tools used to assess foot mobility either lack reliability, correlation with dynamic foot function, or require a significant amount of experience to use reliably. PURPOSE: To develop a clinical tool that can be used by novice clinicians with dynamic foot function, or require a significant amount of experience to use. METHODS: A novice clinician (less than one year of experience) performed a clinical test on 10 healthy subjects (10 F, ages 21 ± 1.83, BMI 21.78 ± 3.01) with no prior lower extremity injuries. RESULTS: While our results have not been tested or compared to see if stability range limits can be improved through training, these tools could be used to screen individuals who require foot neuromuscular control training for injury prevention and rehabilitation.

CONCLUSION: The seated trunk control test shows good to excellent within and between day reliability for both the number of errors and time to the first error. Furthermore, there were minimal differences between trials, indicating that after the practice trials, there was no additional learning, yielding stable consistent results. These results indicate that the test is a reliable assessment of trunk neuromuscular control. Having established the tests reliability, subsequent studies should assess its ability to differentiate injured versus non-injured individuals.

Methods. Currently, many commercial products or methods are being marketed for being the best way to improve overall balance and stability. Several of these products have not been tested or compared to see if stability range limits can be improved within a five week session by using these devices.

Purpose: The purpose of this study was to compare if commercial balance methods can improve Limit of Stability (LOS) in healthy adult participants.

Methods: A 4 group pre-test/post-test non-equivalent control group design was selected for the protocol. Subjects were grouped into 4 categories, Bossa Balance Trainer (BBT), Slack-line Device (SLD), Vinyasa Yoga (VG) and Control Group (CG). All subjects (n = 148) were assessed pre and post via computerized posturography (Bertec, Inc. Columbus, OH). LOS was determined of right lateral and anterior/posterior planes. The experimental groups (BBT, SLD, VY) practiced their skills twice a week for at least 30 minutes for 5 straight weeks. A 4 x 2 multivariate MANOVA was used to determine any significance ($p < 0.05$) within subjects and between groups.
Results: Significance was observed in the frontal (p = .036) and right sagittal planes (p = .034) within the experimental groups. VY was significantly higher in the frontal plane (SD = 3.07 ± 1.90) than MBT (SD = 2.63 ± 1.62) and SL (SD = 1.97 ± 0.34). However, SLD was significantly higher in the right sagittal plane (SD = 4.16 ± .72) compared to VY (SD = 3.57 ± 5.4) and MBT (SD = 3.31 ± .46). Post-hoc power scores demonstrated a value of 1.0 with regards to effect between subjects (group) and within subjects (time/time * group).

Conclusion: Commercial balance methods can contribute to increasing Limit of Stability (LoS) scores in healthy adults. However, there is not a definitive program or device that increases LoS in all planes, based upon the results of this study.

Reduction in balance has been identified as an indicator of risk of fall, and thus, an accurate and cost effective balance assessment tool is essential for prescribing effective postural control strategies. PURPOSE: To establish the validity of the Microsoft Xbox Kinect (Kinect v2) in assessing the whole body center of mass (CoM) excursion and velocity during single leg balance and voluntary ankle sway tasks among young and elderly subjects. METHODS: Twenty subjects (10 young: age = 20.5 ± 2.3 years, Height = 171.8 ± 7.2 cm, Weight = 70.7 ± 11.6 kg; 10 elderly: age = 70.6 ± 9.5 years, Height = 169.1 ± 8.7 cm, Weight = 74.0 ± 17.8 kg), with no history of lower extremity injury, participated in this study. Subjects performed a total of six randomized trials; four single leg stand (SLS) and two ankle sway trials. A comparison between the balance outcome measures (anteroposterior (AP) and mediolateral (ML) CoM excursion and velocity and average sway length) from the Kinect v2 and a traditional three-dimensional motion analysis (3DMA) system was performed. RESULTS: Results from the SLS and voluntary ankle sway trials showed consistency, agreement, and correlation between systems was excellent (ICC > 0.75) for all CoM related variables when all subjects were considered a single group as well as when the elderly and young groups were analyzed. Concordance between systems ranged from poor to almost perfect depending on the group, task, and variable assessed. CONCLUSION: This new technique, using a low cost motion analysis technology, may enable real time, objective assessments of balance parameters in the clinical and research environments, which represents a clear advancement in clinical balance assessment and home-based rehabilitation programs.

The Star Excursion Balance Test (SEBT) is a simple clinical assessment of dynamic balance that is commonly used as a measure of performance and injury risk among healthy and injured populations. Continued efforts to improve the sensitivity and repeatability of the SEBT, while maintaining the relative ease with which the SEBT can be implemented, may aid clinicians in utilizing the SEBT as an evaluative tool in patients with suspected balance deficits. To date, there is no study examining the use of the Microsoft Kinect on assessing the SEBT reach distance measures. Purpose: To establish the validity and reliability of the Xbox One Kinect (Kinect v2) to automatically assess the SEBT reach data in all eight directions. Methods: A total of twelve female subjects (5 males and 5 females; age: 26.8 ± 5.7 years; height: 174.2 ± 8.3 cm; weight: 73.5 ± 10.8 kg) participated in this single session observational research study. The reach distances in the eight different directions of the SEBT were measured concurrently from the Kinect v2 and a traditional three-dimensional motion analysis system (3DMA) system. Results: The maximum SEBT reach distance difference between the Kinect and a traditional motion analysis system (BTS) was 2.01 cm, while the minimum difference obtained was 0.86 cm. The maximum ICC difference between the two systems was 0.01 and the maximum difference in CV was 1.7%, indicating that the Kinect is able to provide similar absolute and relative reliability compared to the BTS. Additionally, Pearson’s correlation coefficient showed high agreements between the Kinect and the BTS (r = 0.97) in all directions of the SEBT. Conclusion: The performance of the Kinect was comparable to that of the BTS in determining the trajectories of the subject’s landmarks and thus the reach distance values during complex dynamic tests such as the SEBT.

Results from the SLS and voluntary ankle sway trials showed that consistency, agreement, and correlation between systems was excellent (ICC > 0.75) for all CoM-related variables when all subjects were considered a single group as well as when the elderly and young groups were analyzed. Concordance between systems ranged from poor to almost perfect depending on the group, task, and variable assessed. CONCLUSION: This new technique, using a low cost motion analysis technology, may enable real time, objective assessments of balance parameters in the clinical and research environments, which represents a clear advancement in clinical balance assessment and home-based rehabilitation programs.

Assessment of lower extremity loading during running is often completed either overground or on an instrumented treadmill in a biomechanics lab. A new product has been developed to allow for the assessment of plantar loading on an iPod using Bluetooth, which could allow for the assessment of running in an outdoor setting. PURPOSE: To validate a single sensor in-shoe force insole (pedoped, Novel Electronics, St. Paul, MN) against a force plate during various running conditions. METHODS: The study included 12 subjects (age 25.3 ± 4.2, height 68.7 ± 4.1 cm, weight 75.8 ± 17.9 N) each fitted with a pair of pedoped insoles (100Hz) and a pair of New Balance shoes. Each subject completed a 20 second running trial for 6 different conditions on an instrumented treadmill (1200 Hz). These conditions include running at a 9, 10 and 11 min/mi pace, running uphill at 10 min/mi, running with an exaggerated heel strike and a wide gait pattern at 11 min/mi (R9, R10, R11, RU, RHS, and RW respectively). A Matlab program was created to calculate peak vertical ground reaction forces (vGRF), loading rate (LR), and impulse (I) for each step. The interclass correlation (ICC 3,k) comparing the pedoped insoles with the force plate was calculated in SPSS. The ranges used for the ICC are: fair 0.40-0.59, good 0.60-0.74, and excellent 0.75-1.00. RESULTS: The average peak vGRF, LR and I are presented in Table 1 along with the specific ICC values. For the vGRF the ICC values are considered excellent (0.81-0.91), LR ICC values are good to excellent (0.74-0.95), and I ICC values are excellent (0.84-0.91). CONCLUSIONS: Loading differences between the pedoped and force plate could result from differences in measurement location. These results indicate that these single sensor wireless insoles (pedoped) are a valid alternative to assessing lower extremity loading parameters during running allowing researchers to expand testing to a variety of settings outside of the lab.
regarding the impact of travel prior to competition is available to inform medical staff practice, however such data has not be collected from elite Paralympic athletes. This seems a considerable oversight given the unique challenges these athletes face with respect to travel and sleep.

