Evidence suggests that high-intensity interval training can be as beneficial, or superior to traditional low to moderate intensity, long duration exercise in clearing postprandial triglycerides (TG). PURPOSE: To compare the effect of exercise intensity on postprandial lipemic responses after a high fat meal. METHODS: Maximal oxygen consumption (VO2) was measured in 13 participants (9 male, 4 female). There were no differences between males and females among age (males: 24.2 ± 2.2 years; females: 23.2 ± 2.1 years), height (1.74 ± 0.04 meters vs. 1.69 ± 0.09 meters, respectively), or VO2max (41.42 ± 3.87 mL/kg/min vs. 36.97 ± 1.39 mL/kg/min, respectively). Males weighed heavier than females (78.9 ± 11.2 kg vs. 65.3 ± 2.1 kg, p = 0.04). In a randomized crossover design, participants returned on two separate occasions where they arrived fasted and consumed a high-fat milkshake made from premium chocolate cream and heavy whipping cream, delivering 1.3 g/kg bodyweight of fat. Participants performed either low intensity exercise (LE) on a treadmill at a self-selected pace to elicit a heart rate (HR) of 40-60% of heart rate reserve (HRR) for 30 minutes or perform high-intensity interval exercise (HE) of 8 repetitions of 30 second sprints on a treadmill with 90 second active rest. Participants returned on a non-consecutive test day to perform the opposite test. Blood was sampled via fingerstick for TG at baseline (T0), 1 hour (T1), 3 hours (T3), and 5 hours (T5) postprandially. Area under the curve (AUC) determined the postprandial lipemic response via the trapezoid method. Comparisons among TG at each time point and AUC were determined via paired samples t-tests. Significance was set at p < 0.05. RESULTS: No differences were found among baseline, 1H, or 3H TG values between the exercise conditions (p > 0.05). 5H TG and AUC were lower in LE compared to HE (5H: 149.54 ± 113.18 mg/dL vs. 195.85 ± 117.14 mg/dL, respectively, t(13) = -3.384, p = 0.005, d = 0.402; AUC: 430.39 ± 269.64 mg/dL vs. 508.12 ± 256.97 mg/dL, respectively, t(13) = -2.212, p = 0.04, d = 0.295). Normalized peak TG values were not significantly different among groups. CONCLUSIONS: LE resulted in lower postprandial lipemic responses and lower peak compared to HE. The relatively short HE session may have not been sufficient in duration to clear postprandial TG.

**Thematic Poster - Carbohydrate and Fat Metabolism**

**Title:** Similar Substrate Use During Prolonged Cycling in Men and Women

**Authors:** Beth W. Glace, Ian J. Kremenic, Malachy P. McHugh, FACSM.

**Affiliations:** Lenox Hill Hospital, New York, NY (Sponsor: Malachy McHugh, FACSM)

**Purpose:** It is generally accepted that, compared to men, women rely more upon lipids as a substrate during moderate intensity exercise. However, most studies were conducted in a fasting condition, which is not how prolonged exercise is typically performed. The purpose of this study was to compare substrate use between sexes in well-trained recreational cyclists during prolonged exercise after a standardized breakfast.

**Methods:** Well-trained cyclists [18 women, 16 men] were recruited. Subjects reported to our lab twice. On the first day they performed a VO2max test. At 7:30 a.m. on a subsequent day, they drank a standardized breakfast of a liquid meal replacement which provided 6 kcal/kg. At 9 a.m. they pedaled on their own bikes for 2 hours at their ventilatory threshold [−65% VO2 vs. VO2peak with 5.1 min sprints interspersed throughout. Water was provided at a rate of 1% body mass/h. Ventilatory gas exchange was measured every 20 min to calculate RER. Descriptive data were compared using independent t-tests, ventilatory data were compared using repeated measures ANOVA. **Results:** Men and women were of similar age [38 yrs, p=0.92] and VO2max was typical of well-trained, recreational cyclists. 56 mL/kg/min for men, and 47 mL/kg/min for women. Body mass declined by 1% and did not differ between sexes [p=0.98]. RER declined during exercise [p>0.001] but there was no difference between sexes [p=0.38] and no time x sex interaction [p=0.78], indicating that substrate usage was similar between men and women. Perception of effort and heart rate increased over time, but did not differ between men and women [time x sex p=0.26, effect of sex, p=0.62].

**Conclusions:** The notion that women rely more upon lipids during exercise was not supported by our data in fed subjects. Men and women who perform prolonged exercise after a light meal, as is typical, are likely to use similar amounts of fats and carbohydrates. This underscores the importance of nutritional status in studies comparing men and women.

**Postprandial Lipemic Responses After A High-fat Meal And Low- Or High-intensity Interval Exercise**

**Authors:** Racine R. Emmons, Michael A. Figureuora, Toni T. LaSala.

**Affiliations:** William Paterson University, Wayne, NJ (Sponsor: Gordon Schmidt, FACSM)

**Purpose:** It is generally accepted that, compared to men, women rely more upon lipids during exercise. However, most studies were conducted in a fasting condition, which is not how prolonged exercise is typically performed. The purpose of this study was to compare substrate use between sexes in well-trained, recreational cyclists during prolonged exercise after a standardized breakfast.

**Methods:** Maximal oxygen consumption (VO2) was measured in 13 participants (9 male, 4 female). There were no differences between males and females among age (males: 24.2 ± 2.2 years; females: 23.2 ± 2.1 years), height (1.74 ± 0.04 meters vs. 1.69 ± 0.09 meters, respectively), or VO2max (41.42 ± 3.87 mL/kg/min vs. 36.97 ± 1.39 mL/kg/min, respectively). Males weighed heavier than females (78.9 ± 11.2 kg vs. 65.3 ± 2.1 kg, p = 0.04). In a randomized crossover design, participants returned on two separate occasions where they arrived fasted and consumed a high-fat milkshake made from premium chocolate cream and heavy whipping cream, delivering 1.3 g/kg bodyweight of fat. Participants performed either low intensity exercise (LE) on a treadmill at a self-selected pace to elicit a heart rate (HR) of 40-60% of heart rate reserve (HRR) for 30 minutes or perform high-intensity interval exercise (HE) of 8 repetitions of 30 second sprints on a treadmill with 90 second active rest. Participants returned on a non-consecutive test day to perform the opposite test. Blood was sampled via fingerstick for TG at baseline (T0), 1 hour (T1), 3 hours (T3), and 5 hours (T5) postprandially. Area under the curve (AUC) determined the postprandial lipemic response via the trapezoid method. Comparisons among TG at each time point and AUC were determined via paired samples t-tests. Significance was set at p < 0.05. **Results:** No differences were found among baseline, 1H, or 3H TG values between the exercise conditions (p > 0.05). 5H TG and AUC were lower in LE compared to HE (5H: 149.54 ± 113.18 mg/dL vs. 195.85 ± 117.14 mg/dL, respectively, t(13) = -3.384, p = 0.005, d = 0.402; AUC: 430.39 ± 269.64 mg/dL vs. 508.12 ± 256.97 mg/dL, respectively, t(13) = -2.212, p = 0.04, d = 0.295). Normalized peak TG values were not significantly different among groups. **Conclusions:** LE resulted in lower postprandial lipemic responses and lower peak compared to HE. The relatively short HE session may have not been sufficient in duration to clear postprandial TG.
a low fat diet (LFD) or a 60% kcal high fat diet (HFD) for 12 wks to induce insulin resistance. Plantaris muscle overload was elicited by unilateral ablation of the distal 2/3 of the gastrocnemius and soleus. The contralateral leg was sham-operated. Muscles were weighed 5 days later. Overload increased muscle mass ~40% in both LFD and HFD mice. To assess glucose uptake, muscles were incubated in [1-14C]-2-deoxyglucose. Overload increased muscle glucose uptake ~80% in both LFD (Sham: 0.52 ± 0.02; Overload: 0.91 ± 0.04 (µmol-g muscle/h)) and HFD mice [Sham: 0.49 ± 0.04; Overload: 0.86 ± 0.09 (µmol-g muscle/h)], showing that overload stimulates glucose uptake independent of insulin resistance. To determine if this effect is due to increased glucose transporter (GLUT) or hexokinase levels, immunoblots were performed. Overload did not alter GLUT4 or hexokinase. In contrast, overload increased GLUT1 ~70%, but only in insulin resistant muscles. Decreased glycogen enhances glucose uptake. To determine if overload lowered glycogen levels, glycogen content was measured using a hexokinase-based reagent. Overload increased glycogen ~26% in LFD (Sham: 29.0 ± 1.6; Overload: 36.1 ± 1.5 mmol/g muscle), and ~40% in HFD mice (Sham: 31.2 ± 2.1; Overload: 42.3 ± 1.7 mmol/g muscle). To determine if overload-induced glucose uptake is dependent on glucose utilization, muscles were incubated in [5-3H]-glucose to assess glycolytic flux, and immunoblots performed to assess the rate limiting enzyme of the pentose phosphate pathway, glucose-6-phosphate dehydrogenase (G6PD). Overload did not alter muscle glycolytic flux. In contrast overload increased muscle G6PD ~140% in LFD, and ~82% in HFD mice. CONCLUSION: Insulin resistance does not impair overload-induced muscle hyperglycemia or glucose uptake, but does alter glucose utilization. SUPPORT: NIH R01 DK103562

PURPOSE: Restoring muscle and liver glycogen content during short-term (<6 h) recovery from prolonged exercise is pertinent for athletes seeking to maximize performance in repeated exercise bouts. Previous research suggests co-ingestion of fructose-glucose carbohydrate sources augments liver and has equivalent effects on muscle glycogen storage during short-term recovery from prolonged exercise compared to isonenergetic glucose ingestion. The aim of the present investigation was to determine if this has a discernible effect on subsequent exercise capacity.

METHODS: Eight trained endurance runners and triathletes performed two experimental trials in a single-blind, randomised, and counterbalanced cross-over design. Trials involved treadmill running to exhaustion at 70 %VO2max, a four-hour recovery with 90 g.h⁻¹ of glucose-maltodextrin (GLU) or fructose-maltodextrin (FRU) ingestion (1:1.5 ratio), and a second bout of treadmill running to exhaustion at 70 %VO2max. Indirect calorimetry and stable isotope methods were employed to estimate substrate oxidation and ingested carbohydrate oxidation.

RESULTS: Endurance capacity in the second exercise bout was significantly greater with FRU (81.4 ± 22.3 vs. 61.4 ± 9.6 min, P = 0.02), a large magnitude effect (ES = 1.84 ± 1.12, 32.4 ± 19.9%). Total carbohydrate oxidation rates were not significantly different between-trials at given time-points, although the total amount of carbohydrate oxidised in the second exercise bout was significantly greater with FRU (223 ± 66 vs. 157 ± 26 g, P = 0.02). Ingested carbohydrate oxidation rates, representing carbohydrate stored during recovery and/or that derived from ongoing absorption, were greater during both trials with FRU (P = 0.001). Plasma glucose and non-esterified fatty acid concentrations were not significantly different between-trials. Plasma lactate concentrations were significantly greater during recovery with FRU (P = 0.001). Self-reported nausea and stomach fullness during bout two were marginally in favour of FRU.

CONCLUSION: Short-term recovery of endurance capacity was significantly enhanced with fructose-maltodextrin vs. glucose-maltodextrin ingestion during recovery.
### 1076 Board #8 May 31 8:00 AM - 10:00 AM Acute Exercise by Insulin Resistant Rats Induces Muscle Fiber Type-selective Improvement in Insulin-stimulated Glucose Uptake

Mark W. Patakay, Carmen S. Yu, Yilin Nie, Edward Arias, Manak Singh, Robert Ploutz-Snyder, Christopher Mendias, Gregory Cartee, FACS.M. University of Michigan, Ann Arbor, MI. (Sponsor: Gregory Cartee, FACS.M) (No relevant relationships reported)

**PURPOSE:** To determine if acute exercise induces muscle fiber type-selective changes in glucose uptake (GU), glycogen content or GLUT4 protein abundance in insulin resistant rats.

**METHODS:** Rats were fed a high-fat diet (HFD; 60% fat) or a low-fat diet (LFD; 15% fat) ad libitum for two weeks. On the experimental day, HFD rats were sedentary (SED) or exercised (2h swim exercise). All LFD rats remained SED, serving as controls. Exercised rats were studied immediately-post exercise (IPEX) or 3.5h post-exercise (3.5hPEx). Isolated epimysial muscles were incubated with [3H]-2-deoxyglucose (2DG). Muscles from IPEX and SED controls were incubated without insulin. Muscles from 3.5hPEx and SED controls were incubated ±100µU/ml insulin. Muscles were incubated with collagenase to isolate single fibers. Fiber type (myosin heavy chain expression: type I, IIa, IIb, IIX, IIAX, or IIBX) was determined by SDS-PAGE. In the same single fibers, GU was measured by [3H]-2DG accumulation. Fiber type-specific glycogen was measured by histochemical periodic-acid Schiff staining. GLUT4 abundance was determined by immunoblotting. Data were analyzed by one-way ANOVA.

**RESULTS:** In HFD vs LFD rats, GU of insulin-stimulated single fibers was decreased in all fiber types (P<0.05) except type I. Insulin-dependent GU in single fibers of each fiber type was increased IPEX (P<0.05). Glycogen content decreased in all fiber types IPEX (P<0.01). In HFD rats insulin-stimulated GU 3.5hPEx was increased in all fiber types (P<0.05) except type I. GLUT4 content was unchanged by diet or exercise in each fiber type.

**CONCLUSIONS:** Greater insulin-independent GU and decreased glycogen IPEX provides compelling evidence that each fiber type, including type I fibers, was recruited. Neither diet nor exercise effects on GU were attributable to altered GLUT4 abundance regardless of fiber type. Earlier research using whole muscles from normal rats demonstrated that exercise causes greater GLUT4 translocation concomitant with greater phosphorylation of AS160 protein, a key regulator of GLUT4 translocation. Our working hypothesis is that fiber type-selective improvement in insulin-stimulated GU at 3hPEx in insulin resistant rats is attributable to fiber type-selective increases of AS160 phosphorylation that facilitates greater GLUT4 translocation.

#### C-08 Thematic Poster - Mental Health and Exercise

**Thursday, May 31, 2018, 8:00 AM - 10:00 AM**

**Room:** CC-Lower level L100E

**Chair:** Matthew P. Herring, University of Limerick, Limerick, Ireland. (No relevant relationships reported)

**Board #1 May 31 8:00 AM - 10:00 AM**

**Acute Exercise Effects Among Young Adults with Subclinical Generalized Anxiety Disorder: Replication and Expansion**

Matthew P. Herring1, Derek C. Monroe2, Brett R. Gordon2, Mark J. Campbell1. 1University of Limerick, Limerick, Ireland. 2University of California Irvine, Irvine, CA. (No relevant relationships reported)

Little is known about the effects of acute exercise among individuals with subclinical Generalized Anxiety Disorder (GAD), a disorder marked by persistent worry, elevated anxiety, and low energy and fatigue. Recent findings supported the positive effects of acute exercise on worry, state anxiety, and feelings of energy and fatigue among young women with subclinical GAD. However, exercise effects among young men with subclinical GAD are unstudied. **PURPOSE:** To replicate initial findings, to compare acute responses to aerobic exercise and quiet rest among young men with subclinical GAD, and to explore potential sex-related differences. **METHODS:** Thirty-five young adults (21.4±2.3y; 19M; 16F) with Penn State Worry Questionnaire scores ≥45 (60±8) and scores ≥40. among young women with subclinical GAD, and to explore potential sex-related differences. Compared to quiet rest, exercise significantly improved state anxiety (p<0.04; d=0.27) and feelings of energy (p<0.001; d=1.09). Small improvements were found for worry (d=0.22), worry engagement (d=0.18), and feelings of fatigue (d=0.21). Although RM-ANOVA did not support significant differences between sexes, exercise effects on worry, worry engagement, absence of worry, and feelings of energy were stronger among females. Moderate-to-large improvements in worry (d=0.53), absence of worry (d=0.38), and feelings of energy (d=1.35) were found among women. Among men, moderate-to-large improvements in state anxiety (d=0.37) and feelings of energy (d=0.92) and fatigue (d=0.40) were found. **CONCLUSION:** Findings support initial reports of positive effects of acute aerobic exercise on worry, state anxiety, and feelings of energy and fatigue among young women with subclinical GAD. Findings also provide initial support for these positive effects among young men with subclinical GAD.

**Board #2 May 31 8:00 AM - 10:00 AM**

**Working It Out: Acute Exercise to Combat Anxiety and Depression in Individuals Living with PTSD**

Daniel R. Greene1, Steven J. Petruzzello, FACS.M. 1Augusta University, Augusta, GA. 1University of Illinois at Urbana-Champaign, Urbana, IL. (Sponsor: Steven J. Petruzzello, FACS.M) (No relevant relationships reported)

Mental health problems are increasingly prevalent in today’s society. Exercise interventions have been shown to significantly reduce symptoms of many mental health problems, but often overlooked is the potential for exercise to reduce symptoms of Post-Traumatic Stress Disorder (PTSD) and comorbid psychological conditions (e.g., anxiety & depression). **PURPOSE:** Examine the acute effects of a bout of moderate intensity continuous aerobic exercise (MICE) and a bout of high-intensity interval exercise (HIIE), relative to a no-exercise inactive control (SED), in participants with subsyndromal PTSD. **METHODS:** Participants: N=44, 9 males; age (M ± SD): 25.9 ± 9.2 yrs; Estimated VO2max (M ± SD): 34.6 ± 10.2 ml·kg·min−1’ were assessed in participants with subsyndromal PTSD. Methods: Participants: N=24, 9 males; age (M ± SD): 25.9 ± 9.2 yrs; Estimated VO2max (M ± SD): 34.6 ± 10.2 ml·kg·min−1’ completed three randomly ordered 35-min conditions (HIIE, MICE, SED) following a within subjects design. All participants met the criteria for subsyndromal PTSD (i.e., having at least one symptom in each of the major DSM-5 clusters), with an average PCL-5 score of 47.64 which exceeded the cut point for probable PTSD of 33. State Anxiety, and Depression were assessed before (Pre), immediate after (Post0), 20-minutes after (Post20), and 40-minutes after (Post40) each condition. Results: Anxiety and Depression were significantly reduced following all conditions. Anxiety Post40 was significantly less than Pre for HIIE (Cohen’s d = 1.05), MICE (Cohen’s d = 0.78), and SED (Cohen’s d = 0.53). Depression Post40 was significantly less than Pre for HIIE (Cohen’s d = 0.76), MICE (Cohen’s d = 0.84), and SED (Cohen’s d = 0.32). **Conclusion:** Exercise significantly reduced Anxiety and Depression to a greater extent than SED. This study provides evidence for exercise-induced short-term improvements in comorbid psychological conditions associated with PTSD. Future studies need to apply these benefits to a longitudinal program.