**PURPOSE:** To investigate the impact of long compared to short haul travel on sleep, jet-lag, mood and performance in a group of elite Paralympic athletes prior to and during competition.

**METHODS:** For 19 consecutive days, including baseline (12 days), travel (1 day) and competition (6 days), objective measures of sleep and subjective measures of jet-lag, vigour, fatigue, and performance were assessed in 11 elite wheelchair basketball players using wrist actigraphy and self-report questionnaires, respectively. International travel to the World Championships (Manchester, United Kingdom [4 games over 6 days, commencing 2 days post arrival]) from various destinations was categorized into either LONG (6-11 h time-zone change) and SHORT (n=5; less than 2 h time-zone change). Linear mixed models, standardised effect sizes (ES) and magnitude-based inferences were used to analyse the data.

**RESULTS:** There was no substantial influence of travel group (LONG vs. SHORT) on sleep quantity and quality, or subjective responses. However, for all players combined the mean subjective sleep quality and quantity during baseline was below National Sleep Foundation needs, with a further likely small (ES = 0.36 ± 0.25) reduction during competition (6.7 ± 1.4 h vs. 6.3 ± 1.6 h, p=0.02). Increased vigour was associated with a likely moderate increase in subjective performance rating during competition (ES = 0.33 ± 0.26).

**CONCLUSIONS:** This group of Paralympic athletes did not obtain sufficient habitual sleep at home, with travel, regardless of the number of time-zones crossed, and/or competition further reducing sleep quantity. Individualised strategies to increase sleep quantity prior to and particularly following travel would therefore be recommended for this specific group of athletes.

**Evidence suggests that adults with an intellectual disability (ID) who have asthma worry about side-effects of using medications and do not like using their inhalers in public due to stigma. This is problematic, particularly for coaches.**

**Purpose:** To determine whether Special Olympics coaches know how to manage their athlete’s asthma effectively.

**Methods:** Coaches were asked to complete a short survey anonymously while attending training camp with their athletes. The survey consisted of 11 true or false statements regarding asthma, three questions on symptoms, triggers, and preventive techniques, and six yes/no questions on their athletes asthma status, their comfort and confidence in dealing with an athlete having an attack, and their emergency action plan (related to asthma). Twenty seven coaches completed the questionnaire.

**Results:** On average, coaches got 3.9 ± 1.6 of the true/false statements correct. However, they generally identified correct triggers, symptoms and preventive techniques. Less than half of the coaches felt confident dealing with an asthma attack if their athlete had one while playing their sport. Only 5 coaches had received training to prepare them for working with an athlete with asthma and only 9 guidelines, with a further likely small (ES = 0.36 ± 0.25) reduction during competition (6.7 ± 1.4 h vs. 6.3 ± 1.6 h, p=0.02). Increased vigour was associated with a likely moderate increase in subjective performance rating during competition (ES = 0.33 ± 0.26).

**Conclusion:** Special Olympics coaches need to be more informed about asthma management and improving this knowledge is an important step in improving the quality of care for athletes with this condition.
group (CG) with 10 women. The resistance training protocol was applied three times a week engaging muscle groups between superior and inferior muscles. The exercises performed to superior muscles were the Pulley, Peck-Deck, Triceps Fly, Hammer and Side Lateral Raise and the exercises to the inferior muscles were the Abductor, Adductor, Extension Chair, Flexor Bench, and Leg press 90°. Flexibility was tested using a Well’s Bench where the participant performed 3 attempts and the best score was recorded. The dynamic balance was analyzed using a circuit that was performed before and after the intervention beginning and at the end of 12 weeks. Following the prescriptions proposed by Rikli & Jones, the coordination test was performed using a complex task mixed with a circuit. Results: The strength in superior limbs statistically improved between CG and IG (11.40 ± 2.87 vs 19.50 ± 1.52) with similar results with the inferior limbs strength (14.90 ± 3.10 vs 26.56 ± 3.17, p<0.001). Regarding dynamic balance, the IG presents a decrease in the time to complete to task compared to the CG (14.62 ± 8.38 min vs 12.71 ± 6.24, p<0.05). There are no differences in the coordination between CG and IG. Conclusion: The main conclusion of this manuscript brings a new paradigm to the training methods used in elderly populations. The benefits related to the strength development using resistance training are in accordance with the present literature, however, in opposition to the present literature, we found that resistance training is effective in developing dynamic balance. Dynamic balance is fundamental in avoiding falls, which are one of the most common injuries in the elderly population. Therefore, it is fundamental that elderly people work to develop health and wellness by incorporating resistance training as a strategy to develop strength and balance.

1144 Board #323 May 31 3:30 PM - 5:00 PM Maximizing Respiratory Health In Elite Swimmers - A Systematic Approach To Optimize Total Airway Health
James H. Hull1, Anna R. Jackson1, James G. Hopker2, Jon Greenwell1, John W. Dickinson3, 1Royal Brompton Hospital, London, United Kingdom. 2University of Kent, Chatham, United Kingdom. 3British Swimming, Loughborough, United Kingdom. (No relationships reported)

Elite Swimmers are known to have high prevalence of exercise induced bronchoconstriction (EIB), nasal and sinus disorders. There is however limited data available regarding the impact of a systematic assessment, addressing all aspects of respiratory health in elite swimmers with EIB, prior to the 2016 Olympics. METHODS: 15 elite swimmers (9 males, 6 females), age 22.2 ± 2.9 yrs underwent a systematic assessment of total airway health three months prior to the Olympics. All swimmers had a prior diagnosis of EIB, confirmed by indirect bronchoprovocation tests and are presented as mean ± SD. Results: Of the swimmers, 12 reported troublesome respiratory and allied symptoms. Moreover, inhaler use of glucocorticoids had increased by 12.9 ± 7.7 % above baseline. At the review FeNO was reduced (pre: 27.7 ± 15.1, post: 16.3 ± 6.5 ppb) (p = 0.006) from baseline. CONCLUSION: Despite being prescribed EIB treatment over half of an elite cohort of swimmers reported troublesome respiratory and allied symptoms. Moreover, inhaler technique was sub-optimal with frequent report of side-effects. Respiratory health in elite swimmers can be optimized through systematic assessment of airway health.