**Board #3 May 31 8:00 AM - 10:00 AM**

**The Interrelationship Between Depression and Hemoglobin: Men Are Affected More Than Women**

Tina Bhateja1, Jonathan M. Saxe2, Lewis E. Jacobson3, Courtney D. Jensen1. 1University of the Pacific, Stockton, CA. 2St. Vincent Hospital, Indianapolis, IN. (No relevant relationships reported)

There are 16.1 million Americans with major depressive disorder (MDD) and 3.4 million Americans with anemia. Low hemoglobin (Hb) is known to predict depressive symptoms, but seldom is the inverse examined: how does MDD affect Hb? There may be a cyclic relationship in which depression reduces engagement in physical activity and reduced activity lowers Hb. This presents possible implications for young athletes owing to higher depression scores on average than age-matched controls. **PURPOSE:** To investigate MDD as a predictor of serum Hb levels. **METHODS:** We analyzed 2,206 patients who were treated at a major hospital. All patients had Glasgow Coma Scale scores ≥21, received a complete blood count with differential, and were screened for MDD between depressed and non-depressed PTSD patients. MDD were assessed with independent samples t-tests; multiple linear regression measured the effect of MDD on Hb, controlling for confounding variables. **RESULTS:** Among depressed patients, Hb was 12.16 ± 1.86 g/dL, among non-depressed patients, Hb was 13.52 ± 1.93 g/dL (p<0.001). This difference was more pronounced among men (14.24 ± 12.36; p<0.001) than women (12.62 ± 12.02; p<0.015). Across the total sample, holding constant age, sex, oximetry, blood pressure, use of dialysis, and diagnoses of diabetes, bleeding disorder, cirrhosis, cancer, and respiratory disease, depression associated with a 5.7% reduction in Hb (p<0.001; 95% CI: -1.38 to -0.50 g/dL). The overall model was significant (r²=0.299; p<0.001). Among men,
the model retained significance ($\tau^2=0.226; p<0.001$) and a diagnosis of depression associated with a reduction in Hb of 1.56 g/dL ($\tau=0.002; 95\% CI: -0.256 to -0.56 g/dL$).

CONCLUSIONS: The relationship between Hb and depression may be cyclic. In our population, depression had a greater effect on Hb than diabetes and respiratory diseases, and it had the same effect as bleeding disorders. Depression, via endocrine changes and reductions in physical activity, may lower oxygen-carrying capacity of the blood, and in turn affect endurance performance. Exercise-induced oxidative stress promotes Hb synthesis. For the anemic patient, exercise may enhance mood; for the moody, exercise may enhance oxygen-carrying capacity. For the athlete and the sport psychologist, there may be further implications.

Track and field athletes are under extreme amounts of pressure to be successful as student-athletes. Their academics and demands for their events may predispose them to having low self-esteem (LSE) and mental health disorders like depression (DEP). PURPOSE: To examine the prevalence of DEP and LSE in collegiate, NCAA Division I track and field athletes; and to investigate differences between academic status (i.e., freshman, senior, etc.) and event type (e.g., sprinter, distance, lean events etc.). METHODS: Collegiate female track and field athletes (n=387) were recruited from 25 NCAA Division I Institutions to participate in an online study. Demographic information, Center for Epidemiologic Studies Depression Scale (CESD) to estimate the risk for DEP and the Rosenberg Self-Esteem Scale for LSE were completed. RESULTS: The prevalence of DEP risk was estimated to be 65.1% (n=252). No significant differences were found between event type and PE; however the highest LSE risk was from freshman (19.4%) then sophomores (17.3%). Significant differences were found between event type and PE within sprinters, middle distance runners, and distance runners (11.4% - 19.6%, p ≤0.01). Overall, LSE was 10.9% (n=42), with LSE found highest among sophomores (4.1%) then freshman (3.9%). No significant differences were found for event type and LSE; however distance runners were at the highest risk for LSE with 4.4%. CONCLUSIONS: Female track and field athletes demonstrated a high risk of DEP and a lower risk for LSE. Freshman and sophomores demonstrated the highest risk for DEP and LSE, potentially due to the new academic and collegiate sport demands placed upon them. Overall, it is perceived the more acclimated (upper classman) a student-athlete is, the lower risk they have for DEP and LSE. Additionally, distance runners were found to have a higher risk of DEP and LSE; therefore, further examination is needed to draw conclusions to what additional pressures they may have. With a risk of DEP and LSE being most prevalent among younger collegiate athletes, universities need to focus on establishing a support system or mentoring program for incoming student-athletes.

Physical activity (PA) can protect against depression. However, few studies have assessed the influence of dose, including whether meeting PA guidelines is sufficient or if greater benefits can be derived from greater volumes of PA. PURPOSE: To examine associations between different volumes of MVPa and walking prevalence and incidence of depressive symptoms and depression status using data from the Irish Longitudinal Study on Ageing. METHODS: Participants (N=4,556; 56.7% female) aged 50 years completed the International PA Questionnaire (IPAQ) at baseline, and the Center for Epidemiological Studies Depression Scale at baseline and two years later. Participants were classified as meeting World Health Organisation PA guidelines or not, divided into IPAQ categories, and divided into tertiles based on weekly minutes of walking. Prospective analyses included 4,146 non-depressed respondents.

RESULTS: After adjustment for age, sex, waist circumference, social class, highest smoking, odds of prevalent depression were 45.2% (OR=0.55, 95%CI: 0.44-0.69; p<0.001) lower among those meeting PA guidelines, 40.3% (OR=0.60, 0.47-0.76; p<0.001) and 53.2% (OR=0.47, 0.66-0.61; p<0.001) lower among those in minimally-active and very-active IPAQ categories, respectively, and 24.9% (OR=0.75, 0.59-0.96; p<0.02) and 44.1% (OR=0.56, 0.43-0.73; p<0.001) in moderate and high walking tertiles, respectively. Odds of incident depression were 24.4% (OR=0.76, 0.56-1.01; p=0.06) lower among those meeting PA guidelines, 34.7% (OR=0.65, 0.46-0.93; p=0.02) and 24.5% (OR=0.75, 0.77-1.07; p=0.10) lower among those in minimally-active and very-active IPAQ categories, respectively, and 22.7% (OR=0.77, 0.54-1.09; p=0.13) and 25.6% (OR=0.74, 0.52-1.06; p=0.10) lower among those in moderate and high walking tertiles, respectively. CONCLUSION: Among a large, nationally-representative sample of older adults, moderate and high volumes of MVPa were significantly associated with lower odds of concurrent depression and significantly and non-significantly associated with lower odds of incident depression, respectively. Meeting PA recommendations and walking were associated with significantly lower odds of concurrent depression and non-significantly lower odds of incident depression.
way of examining potential placebo effects of activity on affective outcomes. This also provides insights into how activity may influence affective responses in individuals with a SCI.

1085 Board #8 May 31 8:00 AM - 10:00 AM
Acute Effects of Resistance Exercise in Depressed Black/African American People Living with HIV
Sanaz Nosrat, James W. Whitworth, Nicholas J. SantaBarbara, Mark E. Louie, Joseph T. Ciccolo, Teachers College, Columbia University, New York, NY.
(No relevant relationships reported)

In the US, Blacks/African Americans (AA) comprise the largest proportion of People Living with HIV (PLWH). Depressive symptoms and fatigue are highly prevalent among PLWH. Depressive symptoms are linked to progression of HIV disease, and fatigue is linked to severity of depressive symptoms. Resistance exercise (RE) is shown to have psychological benefits in non-HIV depressed populations, and these benefits are hypothesized to be intensity-dependent. To date, no study has examined the use of a single bout of RE for management of affect and fatigue with depressed PLWH.

PURPOSE: To test the acute effects of RE intensity on affect, arousal, and distress among sedentary AA PLWH who screen positive for depression.

METHODS: Twenty-five men and 17 women ages 24-66 (47.5±11.2) with a Center for Epidemiologic Studies Depression Scale score of ≥10 completed a battery of questionnaires and 10 repetition maximum (10RM) muscular strength tests. Participants were randomized into: moderate intensity RE (MR) (i.e., 70% of 10RM), n=21, or vigorous intensity RE (VRE) (i.e., 100% of 10RM), n=21. They had to complete 3 sets of 10 repetitions for 5 exercises. Affect, arousal, and distress were measured with the Feeling Scale, Felt Arousal Scale, and Subjective Units of Distress Scale, respectively. Measures were administered at PRE, MID, POST, at 15-minute DELAY, and at 30-minute DELAY. Changes were analyzed using ANOVAs, with Bonferroni adjustment.

RESULTS: There were significant group x time interactions for affect (p<.05), and distress (p<.05), and main effect of time for arousal (p<.01). With VRE, affect improved PRE to POST (p<.01), PRE to DELAY15 (p<.01), and PRE to DELAY30 (p<.01), and arousal increased PRE to MID, and PRE to POST (p<.01). In addition, distress reduced PRE to all time points (p's<.01). With MR, affect decreased PRE to MID (p<.01), while arousal increased PRE to MID, and PRE to POST (p<.01). In addition, distress reduced PRE to Delay15 (p<.01), and PRE to DELAY30 (p<.01).

CONCLUSIONS: Results suggest that an acute bout of MRRE is more effective than VRE in improving affect, increasing energy, and reducing distress in depressed AA PLWH. However, VRE also appears to have distress-reducing benefits. These findings should be considered when prescribing exercise for symptom management in this population.

1086 Board #1 May 31 8:00 AM - 10:00 AM
Chair: Brian Noehren, FACSM. University of Kentucky, Lexington, KY.
(No relevant relationships reported)

Peak and Rapid Force Deficits during Countermovement Jump Persist Longer than Reduced Jump Height post-ACL Reconstruction
(No relevant relationships reported)

Following anterior cruciate ligament reconstruction (ACL-R) athletes often demonstrate persistent lower extremity biomechanical abnormalities which may inhibit return to sports and/or contribute to increased risk of re-injury. Countermovement jump (CMJ) height is an indicator of lower extremity explosiveness and athletic ability. Phase-specific CMJ ground reaction force-time curve variables provide detailed information on jump performance, and have not yet been examined in collegiate athletes post-ACL-R.

PURPOSE: To assess eccentric (ECC) and concentric (CONC) phase CMJ maximal and rapid ground reaction force (GRF) variables in collegiate athletes post-ACL-R and compare with healthy controls.

METHODS: 18 Division I athletes (12 males) post-ACL-R and 18 controls matched by sport, gender, year, and position performed maximal CMJs on force plates (800 Hz) 5.7 ± 1.8 (EARY) and 9.8 ± 1.8 months post-surgery (LATE), ECC and CONC phase peak force, rate of force development (RFD), and rate of force unloading (RFU) were computed. Variables were analyzed by 3-way mixed ANOVAs (group x limb x interval).

RESULTS: Jump height was significantly lower in the ACL-R group EARLY (ACLR: 29.7 ± 7.5 cm, CONTROL: 35.7 ± 11.3 cm), but not LATE (33.8 ± 7.6 cm). ACLR group involved (INV) limb peak and rapid force variables were significantly reduced compared to the uninvolved limb at both intervals (Limb symmetry indices: peak ECC force - EARLY: 84.1%, LATE: 96.9%; peak CONC force - EARLY: 83.8%, LATE: 90.1%; ECC RFD - EARLY: 83.3%; LATE: 82.4%; CONC RFU - EARLY: 80.3%, LATE: 90.0%). LATE post-surgery, ACLR group INV limb peak ECC force (deficit: 10.8%), peak CONC force (7.6%), ECC RFD (41.8%), and CONC RFU (22.5%) were significantly lower compared to CONTROL athletes.

CONCLUSIONS: Although CMJ height was not significantly reduced compared to healthy controls 10 months post-surgery, collegiate athletes post-ACL-R present with CMJ maximal and rapid force deficits between limbs and when compared to healthy controls. These findings indicate that kinetic abnormalities persist despite minimal limitation in jump height, the most common CMJ performance metric. Deficits in rapid GRF capacity are greater than deficits in maximal GRF capacity and have practical relevance, as sports activities have limited time available for force development.

1088 Board #2 May 31 8:00 AM - 10:00 AM
Neuromuscular Training Improves Sagittal Plane Hip and Knee landing Kinematics and Kinetics In ACL-reconstructed athletes
Christopher Nagelli, Samual Wordeman, Stephanie Di Stasi, Joshua Hoffman, Tiffany Marulli, Timothy E. Hewett, FACSM, Mayo Clinic, Rochester, MN. 'The Ohio State University, Columbus, OH.
(No relevant relationships reported)

Deficits in hip and knee biomechanical and neuromuscular control are commonly observed in anterior cruciate ligament (ACL) reconstructed (ACL-R) athletes and are associated with an elevated risk of future ACL injury. The efficacy of neuromuscular training (NMT) programs to improve hip and knee biomechanical deficits in ACL-R athletes is currently unknown.

PURPOSE: To quantify the effect of a NMT program in ACL-R reconstructed athletes to improve sagittal plane landing biomechanics. The primary hypothesis tested was that sagittal plane hip and knee biomechanics associated with greater risk of ACL injury would be significantly reduced in ACLR athletes after participation in an NMT program. It was further hypothesized that following training hip and knee sagittal plane biomechanics in the ACLR cohort would not differ from a control cohort who also completed the training program.

METHODS: Eighteen ACL-R and ten control athletes were recruited and completed a 12 session NMT program. Both groups of athletes participated in three-dimensional motion analysis prior to and after completion of the NMT program to evaluate hip and knee kinematics and kinetics during a drop vertical jump. Repeat-measure ANOVA was conducted to determine the effect of training on kinematic and kinetic measures in ACLR athletes. In addition, a two-way ANOVA was conducted to compare post-training differences between the ACLR and control group.

RESULTS: The ACLR athletes demonstrated significantly greater hip and knee flexion angle at initial contact and lower hip and knee flexion moment at initial contact after participation in the NMT program (p<0.05). Post-training comparison between the ACLR and control group showed no significant differences (p>0.05) in hip and knee flexion moment at initial contact and knee flexion angle at initial contact. The ACLR group landed with significantly greater (p<0.05) hip flexion angle at initial contact than the control group after training.

CONCLUSIONS: Hip and knee sagittal plane biomechanical and neuromuscular measures of ACL injury risk demonstrate significant improvements after completion of a NMT program in ACLR athletes. In addition, comparison of post-training hip and knee biomechanics between ACLR athletes and controls demonstrate recovery of biomechanical control.

1089 Board #3 May 31 8:00 AM - 10:00 AM
Biomechanical Adaptations After Exercise in Healthy and ACL Reconstructed Individuals
Lindsay V. Slater, Silvia Blemker, Jay Hertel, FACSM, Sue Saliba, Art Weltman, FACSM, Joe Hart, FACSM.
Northwestern University, Chicago, IL. 'University of Virginia, Charlottesville, VA. (Sponsor: Joe Hart, FACSM)
(No relevant relationships reported)

Athletes with history of anterior cruciate ligament (ACL-R) reconstruction (ACL-R) who return to high-level of sport are at increased risk of another ACL injury during a game. Neuromuscular fatigue during sport may result in adaptive movement patterns that increase risk of injury. PURPOSE: Compare changes in an ACL-R limb and a healthy limb based on fitness level after exercise. METHODS: Thirty-three individuals with history of ACLR (22F/11M, 22.7±23.3 months post-surgery) and 29 healthy

ACSM May 29 – June 2, 2018 Minneapolis, Minnesota
Fear of Reinjury and Optimization of Movement Control in the ACLR Limb during Rehabilitation, rather than limb symmetry, may help to improve ACLR outcomes at return to play.

Previous work has revealed significant between limb asymmetry following anterior cruciate ligament reconstruction (ACLR). Current clinical return to sport testing utilizes single-limb hop distance symmetry (limb symmetry index (LSI)>90%) and time since surgery to determine readiness to return to sport (RTS). Loading metrics could provide new insights on readiness to RTS. Functional knee braces are recommended by clinicians following ACLR. The impact of bracing on hop symmetry is not well understood.

**Purpose:** To evaluate the effect of knee bracing and time since surgery on loading symmetry during hop testing (single hop (SH), triple hop (TH) and crossover hop (CH)).

**Methods:** 25 ACLR (6 male/19 female, age: 18.7, height: 1.73 m, weight: 709.7 kg) completed hop testing after being RTS (29.8 weeks post-op) by the orthopedic surgeon and again 3 months later (RTS +3), while wearing the loadsol (100Hz) (Novel Electronics, St. Paul, MN). Hopping tasks (SH, TH and CH) were collected twice per task. Testing (testing order was randomized) was collected with and without a custom extension constraint knee brace (DonJoy Orthopaedics).

Peak vertical ground reaction force (vGRF), loading rate (LR), and impulse (Imp) were calculated using a custom Matlab program. The LSI was calculated as the ratio of the Sx/Sys×100%. The effect of time (RTS, RTS +3) and condition (Braced, Non-Braced) was assessed using a repeated measures ANOVA for all tasks.

**Results:** No significant interactions or main effects for time were found. Bracing resulted in improved LSI’s for vGRF during TH, p<0.039 and CH, p<0.013) and for Imp during the TH (p<0.039) (Table 1). Conclusion: These results reveal that loading symmetry is improved while wearing a functional knee brace and loading symmetry (LSI>90%) was achieved during most hopping tasks. Future work needs to examine additional functional measures (eg. bilateral landings, running) to determine the impact of functional knee bracing and time on loading LSI.

**Table 1**

<table>
<thead>
<tr>
<th>Task</th>
<th>Single Hop</th>
<th>Triple Hop</th>
<th>Crossover Hop</th>
</tr>
</thead>
<tbody>
<tr>
<td>vGRF</td>
<td>vGRF</td>
<td>vGRF</td>
<td>vGRF</td>
</tr>
<tr>
<td>LR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTS</td>
<td>93.24 (99.95)</td>
<td>89.05 (100.22)</td>
<td>92.897 (100.5)</td>
</tr>
<tr>
<td>TH</td>
<td>87.362 (99.78)</td>
<td>89.478 (100.92)</td>
<td>90.497 (100.53)</td>
</tr>
<tr>
<td>CH</td>
<td>91.807 (99.61)</td>
<td>94.835 (102.28)</td>
<td></td>
</tr>
<tr>
<td>RTS+3</td>
<td>97.791 (100.37)</td>
<td>97.633 (100.26)</td>
<td>92.124 (100.34)</td>
</tr>
<tr>
<td>Braced</td>
<td>91.921 (99.93)</td>
<td>92.063 (100.53)</td>
<td>93.256 (100.53)</td>
</tr>
<tr>
<td>Non-Braced</td>
<td>93.928 (99.86)</td>
<td>94.656 (100.54)</td>
<td>97.856 (100.74)</td>
</tr>
</tbody>
</table>

Note: values are presented as mean (SE)
Anterior cruciate ligament (ACL) injury can disrupt one’s proprioception such as joint position sense (JPS) and ultimately motor function. The application of localized vibration has been used to investigate the integrity of the sensomotor system and the mechanisms of quadriceps weakness after ACL injury and ACLR-reconstruction (ACLR). However, effects of localized vibration on knee JPS in ACLR subjects are largely unknown.

**PURPOSE:** To evaluate JPS with and without vibration and compare among ACLR, contralateral, and control limbs. **METHODS:** Fourteen subjects with ACLR (8 males and 6 females) and fourteen control subjects (7 males and 7 females) participated. Subjects sat on an isokinetic dynamometer chair with vibration strapped on the quadriceps tendon while visual and auditory cues were removed. Subjects were asked to remember target position and replicate that position. The absolute difference between the target and replicated trial was used as JPS. There were three trials at three target positions (15, 45, and 75 degrees of knee flexion) with and without vibration. The JPS differences between vibration and no-vibration conditions were calculated by subtraction. The average JPS was used for analyses. The order of testing conditions was randomized. One-way analysis of variance (ANOVA) or nonparametric (Kruskal-Wallis) was used to compare among limbs. Significance was set at p=0.05. **RESULTS:** There were no significant JPS differences among ACLR, contralateral, and control limbs (p=0.207-0.914) in vibration and no-vibration conditions. Similarly, there were no JPS differences between vibration and no-vibration conditions were used to compare the limbs, there were no significant JPS differences among ACLR, contralateral, and control limbs (p=0.288-0.755). **CONCLUSION:** The current investigation found minimal effects of localized vibration on JPS in the ACLR, contralateral, and control limbs. There are several potential reasons such as vibration-induced post effect, locations of vibration, types of vibration, and rehabilitation status. Despite the current results and limitations, continued effort to develop and refine a means to examine one’s sensomotor system is warranted. Supported by NIH R01AR056259, R01AR055563, L30AR070273, K12HD065987, the Mayo Clinic Kelly Orthopedic Fellowship.

**Individuals 3 months post-ACLR reconstruction (ACLR) decrease vertical (vGRF) and posterior (pGRF) ground reaction forces during loading response (LR) of gait. At this time of double limb support (DLS), decreased loading may result from modifications in gait among limbs; α=0.05, post hoc: paired and independent t-tests. The average JPS was used for analyses. The order of testing conditions was randomized. One-way analysis of variance (ANOVA) or nonparametric (Kruskal-Wallis) was used to compare among limbs. Significance was set at p=0.05 a priori. **RESULTS:** There were no significant JPS differences among ACLR, contralateral, and control limbs (p=0.207-0.914) in vibration and no-vibration conditions. Similarly, there were no JPS differences between vibration and no-vibration conditions were used to compare the limbs, there were no significant JPS differences among ACLR, contralateral, and control limbs (p=0.288-0.755). **CONCLUSION:** The current investigation found minimal effects of localized vibration on JPS in the ACLR, contralateral, and control limbs. There are several potential reasons such as vibration-induced post effect, locations of vibration, types of vibration, and rehabilitation status. Despite the current results and limitations, continued effort to develop and refine a means to examine one’s sensomotor system is warranted. Supported by NIH R01AR056259, R01AR055563, L30AR070273, K12HD065987, the Mayo Clinic Kelly Orthopedic Fellowship.

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**Purpose** World Cancer Research Fund (WCRF) and American Institute for Cancer Research (AICR) routinely review, synthesize and interpret the scientific literature on the links, between physical activity, nutrition, and cancer through the Continuous Update Project (CUP). The WCRF/AICR Third Expert Report, to be published in 2018, will present the latest synthesis of the strength of the evidence linking physical activity to 17 cancer sites and to outcomes in breast cancer survivors. These assessments inform the update of the WCRF/AICR Recommendations for Cancer Prevention and Survival. **Methods** The research team at Imperial College London searched PubMed for relevant prospective studies and extracted literature according to the CUP Systematic Literature Review Protocol for each cancer site. Meta-analyses were conducted comparing the highest versus the lowest categories of physical activity. Where possible, dose-response meta-analyses were conducted and summary relative risks (RR) were calculated using a random effects model. The CUP Expert Panel graded the evidence as: Convincing/probable (strong evidence); Limited-suggestive (limited evidence); 3) Limited-no conclusion (limited evidence); 4) Substantial effect on risk unlikely (strong evidence). **Results** The Panel determined that strong evidence supports that physical activity decreases the risk of postmenopausal breast cancer by 13% (RR: 0.87; 0.79-0.96), endometrial cancer by 17% (RR: 0.83; 0.73-0.98), and prostate cancer by 21-27% (RR: 0.79; 0.71-0.88, occupational; RR: 0.73: 0.58-0.93, recreational). Studies with comparable measurements were too few to allow dose-response analysis in endometrial and colon cancer; dose-response analyses were statistically non-significant for breast cancer. Limited-suggestive evidence was found for decreased risk of liver and esophageal cancer and all-cause mortality in breast cancer survivors with highest vs. lowest physical activity levels. **Conclusions** There is strong evidence that physical activity reduces the risk of cancer at specific sites. Research is needed to determine the duration, intensity, frequency and timing of physical activity for optimal cancer risk reduction and to improve prognosis in cancer survivors.
for pilot data collection were randomized to one of three groups: no additional PA prescribed (CON), 300 min/wk of lighter-intensity PA (LIPA; 40-60% HRR) and 150 min/wk of higher-intensity PA (HIPA; 60-80% HRR). VO₂peak (maximal Balke protocol), anthropometric measures (height, weight, waist and hip circumferences) and body composition (DXA) were assessed at baseline and end of study. Participants in both PA groups received written resources on PA, an activity tracker (Polar A360®) to record heart rate and PA time, and a diary to record PA goals, facilitators and barriers throughout the intervention. In-person/telephone meetings occurred every three weeks to review activity tracker data, reinforce adherence and discuss barriers to achieving the prescribed PA goals.

**RESULTS:** Statistical differences in VO₂peak between groups were noted. Specifically, increases in VO₂peak were noted in HIPA vs. CON (5.9±6.4 vs. 0.5±3.0 ml/kg/min; P = 0.01) and LIPA vs. CON (4.2±4.9 vs. 0.5±3.0 ml/kg/min; P = 0.03). No significant changes in BMI (0.3±0.9, -0.1±1.0, -0.0±1.4 kg/m²; P = 0.60), waist (1.2±4.2, -1.1±3.3, -1.1±3.8 cm; P = 0.2) and hip (0.8±1.7, -0.2±2.7, -0.2±2.1 cm; P = 0.4) circumferences, body fat (0.1±1.4, 0.4±1.9, -1.1±2.3 kg; P = 0.3) and lean (0.4±0.8, -0.1±1.4, 0.7±1.5 kg; P = 0.3) mass were observed between CON, LIPA and HIPA, respectively.

**CONCLUSIONS:** Pilot results indicate that improvements in cardiorespiratory fitness can be achieved with both higher- and lower-intensity PA in breast cancer survivors.

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**SELF-REPORTED PHYSICAL ACTIVITY IS ASSOCIATED WITH ANGIOGENESIS-AND INFLAMMATION-RELATED BIOMARKERS IN COLORECTAL CANCER PATIENTS: RESULTS FROM THE COLOCARE COHORT**

Caroline Himbert, Biljana Gigic, Christy A. Warby, Tengda Lin, Petra Schrots-King, Claire Abbenden-Hartman, Stephanie Skender, Nina Habermann, Lin Zieliske, Alexis Ulrich, Juergen Boehm, Jennifer Oest, Cornelia Uhrich, FACSM,1,2 Huntsman Cancer Institute, Salt Lake City, UT, 1University Clinic of Heidelberg, Heidelberg, Germany, 2National Center for Tumor Diseases, Heidelberg, Germany. 3European Molecular Biology Laboratory, Heidelberg, Germany. (Sponsor: Jim Martin, FACSM)

**Background:** Increased physical activity among cancer patients is associated with decreased cancer-related deaths and improved quality of life. The underlying mechanisms of this association are under investigation. We examined the association between biomarkers of angiogenesis and inflammatory pathways and physical activity in colorectal cancer patients.

**Materials/Methods:** Pre-surgery (baseline) serum samples were collected from 222 colorectal cancer patients in the ColoCare Cohort. Levels of CRP, SAA, IL-6, IL-8, MCP-1, sICAM-1, sVCAM-1, TNFα, VEGFA, and VEGFD were measured with the Meso Scale Discovery platform. Self-reported physical activity levels were assessed at baseline by using the VITAL questionnaire from the VITamins And Lifestyle cohort study and calculated in metabolic equivalent (MET) hours/week (h/wk). PA participants were classified into ≤10 METs h/wk versus >10 METs h/wk. Vascular endothelial growth factors (VEGF) were measured by ELISA. Circulating levels of pro-inflammatory cytokines and sICAM-1, sVCAM-1, and IL-8 were measured using the Bio-Plex system.

**Results:** A total of 132 patients (59%) reported weekly physical activity levels below the prescribed PA goals. Lower METs h/wk were significantly correlated with increased IL-8, sICAM-1, and VEGFD serum levels (r=0.14, p=0.046, r=0.15, p=0.047; r=0.20, p=0.006, respectively). sVCAM-1 and VEGFD also significantly differed by METs h/wk groups, where increased physical activity was associated with decreased biomarker levels (≤10 METs h/wk vs. >10 METs h/wk, sVCAM-1: 0.6±0.2 vs. 0.6±0.1; p=0.03, VEGFD: 0.26±0.38 vs. 0.79±0.240, p=0.002).

**Discussion:** For the first time, we report an association between not only inflammation-related, but also angiogenesis-related biomarkers in patients diagnosed with colorectal cancer. This research contributes to our understanding regarding potential mechanisms of physical activity in relation to cancer development, and prognosis.

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**DIFFERENCES IN PHYSICAL ACTIVITY PATTERNS BETWEEN ADULTS WITH AND WITHOUT CANCER HISTORY**

Arnal A. Wanigatunga,1 Gillian K. Gresham,1 Pei-Lun Kuo1, Pablo Martínez-Amézquita,1 Vadim Zipunnikov2, Sydney M. Dy1,2, Eleanor M. Simonick1, Jennifer A. Schrack,1 Johns Hopkins University, Baltimore, MD, 2 Cedars-Sinai Medical Center, Los Angeles, CA. (Sponsor: Todd M. Manini, FACSM)

**ABSTRACT**

Purpose: Patterns of activity and rest in a typical day may provide insight into functional capacity and reserve in older adult survivors that may not be apparent in examining total physical activity alone. Using objectively collected PA data from the Baltimore Longitudinal Study of Aging, we assessed differences in the accumulation of daily PA among older adults by cancer history.

Methods: 663 participants (mean age 71.7±10 years, 51% women) wore a chest-fitted accelerometer for 7 consecutive days. Participants self-reported cancer history via questionnaire. Accelerometer data were summarized into two continuous metrics: 1) log-transformed total daily PA volume defined as means counts/day and 2) a fragmentation index defined as the total number of PA bouts (consecutive minutes registering at ≥10 counts/min)/total PA minutes. Volume and fragmentation were also each dichotomized into low and high categories using their medians. Participants were categorized into four groups: high PA/low fragmentation, low PA/low fragmentation, high PA/high fragmentation, and low PA/high fragmentation to assess patterns of daily PA accumulation. Multivariable regression models were used to estimate PA pattern differences by cancer history, adjusting for demographics, behavioral factors and number of morbid conditions.

Results: Participants reporting cancer history averaged 0.12 SE=0.05, p=0.02 fewer log-transformed activity counts per day compared to those reporting no cancer history. Although no significant fragmentation differences were detected between cancer groups (p=0.15 in the continuous model), cancer history was associated with a 78% (odds ratio: OR: 1.78, 95% confidence interval: CI: 1.12-2.82) higher odds of being in a high (versus low) fragmentation group and a 93% (OR: 1.98, 95% CI: 1.13-3.32) higher odds of being in a low PA/high fragmentation group (versus high PA/low fragmentation group) when compared to no cancer history.

Discussion: These results suggest that cancer survivors engage in lower total daily PA and that this activity is performed in a more fragmented manner, compared to those with no cancer history. Collectively, these results may be attributable to lower reserve capacity and greater fatigue burden among older cancer survivors that warrant further investigation.

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**PENNSYLVANIA CANCER SURVIVORS AND THEIR ADHERENCE TO THE ACSM PHYSICAL ACTIVITY GUIDELINE**

Joachim Wiskember, Wayne Foo, Renate M. Winkel, Shirley M. Bluthmann, Scherzadea K. Mama, William Calo, Eugene Lengerich, Joel Segel, Kathryn H. Schmitz, FACSM. The Pennsylvania State University, Hershey, PA. (Sponsor: Kathryn Schmitz, FACSM)

**PURPOSE:** To investigate whether Pennsylvania cancer survivors adhere to the ACSM exercise and cancer roundtable guidelines recommending to perform either 75 min of vigorous aerobic exercise per week or 150 min of moderate aerobic exercise per week, or an equivalent combination, and to performed muscle-strengthening exercises at least two times weekly.

**METHODS:** We analyzed data from cancer survivors (n=585), identified using the Pennsylvania Cancer Registry, who were mailed a BRFSS-based questionnaire. We created four guideline-related groups (meeting aerobic guideline, meeting strength guideline, meeting both guideline and not meeting any guideline aspects). We evaluated whether demographic factors (e.g. age, gender, education), health aspects (e.g. smoking, comorbidities, general health status) or disease-related factors (e.g. cancer type, time since diagnosis) were associated with meeting the PA guideline.

**RESULTS:** Out of 585 respondents 449 (77%) provided sufficient PA data to be included in the analysis. Overall 84 (18.7%) of participants met both, 144 (32.1%) met the aerobic and 28 (6.2%) met the strength guideline. However, 192 (43%) did not meet any aspects of the guideline. Participants with higher education (p=0.01) and unemployed/retired participants (p=0.04) were more adherent to PA guidelines (main differences for the subcategory meeting both guideline aspects). Having more than two comorbidities (p=0.01), being a smoker (p=0.04) or being overweight/obese (p<0.01) and having a lower general health perception (p=0.01) was associated with lower adherence rates for PA guidelines. With regard to disease-related factors no significant differences were found. However, cancer type was borderline non-significant (p=0.055) showing lower adherence rates for lung and gynecologic (other than breast) cancer patients.

**CONCLUSIONS:** More than 50% of Pennsylvania cancer survivors were meeting at least one component of the ACSM PA guideline for cancer patients. Various factors were found to be associated with adherence to the guideline. Identifying predictors for low guideline adherence can help to identify patient groups that may benefit from increased support to achieve a physically active lifestyle.

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Cancer-related fatigue is the most debilitating side effect reported by cancer survivors, often lasting years following treatment. **PURPOSE:** To determine the effects of a 10 wk exercise intervention compared to a health education intervention on fatigue, psychological health outcomes and physical fitness in cancer survivors with documented fatigue. **METHODS:** This quasi experimental study allocated 37 post-treatment cancer survivors (33 female, 4 male, aged 55±2 yr, body mass index 28.5±1.3, time since treatment 2.3±0.3 yr; mean(SEM) to an exercise group (ExG, n=19) or health education comparison group (HEG, n=18). The intervention, with 2 min increments weekly, was tailored to fatigued individuals and emphasized brisk walking, stretching, exercise education and self-efficacy enhancement. Participants were evaluated at 0, 4, 8 and 10 weeks with the ExG evaluated again at 26 weeks. **RESULTS:** The intervention effect on fatigue (FACT-F) in ExG was greater (p<0.05) than in HEG, the difference between groups at 10 weeks being 4 times the recognised clinical important difference. The intervention also increased (p<0.05) cognitive function, global quality of life, 6 min walk test and 30 sec sit to stand scores. It reduced (p<0.05) insomnia and fear of physical activity. There was no intervention effect on C-reactive protein, total leukocytes, lymphocytes, monocytes or granulocytes, or on pulse wave velocity. The intervention effect on fatigue in ExG was largely achieved by wk 4 and maintained to 26 weeks. There was 100% retention rate at 10 weeks in both experimental groups and no adverse events reported. **CONCLUSIONS:** In survivors with documented fatigue, progressive exercise training has beneficial and sustained effects of considerable magnitude on fatigue, physical fitness and other quality of life outcomes beyond those attributable to peer support and investigator attention. These effects do not appear to be mediated by inflammatory factors. 

<table>
<thead>
<tr>
<th>Fatigue and fitness changes following an exercise intervention in fatigued cancer survivors</th>
<th>Exercise</th>
<th>Health Education</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome</strong></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>- Fatigue (FACT-F)</td>
<td>19.3±2.2</td>
<td>40.3±2.4 *</td>
</tr>
<tr>
<td>- Quality of Life (EORTC QLQ-C30)</td>
<td>50.0±4.6</td>
<td>69.3±4.7 *</td>
</tr>
<tr>
<td>- Cognitive Functioning (EORTC QLQ-C30)</td>
<td>41.2±7.7</td>
<td>71.9±6.5 *</td>
</tr>
<tr>
<td>- Insomnia Severity (ISI)</td>
<td>15.2±1.8</td>
<td>8.2±1.6 *</td>
</tr>
<tr>
<td>- Fear of physical activity (FAPA-B)</td>
<td>28.9±6.3</td>
<td>13.1±3.7 *</td>
</tr>
<tr>
<td>- 6 min walk test (m)</td>
<td>438±16</td>
<td>602±18 *</td>
</tr>
<tr>
<td>- 30 sec Sit to Stand (reps)</td>
<td>13.4±0.8</td>
<td>23.8±1.2 *</td>
</tr>
<tr>
<td>- Pulse Wave Velocity (m/s)</td>
<td>5.8±0.8</td>
<td>6.2±0.6</td>
</tr>
<tr>
<td>- C reactive protein (mg/L)</td>
<td>1.9±0.6</td>
<td>2.9±0.8</td>
</tr>
</tbody>
</table>

Values are mean ± SEM. *p<0.05 compared to pre-value in same group. ↓significant group x timepoint interaction.
Performance was similar on Days 1 and 2, although it did decline during exercise due to ventilatory threshold (VT). Subjects were asked to report prior night sleep duration and average sleep duration during the previous calendar month. Acute:chronic sleep was calculated as the ratio of prior night and prior month sleep. Variables were grouped by prior night and prior month sleep durations (8 hours, ≥6 hours) as well as acute:chronic sleep (ac:ch ≥1). VO_{2max}, T_{awake}, and VT were compared between groups using least square means from age-adjusted linear models. Effect size was calculated as Cohen’s d.

**Results:** No statistically significant differences were identified between those subjects who slept ≥8 the prior night and those who slept <8 hours, with respect to VO_{2max} (50.3 ± 2.4 v 47.6 ± 2.0 ml/kg/min, p=0.10, d=0.45), T_{awake} (15.7 ± 0.7 v 14.9 ± 0.9 min, p=0.17, d=0.37), or VT (43.2 ± 1.9 v 40.7 ± 2.2 ml/kg/min, p=0.09, d=0.46). Subjects who averaged ≥8 hours of sleep in the prior month demonstrated significantly greater VO_{2max} (50.4 ± 3.2 v 45.2 ± 1.7 ml/kg/min, p<0.01, d=0.83) and VT (43.0 ± 1.5 v 39.0 ± 2.9 ml/kg/min, p=0.016, d=0.78), but not T_{awake} (15.6 ± 0.6 v 14.8 ± 1.2 min, p=0.24, d=0.37). On the other hand, subjects who slept the previous night more than over the previous month (acute: chronic ≥1) demonstrated greater T_{awake} (16.4 ± 1.0 v 14.9 ± 0.7 min, p=0.012, d=0.73), but not VO_{2max} (50.1 ± 2.8 v 48.7 ± 1.3 ml/kg/min, p=0.38, d=0.25) or VT (42.7 ± 2.5 v 41.9 ± 1.7 ml/kg/min, p=0.60, d=0.15).

**Conclusion:** Among female adolescent athletes, greater sleep duration over the prior month is associated with increased VO_{2max} and VT, while increased prior night sleep relative to the preceding month was associated with increased T_{awake}. This suggests that chronic sleep may facilitate physiologic adaptation to increased aerobic capacity, while acute:chronic sleep may exert a greater influence on perceived exertion that impacts overall performance.

Acute sleep deprivation is often experienced in military operations. **Purpose:** To determine the relationship between acute, chronic, and acute:chronic sleep on aerobic performance in female youth soccer athletes. **Methods:** Fifty-nine female soccer players (13-18 years) underwent cycle ergometer testing to determine maximal aerobic capacity (VO_{2max}), time to exhaustion (T_{exh}) and ventilatory threshold (VT). Subjects were asked to report prior night sleep duration and average sleep duration during the previous month. Acute:chronic sleep was calculated as the ratio of prior night and prior month sleep. Variables were grouped by prior night and prior month sleep durations (≥8 hours, >8 hours) as well as acute:chronic sleep (ac:ch ≥1). VO_{2max}, T_{awake}, and VT were compared between groups using least square means from age-adjusted linear models. Effect size was calculated as Cohen’s d.