1145 Board #324 May 31 3:30 PM - 5:00 PM Venous Thromboemboli Associated with Acute Aerobic Exercise: A Review of Case-Report Commonalities
Paul M. Parducci1, Amanda L. Zaleski1, Gregory A. Panza2, Linda S. Pescatello, FACSM1, Paul D. Thompson, FACSM2, Beth A. Taylor1. 1University of Connecticut, Storrs, CT. 2Hartford Hospital, Hartford, CT. (Sponsor: The Hartford Foundation)

Venous thromboembolic (VTE) events (deep vein thrombosis (DVT) and pulmonary embolism (PE)), have been reported in otherwise healthy athletes following acute bouts of aerobic exercise. PURPOSE: To review case reports and assess the commonalities of athletic individuals diagnosed with VTE, as well as the return-to-play recommendations prescribed by their physicians. METHODS: We reviewed reports (n=14) of trained individuals (mean±sd; age 30.9 ± 15.3; F:M = 8/6) who were diagnosed with DVT and/or PE following a bout of aerobic exercise. We assessed frequency of VTE risk factors, symptoms with which patients presented, and return-to-play recommendations prescribed by clinicians. Results: Comparisons between the male and female groups were assessed by a one-way ANOVA. RESULTS: Of the 14 cases of diagnosed VTE reported in healthy trained athletes, seven patients (50%) were diagnosed with PE, four (28.6%) with DVT, and three (21.4%) with both DVT and PE after a bout of vigorous exercise (11.7±3.0 METs). Female patients were on average younger than males (22.3±8.6 vs 41.8±17.7, p<0.014) The most frequent reported commonality was the presentation of symptoms after a period of prolonged inactivity (> 1 hour) following an aerobic exercise bout, seen in nine (64%) individuals. Additionally, seven (87.5%) of the eight women were oral contraceptive (OC) users. Only two (12.3%) individuals were diagnosed with an inherited clotting disorder. Five cases (35.7%) did not report return-to-play recommendations, and in those that did, the recommendations varied widely, ranging from a period of physical inactivity, to restrictions on physical activity and wearing compression garments. CONCLUSIONS: Female athletes presenting with VTE were significantly younger than male athletes, and most were using OCs, suggesting that the mechanisms underlying VTE may differ in men vs. women. Moreover, the frequency with which a period of inactivity preceded VTE also supports the possibility that aerobic exercise in combination with other risk factors can exacerbate VTE independent of underlying preexistent coagulatory disease. This information may help clinicians better prevent, diagnose and treat VTE in athletic patients and also highlights the need for better defined return-to-play guidelines for athletes following VTE.

1146 Board #325 May 31 3:30 PM - 5:00 PM L-glutamine Enhances Plasma Glutamine And Maintains Concentrations Of Alanine And Arginine Following High Intensity Cycling
Zachary S. Clayton1, Ari Hozman1, Brittany Braden2, Mark Kern2. 1University of Oregon, Eugene, OR. 2San Diego State University, San Diego, CA.

Email: zclayton@uoregon.edu (No relationships reported)

Glutamine is a naturally occurring nonessential, gluconogenic amino acid. Prolonged exercise is associated with a decrease in intramuscular and plasma concentrations of glutamine, which may be linked to performance decrements. Thus, we hypothesized that exogenous glutamine supplementation would preserve the plasma glutamine pool following high intensity cycling, as well as improve performance in a repeated bout of cycling. Two solutions [61 g glucose polymer (PLC); 61 g glucose polymer and 0.3 g.kg-bodyweight L-glutamine (GLN)] were tested using a double-blind randomized, cross-over design. During each trial, ten cyclists ingested one liter of test solution immediately following an initial exercise bout (30 min at 70% VO2 max, 6 x 1 min sprints at 140% VO2 max, 45 min at 70% VO2 max) and recovered for two hours in a seated position. Immediately following the recovery period, subjects completed a time to exhaustion (cycle at 80% VO2 max, 90% HR max, 100 RPM) test. Blood was collected immediately following the initial exercise bout, after 2 h recovery, and immediately following the time to exhaustion test. Glutamine concentration was increased (p = 0.05) by approximately twofold (676±126 to 1410±636 µmol/L) from baseline to the completion of recovery for GLN, while no difference was detected in the PLC trial. At the end of recovery, GLN maintained alanine and arginine concentrations while these amino acids were reduced in the PLC trial. However, the increased concentration of plasma glutamine and maintained concentrations of alanine and arginine did not influence performance (GLN: 20.98±10.35; PLC: 21.5±8.53 min).

1147 Board #326 May 31 3:30 PM - 5:00 PM The Influence of Exercise Volume on Cardiorespiratory Fitness and Cardiovascular Disease Risk Factors
Thomas Burke, Kelsie Ostojeic, Nicole Koontz, Leonard A. Kaminsky, FACSM, Matthew Harber, FACSM. Ball State University, Muncie, IN. (Sponsor: Dr. Matthew Harber, FACSM)

(No relationships reported)

Purpose: To investigate the relationship of total exercise volume in relation to the American College of Sports Medicine (ACSM) aerobic exercise guidelines on improving cardiovascular disease (CVD) risk factors and cardiorespiratory fitness (CRF). METHODS: Ninety-two individuals (57:01:11 (28-79) years; 41% male, 59% female) in a self-referee exercise program completed a CVD risk factor assessment, body composition (IDXA), and maximal exercise testing pre- and post- 6 months of participation. All were provided an individualized exercise prescription based on ACSM aerobic exercise guidelines. Exercise volume (frequency, intensity, and duration) was recorded daily and subjects were stratified into three groups (HIGH, MODERATE, LOW) based on the total volume performed. A 2 x 3 (gender x time) ANOVA with repeated measures on time was performed to assess differences between groups for resting hemodynamics, blood lipids, body composition, and CRF. Correlation analyses were used to examine the relationship between exercise volume,
CVD risk factors, and CRF. **Results:** Exercise volume was higher (p<0.05) in HIGH compared to MODERATE and LOW, and MODERATE was higher (p<0.05) than LOW. A main effect of exercise volume was found for hemoglobin, systolic diastolic blood pressure, total cholesterol, triglycerides, LDL, body weight, waist circumference, BMI, CRF, body fat composition, and lean mass, independent of group. Exercise volume was correlated (p<0.05) with markers of aerobic fitness; resting heart rate (r=-0.236) and CRF (r=0.286). Improved plasma lipid profile was (p<0.05) correlated with exercise volume; total cholesterol (r=-0.287), LDL (r=-0.222), glucose (r=-0.247). Additionally, exercise volume was significantly correlated with markers of body composition, mainly fat distribution; body weight (r=0.369), body mass index (r=0.356), fat mass (r=0.417). **Conclusion:** Participation in a self-referred exercise program improves CRF and CVD risk factors regardless of exercise volume. Correlations between exercise volume and CVD risk factors (e.g. blood lipids, body composition) suggest a dose response relationship. Randomized control trials are warranted to assess the impact of exercise volume on CVD risk factors.

**B-77 Free Communication/Poster - Nutrition and Health**

**Wednesday, May 31, 2017: 1:00 PM - 6:00 PM**
**Room: Hall F**

**1148 Board #327**
May 31 2:00 PM - 3:30 PM
**Assessing Urine Concentration in Children by Combining Urine Color and Void Number**
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**Purpose:** To evaluate the diagnostic ability of two combined practical markers for high urine concentration in children. **Methods:** Twenty-four hour urine samples from 210 Greek children (age: 8-14 y, body mass: 43.4±12.6 kg, height: 1.49±0.13 m, girls: 105) were collected and analyzed for urine osmolality (UOsm), color (UC), and the number of voids (Void). Receiver Operating Characteristic (ROC) analysis was performed for UC, Void, and combination of UC and Void to determine markers' diagnostic ability for detecting high urine osmolality (UOsm> 800 mmol·kg⁻¹). **Results:** Sixty-four out of the 210 children (30%) had UOsm greater than 800 mmol·kg⁻¹, with mean UOsm, Void, and Void of 686±232 mmol·kg⁻¹, 3±1, and 6±2, respectively. UC displayed an overall diagnostic accuracy (area under the curve, AUC) of 90% (adjusted for gender, age and body mass index) with 98.4% sensitivity, 59.6% specificity, and threshold of 9 times per day. When combined ROC analysis was performed for UC & Void, the AUC was significantly increased from 73.7% (adjusted for age and gender) with 51% sensitivity, specificity of 61% and threshold of 0.3, respectively, to an overall diagnostic accuracy of 90% (adjusted for gender, age and body mass index) with 95% sensitivity, specificity of 92% and threshold of 2. **Conclusion:** Both urine color alone and the combination of urine color assessment and void count can be used as valid and simple diagnostic measures to detect high urine concentration.

**Grant Funding Info:** Funding provided by Danone Research.

**1149 Board #328**
May 31 2:00 PM - 3:30 PM
**A First Morning Spot Sample Overestimates 24-Hour Urine Osmolality in Children and Adults**
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**Reported Relationships:** A.D. Seal: Consulting Fee; Quest Diagnostics. Contracted Research - Including Principle Investigator; Danone Research.