**Results:** No statistically significant differences were identified between those subjects who slept ≥8 the prior night and those who slept <8 hours, with respect to VO_{2max} (50.3 ± 2.4 v 47.6 ± 2.0 ml/kg/min, p=0.10, d=0.45), T_{awake} (15.7 ± 0.7 v 14.9 ± 0.9 min, p=0.17, d=0.37), or VT (43.2 ± 1.9 v 40.7 ± 2.2 ml/kg/min, p=0.09, d=0.46). Subjects who averaged ≥8 hours of sleep in the prior month demonstrated significantly greater VO_{2max} (50.4 ± 3.2 v 45.2 ± 1.7 ml/kg/min, p<0.01, d=0.83) and VT (43.0 ± 1.5 v 39.0 ± 2.9 ml/kg/min, p=0.016, d=0.78), but not T_{awake} (15.6 ± 0.6 v 14.8 ± 1.2 min, p=0.24, d=0.37). On the other hand, subjects who slept the previous night more than over the previous month (acute: chronic ≥1) demonstrated greater T_{awake} (16.4 ± 1.0 v 14.9 ± 0.7 min, p=0.012, d=0.73), but not VO_{2max} (50.1 ± 2.8 v 48.7 ± 1.3 ml/kg/min, p=0.38, d=0.25) or VT (42.7 ± 2.5 v 41.9 ± 1.7 ml/kg/min, p=0.60, d=0.15).

**Conclusion:** Among female adolescent athletes, greater sleep duration over the prior month is associated with increased VO_{2max} and VT, while increased prior night sleep relative to the preceding month was associated with increased T_{awake}. This suggests that chronic sleep may facilitate physiologic adaptation to increased aerobic capacity, while acute:chronic sleep may exert a greater influence on perceived exertion that impacts overall performance.
CONCLUSIONS: While being a competitive scholarship athlete is stressful and time consuming, it is not all that defines the participants. Further examination of other factors, such as academic demands, along with social and family commitments should be studied to better understand their effects on the hormone and psychometric scores. 

1109 Board #5 May 31 8:00 AM - 10:00 AM Self-Reported, Current and Ideal Sleep Habits of Adolescent Athletes
Melissa L. Anderson, Kortney J. Dalrymple, Timothy J. Roberts. GSSI, Bradenton, FL.
Reported Relationships: M.L. Anderson: Salary. This study was funded by the Gatorade Sports Science Institute. The views expressed in this abstract are those of the authors and do not necessarily reflect the position or policy of PepsiCo, Inc.

BACKGROUND: Leading health organizations recommend adolescents obtain 8 to 10 hours of sleep each day. There is a growing body of literature that suggests many adolescents, including athletes, are not meeting these recommendations; however, barriers to obtaining adequate sleep are still largely unknown. PURPOSE: To quantify sleep habits in a group of athletes and to understand how their current habits compare with their self-reported ideal sleep durations. METHODS: One hundred seventy three adolescent team- and individual-sport athletes (16 ± 2 y; male: n=139, female: n=34) from 10 different sports completed both Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS) surveys during a laboratory visit. The PSQI was analyzed to determine self-reported habitual bedtime, wake time, and sleep duration, as well as sleep quality over the previous month. The ESS was analyzed to determine self-reported ideal bedtime, wake time, and sleep duration. Data are presented as mean ± SD. A paired t-test was used to compare current and desired sleep durations.

RESULTS: Habitual bedtime (n=171) was 22:37 ± 0:46. Habitual wake time (n=167) was 06:47 ± 0:58. Self-reported actual sleep duration was 7:6 ± 1:0 h with 54% of athletes obtaining less than the recommendation of 8 h of sleep per night. To feel their best, ideal self-reported bedtime (n=162) was 21:57 ± 0:41 and self-reported wake time (n=159) was 07:49 ± 1:18. Calculated ideal total sleep duration (n=158) was 9:9 ± 1:4 h, which was significantly longer than actual sleep duration (n=155; p<0.001). Habitual sleep quality, assessed as the mean Global PSQI score, (n=159) was 4.1 ± 2.2; however, 63 athletes (39.6%) had a score ≥5, which is the PSQI cutoff indicative of poor sleep quality. CONCLUSIONS: Self-reported habitual sleep duration in a group of adolescent athletes suggests the majority do not meet the minimum sleep duration recommendations and many have poor sleep quality. However, when reporting their ideal sleep habits, most athletes would prefer to obtain significantly more sleep, desiring durations at the top end of the recommendations even. This suggests lack of desire is not the main reason for sub-optimal sleep duration in this group. Therefore, researchers and practitioners should focus on identifying and creating solutions to overcome barriers to sleep.

1110 Board #6 May 31 8:00 AM - 10:00 AM Sleep Coaching Augments the Physiological Benefits of Exercise Training
Eric V. Neufeld, Brett A. Dolezal, David M. Boland, Jennifer L. Martin, Christopher B. Cooper, FACSM. David Geffen School of Medicine at UCLA, Los Angeles, CA. (No relevant relationships reported)

Exercise and quality sleep exert positive effects on each other. The practice of healthy habits also enhances sleep quality and duration. PURPOSE: To examine whether a multicomponent sleep coaching intervention (SC) combined with aerobic and resistance training programs would improve fitness and health measures more than the training program alone. METHODS: Thirty-eight healthy fitness club patrons (22 men) were randomized to receive SC (n = 19), consisting of twelve, 10 min education sessions between the trainer and participant to discuss the role and relationship to sleep associated with sleep and exercise, personalized sleep and resistance training assignments or equal-attention (EA) (n =19), consisting of twelve, 10 min education sessions to provide information to the athletes on general wellness topics. All assignments or equal-attention (EA) (n =19), consisting of identical training and education time, with education sessions discussing general wellness topics. All athletes completed both Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS) surveys during a laboratory visit. The PSQI was analyzed to determine self-reported habitual bedtime, wake time, and sleep duration, as well as sleep quality over the previous month. The ESS was analyzed to determine self-reported ideal bedtime, wake time, and sleep duration. Data are presented as mean ± SD. A paired t-test was used to compare current and desired sleep durations.

RESULTS: Self-reported actual sleep duration was 7:6 ± 1:0 h with 54% of athletes obtaining less than the recommendation of 8 h of sleep per night. To feel their best, ideal self-reported bedtime (n=162) was 21:57 ± 0:41 and self-reported wake time (n=159) was 07:49 ± 1:18. Calculated ideal total sleep duration (n=158) was 9:9 ± 1:4 h, which was significantly longer than actual sleep duration (n=155; p<0.001). Habitual sleep quality, assessed as the mean Global PSQI score, (n=159) was 4.1 ± 2.2; however, 63 athletes (39.6%) had a score ≥5, which is the PSQI cutoff indicative of poor sleep quality. CONCLUSIONS: Self-reported habitual sleep duration in a group of adolescent athletes suggests the majority do not meet the minimum sleep duration recommendations and many have poor sleep quality. However, when reporting their ideal sleep habits, most athletes would prefer to obtain significantly more sleep, desiring durations at the top end of the recommendations even. This suggests lack of desire is not the main reason for sub-optimal sleep duration in this group. Therefore, researchers and practitioners should focus on identifying and creating solutions to overcome barriers to sleep.

1111 Board #7 May 31 8:00 AM - 10:00 AM Effects Of Continuous Versus Interval Exercise On Sleep Profile In Young Healthy Males
Jorge Fernando Tavares de Souza, Solange Prado São José, Hanna Karen Moreira Antunes. Universidade Federal de São Paulo, São Paulo, Brazil. (No relevant relationships reported)

The total sleep time of the population is decreasing every year and, in addition, the number of people complaining of poor sleep or sleep disorders is increasing. On the other hand, regular exercise is known as one of the tools that help to promote sleep hygiene. However, it is not known which type of exercise is best. PURPOSE: To examine whether a multicomponent sleep coaching intervention (SC) combined with aerobic and resistance training programs would improve fitness and health measures more than the training program alone. METHODS: Thirty-eight healthy fitness club patrons (22 men) were randomized to receive SC (n = 19), consisting of twelve, 10 min education sessions between the trainer and participant to discuss the role and relationship to sleep associated with sleep and exercise, personalized sleep and resistance training assignments or equal-attention (EA) (n =19), consisting of identical training and education time, with education sessions discussing general wellness topics. All athletes completed both Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS) surveys during a laboratory visit. The PSQI was analyzed to determine self-reported habitual bedtime, wake time, and sleep duration, as well as sleep quality over the previous month. The ESS was analyzed to determine self-reported ideal bedtime, wake time, and sleep duration. Data are presented as mean ± SD. A paired t-test was used to compare current and desired sleep durations.

RESULTS: Self-reported actual sleep duration was 7:6 ± 1:0 h with 54% of athletes obtaining less than the recommendation of 8 h of sleep per night. To feel their best, ideal self-reported bedtime (n=162) was 21:57 ± 0:41 and self-reported wake time (n=159) was 07:49 ± 1:18. Calculated ideal total sleep duration (n=158) was 9:9 ± 1:4 h, which was significantly longer than actual sleep duration (n=155; p<0.001). Habitual sleep quality, assessed as the mean Global PSQI score, (n=159) was 4.1 ± 2.2; however, 63 athletes (39.6%) had a score ≥5, which is the PSQI cutoff indicative of poor sleep quality. CONCLUSIONS: Self-reported habitual sleep duration in a group of adolescent athletes suggests the majority do not meet the minimum sleep duration recommendations and many have poor sleep quality. However, when reporting their ideal sleep habits, most athletes would prefer to obtain significantly more sleep, desiring durations at the top end of the recommendations even. This suggests lack of desire is not the main reason for sub-optimal sleep duration in this group. Therefore, researchers and practitioners should focus on identifying and creating solutions to overcome barriers to sleep.
C-12  Free Communication/Slide - New Insights in Measurement of Physical Activity and Sedentary Behavior  

**PURPOSE:** To characterize and compare the change in moderate to vigorous physical activity (MVPA) between an accelerometer and smart phone-based physical activity log across a three-week physical activity intervention. METHODS: Participants (N=204, 77% female, age=33±11y, BMI=28.2±7.1 kg/m²) in the Make Better Choices (MB1C) Study were randomized to one of two activity-related intervention arms: 1) increase MVPA arm or 2) decrease sedentary active control arm. Participants wore an accelerometer while simultaneously completing a smartphone-based physical activity log for five weeks: a two-week baseline assessment phase and a three-week intervention follow-up phase. Linear mixed effects models were used to characterize the difference in MVPA between measurement methods across baseline and intervention. RESULTS: Physical activity logs show a 43.5 min/day (95% CI: 31.9, 55.1) difference in means between the two groups at follow-up and accelerometer results indicate a 12.3 min/day (95% CI: 9.5, 15.2) difference in means between the two groups at follow-up, with the increase MVPA group recording more minutes per day of MVPA. Correlations between the two measurement methods for the physical activity group increased from baseline (r=0.58, p<0.001) to intervention follow-up (r=0.68, p<0.001) and no change was seen in the active control group from baseline (r=0.59, p<0.001) to intervention follow-up (r=0.55, p<0.001). Intervention effect size when using the physical activity log was 0.48 and 0.54 when capturing change (r=0.59, p<0.001) to intervention follow-up (r=0.55, p<0.001). Similar effect sizes suggest smartphone-based physical activity log may provide similar results to accelerometers for estimating intervention effects.  

**CONCLUSIONS:** During a multistage ultra-endurance triathlon, performance time can be predicted by sleep time the night before. In addition, faster performance times during each stage predicts more sleep time. These results demonstrate the need for more research to elucidate how these factors influence estimates of ST from RGA in free-living settings. Funded by: NIH: 1F31HL129802-01

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May 31, 2018

Vol. 49 No. 5 Supplement  S217

Official Journal of the American College of Sports Medicine

The present study compared sedentary time estimates from a thigh-worn monitor (AP) to a wrist and hip-worn AG monitor across five different activity domains in a free-living environment. METHODS: Participants (n=16, mean age=26.9yrs, 69% female) were two AG monitors (right hip, non-dominant wrist, and one AG accelerometer (thigh) for two, 2-hour sessions. Each participant completed 2 out of 5 activity domains that represent daily life: household (H, N=5), active leisure (AL, N=8), sedentary leisure (SL, N=6), work (W, N=7), and transportation/errands (TE, N=4). Sedentary time was estimated from AG hip data using: Sojourn 3x (S3x), 100 vertical cut point (V100), 200 vector magnitude cut point (VM200), and the Cootre two-regression (C2) method. A random forest machine learning method (RF) was used to classify AG wrist data. Relationship between AG and AP methods were examined with Pearson correlations. A paired t-test was used to examine mean differences in overall sedentary time estimates, and a linear mixed effects model was used to test for any significant interaction between accuracy of AG methods by activity domain. P-values < 0.05 are considered statistically significant. RESULTS: Compared to AP, correlations for AG methods were: S3x (r=0.82), VM200 (r=0.81), C2 (r=0.71), V100 (r=0.61) and RF (r=0.68), (all p<0.05). Compared to AP, estimates were significantly higher for the S3x (mean diff [95%CI] 9.4 (4.5-18.3) min, 95%CI 0.02, p=0.003). The S3x was not statistically different than AP. The accuracy of S3x did not differ by domain (0.05), while the accuracy of the 200VM, C2, 100V and RF estimates significantly differed by domain (p<0.05). VM200, C2 and RF overestimated sedentary time in the TE and H domains and underestimated in AL and SL. CONCLUSIONS: The S3x method overestimated sedentary time compared to AP, but was the most precise and consistent across domains. These data highlight the importance of ensuring a range of activity domains in free-living validation studies. Future research should expand the sample and include direct observation measures of sedentary time compared to AP and AG. Supported by Bill and Linda Frost Fund

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May 31, 2018

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Official Journal of the American College of Sports Medicine

The purpose of this study was to determine the accuracy of 14 step counting methods under free-living conditions during all waking hours of one day. METHODS: Twelve adults (mean±SD, age: 35±13yrs) wore a chest harness that held a GoPro video camera angled down towards the feet. The GoPro continuously recorded video of all steps taken throughout the day. Simultaneously, participants wore two StepWatch [SW] devices on each ankle (each programmed with different settings), one activPAL [AP] on each thigh, four devices at the waist (Fitbit Zip [FZ], Yamax Digi-Walker SW-200 [DW]), New Lifestyles NL-2000 [NL], and ActiGraph GT3X

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**Abstracts were prepared by the authors and printed as submitted.**
CONCLUSION:
For the AW, mean absolute percent error (MAPE) was used to assess individual-level accuracy, except for AW which estimated net EE, thus separate equivalence test was performed between the estimated (PAM) and measured (K4b2) EE recorded at the start and end of the trial, and the difference was used for analysis.

Oxygen consumption was converted to EE in kilocalories (kcal), then summed over the whole trial to obtain gross EE. Net EE was calculated by subtracting the estimated EE from gross EE.

RESULTS:
Consumer-grade physical activity monitors (PAMs) have been extensively examined for estimating energy expenditure (EE) in adults; however, few studies have examined their ability to estimate EE in youth. PURPOSE: The purpose of this study was to examine equivalence between predicted EE (consumer-grade PAMs) and measured EE (indirect calorimetry) in youth. METHODS: Ninety-five youth (mean(SD); age, 12.2(3.5) yr; 49% male) performed 30 min of supine rest and 16 structured activities ranging from sedentary behaviors to vigorous intensities. Each structured activity was performed twice: once for 60-90 s and once for 4.5 min. During all testing, participants wore an Apple Watch 2 (AW, left wrist) and Mymo Activity Tracker (MT, right hip). Samples subsampled two Misfit Shine 2 devices (MSS, right wrist), Misfit Shine (MS, right shoe, n = 27), a Samsung Gear Fit 2 (SG, right wrist, n = 44), and/or a Fitbit Charge 2 (FC, right wrist, n = 53). A Cosmed K4b2 was used as the criterion measure of EE. Oxygen consumption was converted to EE in kcalories (kcal), then summed over the whole trial to obtain gross EE. Net EE was calculated by subtracting the estimated basal EE (Schafied’s equation) from the measured gross EE. For all PAMs, EE was recorded at the start and end of the trial, and the difference was used for analysis. 95% equivalence testing was used to compare the predicted EE (consumer-grade PAMs) and measured EE (indirect calorimetry) in youth.

RESULTS: The SW devices captured between 95.3% and 102.8% of actual steps throughout the day (P>0.05). Seven step counting methods estimated less than 100% of actual steps; FZ, NL, AG with the Moving Average Vector Magnitude algorithm (MAVM) and within the frequency detection (LFE), both worn on the hip, the FC worn the non-dominant wrist, and the AP on both the left and right thighs, capturing 69% to 81% of actual steps (P>0.05). Three methods estimated more than 100% of actual steps; AG with LFE worn on the hip and both wrists, capturing 128% to 220% of actual steps (P>0.05). Estimated steps from SW (with all settings), DW, FC on the dominant wrist, and AG (with LFE and MAVM) on both wrists did not significantly differ from actual steps (P>0.05).

CONCLUSIONS: Across all waking hours of one day, step counts differ between methods. Compared to hand counted steps, the SW device, regardless of settings, was highly accurate for counting all free-living steps.

<table>
<thead>
<tr>
<th>Method</th>
<th>Mean EE (kcal)</th>
<th>MAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>K4b2 EE</td>
<td>160 (143-175)</td>
<td>75±42</td>
</tr>
<tr>
<td>Apple Watch EE</td>
<td>75±42</td>
<td>56±4</td>
</tr>
<tr>
<td>MSS</td>
<td>160 (143-175)</td>
<td>75±42</td>
</tr>
<tr>
<td>MS</td>
<td>75±42</td>
<td>56±4</td>
</tr>
</tbody>
</table>

Table 1: Mean EE (kcal) and MAPE for six PAMs in youth

<table>
<thead>
<tr>
<th>Method</th>
<th>Gross EE (kcal)</th>
<th>Net EE (kcal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>K4b2</td>
<td>232±71</td>
<td>160 (143-175)</td>
</tr>
<tr>
<td>Apple Watch</td>
<td>236±108</td>
<td>75±42</td>
</tr>
<tr>
<td>MSS</td>
<td>208±77</td>
<td>75±42</td>
</tr>
<tr>
<td>MS</td>
<td>208±76</td>
<td>75±42</td>
</tr>
<tr>
<td>Samsung Gear Fit 2</td>
<td>177±65</td>
<td>56±4</td>
</tr>
<tr>
<td>Fitbit Charge 2</td>
<td>281±11</td>
<td>75±42</td>
</tr>
</tbody>
</table>

*significantly equivalent to K4b2 (p<0.05); *values in parentheses are equivalence zone

RESULTS: The Exercise Vital Signs (EVS) is a new brief (~30 seconds) physical activity (PA) questionnaire used by the Exercise is Medicine initiative within the American College of Sports Medicine. While the criterion validity of the EVS has been evaluated in a select number of ethnic groups, research on the validity and reliability of the EVS questionnaire in a diverse, urban sample is lacking. PURPOSE: To determine the validity and reliability of the EVS in a diverse, urban sample.

METHODS: An ethnically-diverse sample (White 33%, Latino 31%, Asian 21%, Black 15%) of N=39 participants (age 31(10)) were asked to wear an accelerometer at the hip for 9 days and to complete the EVS at the beginning (T1) and end (T2) of the wear period. The criterion validity of the EVS-estimated minutes of weekly moderate-vigorous PA (MVPA) was determined against accelerometer-derived estimates of the total time spent in ≥10min bouts of MVPA using Spearman’s correlations. EVS responses were used to predict subjects who were confirmed to meet current PA guidelines of ≥150 MVPA min/week via accelerometry using logistic regression. The EVS receiver operating characteristic area under the curve (AUC), sensitivity, and specificity were calculated. The concurrent validity of the EVS MVPA estimates was tested against accelerometer-derived steps/day using Spearman’s correlations. The intraclass correlation coefficient (ICC) was calculated between the EVS responses at T1 and T2 in order to evaluate questionnaire test-retest reliability.