Hydration is frequently assessed using the concentration of single spot urine samples collected from first morning urine. However, circadian variations and overnight fasting (i.e., during sleep) likely affect morning urine concentration. Twenty-four-hour urine samples provide a more complete view of daily hydration, but collection is time-consuming and is difficult to manage, particularly in studies involving children. The degree to which first morning urine overestimates 24-h urine concentration has been characterized in adults, but less in children. **PURPOSE:** To evaluate the diagnostic accuracy of first morning urine concentration to accurately identify children and adults with high 24-h urine concentration (>800 mmol·kg⁻¹). **METHODS:** Hydration was assessed via total urine osmolality (UOsm) in a total of 210 children (age: 8-14 years, body mass: 43.4±12.6 kg, height: 1.49±0.13 m, girls: 105) and 82 adults (age: 23.6±2.9 y, body mass: 65.8±8.1 kg, height: 1.72±0.76 m, women: 41). Data collection included both a full 24-h collection (UOsm_24) as well as the associated first morning spot urine sample (UOsm_AM). The diagnostic accuracy of UOsm_AM to identify UOsm_24 > 800 mmol·kg⁻¹ was evaluated using receiver operating characteristic (ROC) analysis in children and adults separately. **RESULTS:** Mean UOsm in children and adults, respectively, were as follows: UOsm_AM: 780±235 and 782±244 mmol·kg⁻¹; UOsm_24: 686±223 and 567±214 mmol·kg⁻¹. ROC analysis for UOsm_AM for detecting UOsm_24 > 800 in children yielded an area under the curve (AUC) of 82.3% with sensitivity, specificity, and threshold values of 53.1%, 95.2%, and 1009 mmol·kg⁻¹, respectively. In adults, the AUC was 89.0%, with sensitivity, specificity, and threshold values of 87.1%, 96.0%, and 999 mmol·kg⁻¹, respectively. **CONCLUSIONS:** Urine osmolality measured with a first morning spot sample overestimates 24-h urine osmolality in both children and adults. This is in line with previous research in adults suggesting that spot urine samples only reach equivalence with 24-h urine osmolality in the early to late afternoon. Similar research needs to be performed in children. Funding provided by Danone Research.
supplementation, and sun exposure. Descriptive statistics, student and paired t-tests, repeated measures, one- and two-way ANOVAs were used to detect differences in vitamin D levels across groups and within and between groups. SSPS v 23 was used. Significance was set at p<0.05.

RESULTS: In total, 284 (48.6%) of all subjects were at risk for vitamin D deficiency (<20 ng/mL). There was a significant (p<0.05) difference for total kilocalories (kcals) consumed, with the Low group consuming significantly fewer kcals compared to the Adequate group (Low: 960 ± 215 kcals; Med-Low: 1080 ± 265 kcals; Adequate: 1280 ± 250 kcals). There was a significant (p<0.05) difference for grams of carbohydrate between menu (55.3 ± 18.9g) and served (56.5 ± 20.5g) compared to what was consumed (38.5 ± 21.7g).

CONCLUSION: There was a significant (p<0.05) difference for total kilocalories (kcals) between menu (448 ± 130), served (522 ± 148) and consumed (461 ± 207). There was also a significant (p<0.05) difference for grams of carbohydrate between menu (55.3 ± 18.9g) and served (56.5 ± 20.5g) compared to what was consumed (38.5 ± 21.7g). There was a significant (p<0.05) difference for grams of fat between menu (16.0 ± 7.5g) and served (17.0 ± 7.2g), and between menu (16.0 ± 7.5g) and consumed (14.0 ± 6.3g).

Board #334 May 31 2:00 PM - 3:30 PM
Dietary Guidelines For Americans: Comparing Menus To What Is Served And Consumed In Preschool Children
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(No relationships reported)

Preschool menus must meet the Dietary Guidelines for Americans however, what is actually served and consumed by children is not restricted, potentially affecting consumption of a balanced diet. PURPOSE: Compare preschool menus that meet dietary guidelines to what is actually served and consumed by children.

METHODS: Fifty-two preschool children (mean±SD, age 3y and 10m ± 8m) from a university early childhood center participated in the 10-week study. Each day, 15 children were randomly selected for nutritional analysis of their lunch. Prior to and immediately after consumption, a picture of the child’s tray was taken using digital photography. A child had additional food (second serving), additional pictures were taken. Analysis of energy and nutrient content for menus, food served, and food consumed was completed using Food Processor Nutrition Analysis by ESHA. Food color (white, brown, orange, yellow, red, green, other) was determined by observation during analysis. A food preference survey was administered orally to children immediately after each meal.

RESULTS: There was a significant (p<0.05) difference for total kilocalories (kcals) between menu (448 ± 130), served (522 ± 148) and consumed (461 ± 207). There was also a significant (p<0.05) difference for grams of carbohydrate between menu (55.3 ± 18.9g) and served (56.5 ± 20.5g) compared to what was consumed (38.5 ± 21.7g). There was a significant (p<0.05) difference for grams of fat between menu (16.0 ± 7.5g) and served (17.0 ± 7.2g), and between menu (16.0 ± 7.5g) and consumed (14.0 ± 6.3g).
8.7g, served (21.2 ± 9.7g) and consumed (14.5 ± 10.9g). There was a significant (p<0.05) difference for protein between menu (21.7 ± 5.7g), served (27.9 ± 10.6g) and consumed (19.5 ± 10.6g). The majority of the protein served was white (38.1%), brown (20.4%), or yellow (14.2%) with minimal green (10.7%), orange (10.2%), or red (6.1%) foods. Children described food as yummy (75.2%), okay (7.6%), and yucky (17.2%). Consumption of vegetables (46.9%) was significantly (p<0.05) lower than dairy (88.9%), fruits (82%), grains (81.8%), and meats (72.8%). Children consumed a high percentage (77.9%) of fats/sweets.

CONCLUSION: The amount of food consumed was significantly less than the menu and served amounts, indicating that children were not following the dietary recommendations as intended, potentially contributing to long-term health consequences.

1156 Board #335 May 31 2:00 PM - 3:30 PM Characterization of Nutritional Intake and Distribution in Pediatric Burn Patients Julianna M. Bores, Victoria G. Rontoyanni, Ileana Gutierrez, David N. Herndon, Craig Porter, Oscar E. Suman, FACSM, UTMB. University of Texas Medical Branch, Galveston, TX. (Sponsor: Oscar E. Suman, FACSM)

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(No relationships reported)

PURPOSE: The hypermetabolic response after a severe burn results in whole body catabolism and calorie deficits leading to malnutrition and losses in lean body mass (LBM). Thus, proper nutrition after a severe burn is essential to recovery. Current practice is to increase nutritional intake by (1.2-1.5 kcal x resting energy expenditure (REE)) and protein (1.5-2.5 g protein/kg/day) to increase LBM. Research in non-burned children has shown that 20-30% of total energy intake is consumed during the main meals. The purpose of this study was to examine the nutritional profile and distribution of substrates in severely burned pediatric outpatients in comparison to non-burned children to further direct recovery efforts to mitigate catabolism and increase LBM.

METHODS: Caregivers of 23 burned children (>30% total body surface area burned) and 7 non-burned children (NB) (21 male, 9 female; 13 burned children and 7 non-burned children. It has been studied that school-age children have access to a diet with a high caloric and sugar content the Nutritionist Pro (v 5.2) program was used. RESULTS: The amount of food consumed was significantly less than the menu and served amounts, indicating that children were not following the dietary recommendations as intended, potentially contributing to long-term health consequences.

1157 Board #336 May 31 2:00 PM - 3:30 PM Consumption Of Sugar-sweetened Beverages By Sex And Weight Status In Children From The Mexico-US Border Luis M. Gómez- Miranda1, Ricardo A. Briones- Villalba1, Melinna Ortiz-Ortiz2, Roberto Espinoza-Gutiérrez2, Iván Rentería1. 1Universidad Autónoma de Baja California, Tijuana, Mexico. 2Universidad Autónoma de Baja California, Ensenada, Baja California, Mexico. (Sponsor: Dr. Laurie Milliken, FACSM)

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(No relationships reported)

It has been studied that school-age children have access to a diet with a high caloric content and low nutritional value, in addition, these population similarly consumes sugar sweetened beverages. The consumption of these beverages is associated with the development of metabolic disease, diabetes, cancer and metabolic syndrome. PURPOSE: To identify the frequency of consumption of sugar sweetened beverages by sex and weight status in children from the Mexico-US border. METHODS: A total of 453 students (235 girls and 218 boys) from 4th to 6th grade of five elementary schools in the city of Tijuana, Baja California, Mexico were measured. Height, weight and BMI was obtained by anthropometry. The questionnaire of beverage consumption (Hedrick et al 2010) was administered, to calculate the calorie and sugar content the Nutritionist Pro (v 5.2) program was used. RESULTS: The prevalence of overweight and obesity was 45%. Thirty two per cent of boys and 22% of girls consumed more than 50 grams per day of sugar from drinks. As revealed by the Mann-Whitney Test, significant differences by sex were observed in the consumption of grams of sugar per day (p = 0.001) and calories from beverages (p = 0.002). Also, the boys reported a higher consumption of kilocalories from sugar sweetened beverages (p = 0.001) and milliliters per day (p = 0.001) than girls. No significant differences of sugar and kilocalories consumption from sugar sweetened beverages among children with normal weight and those who were overweight and obese were found. CONCLUSIONS: This study indicates a high intake of sugar from drinks, which is higher than recommended by WHO. The boys reported a higher consumption of sugar sweetened beverages and kilocalories than girls. The study shows no significant differences in the sugar and kilocalories consumption by weight status.
Social jetlag occurs when there is a mismatch between an individual’s circadian clock and their sleep schedule. Recent research has shown that social jetlag is associated with many health related factors, particularly with overweight and obesity. However, the relationship between social jetlag and cardiorespiratory fitness has not yet been studied, including in adolescents. **PURPOSE:** To investigate the relationship between social jetlag, measured as the difference in hours between the midpoint of sleep on school and non-school days, and cardiorespiratory fitness. **METHODS:** Cardiorespiratory fitness, anthropometric, demographic and dietary data were collected from students aged 15 to 18 years attending secondary schools in Otago, New Zealand. Students completed an online lifestyle survey in one class period. Food choice was assessed using the validated New Zealand Adolescent FFQ and three dietary patterns ("Treat Foods", "Fruits and Vegetables" and "Basic Foods") were generated using principal components analyses. A subset of participants also undertook fitness testing measurements. The primary outcome, cardiorespiratory fitness, was expressed as the maximal oxygen uptake (VO₂ max) and three dietary patterns were determined with Body Mass Index (BMI) Z scores, sex, age, socio-economic status and ethnicity. An interaction between sex and social jetlag was also tested for.

**RESULTS:** Questionnaire, BMI and cardiorespiratory fitness data were available for 279 participants, with a mean (SD) age of 15.7 (0.9) years. Mean (SD) VO₂ max was 34.3 (5.6) ml/kg per min for girls and 48.5 (7.1) ml/kg per min for boys. Mean (SD) social jetlag was 1 hour 53 minutes (1 hour 17 minutes). One-hour increase in social jetlag was associated with a 0.78 ml/kg per min decrease in VO₂ max (CT: -1.39, -0.18). There was no significant interaction between sex and social jetlag.

**CONCLUSIONS:** Social jetlag is a significant correlate of cardiorespiratory fitness in adolescents. Minimising social jetlag may be beneficial to improve physical fitness of adolescents and has the potential to be a simple and measurable goal in lifestyle interventions.

**1160 Board #339**
May 31 2:00 PM - 3:30 PM

**The Relationship between Social Jetlag and Cardiorespiratory Fitness in New Zealand Adolescents**
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**No relationships reported**

An association has been established between total energy intake and cardiorespiratory fitness (CRF) in adolescents; however, there is little research examining dietary components. **PURPOSE:** To determine if an association exists between F/V intake and CRF in adolescents. **METHODS:** A sample of 424 adolescents (234 males and 190 females) age 10-18 years completed the Dietary Behavior section of the Youth Risk Behavior Survey (YRBS) and the FITNESSGRAM 20 meter Pacer Test (PACER). This section of the YRBS assesses F/V intake based on intake frequency over a one week period. Peak oxygen consumption (VO₂ max) was calculated from the PACER results and categorized based on the FITNESSGRAM aerobic standards, placing individuals into one of three categories: Healthy Fitness Zone (HFZ), Needs Improvement (NI), and Needs Improvement – Health Risk (NI-HR). Mean differences in total F/V intake for participants in each of the CRF categories were assessed using a one way ANOVA. **RESULTS:** The mean total F/V intake values (times per week) showed slight differences between each of the categories. For male participants the F/V intake values (ages 10-15) were 8.6 (SD 7.0) for the HFZ, 12.7 (SD 8.1) for the NI, and 20.5 (SD 10.9) for the NI-HR categories. For female participants in the HFZ, NI, and NI-HR categories were 12.2 (SD 7.4), 16.9 (SD 10.9) and 24.9 (SD 12.9) respectively. The mean F/V intake for female participants in the HFZ, NI, and NI-HR categories were 20.9 (SD 16.2), 20.3 (SD 19.6) and 15.9 (SD 9.6) respectively. However, none of these differences were statistically significant (all p>0.05). Average fruit and vegetable intakes were also individually analyzed, but with no significant results (all p>0.05).

**CONCLUSION:** F/V intake does not have a significant association with CRF in adolescents.

**1162 Board #341**
May 31 2:00 PM - 3:30 PM

**Association of Fruit and Vegetable Intake with Cardiorespiratory Fitness in Adolescents**
Jonathan C. Grimwood1, Dale D. Brown, FACSM1, Kelly R. Laurson2, Skip M. Williams3, Mary L. Henninger4, Jennifer L. Barnes5, Dan Phelps6. 1Illinois State University, Normal, IL. 2Hononegah Community High School, Rockton, IL.
No relationships reported

**PURPOSE:** Previous research indicates that energy intake is lower in moderately active when compared to sedentary and highly active individuals. However, relationships between choices of foods varying in energy density and physical activity (PA) remain largely unexplored.

**PURPOSE:** To determine the relationship between habitual PA and dietary factor consumption with high/low energy density in a nationally representative sample.

**METHODS:** Data from the National Health and Nutrition Examination Survey 2009-2010 Dietary Screener Questionnaire were utilized to estimate key dietary factor intake. Participants (n=5,302; age range: 18-69) were divided into quartiles based on PA behavior, defined as moderate- or high-intensity activities for work, recreation and shuttle run test. Multivariate linear regression analyses were undertaken with VO₂ max as the primary outcome. Analyses were adjusted for dietary pattern scores, Body Mass Index (BMI) Z scores, sex, age, socio-economic status and ethnicity. An interaction between sex and social jetlag was also tested for.

**RESULTS:** Questionnaire, BMI and cardiorespiratory fitness data were available for 279 participants, with a mean (SD) age of 15.7 (0.9) years. Mean (SD) VO₂ max was 34.3 (5.6) ml/kg per min for girls and 48.5 (7.1) ml/kg per min for boys. Mean (SD) social jetlag was 1 hour 53 minutes (1 hour 17 minutes). One-hour increase in social jetlag was associated with a 0.78 ml/kg per min decrease in VO₂ max (CT: -1.39, -0.18). There was no significant interaction between sex and social jetlag.