RESULTS: Reliability for the EVS questionnaire was strong (ICC> .98). There was a moderate correlation (rho= .58 at T1; rho= .01 at T2) between the EVS-estimated PA minutes/week and the accelerometer-derived MVPA minutes/week. There was also a moderate correlation (rho=.43 at T2, p=.006) between EVS-determined PA minutes/week and the accelerometer-derived steps/day. The T2 EVS specificity and sensitivity were 56% and 78%, respectively, and the AUC was 0.74.

CONCLUSIONS: In a diverse, urban sample, the EVS questionnaire has acceptable validity and high test-retest reliability. The EVS may be a useful tool for identifying ethnically-diverse individuals not meeting current PA guidelines. Further research in larger ethnically-diverse samples is needed.
**Table 1. Accuracy of OPTRA-T scores and screening test in identifying toddlers at risk of insufficient daily activity according to current physical activity recommendations**

<table>
<thead>
<tr>
<th>Observation Length</th>
<th>Average (n = 60)</th>
<th>Median (n = 60)</th>
<th>95% CI</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive Predictive Value</th>
<th>Negative Predictive Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 min</td>
<td>88%</td>
<td>89%</td>
<td></td>
<td>90%</td>
<td>92%</td>
<td>96%</td>
<td>96%</td>
</tr>
<tr>
<td>30 min</td>
<td>92%</td>
<td>92%</td>
<td></td>
<td>91%</td>
<td>93%</td>
<td>96%</td>
<td>96%</td>
</tr>
<tr>
<td>45 min</td>
<td>91%</td>
<td>91%</td>
<td></td>
<td>90%</td>
<td>92%</td>
<td>96%</td>
<td>96%</td>
</tr>
<tr>
<td>60 min</td>
<td>90%</td>
<td>90%</td>
<td></td>
<td>90%</td>
<td>92%</td>
<td>96%</td>
<td>96%</td>
</tr>
</tbody>
</table>

*American Heart Association. The AHA’s Recommendation’s for Physical Activity in Children

**Institute of Medicine. Early Childhood Obesity Prevention Policies**

**PURPOSE:**

Determine the sensitivity of a consumer activity tracker (CAT) to detect changes in physical activity (PA) measures during laboratory (LAB) and free-living (FL) conditions.

**METHODS:**

Twenty-one participants wore the CAT and ActiGraph GT3X+ accelerometer (AG) at the hip and dominant wrist during three, 1-hour LAB sessions: sedentary (SS), sedentary plus walking (SW), and sedentary plus jogging (SJ). For SW and SJ, participants performed 30-minutes of sitting, then 30-minutes of walking or jogging at 5.15 or 8.0 kph, respectively. Direct observation (DO) of steps served as the criterion measure for SW and SJ sessions. Devices were also worn during two FL conditions: 1) active week where participants met activity guidelines (ACT); 2) sedentary week, absent of purposeful activity (SED). The PA measures were: CAT and AG steps and kCals, CAT “points”, and AG vertical axes counts. For LAB and FL, significant differences were examined by comparing non-overlapping 95% confidence intervals (C.I.’s) and linear mixed effects models, respectively. Linear mixed effects models were fit for differences (bias; absolute and percent) between CAT device estimated steps and DO step (α ≤ 0.05).

**RESULTS:**

For all hip-worn CAT measures there was a significant step-wise increase (p < 0.05) from SS to SJ. For the wrist-worn CAT, there was a significant step-wise increase in steps and “points” from SS to SJ (p < 0.05). However, the wrist CAT kCal estimates were greater for SJ, compared to SS and SW, which were similar to each other [95% C.I.’s: (95.5, 152.8) and (141.1, 378.9), respectively]. Compared with DO, CAT hip significantly underestimated steps by 3.5%, while CAT wrist significantly underestimated steps by 11.2% (p < 0.05). As hypothesized, participants who did not satisfy VO₂max criteria were significantly older than those who satisfied criteria (p = 0.049) and attained a directly measured VO₂max that was 2.31 mL·kg⁻¹min⁻¹ less than their OUES-predicted VO₂max value (d = 2.72; p < 0.001). Conclusions: Older adults are less likely to satisfy VO₂max criteria, which results in an underestimation of their CRF. Without adhering to standardized criteria, VO₂max measurement error may lead to misinterpretation of CRF and age-related associations. Here, we conclude that OUES is a reliable, valid measurement of CRF which does not require consideration of standardized criteria.

**Graded exercise tests (GXTs) can be used to determine peak oxygen uptake (VO₂max) and the lactate threshold (LT), and are commonly employed by sport scientists and coaches to evaluate and prescribe exercise training. Two critical methodological choices that influence these indices are GXT stage length (for VO₂max) and the method used to calculate the LT.**

**REFERENCES:**

1. American Heart Association. The AHA’s Recommendation’s for Physical Activity in Children

2. Institute of Medicine. Early Childhood Obesity Prevention Policies

**Abstracts were prepared by the authors and printed as submitted.**
using mean difference (MD), effect size (ES), intraclass correlation (ICC), and the coefficient of variation (CV). RESULTS: The VO_{2peak} value from GXT was 61.0 ± 5.3 mL/kg/min and the posttest VO_{2peak} was 55.4 ± 7.5 mL/kg/min (mean ± SD). The MLSS power was 264 ± 39 W; VO_{2MLSS} derived from GXT, X, underestimated VO_{2peak} from GXT, MD = -12.2, -2.1, -3.7 and -4.8 mL/kg/min; ES = 0.23, 0.36, 0.69 and 0.88; ICC = 0.82, 0.75, 0.63 and 0.77; GXT vs. GXT, X, underestimated VO_{2peak} from GXT, MD = -12.2, -2.1, -3.7 and -4.8 mL/kg/min; ES = 0.23, 0.36, 0.69 and 0.88; ICC = 0.82, 0.75, 0.63 and 0.77. CONCLUSION: The log-poly-MD_{de} derived from GXT yielded the most valid estimate of the MLSS; however, the VO_{2peak} from the four longest GXTs (3, 7 and 10 min) underestimated the VO_{2peak} from GXT.

1125 May 31 8:30 AM - 8:45 AM Evaluation of VO_{2peak} Calculations for the Boer 2 Through 5 Protocols
Nicholas F. Boer, Josh Johann, Gregory Heath, FACSM. Univ. of Tennessee, Chattanooga, TN.
(No relevant relationships reported)

PURPOSE: The purpose of this investigation was to determine whether individuals of varying fitness levels would self-select an appropriate exercise test from the Boer 1 - 5 graded (maximal) exercise testing protocols. The protocols were developed to be used during fitness evaluations (1 - 5 graded). Moderate Fit, 3 - Fit, 4 - Highly Fit and 5 - Elite. It is hypothesized that calculated VO_{2peak} in each group will be different, while testing time will be statistically the same.

METHODS: Students from an exercise prescription lab course completed one of the five Boer protocols as a class assignment. Subjects completed a short survey and listened to a lecture regarding protocol selection. Subjects completed the grade exercise test and stopped the test when volitional fatigue was achieved. Treadmill testing time and calculated VO_{2peak} (from the intensity reached during the last two minutes) was recorded. A one-way ANOVA was completed with treadmill time and calculated VO_{2peak} as dependent variables and protocol selection as the independent variable.

RESULTS: N=83 (33 Male, 50 Female) Age 21.8 years (1.3), BMI 24.9 (4.3) There were no statistical difference between male and female results. Therefore, all subjects were pooled into the respective protocol. (No subjects completed Boer 1.)

<table>
<thead>
<tr>
<th>Group</th>
<th>VO_{2Peak} (ml/kg/min)</th>
<th>Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boer 1</td>
<td>36.5 (2.2)*</td>
<td>14.9 (2.6)</td>
</tr>
<tr>
<td>Boer 2</td>
<td>43.3 (3.8)*</td>
<td>13.9 (2.1)</td>
</tr>
<tr>
<td>Boer 3</td>
<td>54.1 (4.5)*</td>
<td>13.5 (2.2)</td>
</tr>
<tr>
<td>Boer 4</td>
<td>64.0 (5.2)*</td>
<td>12.8 (1.5)</td>
</tr>
</tbody>
</table>

* (p<0.0001) compared to each of the other groups Total time includes a three minute warm up. CONCLUSIONS: Subjects were able to determine an appropriate Boer 1 - 5 protocol and calculated VO_{2peak} was discrepit between participants in each protocol. Treadmill time remained similar in each group, which does not occur when existing maximal protocols are used to determine aerobic fitness in subjects of varying fitness levels. Preliminary evidence would suggest that this is a viable method to test aerobic fitness in the population.

1126 May 31 8:45 AM - 9:00 AM Change In VO_{2max} And Time Trial Performance To Interval Training Prescribed According To Ventilatory Threshold
(No relevant relationships reported)

Research shows that about 20% of participants demonstrate no change in maximal oxygen uptake (VO_{2max}) in response to moderate intensity continuous training (MICT) (Bouchard et al 1999) or high intensity interval training (HIIT, Astorino & Schubert 2014). Approximately 50% of this non-response is hereditary (Bouchard et al 1999) although the other 50% is unexplained (Maan et al 2015) and likely related to participants’ habitual physical activity and dietary patterns, sleep, and traits of the training regime. In univariate, Wolpensijn et al (2015) showed that MICT prescribed according to Ventilatory Threshold (VT) led to lower onset of individual non-response than when prescribed using HR. PURPOSE: To prescribe HIIT according to VT to monitor aggregate and individual responses in both VO_{2max} and time trial (TT) performance. METHODS: Eleven active (age and VO_{2max} = 28.9 ± 7.9 yr and 38.4 ± 4.5 mL/kg/min) subjects were separated by 3 wk. Five protocols were used to determine VT, with an alternate change in VO_{2peak} (P<0.01) from 0.52±0.14%.Watt -1 to 56.4±3.8 ml.min -1 . The change in muscle HHb/work rate slope had increased (P=0.019) by 0.89±0.47%.Watt -1 . The change in muscle HHb amplitude was correlated to the increase in VO_{2peak} (r=0.75, P=0.03). Muscle ttHHb amplitude increased with 85±79%, although this was not correlated to VO_{2peak} increase (r=0.22, P>0.05). Cerebral O2Hb amplitude had increased (P=0.015) by 50±57%. O2Hb work rate slope had increased (0.89±0.47%.Watt -1 × 1.00±0.42%.Watt -1 , P<0.05). Cerebral totHHb did not show a change in amplitude (28±46%, P>0.24) nor in slope (0.67±0.15% .Watt -1 × 0.73±0.27% .Watt -1 , P>0.58). CONCLUSIONS: This study showed that the improvement in VO_{2peak} was predominantly related to an improved fractional O2 extraction (i.e., amplitude of muscle HHb). However, interval training also induced an enhanced O2 diffusive capacity (i.e., amplitude of muscle tetHHb) and cerebral oxygenation which might also affect maximal exercise performance.

1127 May 31 9:00 AM - 9:15 AM The Impact Of An Interval Training Program On Muscle And Cerebral Oxygenation Responses To Incremental Ramp Exercise.
Jan Boone, Kevin Caen, Kobe Vermeire, Jan Bourgois. Ghent University, Ghent, Belgium.
(No relevant relationships reported)

PURPOSE: To study the effects of interval training on cerebral and muscle (de) oxygenation and their relationship to improvements in VO_{2peak} obtained from incremental ramp cycle exercise.

METHODS: Ten male subjects performed incremental ramp exercise tests (50 Watt + 25 Watt.min -1 ) prior to and following a six week training intervention. During the tests, muscle (M. Vastus Lateralis) and cerebral (de)oxygenation (O2Hb and HHb) was recorded with Near-Infrared Spectroscopy (NIRS 200, Hamamatsu, Japan). The training sessions were performed 3 times a week and consisted of 6 bouts of 4 min cycling at the critical power, interspersed by 3 min recovery a work rate corresponding to the gas exchange threshold. The changes in the tissue oxygenation responses (muscle HHb and totHHb, cerebral O2Hb and totO2Hb) was calculated by expressing these responses obtained from the posttest relative to those obtained in the pretest in which the amplitude was set to 100%.

RESULTS: Following the training intervention, the VO_{2peak} had increased from 52.4±3.5 mL.min -1 .kg -1 to 56.4±3.8 mL.min -1 .kg -1 (P<0.001) and peak power output from 384±36 Watt to 412±40 Watt (P<0.001). Muscle HHb amplitude had increased (P=0.01) with 64±50%, whereas also the muscle HHb work rate slope had increased (P=0.01) from 0.52±0.14% .Watt -1 to 0.99±0.57% .Watt -1 . The change in muscle HHb amplitude was correlated to the increase in VO_{2peak} (r=0.75, P=0.03). Muscle totHHb amplitude increased with 85±79%, although this was not correlated to VO_{2peak} increase (r=0.22, P>0.05). Cerebral O2Hb amplitude had increased (P=0.015) by 50±57%. O2Hb work rate slope had increased (0.89±0.47%.Watt -1 × 1.00±0.42%.Watt -1 , P<0.05). Cerebral totO2Hb did not show a change in amplitude (28±46%, P>0.24) nor in slope (0.67±0.15% .Watt -1 × 0.73±0.27% .Watt -1 , P>0.58). CONCLUSIONS: This study showed that the improvement in VO_{2peak} was predominantly related to an improved fractional O2 extraction (i.e., amplitude of muscle HHb). However, interval training also induced an enhanced O2 diffusive capacity (i.e., amplitude of muscle tetHHb) and cerebral oxygenation which might also affect maximal exercise performance.
exercise across different populations. METHODS: 232 male subjects divided in 24 international-level professional cyclists (PC), 77 US domestic competitive cyclists (DC), 107 recreational cyclists (REC) and 24 sedentary men (SM) performed an incremental cycling test starting at 1.0 W kg⁻¹ with increments of 0.5 W kg⁻¹ every 5 min until volitional exhaustion. VO₂ and VO₂max (ml kg⁻¹) and [La] (mM L⁻¹) were measured at the end of each step. Comparisons were made for each group by means of a Student t-test. Pearson correlation coefficient was used to verify the relationships between the different variables studied. Statistical significance was set at p<0.05.

RESULTS: The average correlations between the VO₂ and the [La] at each step of the cycling test were for PC (r = 0.53 ± 0.02, p<0.001), DC (r = 0.41 ± 0.12, p<0.001), REC (r = 0.17 ± 0.14, p=0.001) and SM (r = 0.13 ± 0.21, p=0.001). The average correlations between VO₂ and [La] at each step of the incremental test was moderate for PC (r = -0.59 ± 0.14, p<0.001) while weak for DC (r = -0.36 ± 0.15, p=0.001), REC (r = -0.27 ± 0.26, p=0.001) and SM (r = -0.32 ± 0.28, p=0.001).

CONCLUSION: Our study shows weak to moderate correlations between VO₂, VO₂max and [La] across different populations. Since lactate is a more descriptive parameter of the metabolic responses to exercise, measuring [La] over VO₂ and VO₂max is a more appropriate parameter to assess metabolic fitness and performance.

### Table 1. The relationship between SF, Distance, and RER

<table>
<thead>
<tr>
<th>SF variations</th>
<th>Distance (mile)</th>
<th>RER</th>
</tr>
</thead>
<tbody>
<tr>
<td>90%</td>
<td>1.00 ± 0.5</td>
<td>1.05 ± 0.03</td>
</tr>
<tr>
<td>95%</td>
<td>1.04 ± 0.5</td>
<td>1.05 ± 0.03</td>
</tr>
<tr>
<td>100% (PSF)</td>
<td>1.32 ± 0.6*</td>
<td>1.04 ± 0.02</td>
</tr>
<tr>
<td>105%</td>
<td>1.64 ± 0.7</td>
<td>1.04 ± 0.03</td>
</tr>
<tr>
<td>110%</td>
<td>1.15 ± 0.7    *</td>
<td></td>
</tr>
</tbody>
</table>

Note: Results reported in mean ± SD. *p < 0.05, vs. 105% SF conditions. \( \overline{R} \) < 0.05, vs. 100% PSF conditions.

C-14 Clinical Case Slide - Cardiovascular II

**Abstracts were prepared by the authors and printed as submitted.**

**THURSDAY, MAY 31, 2018**

#### 1131 Chair: Paul D. Thompson, FACSM. Hartford Hospital, Hartford, CT.

**1132 Discussant: Benjamin D. Levine, FACSM. Texas Health Presbyterian Hospital Dallas, Dallas, TX.**

**1133 Discussant: Rachel Lampert. Yale University, New Haven, CT.**

**1134 May 31 8:00 AM - 8:20 AM**

**Left Arm Cramping and Prominent Veins in a 19 year-old Women's Collegiate Soccer Player**

Andrew Schleihauf, Kimberly Kaiser, Robert Hosey, FACSM. University of Kentucky, Lexington, KY. (No relevant relationships reported)

History: 19-year-old female collegiate soccer goalie with PMHx iron-deficiency anemia due to heavy menses presents with left arm cramping, numbness, and purple discoloration. She was doing an overhead weightlifting workout and felt numbness and a cramping sensation in her left arm while performing front squats. She then noticed a purple discoloration of her left arm along with prominent veins and presented to the training room. After being examined, she was sent to the emergency department. She denies having any previous episodes similar to this. She was on oral contraceptives due to heavy menses but has no personal or family history of clotting disorders.


Differential Dx: Neurogenic thoracic outlet syndrome, vascular thoracic outlet syndrome, complex regional pain syndrome.

Diagnosis: DVT in left subclavian vein.

**Final working diagnosis:** Paget-Schroetter syndrome

**Treatment and Outcome:** She was placed on a heparin drip and underwent thrombolysis with catheter directed IPA. A balloon angioplasty was done of the left subclavian vein for a 3 cm occlusion and then she underwent a first rib resection 6 weeks after initial presentation. Upon arrival to school for the fall semester, she continued to have pressure, mild pain, and discoloration of her left arm with minimal exertion. Repeat ultrasound and angiogram showed no evidence of acute thrombus one-month post surgery. After continuing to get discoloration of her arm walking across campus, she underwent a venogram two months after surgery that showed a well-adhered thrombus in her subclavian vein. She is scheduled to return to full soccer activity after 5 months.

**Abstracts were prepared by the authors and printed as submitted.**
History: A 19 year old male freshman basketball player referred for his pre-participation examination. He denied any cardiac symptoms or family history of sudden cardiac death. Screening ECG did not demonstrate pathological electrocardiographic abnormalities for athletes. Screening echocardiogram was significant for moderate concentric left ventricular hypertrophy and an interventricular septal diameter of 1.41 cm. Physical Exam: African-American Male. Height 76.5 in, Weight 349.4 lbs, BMI 42.4, Arm span: height ratio 1.06. Cardiac exam without murmurs, rubs or gallops. No physical findings consistent with Marfan’s Syndrome. Differential Diagnosis: Physiologic Left Ventricular Hypertrophy (Athlete’s Heart). Hypertrophic Cardiomyopathy, Hypertensive Cardiomyopathy Tests and Results 1. Cardiac MR (1) Moderate to borderline severe symmetric hypertrophy. Hyperdynamic left ventricular systolic function. Ejection fraction of 75%. (2) No evidence of hyper-enhancement with gadolinium. (3) Maximal interventricular septum thickness of 17 mm. (4) Left Ventricular End Diastolic Volume Index (LVEDVI)/Left Ventricular End Diastolic Mass Index (LVEDMI) ratio of 0.75 (less than 1.2 is more consistent with HCM). (5) Wall thickness to LVEDVI ratio is 0.23 (less than 0.15 suggests HCM). (6) Findings equivocal for the assessment of hypertrophic cardiomyopathy versus athlete’s heart. 2. Transesophageal Echocardiogram with Color Flow Doppler and Spectral Doppler (1) Normal left ventricular size, structure, systolic function. (2) Mild LV asymmetric septal hypertrophy, septal thickness 1.6 cm, posterior wall thickness 1.3 cm. (3) No evidence of left ventricular outflow tract obstruction. (4) Normal global longitudinal strain imaging with normal strain-derived left ventricular systolic function. 3. Exercise Stress Test (1) No ischemic ECG changes or arrhythmia with stress. Final Diagnosis: Physiologic Left Ventricular Hypertrophy (Athlete’s Heart) Treatment and Outcomes: After being withheld from football during this evaluation, he has since been cleared for participation and has not demonstrated any unusual symptoms, including lightheadedness, dizziness, syncope, chest pain or shortness of breath. He is scheduled for follow-up in 6 months with a repeat echocardiogram.