**CONCLUSIONS:** Social jetlag is a significant correlate of cardiorespiratory fitness in adolescents. Minimising social jetlag may be beneficial to improve physical fitness of adolescents and has the potential to be a simple and measurable goal in lifestyle interventions.

**1166 Board #342**
May 31 2:00 PM - 3:30 PM

**Metabolome Analysis Of Sex Differences In Plasma Metabolite Profiles Caused By Acute Resistance Exercise**
Mikako Sakamaki-Sunaga1, Kayoko Kamemoto2, Mizuki Yamada3, Takanobu Okamoto1, 1Nippon Sport Science University, Tokyo, Japan. 2Teikyo University, Tokyo, Japan.
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No relationships reported.

**PURPOSE:** The present study used metabolome analysis to determine sex differences in plasma metabolite profiles caused by acute resistance exercise.

**METHODS:** Six healthy men and six eumenorrheic women (age, 25.7±4.5 and 20.7±1.1 years; height, 169.3±2.0 and 162.9±4.5 cm; weight, 66.6±6.0 and 56.9±6.1 kg, respectively) volunteered to participate in this study. All of them performed three sets of leg extensions at 70% of one repetition maximum (RM) until failure for each set. Blood samples were collected at rest and immediately after exercise from the women in the lateral phase of the menstrual cycle. Blood concentrations of progesterone and 17-β-estradiol in the samples were determined by ELISA, and endogenous metabolites in plasma were estimated using capillary electrophoresis time-of-flight mass spectrometry.

**RESULTS:** Blood concentrations of estradiol and progesterone were significantly lower in men than in women at rest (30.8±9.8 vs. 242.8±95.4 pg/mL, p<0.01 and 7.6±1.2 vs. 11.5±3.0 ng/mL, p<0.05, respectively). Metabolomics analysis indicated that levels of amino acids and glycerol, which are precursors of fatty acids, were significantly lower in men than in women at rest (valine: 232±2 vs. 188±20 µM, p<0.01; leucine: 135±18 vs. 100±9.6 µM, p<0.01; isoleucine: 235±33 vs. 183±23 µM, p<0.01; uridine: 15±2 vs. 10±1.1 µM, p<0.01; methionine: 23±2 vs. 19.4±1 µM, p<0.05;
tryptophan: 61±5.9 vs. 52±6.1 µM, p<0.05). Rates of change in metabolites increased significantly more in men than in women after exercise (lactic acid: 1231.1±263.8 vs 732.2±521.9, p<0.05; malic acid: 320.1±136.4% vs 168.5±92.2%, p<0.05; glycerol 3-phosphate: 37.5±11.0% vs. 38±25.8%, p<0.01; creatine: 26.8±16.2% vs. 3.7±9.0%, p<0.05; citrulline: 1.86±2.6% vs. -8.5±8.4%, p<0.05).

CONCLUSIONS: Metabolite profiles and values for sex hormones changed in a sex-dependent manner after acute resistance exercise. Therefore, sex hormone concentrations might influence energy utilization during resistance exercise.

3) volunteered to participate and were 18-65 years old, 2) subjects were male and female, 3) body weight was reported at baseline and follow-up, 4) the inclusion criteria for eligible studies were as follows: 1) subjects were children or adolescents, 2) exercise intervention was performed, 3) the baseline and follow-up body weight was reported, 4) all components of physical fitness in premenopausal, inactive overweight or obese women. These findings may be attributed to the hybrid nature of this exercise regimen all components of physical fitness in premenopausal, inactive overweight or obese women. These findings may be attributed to the hybrid nature of this exercise regimen.

B-78 Free Communication/Poster - Obesity

Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall F

An 8-month Small-group Circuit Functional Training Program Improves Body Composition And Performance Of Overweight/obese Women.

Alexios Batrakoulis1, Kalliopi Georgakouli1, Konstantinos Papanikolaou1, Nikolaos Zourbanos1, Dimitrios Draganidis1, Chats-Chats Deli1, Maria Michalopoulou1, Alexandra Avloniti1, Athanasios Chatzinikolaou2, Athanasios Jamurtas1, Ioannis Fatouros1. 1University of Thessaly, Trikala, Greece. 2Democritus University of Thrace, Komotini, Greece. (Sponsor: Theodore J. Angelopoulos, FACSM)

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(No relationships reported)

The body weight training, high-intensity interval training (HIIT), functional fitness, group personal training, and circuit training are currently some of the top worldwide trends in the commercial, corporate, clinical, and community landscapes within the health and fitness industry. Additionally, adult obesity and physical inactivity are considered as the top global public health problems nowadays.

PURPOSE: This study aimed to evaluate the effects of a circuit functional training program on body composition and performance in sedentary overweight or obese women.

METHODS: Twenty-eight premenopausal overweight or obese women (n=28; 36.8 ± 4.6 years; 166.0 ± 0.1 cm; 79.7 ± 9.1 kg; 28.8 ± 2.8 kg/m²) volunteered to participate and were randomly assigned to either a control (C, n=14) or an experimental group (E, n=14). Exercise consisted of a low volume circuit functional training program (~30 min) and 3 sessions per week in nonconsecutive days for 32 weeks. Both groups were tested pre- and post-intervention in body mass index (BMI), waist-to-hip ratio (WHR), body composition (DXA), resting metabolic rate (RMR), upper and lower body muscular strength (IRM) and endurance, curl up and push up, cardiovascular endurance (VO2peak), flexibility (sit and reach test), static balance (Sharpened Romberg test), and subjective vitality. Comparisons were made using two-way ANOVA with repeated measures.

RESULTS: Significant improvements were observed between pre- and post-testing measures in E. Body fat, BMI, and WHR declined (p<0.001) by 11.4%, 6%, and 4.6% while fat-free mass (p<0.05), upper and lower body muscular strength, trunk and upper body muscular endurance, VO2peak, flexibility, static balance, and subjective vitality increased (p<0.001) by 1.9%, 30.9% and 27.2%, 91.6% and 238.5%, 26.8%, 34.5%, -25.4%, and 131.8%, respectively.

CONCLUSION: These results suggest that a time-effective exercise modality that combines the circuit training, HIIT, and functional fitness using body weight exercises may improve all components of physical fitness in premenopausal, inactive overweight or obese women. These findings may be attributed to the hybrid nature of this exercise regimen for small groups applying full-body movements and high-intensity routines according to HIIT principles adapted to sedentary individuals.

1166 Board #345 May 31 2:00 PM - 3:30 PM Effects Of Exercise Intervention On Visceral Fat In Obese Youth: Meta-analysis

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(No relationships reported)

Childhood obesity is associated with a higher chance of the development of several diseases, premature death, and disability in adulthood. Previous studies have examined the effects of exercise on visceral fat; however, many of these studies applied different methodologies and showed different results. PURPOSE: To assess the effects of different exercise types on visceral fat in obese youth and to suggest the most effective way to reduce visceral fat using a meta-analysis. METHODS: Electronic database searches were performed in Pubmed, MEDLINE, Academic Search Complete, SportDiscus, and CINAHL from the earliest record to May 2016. Key words included ‘exercise or training’, ‘visceral fat’, and ‘child or adolescent or youth’. The inclusion criteria for eligible studies were as follows: 1) subjects were obese at baseline, 2) subjects aged 6-18 years, 3) body weight was reported at baseline and after intervention, and 4) studies were published in peer-reviewed journals written in English. Two authors independently selected trials, assessed trial quality and extracted data. Comprehensive Meta-Analysis version 3 software was used to compute effect size (ES) and the 95% confidence intervals (CI) using a random effects model. Heterogeneity was assessed using the Cochran’s Q statistic. Four moderator variables (gender, types of exercise, treatment periods, and disease conditions) were analyzed. RESULTS: Of the 177 studies from the initial search, 48 were derived from the 30 selected studies. The overall treatment effect was large (Cohen’s d (ES) = 1.05, 95% CI = 0.94, 1.16). Subgroup analyses showed that exercise type (Qb = 10.84, df = 2, p < 0.004) and treatment length (Qb = 23.76, df = 1, p < 0.001) influenced the overall ES. The combined exercise program (Aerobic + Resistance training; ES = 1.19, 95% CI = 1.06, 1.35) and treatment periods longer than 6 months (ES=1.23, 95% CI = 1.10, 1.35) appeared to be the most effective in reducing visceral fat. However, ESs were similar among gender and disease conditions. CONCLUSIONS: There was a large overall effect for exercise intervention on visceral fat in obese youth. Findings from this meta-analysis can help in designing an effective exercise intervention to reduce visceral fat in obese youth.