PHYSICAL EXAMINATION: Well developed in no distress. No thyromegaly. No presyncope or syncope. Also denies effort intolerance.

HISTORY: A 16 year old male competitive basketball player referred for a 3 month history of intermittent palpitations associated with chest pain at rest. Initially the episodes are characterized by irregular heartbeat, followed by chest pain with occasional shortness of breath. There is also chest pain associated with exercise. Characterized as burning which lasts 15-20 seconds. It does not change with activity level. He can usually play through the pain. He denies dizziness, presyncope or syncope. Also denies effort intolerance.


TESTS AND RESULTS: ECG: sinus bradycardia, LVH, ST elevation right precordial leads, T wave inversion inferior leads.

ECHOCARDIOGRAM: LVH with notable hypertrophy of left posterior wall (14 mm). Borderline LAE.

HOLER MONITOR: rare PVC’s and PAC’s. One polymorphic couplet

CARDIAC MRI: borderline concentric LVH (max 12.8 mm: Z score 2.2), borderline LV wall mass. Borderline LAE. No regional wall motion abnormalities or delayed gadolinium enhancement.

METABOLIC STRESS: peak VO2 93% predicted. Ventricular ectopy at rest, with exercise and in recovery: suppressed at max HR, PFT (post exercise): FVC decreased 15%; FEV1 decreased 14%; FEF 25-75% decreased 39%

CARDIAC CATHETERIZATION: normal LV end diastolic pressures. No myocardial bridging.

GENE DX: negative

FINAL WORKING DIAGNOSIS: 1. Left Ventricular Hypertrophy
remains patent and the ventricles are normal. There is decreased flow across the foramen magnum at the fourth ventricular outflow and posterior to the cerebellar tonsils. **Cervical spine MRI:** No syrinx. **Neurological evaluation:** Asymptomatic Chiari 1 malformation. **FINAL WORKING DIAGNOSIS:** 1. Vasovagal syncope. 2. ASD status post closure. 3. Asymptomatic Chiari 1 malformation. **TREATMENT AND OUTCOMES:** The athlete was allowed to participate when she expressed understanding of the associated risks. Episodes of syncope continued to occur.

**C-15 Clinical Case Slide - Knee II**

**Thursday, May 31, 2018, 8:00 AM - 10:00 AM**

**Room: CC-200F**

1140 **Chair:** Aaron Rubin, FACSM. Kaiser Permanente Sports Medicine Program, Fontana, CA.  
(No relevant relationships reported)

1141 **Discussant:** Anthony E. Annan. Home, London, United Kingdom.  
(No relevant relationships reported)

1142 **Discussant:** Cindy Y. Lin. University of Washington Medical Center, Seattle, WA.  
(No relevant relationships reported)

1143 **May 31 8:00 AM - 8:20 AM**

**Knee Pain - Exercise**

Samuel T. Dona, Dean Padavan, Robert Monaco, Steven Selafani. Atlantic Sports Health, Morristown, NJ.  
(No relevant relationships reported)

**HISTORY:** A 58-year-old male presented with a 4-week history of spontaneous knee pain. One year prior to presentation, he had bariatric surgery and increased his exercise regimen resulting in a 100 lb weight loss. He denies trauma or inciting injury. His pain localized to the posterolateral knee and is described as a 5/10 cramping pain. He describes a popping sensation and experiences a snapping moment in the lateral knee with deep squatting. He denies swelling and ecchymosis. He has tried ice, physical therapy and ibuprofen without relief.

**PHYSICAL EXAMINATION:** Focused left knee exam revealed a palpable cystic structure in the lateral popliteal fossa. There is tenderness over the lateral joint line with no instability of the proximal tibiofibular joint or biceps femoris tendon. Range of motion was 0-140° with pain greater than 120° of flexion. When the knee is brought into deep flexion, there is an audible pop over the lateral aspect of the knee. When the knee is then brought into extension, there is reproduction of an audible pop and snapping moment of the lateral knee end range extension. Flexion McMurray’s test is positive. Strength, reflexes, sensation, and pulses are normal throughout.

**DIFFERENTIAL DIAGNOSIS:**
1. Snapping biceps femoris tendon
2. Snapping popliteus tendon
3. Lateral meniscus tear
4. Iliotibial band friction syndrome
5. Proximal tibiofibular joint instability

**TESTS AND RESULTS:**
1. ECG  
— narrow complex tachycardia with rate 184, QTc 441, and indeterminate PR
2. CMP  
— creatinine 1.09
3. Troponins  
— T0 <0.010

**FINAL WORKING DIAGNOSIS:**  
Exercise-induced SVT likely secondary to AVNRT

**TREATMENT AND OUTCOME:**
1. IL IV fluid bolus
2. Vagal maneuvers - modified Valsalva technique (strain followed by passive leg raise for 15 seconds at 45 degrees)  
— synchronized cardioversion was considered unnecessary with stable vital signs  
— normal sinus rhythm (NSR) was achieved after 3 attempts
3. Outpatient referral to pediatric cardiology before return to activity  
— previous outpatient testing was reviewed and within normal limits
4. MRI of left knee without contrast:  
— Normal biceps femoris tendon. Popliteal cyst noted.

**PHYSICAL EXAMINATION**:  
1139 May 31 9:40 AM - 10:00 AM

**Evaluation And Management Of Recurrent Symptomatic, Exercise-induced Tachyarrhythmia**

Michael Fitzgerald. University of Kentucky, Lexington, KY.  
(No relevant relationships reported)

**HISTORY:** A 15-year-old high school sophomore presented to the ED with palpitations, chest pain, and lightheadedness that began during volleyball conditioning. She reported one similar episode several months earlier and was seen by pediatric cardiology for outpatient evaluation, which included resting ECG, 24-hour Holter monitor, and echocardiogram. While participating in consecutive scrimmages, she felt her heart racing and experienced dull, non-radiating substernal chest pain. Her symptoms prevented further participation and did not resolve with rest. Her heart rate was recorded as 195bpm at home.

**PHYSICAL EXAMINATION:** HR 186, RR 22, BP 107/68. Patient was diaphoretic but generally well appearing and in no acute distress. Cardiovascular exam revealed rapid heart rate with regular rhythm and identifiable S1 and S2 heart sounds without murmurs or clicks. Peripheral pulses were 2+ and symmetric, no JVD. Chest pain was not reproducible. Lungs were clear to auscultation bilaterally. Abdomen was soft and non-distended. Thyroid was symmetric and without nodules.

**DIFFERENTIAL DIAGNOSIS:**
1. Supraventricular tachyarrhythmia (SVT)  
— AVNRT  
— MAT  
2. Sinus tachycardia  
— hyperthyroidism
3. WPW syndrome
4. Ventricular tachycardia
5. Atrial fibrillation

**TESTS AND RESULTS:**
1. ECG  
— narrow complex tachycardia with rate 184, QTc 441, and indeterminate PR
2. CMP  
— creatinine 1.09
3. Troponins  
— T0 <0.010

**FINAL WORKING DIAGNOSIS:**  
Exercise-induced SVT likely secondary to AVNRT

**TREATMENT AND OUTCOME:**
1. IL IV fluid bolus
2. Vagal maneuvers - modified Valsalva technique (strain followed by passive leg raise for 15 seconds at 45 degrees)  
— synchronized cardioversion was considered unnecessary with stable vital signs  
— normal sinus rhythm (NSR) was achieved after 3 attempts
3. Outpatient referral to pediatric cardiology before return to activity  
— previous outpatient testing was reviewed and within normal limits
4. Patient was given the option for antiarrhythmic management vs. catheter ablation -  
— previous outpatient testing was reviewed and within normal limits

**DIFFERENTIAL DIAGNOSIS:**
1. Snapping biceps femoris tendon
2. Snapping popliteus tendon
3. Lateral meniscus tear
4. Iliotibial band friction syndrome
5. Proximal tibiofibular joint instability

**TESTS AND RESULTS:**
Three view x-rays of left knee:  
— Medial joint space narrowing. No acute fracture. Dynamic ultrasound of the left knee:  
— negative McMurray’s test. MRI of left knee without contrast:  
— incomplete discoid lateral meniscus and small multiseptated popliteal cyst noted.

**FINAL WORKING DIAGNOSIS:** Left knee discoid lateral meniscus with subluxation of the meniscus

**TREATMENT AND OUTCOMES:**
1. Patient counseled on activity modification.
2. Dynamic ultrasound revealed no evidence of hamstring irregularities.
4. After MRI evaluation, orthopedic surgery performed an arthroscopic partial meniscectomy of subluxing torn posterior horn and midbody sauerization of lateral meniscus.
5. He tolerated surgery well with no further subluxation of his meniscus in physical therapy.

1144 **May 31 8:20 AM - 8:40 AM**

**Knee Effusion-gymnast**

Reno Ravindran. Nationwide Childrens Hospital, Columbus, OH.  
(No relevant relationships reported)

**HISTORY:** 12 y/o gymnast comes into the office complaining of right knee swelling with minimal pain for 3 days after a gymnastics competition. She does not recall a specific injury during the competition but noticed discomfort as the day went on. The swelling worsened later that evening. They were seen by their primary care provider
who referred them in to sports medicine clinic. She does endorse similar swelling and pain 6 weeks ago that responded to ibuprofen and ice and resolved in 2-3 days. Denies locking, catching, popping or instability episodes in knee. Family history: unknown; adopted

PHYSICAL EXAMINATION: Inspection: Moderate sized effusion, no erythema. Range of motion full in flexion and extension with mild discomfort in full flexion. Palpation: Mild tenderness around patellar facets, mild medial joint line tenderness. Special Tests: Negative Lachman's, Negative McMurray's, Negative patellar apprehension, Mild pain with valgus stress at 30degrees. Proprioception: Engaged Hip exam normal

DIFFERENTIAL DIAGNOSIS: 1. Patellofemoral Syndrome. 2. MCL sprain.
3. Inflammatory process: JIA, Synovitis. 4. Patellar instability

TEST AND RESULTS: X-rays 4 view Within normal limits. MRI with and without contrast. Findings consistent with an inflammatory synovitis with a moderate knee effusion and moderate synovitis. 2. Signal abnormality both deep and superficial to the medial collateral ligament may be secondary to strain. Labs: ESR 20mm/h, CBC normal, CRP: normal, ANA positive, Lyme serology positive

FINAL WORKING DIAGNOSIS: 1. Lyme Synovitis 2. Grade I MCL sprain

TREATMENT AND OUTCOMES: Currently undergoing antibiotic treatment with doxycycline 75mg BID for 4 weeks. Is also going through physical therapy in regards to MCL sprain.

1145 May 31 8:40 AM - 9:00 AM
Acute Knee Pain in Adolescent Basketball Player
Kristopher Paultry. JMH/UM, Miami, FL.

(No relevant relationships reported)

History:
14 y/o male basketball player presents to ED after sustaining an injury to his left lower extremity. This occurred during a school basketball game while landing from a jump shot. Patient stated he felt a pop in his left knee upon landing and rated pain a 9/10 severity. Immediately after, he had swelling with decreased ROM and was unable to flex/extend his knee due to pain.

PE:
Left Knee:
Edema was present with mild discoloration over the anterior of knee and severe tenderness upon palpation over anterior patellar tendon. Patient unable to perform active ROM. Passive ROM limited secondary to pain. Full scope of exam, including assessment of ligaments, menisci, and ROM also limited secondary to pain. Bilateral Ankles:
No deformity noted b/l. Non-tender on palpation. Neurovascularly intact.

Differential Diagnosis:
Patellar dislocation
ACL tear Patellar tendon rupture Proximal tibia fracture Distal femur fracture Meniscal tear

Tests and Results:
X-rays of left femur (3 view), left knee (AP/ lateral), and left tibia/fibula (3 view):
Findings showed a displaced type-3a tibial tuberosity avulsion fracture, displaced 1.5 cm with an associated knee effusion and intra-articular extension. No additional fractures noted on left femur, knee, tibia, or fibula.

Final/Working Diagnosis:
Closed left tibial tubercle avulsion fracture, displaced type-3A with avulsion of left quadriceps infrapatellar tendon.

Treatment and Outcome:
1. Open reduction and internal screw fixation of tibial tuberosity with repair of infrapatellar tendon
2. Long leg walker cast placed
3. At 6 week follow-up visit, repeat x-rays showed anatomic alignment of the fracture site, good positioning of 2 fixation screws, and articular surface which was realigned. Knee immobilizer was discontinued and he was given walker for stability. Instructed to d/c use of walker once left knee felt stable and remain out of athletic activities until further evaluation. Referred to PT for Quad strengthening and ROM exercises.
4. At 5 month post injury visit, patient showed favorable progress. He had full ROM, improved strength, and was cleared to resume sports starting at a low level intensity. He was advised to gradually increase the duration and intensity of his training. Patient advised to continue knee mobility exercises and to fu w/ CP for routine Health care.

1146 May 31 9:00 AM - 9:20 AM
Soccer Knee Injury
Kameron Bazmi1, Caitlin Cicone1, Richard G. Chang2. SUNY Downstate, Brooklyn, NY. 1Cahn School of Medicine at Mount Sinai, New York, NY.

(No relevant relationships reported)

HISTORY: 19 year old male presented with right thigh weakness and difficulty walking for 2 years following a soccer injury that resulted in a right patellar dislocation. Patient was managed non-operatively for 1 year after the injury before proceeding to surgical intervention. Subsequently, the patient underwent medial patellofemoral ligament reconstruction. Since the injury, patient reported weakness and atrophy of his right quadriceps, with no improvement after surgery. He denied numbness or pain, but did complain of intermittent right lower extremity buckling.

PHYSICAL EXAMINATION: Examination in the clinic revealed right quadriceps atrophy with mild right knee effusion. There was no tenderness to palpation along right quadriceps, knee joint line, patella or patellar tendon. There was limited active range of motion secondary to weakness, with passive range of motion through 0 to 90 degrees limited by pain. Manual muscle testing was 1/5 for right knee extension, 4-5 for right hip abduction, all else 5/5. Lower extremity reflexes were 2+ and symmetrical, bilateral. There was right knee buckling during ambulation.

DIFFERENTIAL DIAGNOSIS:
1. Disuse atrophy
2. Lumbar plexopathy
3. Lumbar radiculopathy
4. Quadriceps muscle avulsion
5. Polyneuropathy
6. Diabetic polyneuropathy

TEST AND RESULTS: Electrodiagnostics:
- Right femoral nerve showed prolonged onset latency
- The right sural nerve showed prolonged peak latency and slowed conduction velocity
- The right superficial peroneal nerve showed prolonged peak latency and mild slowed conduction velocity
- The right saphenous nerve showed decreased amplitude
- Right vastus lateralis, rectus femoris, and vastus medialis showed decreased insertional activity, minimal to no recruitment; vastus lateralis most affected
- Right demyelinating and axonal femoral neuropathy with the lesion at or distal to the right inguinal ligament & right sural and superficial peroneal sensory neuropathies

FINAL WORKING DIAGNOSIS: Primarily axonal femoral neuropathy

TREATMENT AND OUTCOMES:
1. Patient started physical therapy with a focus of strengthening quadriceps, hip abductors and core
2. Patient prescribed Meloxicam 7.5 mg to be used as needed
3. Patient was non-compliant with therapy for over 6 months, did not return to sport and eventually lost to follow up

1147 May 31 9:20 AM - 9:40 AM
Chronic Medial Knee Pain in a Collegiate Basketball Player and Marching Band Member
Nicholas E. Anastasio, David Hryvniak. University of Virginia, Charlottesville, VA. (Sponsor: Robert Wilder, MD, FACS)

(No relevant relationships reported)

History:
Patient 1:
A 17 year-old female collegiate basketball player presented with insidious onset right medial knee pain for the last 8 months. Pain waxed and waned with activity. No history of swelling, instability or locking. No numbness or weakness. Pain located diffusely over the medial knee and proximal medial tibia. Symptoms refractory to PT, patellofemoral kinesiotaping, medial arch support orthotics and NSAIDS. No relief following Medrol dose pack, intraarticular corticosteroid injection, or pes anserine bursa corticosteroid injection.

Patient 2:
A 19 year-old female collegiate marching band member presented with insidious onset right medial knee pain present for 4 years. Patient reported intermittent swelling but denied instability or locking. Symptoms were worse with walking and marching. Previous Rheumatologic consult unrevealing. Symptoms refractory to PT, knee sleeve, and patellar straps. No relief following right pes anserine bursa corticosteroid injection.

Physical Examination:
Patient 1 - Knee without effusion. Diffuse tenderness to palpation over the medial knee at and below mid medial joint line. ROM and strength normal. No laxity. Neurovascular intact.

Patient 2 - Knee without effusion. Tenderness to palpation over the medial joint line and distally over pes anserine. Tinel’s sign positive over the medial femoral condyle. ROM and strength normal. No laxity. Neurovascular intact.

Differential Diagnosis:
1. Pes anserine bursitis
2. MCL bursitis
3. Patellofemoral syndrome
4. Medial meniscal tear
5. Medial patellar plica
6. Saphenous neuralgia

Test and Results:
Patient 1:
XR Knee - No fracture or joint effusion.
MRI knee - No meniscus tear. No internal derangement. Mild increased T2 signal within the superoposterior aspect of Hoffa’s fat.
Diagnostic saphenous nerve block - 0.5% bupivacaine injected 2 inches cephalad to the medial joint line - 24 hours of relief.

Patient 2:
XR Knee - No fracture or malalignment.
MRI knee - Unremarkable MRI of the knee.
Labs - ESR 8, TSH 1.7

Final/Working Diagnosis:
Saphenous Neuralgia
**Clinical Case Slide - Medical Issues II**

**Thursday, May 31, 2018, 8:00 AM - 10:00 AM**  
Room: CC-200E

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

**Discussant:** Andrea Stracciolini, FACSM. Children's Hospital Boston, Boston, MA.  
(No relevant relationships reported)

**Discussant:** Francis G. O'Connor, FACSM. Uniformed Services University, Bethesda, MD.  
(No relevant relationships reported)

**1148 May 31 9:40 AM - 10:00 AM**  
**Lingering Right Knee Pain - Mountain Biking**  
Andrew McBride. University of Colorado - Denver, Aurora, CO.  
(Sponsor: John Hill, FACSM)  
(No relevant relationships reported)

**1152 May 31 8:00 AM - 8:20 AM**  
**Abdominal Pain - Professional Singer**  
Tamara Rial-Rebullido, Fernanda Gonzalez, Ivan Chuli-Medrano.  
(International Hypopressive and Physical Therapy Institute, Vigo, Spain.  
University Autonoma de Durango, Durango, Mexico.  
University of Alicante, Alicante, Spain.  
(Sponsor: Avery D. Faigenbaum, FACSM)  
(No relevant relationships reported)

**1153 May 31 8:20 AM - 8:40 AM**  
**Abnormal Weight Gain in a Collegiate Athlete - Swimming**  
Roberta Dennison. Boston Children's Hospital, Boston, MA.  
(Sponsor: Kathryn E. Ackerman, MD, MPH, FACSM)  
(No relevant relationships reported)
Syncopal Episode in a College Football Player

Bjorn A. Jacobson, Richard A. Okragly. (No relevant relationships reported)

**HISTORY:** A 20 year old African American college football player started to feel faint, walk slowly and then collapse during the end of a fitness session. Immediately triaged by his AT he was unresponsive to verbal or noxious stimuli, demonstrating brief decorticate posturing, tachypneic, with palpable pulses. The episode lasted 90 seconds. I arrived to find an alert and oriented male in no distress. Initially resistant, he did eventually agree to go to the ED. He stated he had taken 5 decongestant pills in the preceding 24 hours. He denied any preceding chest pain or palpitations, but did feel short of breath and light headed prior to collapsing. He said that he had a previous syncopal episode during exercise years ago that was reportedly secondary to dehydration.

**PHYSICAL EXAMINATION:** Initial exam on the field showed an alert, fully coherent and oriented well appearing male in no distress; pupils equal/reactive to light; no foaming of the mouth or tongue bite wounds; a regular rate and rhythm with no murmurs/gallops; lungs clear to auscultation; overall a benign physical exam. VS - BP 133/69, HR 63, RR 18, T 97.9°F, SpO2 98%.

**DIFFERENTIAL DIAGNOSIS:** 1) Vasovagal syncope or other reflex (neurally) mediated syncope 2) Cardiovacular syncope 3) Hypertrophic Cardiomyopathy 4) Metabolic (drug induced) syncope 5) Volume depletion orthostatic syncope 6) Seizure

**TEST AND RESULTS:** 1) BMP, CBC, Cardiac Enzymes - Normal; Chest XR AP and Lateral - Normal; EKG - Sinus Rhythm, Normal Axis, ST elevation in leads V1-V5 followed by T wave inversions, Prominent QR5 complexes (unchanged on 4 EKGs over 3 weeks); 2) ECHO - LVVF 55-60%, mild concentric LVH, bicuspid aortic valve; Cardiac MRI - LVEF 55%, no LVH (wall thickness less than 11 mm), tricuspid aortic valve; Stress EKG (GXT) - Baseline EKG abnormalities normalized, negative for ischemia, Duke treadmill score 14 (low risk)

**FINAL WORKING DIAGNOSIS:** Vasovagal syncope/potentially related to pseudohypodrpicia.

**TREATMENT AND OUTCOMES:** After extensive cardiac work up, baseline EKG repolarization abnormalities normalized with exercise testing. Given his normal cardiac MRI and normal stress testing he was cleared by cardiology for full athletic participation. He was advised to immediately notify us if he develops any recurrent symptoms. He is now completing his college football season without incident.

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Headache and Near Syncope in a Soldier After Training

Robert H. Lutz, Duke Sports Science Institute, Durham, NC. (Sponsor: Shawn F. Kane, FACSM) (No relevant relationships reported)

**HISTORY:** A 34 y/o male active duty Soldier presented to an Army clinic with headache, nausea and lightheadedness around 1000 in the morning. Symptoms started in the preceding 24 hours. He denied any preceding chest pain or palpitations, but did eventually agree to go to the ED. He stated he had taken 5 decongestant pills in the preceding 24 hours. He denied any preceding chest pain or palpitations, but did feel short of breath and light headed prior to collapsing. He said that he had a previous syncopal episode during exercise years ago that was reportedly secondary to dehydration.

**PHYSICAL EXAMINATION:** Initial exam on the field showed an alert, fully coherent and oriented well appearing male in no distress; pupils equal/reactive to light; no foaming of the mouth or tongue bite wounds; a regular rate and rhythm with no murmurs/gallops; lungs clear to auscultation; overall a benign physical exam. VS - BP 133/69, HR 63, RR 18, T 97.9°F, SpO2 98%.

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**TEST AND RESULTS:** 1) BMP, CBC, Cardiac Enzymes - Normal; Chest XR AP and Lateral - Normal; EKG - Sinus Rhythm, Normal Axis, ST elevation in leads V1-V5 followed by T wave inversions, Prominent QR5 complexes (unchanged on 4 EKGs over 3 weeks); 2) ECHO - LVVF 55-60%, mild concentric LVH, bicuspid aortic valve; Cardiac MRI - LVEF 55%, no LVH (wall thickness less than 11 mm), tricuspid aortic valve; Stress EKG (GXT) - Baseline EKG abnormalities normalized, negative for ischemia, Duke treadmill score 14 (low risk)

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Syncopal Episode in a College Football Player

Bjorn A. Jacobson, Richard A. Okragly. (No relevant relationships reported)

**HISTORY:** A 21 y/o M collegiate cross country runner presents to team doctor with hand shaking and body cramping after a strenuous 12 mile run. Complained of generalized weakness, abdominal and leg cramping, nausea, diarrhea, slight shaking of his hands, and thirst. Felt well prior to the run. Endorsed increased thirst this week and had been drinking water. Sent to the ER for IV hydration. On his way to the ER, he suddenly became unresponsive to stiffness, shaking, and frothing at the mouth.


**DIFFERENTIAL DIAGNOSIS:**Metabolic Derangement, Hypotremia, Hypercalcemia, Hypoglycemia; Rhabdomyolysis/Dehydration; Toxic Encephalopathy; Drug Withdrawal; Intracranial Mass; CNS Infection; Epilepsy

**TEST AND RESULTS:** Initial Na 118, Anion Gap 17, Bicarbonate 15, Magnesium 1.5, initial CPK 917, CK rose to greater than 60,000 despite IV hydration, Toxicology Negative, CT head: questionable hypodensities in the medial temporal lobe, MRI Brain: normal, EKG: negative

**FINAL WORKING DIAGNOSIS:** Seizure induced by Hypotremia Secondary to Psychogenic Polydipsia; Hypotremia Induced Myopathy

**TREATMENT AND OUTCOMES:**Sodium corrected in the ICU over a few days. Patient drank a total of 48 oz prior to his run, and 160 oz post-run. Despite hydration and gentle correction of sodium, CK continued to rise. Rhabdomyolysis thought initially due to seizure and muscle breakdown in the setting of aggressive exercise; however, the delayed clearance of CPK raised concerns for glycogen storage deficiency vs genetic dysfunction. Referred to Genetics for a muscle biopsy to rule out glycogen storage deficiency, biopsy pending. Returned to cross country running with strict instructions regarding hydration, runs 5-8 miles without any issues.

Cotton Mouth In A Cross Country Runner

Jason A. Kirkbride, Siobhan Statuta. University of Virginia, Charlottesville, VA. (Sponsor: John MacKnight, FACSM) (No relevant relationships reported)

**HISTORY:** A 21-year-old Dvision 1 cross-country runner presented to the athletic training room the day he was to leave for ACC championships, concerned about his intolerable dry mouth, leg heaviness and worsening fatigue. He had an unintended weight loss of 15 pounds despite working with Sports Nutrition over the summer due to a baseline BMI of 17.9 and a history of a sacral stress fracture the prior year. He endorsed normal eating pattern, but often felt full secondary to increased fluid intake from his dry mouth. Over the past few days, he also noted the onset of blurry vision. His only medication was an Omega-3 supplement and he denied a family history of autoimmune diseases, but did have an uncle with Type II diabetes mellitus.


**DIFFERENTIAL DIAGNOSIS:** Relative energy deficiency in sport Overtraining syndrome Thyroid disease Anemia Viral illness/ Mononucleosis Diabetes Mellitus Type 1 Malignancy Diabetes Insipidus
C-33 Free Communication/Poster - Acute Exercise - Cardiorespiratory Physiology

**Thursday, May 31, 2018, 7:30 AM - 12:30 PM**

Room: CC-Hall B


**1193 Board #1 May 31 8:00 AM - 9:30 AM**

**Aerobic Exercise Reduces The Pro-thrombotic Potential Of Circulating Microparticles in Healthy Individuals**

Patrick J. Highton, David J. Stenson, Fernanda R. Goltz, Naomi Martin, Nicolette C. Bishop. Loughborough University, Leicester, United Kingdom; 1 De Montfort University, Leicester, United Kingdom.

(No relevant relationships reported)

**PURPOSE:** Microparticles (MPs) are extracellular vesicles shed upon cellular activation or apoptosis that possess pro-thrombotic functions via Tissue Factor (TF) expression. Aerobic exercise (AE) may impact circulating MPs, though recent research is conflicting. Previous other results may also reflect underlying circadian variations. This study investigated the impact of AE or rest with a standardized meal on MP phenotypes and pro-thrombotic potential over a morning period.

**METHODS:** 15 healthy males (22.9 ± 3.3 years; 81.9 ± 11.4 kg; VO\(_{2}\) max) at 9am, and consumed a standardised meal (1170 kcal, 43% CHO, 17% PRO, 40% fat) at 10:45am. Venous blood samples were taken at 9am, 10am and 11:30am. Control trials included no exercise. MP phenotypes (platelet, neutrophil, monocyte and endothelial cell) and TF activation or apoptosis that possess pro-thrombotic functions via Tissue Factor (TF)

**RESULTS:** Total numbers of MP increased from 9am to 10am (1.62 ± 0.54 to 2.28 ± 0.92 x10\(^7\); mean ± SD) completed 1 hr of AE (70% VO\(_{2}\) max) at 9am, and consumed a standardised meal (1170 kcal, 43% CHO, 17% PRO, 40% fat) at 10:45am. Venous blood samples were taken at 9am, 10am and 11:30am. Control trials included no exercise. MP phenotypes (platelet, neutrophil, monocyte and endothelial cell) and TF expression were assessed by flow cytometry.

**RESULTS:** Data are presented as mean ± SEM. Effect sizes are presented as r\(^2\) (0.2 = small, 0.5 = moderate, 0.8 = large; Statistical Power Analysis for the Behavioral Sciences, Cohen, 1988). Total numbers of MP increased from 9am to 10am (1.62 ± 0.59 to 1.74 ± 0.73 x10\(^7\); p = 0.016, r\(^2\) = 0.105) in both conditions, but was unaffected by trial. All other phenotype counts remained unchanged by trial or time. The % of TF\(^+\) platelet-derived MP reduced from 9am to 10am (44.0 ± 5.5 to 21.5 ± 2.4%, p = 0.001, r\(^2\) = 0.582) in the exercise trial, but remained unchanged in the control trial (36.8 ± 4.7 to 34.9 ± 3.9%, p = 0.972). %TF+ neutrophil-derived MPs reduced from 9am to 11:30am (42.3 ± 4.4 to 25.1 ± 3.8%, p = 0.048, r\(^2\) = 0.301) in the exercise trial, but remained unchanged in the control trial (28.5 ± 4.1 to 32.2 ± 5.5%, p = 0.508).

**CONCLUSION:** The increase in total MP count was not affected by exercise and may be due to diurnal variation – this warrants further investigation over a 24h period. Moderate intensity AE with an associated meal may seem to have little effect on absolute circulating MP phenotype counts in this population. However, AE induced a large reduction in the % of platelet and neutrophil MPs that express TF, suggesting a mechanism via which AE can reduce cardiovascular risk via reduced TF-stimulated coagulation and thrombosis. This effect requires more investigation in clinical populations at greater cardiovascular disease risk.

1194 Board #2 May 31 8:00 AM - 9:30 AM

**FURIN Variant Associations with Postexercise Hypotension are Ethnicity and Intensity Dependent**

Burak T. Cilhoroz, Gregory A. Panza, Elizabeth D. Schifano, Garrett I. Ash, Lauren M.L. Corso, Ming-Hui Chen, Ved Deshpande, Amanda Zaleski, Paolo Farinatti, Beth A. Taylor, FACS, FACSM, Rachel J. O’Neill, Paul D. Thompson, FACS, FACSM, Linda S. Pescatello, FACSM 1University of Connecticut, Storrs, CT; 2Harford Hospital, Hartford, CT; 3Yale University, New Haven, CT; 4Rio de Janeiro State University, Rio de Janeiro, Brazil. (Sponsor: Linda S. Pescatello, FACS, FACSM)

(No relevant relationships reported)

Furin (paired basic amino acid cleaving enzyme) is a proteoglycan convertase subtilisin/kexin (PCSK) enzyme and important in pro renin receptor processing. FURIN variants have been identified to be involved in multiple aspects of blood pressure (BP) regulation, and targeting PCSKs is a promising future form of drug therapy.

**PURPOSE:** To examine the associations among FURIN variants and the immediate blood pressure (BP) response to bouts of acute exercise performed at different intensity, termed postexercise hypotension (PEH).

**METHODS:** Obese (30.9 ± 3.6 kg/m\(^2\)) African American (n=14) (AF) and Caucasian (n=9) adults 42.0 ± 8.9yr with hypertension (139.8 ± 10.4/84.6 ± 6.2mmHg) performed three random acute exercises: bouts of vigorous (VIGOROUS) and moderate (MODERATE) intensity cycling and control. Subjects were attached to an ambulatory BP monitor for 19 hr. We performed deep-targeted exon sequencing using with the Illumina TruSeq Custom Amplicon kit. Variant genotypes were coded as the number of minor alleles (#MA) and selected for additional statistical analysis based upon Bonferroni or Benjamini-Yekutieli multiple testing corrected p-values under adjusted linear models for 12 hourly BP measurements, when all subjects were awake and ambulating; and for 19 hourly BP measurements, the total duration the BP monitor was worn.

**RESULTS:** After VIGOROUS over 19 hr, as FURIN/#MA increased in rs12917264 (p=2.4E-04), rs66226 (p=2.4E-04), and rs75493298 (p=6.4E-04), systolic BP (SBP) decreased 30.4 to 33.7 mmHg; and in both rs12917264 (p=1.6E-03), rs66226 (p=1.6E-03), and rs75493298 (p=9.7E-05), diastolic BP (DBP) decreased 17.6 to 20.3 mmHg among AF only. In addition, after MODERATE over the awake hours, as FURIN/#MA increased in rs2071410 (p=6.1E-04), rs1573644 (p=6.1E-04), and rs66227 (p=6.1E-04), DBP decreased 12.5 mmHg among Caucasians only.

**CONCLUSION:** FURIN variants were associated with PEH after MODERATE and VIGOROUS over 19 hr among AF, and after MODERATE over the awake hours among Caucasians. FURIN appears to exhibit ethnicity and intensity dependent associations with PEH that merit further exploration among a larger, ethnically diverse sample of adults with hypertension.

1195 Board #3 May 31 8:00 AM - 9:30 AM

**Repeatability of the Neurovascular Responses to Isometric Handgrip in Young Adults**

Gabrielle A. Dillon, Paul J. Fadel, FACS, FACSM, Lacy M. Alexander, FACS, FACSM, Jody L. Greaney 1Pennsylvania State University, University Park, Pa; 2University of Texas Arlington, Arlington, TX. (Sponsor: Lacy Alexander, FACS, FACSM)

(No relevant relationships reported)

Blood pressure (BP) and muscle sympathetic nerve activity (MSNA) responses to isometric handgrip (HG) are primarily driven by the skeletal muscle metaboreflex. The magnitude of the pressor and sympathoexcitatory responses to isometric HG and isolation of the muscle metaboreflex with post exercise ischemia (PEI) are commonly used maneuvers to compare groups and assess aberrant neurovascular regulation. However, the repeatability of these responses remains unclear. **PURPOSE:** Consistent with the NIH requirements for rigor and reproducibility in biomedical research, we sought to determine the intra-day repeatability of the neurovascular responses to isometric HG and PEI in young adults. We tested the hypothesis that the increases in BP and MSNA during isometric HG and PEI would be repeatable within an individual.

**METHODS:** Mean arterial pressure (MAP; finger photoplethysmography), heart rate (HR, ECG), and MSNA (peroneal microneurography) were measured in 8 (6 M; 24±1 yrs) healthy young adults at baseline and during isometric HG at 30% of maximum voluntary contraction followed by PEI to isolate the muscle metaboreflex. Subjects completed two trials separated by 15 min. Linn’s repeatability coefficient (pc) was used to assess repeatability.

**RESULTS:** MAP and MSNA increased significantly during HG and PEI in all subjects during both trials (all p<0.05). The BP and HR responses to HG (MAP: A29.5±15.3/A27.4±15.3 mmHg, pcc=0.68, 95%CI:0.09-0.92; HR: A14.4±3.4/A20.0±4.6 bpm, pcc=0.56, 95%CI:0.00-0.84) and PEI (MAP: A18.5±15.8/A18.5±15.8 mmHg, pcc=0.62, 95%CI:0.14-0.86; HR: A1.1±1.0/A2.0±2.0 bpm, pcc=0.74, 95%CI:0.39-0.91) were repeatable. The increase in MSNA during HG (n=5; A18.5±3.4/A20.6±6.9 bursts/min, pcc=0.44, 95%CI:0.17-0.804) was only moderately repeatable; however, during
Blood pressure (BP) is an important marker of cardiovascular (CV) health. Aquatic (AQ) exercise training has been shown to reduce BP reactivity to exercise to a greater degree than land treadmill (LT) training. Furthermore, an acute bout of AQ exercise tended to elicit a greater post-exercise hypotensive response and augmentation in flow-mediated dilation (FMD). However, it is unclear how long the post-exercise hypotensive benefits last following an acute bout of AQ exercise. **Purpose:** To determine the effects of acute bouts of deep water aqua-jogging and land treadmill exercise on daytime ambulatory BP (AMBPF in pre-hypertensive, physically untrained men and women. **Methods:** All participants following rest 12 hours, 29 ± 13 years, 207 ± 29 kg, 127 ± 8/82 ± 8 mmHg) completed acute bouts of AQ and LT exercise at 55% heart rate reserve for a duration of 30 minutes. Exercise sessions began at 0700 hours. Immediately following the exercise bout, subjects wore an AMBPF device (Oscar 2, Sunetch Medical), which was programmed to take measurements every 15 minutes throughout the day until 1600 hours. Sessions occurred on separate days with 2-7 days off between sessions. The order that the modes were performed was counterbalanced among the subjects. Subjects were required to abstain from alcohol, caffeine, nicotine, and exercise on the day of the session and 24 hours prior. Comparisons between modes were made by a dependent sample t-test. **Results:** All results are displayed in Table 1. **CONCLUSIONS:** Daytime AMBPF was significantly lower following AQ than LT exercise. This is consistent with previous findings of a greater post-exercise hypotensive response in the 1-2 hours post-AQ exercise. Previous research also demonstrated improved FMD and increased atrial natriuretic peptide levels following AQ exercise, which could potentially explain the reduced BP findings. These data further support the efficacy of AQ exercise for the promotion of CV health and BP regulation.