1167 Board #346 May 31 2:00 PM - 3:30 PM Hemodynamic Response to Acute and Chronic Exercise in Obese and Lean Prehypertensive Men

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PURPOSE: Approximately 7.1 million deaths worldwide are ascribed to hypertension (HTN). Those with HTN who fit the lean body phenotype are characterized by mechanistically different HTN compared to an obese HTN phenotype. The purpose of this study was to assess whether body phenotype influences blood pressure (BP)
response following both acute and chronic exercise. METHODS: Obese (body mass index (BMI) 30 kg/m²) and normal weight (BMI 25 kg/m²) men with pre-hypertension (PHTN) (systolic BP (SBP) 120-129 or diastolic BP (DBP) 80-89 mmHg) were asked to participate in a two phase trial. Phase 1 assessed differences in post-exercise hypotension between groups in response to an acute exercise bout. Phase 2 consisted of a two-week aerobic exercise intervention at 65-70% of heart rate (HR) max on a cycle ergometer. Primary outcome measures were; brachial BP, central BP, cardiac output (CO), and systemic vascular resistance (SVR) measured acutely before and one exercise session and following two-weeks of training. RESULTS: There were no baseline resting brachial BP (126 ± 7 mmHg vs. 126 ± 5 mmHg, P = 0.976), central BP (110 ± 5 mmHg vs. 113 ± 6, P = 0.123), age (24 ± 4 yr vs. 25 ± 4 yr, P = 0.547), or VO₂ peak (29.4 ± 4 L/min vs. 32 ± 7 L/min, P = 0.248) differences between Lean and Obese. At rest, obese PHTN had greater CO compared to lean PHTN (6.3 ± 1 vs 4.7 ± 1 L/min, P = 0.001) and decreased SVR compared to lean PHTN (1218 ± 263 vs 1606 ± 444 dyn.s/cm⁵, P = 0.003). Lean PHTN saw a 3 mmHg reduction in both brachial and central SBP (P < 0.05) in response to acute exercise, while obese PHTN witnessed a significant 4 mmHg increased brachial and 3 mmHg increased central SBP (P < 0.05). SVR decreased greater following acute exercise in lean PHTN compared to obese PHTN (224 dyn.s/cm⁵ vs. 75 dyn.s/cm⁵, P = 0.001). Chronically training induced a 4 mmHg reduction in brachial SBP and 3 mmHg reduction for central SBP for lean PHTN with no change in obese PHTN. Lean BP reduction in response following both acute and chronic exercise was by independent exercise bout, patients' RPBs were obtained (Borg scale 0-10). Groups were compared for symptoms and physical activity habits. During the last minute of each constant load individualized constant load work rates (one easy & one harder) for 4-6 mins, followed by a peak exercise test. Constant load work rates were set based on the patient’s symptoms and physical activity habits. During the last minute of each constant load exercise bout, patients' RPBs were obtained (Borg scale 0-10). Groups were compared by independent t test and relationships between variables were examined by regression analysis. METHODS: Data from 112 patients were separated into nonobese (BMI < 30; n = 76) and obese (BMI > 30 kg/m²> 30 kg/m²) patients who were referred for clinical cardiopulmonary exercise testing (CPET) due to an exaggerated rating of breathlessness (RPB) as compared with nonobese patients: Dyspnea on exertion (DOE) is a common symptom in otherwise healthy adults. PURPOSE: BMI was 22 ± 2 kg/m² in the nonobese (62 ± 9 kg) and 36 ± 4 kg/m² in the obese (103 ± 16 kg) patients (mean ± SD; P = 0.001). Age was not different between groups (50 ± 20 yr vs 57 ± 12 yr). Work rates were not significantly different between the nonobese and obese patients at the lower (29 ± 19 W vs 24 ± 14 W) or higher constant load work rates (59 ± 35 W vs 49 ± 27 W). Exercise intensity was also not different between groups at the lower (53 ± 11 vs 56 ± 13% of peak O₂ uptake) or higher work rates (74 ± 11 vs 72 ± 11%). RPB was significantly (P = 0.05) greater in the obese patients (2.3 ± 1.4 vs 3.3 ± 2.2) at the lower work rate, but not at the higher work rate (4.8 ± 1.8 vs 4.9 ± 2.2). Maximal exercise capacity was higher in the nonobese patients (77 ± 24 vs 58 ± 21% predicted). There were no significant relationships between RPB and BMI within either group. However, there was a significant (P = 0.001) association between RPB and ratings of perceived exertion (RPE) in the obese (r = 0.68 & 0.82 for lower & higher constant work rates) and the obese (r = 0.87 & 0.81) patients. CONCLUSIONS: Obesity appears to have a significant effect on breathlessness at lower work rates in this mixed patient population, and should be considered when assessing breathlessness in patients. Supported by NIH RO1 HL096782, King Charitable Foundation Trust, and Texas Health Presbyterian Hospital Dallas. Brachial artery flow-mediated dilation (FMD) is a significant predictor of future cardiovascular disease and preferred non-invasive marker for endothelial vasodilatory function. Importantly, central/abdominal obesity and physical inactivity are associated with endothelial dysfunction. Whole-body vibration training (WBVT) has been shown to improve overall arterial function in sedentary obese pre- and post-menopausal women. Yet, the impact of WBVT on endothelium-mediated vasodilation has not been examined. PURPOSE: To determine whether WBVT would induce greater benefits than a non-exercising control (CON) on endothelial function in young overweight/obese women. METHODS: Thirty-seven young overweight/obese women (age: 21 ± 2 years; body mass index: 31.4 ± 3.4 kg/m²) were randomized into WBVT (n = 24), or CON (n = 13) for 6 weeks (3 days/week). Brachial artery diameter was measured using Doppler ultrasound before and after 5 min of forearm ischemia. FMD was measured before and after the 6-week period. RESULTS: There were no between-group differences at baseline in any of the variables. Following 6 weeks, brachial artery FMD increased (Δ 3.80 ± 1.03%, P < 0.01) in the WBVT group when compared to CON. No significant differences were observed in resting brachial artery diameter at baseline. WBVT. CONCLUSIONS: Six weeks of WBVT elicited a significant improvement in brachial artery vasodilatory function in young sedentary overweight/obese women. Collectively, WBVT may be considered an effective alternate exercise modality for the prevention and treatment of arterial dysfunction in young overweight/obese women.
Methods: It was involved 33 obese women with age of 20-40 years in a weight loss therapy during 4 months. Inclusion criteria were primary obesity, body mass index greater than 30 kg/m² and less than 40 kg/m². The voluntaries were assigned in two different groups: Aerobic Training (AT) and Aerobic plus Resistance Training (ART) groups. The interventions consisted on physical exercise training and application of phototherapy (850nm), immediately after the physical exercise. Metabolic parameters were evaluated. Results: It were showed reduction in body mass (ART: 93±11 vs 89±11, p = 0.001; AT: 94±16 vs 89±16kg, p = 0.001), body mass index (ART: 35±4 vs 31±4, p = 0.001; AT: 35±4 vs 33±4kg/m², p = 0.001), fat mass (ART: 40±3 vs 37±3, p = 0.001; AT: 47±3 vs 44±6%, p = 0.001), visceral fat (ART: 143±19 vs 125±17, p = 0.004 AT: 160±34 vs 150±36cm², p = 0.003), total cholesterol (ART: 205±24 vs 180±22, p = 0.003; AT: 38±2 vs 37±2cm², p = 0.004) and waist (ART: 108±11 vs 105±10, p = 0.002; AT: 99±8 vs 92±7cm, p = 0.001) circumferences in both groups. Only ART group demonstrated reduction of phosphorylation of extracellular signal regulated kinase (ERK1/2) in dehydrogenase (β-HAD), and cytochrome C oxidase (COX-IV). There was also a reduction of phosphorylation of the insulin receptor substrate (Tyr612), Protein kinase B (AKT Ser473) and protein kinase dependent calcium/phosphate kinase (PKC), evaluated by Western Blot. Results: HIIT increased insulin sensitivity evaluated by HOMA-IR in OBR (4.4 ± 1.4 versus 4.1 ± 2.2, p = 0.02) but not in OB (1.8 ± 0.5 versus 2.3 ± 1.0) volunteers. In skeletal muscle, HIIT increased phosphorylation of the insulin receptor substrate (Tyr612), Protein kinase B (AKT Ser473) and protein kinase dependent calcium/calcimodulin (CaMKII) (Thr286), and increased expression of β-hydroxyacyt-CoA dehydrogenase (β-HAD), and cytochrome C oxidase (COX-IV). There was also a reduction of phosphorylation of extracellular signal regulated kinase (ERK1/2) in OBR.

Conclusions: 8 weeks of HIIT promoted improvements in insulin sensitivity, modified components of insulin signaling pathway, and improved oxidative metabolism in skeletal muscle. These changes were independent of changes in body fat. This work was supported by CAPES (PNPD-2455/2011), FAFEMIG (CDS APQ1621-10), and CNPq (477154/2011-5) grants.

Board #352
May 31 2:00 PM - 3:30 PM
High Intensity Interval Training Changes Skeletal Muscle Insulin Signalling Pathway Of Obese Individuals
FLAVIO C. MAGALHAES1, DENIA V. VIEIRA1, MARIANA A. MATOS1, KAIO C. PINHAL1, KURT ESCOBAR2, MARCO FABRICO DIAS-PEIXOTO2, ETEL ROCHA-VIEIRA1, FABIANO T. AMORIM3. 1Federal University of the Jequitinhonha and Mucuri Valleys, Diamantina, Brazil. 2University of New Mexico, Albuquerque, NM. Email: magalaesaufing@gmail.com

Purpose: Obesity, characterized as excess of body fat (BMI ≥ 20 kg/m²), is related to the development of various metabolic disorders, including insulin resistance. Exercise is known to serve as a non-pharmacological approach to increase skeletal muscle insulin sensitivity, although the mechanisms have not been fully elucidated. Additionally, the molecular underpinnings of the effects of high intensity interval training (HIIT) on insulin resistance are less understood. This study evaluated the effects of HIIT on biochemical and molecular markers related to insulin resistance in physically inactive obese individuals.

Methods: 9 obese insulin sensitive (OB, 32 ± 10 y; 92.4 ± 12.9 kg; 35.1 ± 3.8 kg/m²) and 8 obese insulin resistant (OBR; 30 ± 11 y; 106.0 ± 19.6 kg; 37.8 ± 4.6 kg/m²) volunteers were subjected to 8 weeks of HIIT using a cycle ergometer. Insulin resistance was defined as homeostasis model assessment index (HOMA-IR) equal or greater than 2.71. Before and after the training, a maximal ramp test was performed to measure maximal cycling power output. HIIT was performed 3 times a week with progressively increasing intensity and volume (8 to 12 bouts of 1 min duration at 80% to 110% of the maximum power output separated by 1 min active recovery at 30 W). A muscle biopsy and venous blood were performed 72 hours before and after HIIT to allow HOMA-IR calculation. Skeletal muscle samples were analyzed by Western Blot.

Results: HIIT increased insulin sensitivity evaluated by HOMA-IR in OBR (4.4 ± 1.4 versus 4.1 ± 2.2, p = 0.02) but not in OB (1.8 ± 0.5 versus 2.3 ± 1.0) volunteers. In skeletal muscle, HIIT increased phosphorylation of the insulin receptor substrate (Tyr612), Protein kinase B (AKT Ser473) and protein kinase dependent calcium/calcimodulin (CaMKII) (Thr286), and increased expression of β-hydroxyacyt-CoA dehydrogenase (β-HAD), and cytochrome C oxidase (COX-IV). There was also a reduction of phosphorylation of extracellular signal regulated kinase (ERK1/2) in OBR.

Conclusions: 8 weeks of HIIT promoted improvements in insulin sensitivity, modified components of insulin signaling pathway, and improved oxidative metabolism in skeletal muscle. These changes were independent of changes in body fat. This work was supported by CAPES (PNPD-2455/2011), FAFEMIG (CDS APQ1621-10), and CNPq (477154/2011-5) grants.
improvements in cardiovascular fitness (decreased RHR, RSBP, and RDBP; increased 6MWD), body composition (decreased BM, BW%, and WC), and leg strength (greater peak hamstrings torque at 30°·sec⁻¹, 60°·sec⁻¹, and peak quadriceps torque at 30°·sec⁻¹), along with an increase (p < 0.05) in DACE, were observed following UTT. CONCLUSIONS: Our findings demonstrate that an underwater treadmill walking program featuring a gradual and progressive increase in walking speed and duration can enhance health-related fitness and raise daily caloric expenditure in middle-aged adults with type 2 diabetes.

### Purpose

Start of insulin treatment in type 2 diabetes mellitus (T2DM) is associated with weight gain, which further increases cardiovascular and metabolic risk. Changes in moderate-to-vigorous physical activity (MVPA), light physical activity (LPA) and/or sedentary behaviour (SB) may contribute to weight gain. Here, we compared physical activity patterns in T2DM and controls and studied the effects of initiation of insulin therapy.

### Methods

First, we objectively assessed free-living MVPA, LPA and SB in patients with T2DM without (n=40) and with prolonged insulin therapy (T2DM-I, n=42), as well as weight matched (n=38) and lean controls (n=35). Secondly, 40 T2DM patients were followed prospectively across 12-months after initiation of insulin therapy. Weight, MVPA, LPA and SB were measured at baseline, 6 months and 12 months after start of therapy.

### Results

Weight matched controls, T2DM and T2DM-I spent less time in MVPA than lean controls (1.6±1.4h, 1.1±0.8h, 1.5±1.1h and 2.7±1.5h, respectively, P=0.001). T2DM-I, but not T2DM and weight matched controls, spent less time in LPA (P=0.045). Sitting time was higher in T2DM and T2DM-I compared to lean controls (P<0.001), but not compared to weight matched. Prospectively, body weight increased 2.9±4.5kg over 12 months (P<0.05). We found no changes in MVPA, whilst LPA declined from 2.0±1.1 to 1.6±0.9h (P=0.027) and sitting time increased (11.7±1.7 to 12.3±1.9h, P=0.028). Non-obese (BMI<30kg·m⁻²) T2DM patients who started insulin therapy showed a positive correlation between the increase in sitting time vs weight gain (r=0.446, P=0.037) and vs waist circumference (r=0.446, P=0.033). These relations were not present in obese T2DM patients, who started with more sitting time and higher waist circumference (both P<0.05).

### Conclusion

T2DM patients, especially those on insulin therapy, show lower levels of MVPA and LPA, but more sitting time, compared to lean controls. Start of insulin therapy is associated with an increase in sitting time. This increase in sitting time was associated with weight gain in non-obese subjects, but not in obese subjects. This suggests that increased SB, rather than decreased MVPA, may contribute to weight gain associated with insulin therapy in T2DM.

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