#### Table 1. Ambulatory Blood Pressure Response

<table>
<thead>
<tr>
<th>Variable</th>
<th>Aquatic</th>
<th>Land</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP (mmHg)</td>
<td>136 ± 9</td>
<td>140 ± 9</td>
<td>0.051</td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td>76 ± 6</td>
<td>81 ± 6</td>
<td>0.006*</td>
</tr>
<tr>
<td>MAP (mmHg)</td>
<td>96 ± 7</td>
<td>101 ± 6</td>
<td>0.007*</td>
</tr>
<tr>
<td>HR (bpm)</td>
<td>78 ± 12</td>
<td>78 ± 11</td>
<td>0.964</td>
</tr>
</tbody>
</table>

All values represent Mean ± SD. *p < 0.05

#### References

1. Alessio, FACSM
2. Ballard.
3. Hyperglycemia in Overweight and Obese Adults

#### Conclusions

Differences in autonomic modulation between free-weight and weight machines resistance exercise is unknown. **Purpose:** To investigate the effects of acute free-weight (FW) and weight machines (WM) resistance exercise on heart rate complexity (HRC) and variability (HRV) in resistance-trained individuals. **METHODS:** Resistance-trained individuals were assigned to either a FW group (n = 25) or WM group (n = 16). Autonomic modulation was collected at rest, and 15 (Rec 1) and 25 (Rec 2) min following acute exercise (ARE) or a control. Sample Entropy (SampEn), indicative of vagal modulation, was used as a measure of HRF. HRV measurements included vagal modulation (normalized frequency (HFnu)), and sympathetic balance (LF/HF ratio). ARE for both groups consisted of 3 sets of 10 maximum repetitions at 75% 1-repetition maximum (1RM) on the squat, bench press, and deadlift, while the WM group utilized 3 sets of 10 repetitions at 75% 1RM on the leg press, lat pull down, leg extension, chest press, and leg curl. A 2x2x3 ANCOVA was used to examine groups (FW, WM) across conditions (ARE, control) and time (Rest, Rec 1, Rec 2), with load as a covariate. **RESULTS:** The groups were similar (p<0.05) for age, height, weight, BMI, and baseline autonomic modulation, but differed for years of training. There was a significant group by condition by time interaction (p<0.03) for SampEn such that in the FW group (Rest: 1.5±0.3; Rec 1: 1.1±0.3; Rec 2: 1.1±0.4) it was attenuated during Rec 1 and Rec 2 after ARE compared to rest and the control. In the WM group, while there were no significant differences from rest to Rec1 or Rec 2, there was a significant difference from Rec 1 to Rec 2 (Rest: 1.4±0.5; Rec 1: 1.0±0.3; Rec 2: 1.3±0.3) such that it differed from the control. There was also a significant group by time interaction for HFnu (Rest: 62.5±15.0%; Rec 1: 29.5±18.9%; Rec 2: 29.2±19.9%; p=0.002) such that it was attenuated compared to rest, and the control, in both groups. The LF/HF ratio (Rest: 61.6±3.2; Rec 1: 42.0±2.9; Rec 2: 45.6±2.9; p=0.007) was augmented such that it differed from rest, and the control, in both groups. **CONCLUSIONS:** Based on our data the use of free-weight exercise suggests result in significant reductions in vagal modulation that are immediate, and maintained, up to 30 min, which does not appear to occur when using weight machines.

#### References

1. Kent State University, Kent, OH.
2. Exercise in Resistance-Trained Individuals

#### Conclusion

Postprandial hyperglycemia (PPH) is directly associated with cardiovascular disease risk. A single bout of aerobic (AE) or resistance exercise (RE) lowers PPH the following morning in healthy adults. No studies have examined the extent to which prior exercise regulates PPH in overweight and obese adults, and whether differences exist between exercise modalities. **Purpose:** The purpose of this ongoing investigation is to determine the effects of different exercise modalities on PPH responses to an oral glucose tolerance test (OGTT) in overweight and obese adults. We hypothesize that a single bout of exercise performed 14-17 h prior to an OGTT will attenuate increases in blood glucose, independent of exercise modality. **METHODS:** Recruitment for the current study is ongoing. In a randomized, cross-over trial, 32 participants (n=6; 3 women; age=24±3; 5±1; BMI=32.4±5.0 kg/m²) completed three trials. For each trial, an OGTT (1 g/kg body weight) was preceded (14±17 h) by seated rest (control), a single bout of AE, or a single bout of RE. The AE bout consisted of 30 min of continuous moderate-intensity (~60% VO₂max) treadmill exercise. The whole body RE bout consisted of 3 sets of 10 repetitions of the following exercises: leg press, chest press, seated leg extension, lat pulldown, shoulder press, and seated row. The weight used for each set was determined from the participant’s previous determined 10-RM. Blood was obtained prior to and at 30 min intervals for 3 hours following glucose ingestion. Repeated-measures ANOVA and LSD post-hoc tests were used to evaluate differences within and between trials. **RESULTS:** Blood glucose did not differ between trials at baseline. A main effect due to time (P<0.001) was observed for glucose. Relative to baseline, blood glucose increased (P=0.05) by 26-53%, 18-45%, and 16-46% at 30-120 min post-ingestion in the AE, RE, and trial, respectively. Glucose area under the curve did not differ between trials (P=0.37). **CONCLUSION:** Preliminary findings from our ongoing study suggest that acute aerobic or resistance exercise performed the evening prior to an OGTT does not affect PPH responses in overweight and obese adults. Supported by College of Education, Health, and Society Seed Grant and Miami University Committee on Faculty Research Grant.
Acute resistance exercise (RE) with blood flow restriction (BFR) on pulse wave reflection is unclear. **Purpose**: To evaluate the differences between acute upper-body RE (URe) and lower-body RE (LRe) with and without BFR on pulse wave reflection in resistance-trained individuals. **Methods**: Pulse wave reflection was assessed at rest, and during recovery at 10 (R10), 25 (R25), 40 (R40), and 55 (R55) minutes after either URe or LRe with or without BFR in twelve resistance-trained individuals. The URe consisted of the full pulldown and chest press while the LRe consisted of knee extension and knee flexion. The BFr condition consisted of 4 sets of 10, 15, and 15 repetitions at 30% 1-repetition maximum (1RM) while the non-BFr condition consisted of 4 sets of 8 repetitions at 70% 1RM. A 2x2x3 repeated measures ANOVA was used to evaluate the effect of group across conditions and time on pulse wave reflection. **Results**: There were no differences for any variable between conditions. There were significant group by time interactions for brachial systolic blood pressure (BBSP), brachial diastolic blood pressure (BDBP), systolic arterial blood pressure (SAPB), and arterial diastolic blood pressure (ADBMP) such that BBSP (rest: 120±9 mmHg, R10: URe: 115±12 mmHg, LRe: 126±5 mmHg; p<0.001) and SAPB (rest: 104±8 mmHg, R10: URe: 102±10 mmHg, LRe: 109±8 mmHg; p=0.005) were increased at R10 from LRe compared to URe and rest, with no difference from rest to R25, R40, or R55. BDBP (rest: 64±7 mmHg, R10: URe: 60±6 mmHg, LRe: 67±6 mmHg; p=0.001; R25: URe: 62±5 mmHg, LRe: 67±7 mmHg; p<0.001) and ADBP (rest: 53±9 mmHg, R10: URe: 60±9 mmHg, LRe: 69±6 mmHg; p=0.001; R25: URe: 63±5 mmHg, LRe: 69±7 mmHg; p=0.001) were increased at R10 and R25 from LRe compared to URe and rest, and no difference at R40 or R55. There were significant group by time interactions for augmentation index (AIX) (rest: 13.3±9.8%, R10: URe: 26.4±10.5%, LRe: 15.7±8.4%; p=0.001) and AIX normalized to 75 bpm (rest: 3.7±11.7%, R10: URe: 25.4±14.0%, LRe: 15.8±13.5%; p=0.001) such that they were increased at R10 from URe compared to LRe and rest, and were fully recovered by R25. **Conclusions**: These data suggest that LRe significantly elevated blood pressure more so than URe, and that URe significantly increased pulse wave reflection more than LRe, regardless of whether they were completed with or without BFR.

**Dehydration reduces plasma volume and concentrates electrolytes, increasing plasma osmolality (pOsm). Water deprivation (WD) studies in animals demonstrate that elevated pOsm is associated with altered cardiovascular function and blood pressure (BP) regulation. However, it remains unclear if WD augments BP responses to sympathoexcitatory stimuli in humans. **Purpose**: We tested the hypothesis that WD elevates pOsm and consequently augments BP reactivity. **Methods**: Twenty participants (n = 6 men; n = 14 women; age 62.0±9.9 yr; weight 80.9±16.2 kg, body fat 37.3±5.8% of weight; VO2max 19.4±4.7 mL/kg/min) completed 30 min of WD at 65% VO2 reserve or HHE by treadmill walking (90% and 20% of VO2 reserve in 3:2 min ratio) in a randomized crossover design. Both exercise conditions averaged ~65% VO2 reserve. Ultrasonographic measurements of brachial artery FMD were obtained by the same technician under standardized conditions just before, 1 hr and 24 hrs after exercise. FMD responses were analyzed using 2 (condition) x 3 (sample point) repeated measures ANOVA. RESULTS: Brachial artery FMD responses were augmented 1 hr after exercise in both exercise conditions (p<0.005 versus pre-exercise FMD). SSE (pre-exercise = 11.5±1.3; 1 hr = 17.2±1.8; 24 hr = 14.0±2.1, 1%) HHE (pre-exercise = 12.5±1.3; 1 hr = 15.6±2.1; 24 hr = 15.8±1.2%) **Conclusion**: We report for the first time that brachial artery FMD can be augmented by a single episode of exercise in mid-spectrum CKD. SSE and HHE, averaging ~65% VO2 reserve, is equally effective at transiently improving conduit artery vascular function in this clinical population.

**Brachial artery flow-mediated dilation (FMD) is a nitric oxide-dependent measure of conduit artery endothelial function that is transiently potentiated by moderate-intensity steady-state exercise (SSE) in healthy adults. Whether exercise imparts similar effects in adults with Stage 3 or 4 chronic kidney disease (CKD) has not been reported. Moreover, a comparison of SSE and high-intensity interval exercise (HIIE) may add to clinically relevant findings for vascular function in spectrum CKD. **Purpose**: To determine the influence of SSE and a comparable amount of HIIE on post-exercise brachial artery FMD in patients diagnosed with secondary Stage 3 or 4 CKD. **Methods**: Twenty participants (n = 6 men; n = 14 women; age 62.0±9.9 yr; weight 80.9±16.2 kg, body fat 37.3±5.8% of weight; VO2max 19.4±4.7 mL/kg/min) completed 30 min of SSE at 65% VO2 reserve or HHE by treadmill walking (90% and 20% of VO2 reserve in 3:2 min ratio) in a randomized crossover design. Both exercise conditions averaged ~65% VO2 reserve. Ultrasonographic measurements of brachial artery FMD were obtained by the same technician under standardized conditions just before, 1 hr and 24 hrs after exercise. FMD responses were analyzed using 2 (condition) x 3 (sample point) repeated measures ANOVA. RESULTS: Brachial artery FMD responses were augmented 1 hr after exercise in both exercise conditions (p<0.005 versus pre-exercise FMD). SSE (pre-exercise = 11.5±1.3; 1 hr = 17.2±1.8; 24 hr = 14.0±2.1, 1%) HHE (pre-exercise = 12.5±1.3; 1 hr = 15.6±2.1; 24 hr = 15.8±1.2%) **Conclusion**: We report for the first time that brachial artery FMD can be augmented by a single episode of exercise in mid-spectrum CKD. SSE and HHE, averaging ~65% VO2 reserve, is equally effective at transiently improving conduit artery vascular function in this clinical population.

**Water immersion can affect respiratory responses during exercise relative to exercise on dry land. Exercise training in an aquatic environment has added benefits relative to training on land, and improving central hemodynamic responses to strenuous exercise by improving cardiac output (Q) and heart rate recovery (HRR) as well as increasing cerebrovascular blood flow, relative to land-based exercise of a similar intensity, in healthy humans. **Purpose**: We sought to compare pulmonary responses during an incremental exercise done on immersible exercise (II) vs dryland exercise (DE) at the same external power output (Pext). **Methods**: Ten (10) young healthy subjects (Age: 31±9 years; BMI: 23.3±1.9 kg/m²) performed incremental exercise tests on II at chest level to achieve 65% VO2 reserve and 1.1% HIIE (pre-exercise = 12.5 ±1.1%). Pulmonary responses were measured and Pext on II was calculated according to the general fluid equation (Pext = [ρd · g · Vd · d2/4 · π · r2] · Fext/π · r), where ρd is the density of air, g is the acceleration due to gravity, Vd is the dead space volume, r is the radius of the orifice, and Fext is the external power output. Pulmonary responses were measured and Pext on DE was calculated according to the general fluid equation (Pext = [ρd · g · Vd · d2/4 · π · r2] · Fext/π · r), where ρd is the density of air, g is the acceleration due to gravity, Vd is the dead space volume, r is the radius of the orifice, and Fext is the external power output. **Results**: VO2 (p=0.0078) and VO2 (p=0.0138) were significantly lower during exercise on II at every stage of the incremental test relative to DE. No differences were detected between II and DE for respiratory exchange ratio (RER) ventilation (Ve), breathing frequency (f), tidal volume (Vt), fraction of expired O2 and CO2 (PetO2, and PetCO2, respectively), time of inspiration (Ti), time of expiration (Te), time of respiratory cycle (Ttot), duty cycle (Ti/Ttot), and partial pressure of end tidal O2 and CO2 (PetO2 and PetCO2, respectively). **Conclusions**:
Exercise during water immersion results in a significantly lower mean VO2, relative to a land exercise of equivalent power output. No differences were detected in the respiratory gas exchanges, indicating that the lower VO2, reached with IE is not attributed to changes in ventilation, but rather to central or peripheral convection (cardiac output) or diffusion (capillary O2 extraction) factors. We have previously shown that hemodynamic factors (convection) are modestly improved, but not sufficiently to explain the large gap in VO2 between IE and DE. We hypothesize that diffusion is improved by an unknown mechanism that remains to be explained.

Purpose of this study was to compare the acute effects of prolonged sitting on resting blood pressure (BP) with a similar duration of sitting combined with intermittent physical activity (IPA) performed at varying intensities in healthy weight (HIW) and overweight/obese (OW/OB) preadolescent children.

Methods: Thirty-nine children (18 males, 21 females; ages 7–11 years; 33% OW/ OB; 59% non-white) completed four experimental conditions in random order: 8 hours of sitting interrupted with 20, 2-minute low-intensity, moderate-intensity, or high-intensity PA breaks, or 20, 2-minute sedentary breaks. Pre-sitting baseline BP was measured prior to exercise and augmentation index (Alx), pulse pressure (PP), heart rate (HR), and brachial systolic (SBP) and diastolic blood pressure (DBP) were measured prior to exercise and at the end of each exercise condition. Using a digital BP monitor, BP was measured during each experimental condition in the morning (0800 hrs), midday (1200 hrs), and end-of-day (1600 hrs).

Results: Across all time points, there were no significant between-condition differences observed in systolic blood pressure (SBP) (sedentary:101±2 mmHg; low:105±2 mmHg; moderate:102±2 mmHg; high:105±2 mmHg; p=0.05). SBP did however decrease significantly throughout the day for all conditions (morning:106±1 mmHg; midday:101±2 mmHg; end-of-day:103±1 mmHg; p=0.01). OW/OB children displayed a greater decline in SBP throughout the day compared to HW children (p=0.01). Across all time points, no significant between-condition differences were displayed in diastolic blood pressure (DBP) (sedentary:61±2 mmHg; low:63±2 mmHg; moderate:61±2 mmHg; high:65±2 mmHg; p=0.05). No significant effects of time were observed in DBP (morning:63±1 mmHg; midday:62±1 mmHg; end-of-day:62±1 mmHg; p=0.05). At all time points, higher DBP were observed in OW/OB compared to HW children (HIW:60±1 mmHg; OW/OB:64±2 mmHg; p=0.03).

Conclusion: Contrary to previous findings in adults, both interrupted and uninterrupted sitting resulted in a similar decrease in SBP throughout the day. The decline in SBP was greater in OW/OB children compared to HW children. Future research should examine the long-term effects of interrupted and uninterrupted sitting on resting BP in preadolescent children.

Hypertension is a major health concern throughout the United States and is a major cause of cardiovascular disease and recent research has indicated that central aortic pressure measurements more accurately depict the location of pressure within the myocardiun compared to commonly used brachial measurements. Purpose: The purpose of this study was to compare the responses of Tai Chi and walking on measures of central and peripheral cardiovascular measurements when controlling for exercise intensity.

Methods: Two-hundred and twelve individuals who cannot stand or move their lower extremities in a rhythmic manner to perform activities which require an increase in the heart rate, lower extremities, or postural instability. Participants were randomly assigned to one of the two exercise forms. The two exercise forms included Tai Chi and walking. Tai Chi and walking elicited similar PEH effects on systolic blood pressure in prehypertensive individuals.

Purpose: To examine the associations between the peak HR and VO2 responses elicited from the two BRP with their respective VO2 max tests (TM vs. standing BRP) (BK vs. seated BRP).

Methods: Forty healthy subjects, 24 females and 16 males, mean age 24.83 years, performed either a ramped VO2 max test or BK test (respiratory exchange ratio > 1.0). At least 3 days later, the subjects who performed the ramped TM test did the standing BK test and the subjects who performed the standing TM test did the sitting BRP. Each BRP (standing and sitting) consisted of 15 seconds of double arm swings, followed by 45 seconds of rest for 10 rounds. The highest recorded VO2 and HR values (VO2 peak and HR, peak respectively) were recorded after each round.

Results: Metabolic responses were significantly lower for the BRP in both sitting (VO2 peak and HR peak: p < 0.001) and standing (VO2 peak and HR peak: p < 0.001) as compared to the HR max and VO2 max values derived from the BK and TM tests. The BRP produced a VO2 peak that was 71.87% (sitting) and 68.37% (standing) of the subjects’ VO2 max assessed via the BK and TM protocol, respectively. Moderate correlations were found between the VO2 during the seated (r = 0.61; p < 0.003) and standing (r = 0.43; p < 0.03) BRP and the BK and TM VO2 max tests, respectively. The HR peak elicited by the BRP done in sitting (r = 0.52; p = 0.009) and standing (r = 0.67; p < 0.001) had a moderate correlation with the HR max derived from the BK and TM tests.

Conclusions: Both the seated and standing BRPs demonstrated the capacity to produce acute metabolic responses that may enhance aerobic capacity. Battling ropes may be a low cost, accessible option to improve cardiovascular endurance for individuals who cannot stand or move their lower extremities in a rhythmic manner to conduct aerobic exercise.

Purpose: Interval training (IT) is utilised to optimise adaptations to exercise training with some recent research interest in whether low volume IT is efficacious. Therefore the purpose was to determine whether using shorter intervals would elicit similar acute cardiorespiratory responses to longer intervals.

Methods: Nine low active participants (5 males, 1 female) performed an incremental cycle test and then two experimental IT trials on an electronically-braked cycle ergometer at least 48 hours apart in a counter-balanced repeated measures study. Ventilatory threshold (Tvent) and peak oxygen uptake (VO2peak) were calculated from the incremental cycle test. The participants then completed the two IT trials which consisted of six blocks of work and recovery at a ratio of 2.3 minutes for LONG, and a ratio of 1:1 minutes for SHORT. For work and recovery, respectively. The ‘work’ intensity of each IT trial was calculated as 50% of the difference between VO2peak and Tvent (50%) and the ‘recovery’ interval was calculated as 80% of Tvent. SHORT was 12 minutes and LONG was 30 minutes, plus 5 minutes warm-up and 2 minutes cool down. Oxygen uptake (VO2), respiratory exchange ratio (RER), heart rate (HR) and power (W) were recorded continuously. Rating of perceived exertion (RPE) was collected at the end of each interval. Blood lactate ([La]) and systolic blood pressure (SBP) were recorded pre and post exercise. Rate-pressure product (RPP) and energy expenditure (EE) were calculated. Participants reported which was their preferred session. Paired samples analyses were applied to quantitative data.

Results: Mean RPE during work (13 ± 2 vs. 13 ± 3; p = 0.421), mean VO2 (2234 ± 404 vs. 2285 ± 483 mL; p = 0.781), peak VO2 (2548 ± 2456 vs. 2423 ± 2363; p = 0.346), SBP (150 ± 12 vs. 140 ± 13 mmHg; p = 0.204) and [La] (7.30 ± 1.86 vs. 6.46 ± 2.15 mmol L-1; p = 0.416) were not significantly different between SHORT and

Board #13
May 31 8:00 AM - 9:30 AM
Comparing the Changes in Cardiovascular Function After Acute Exposure to Tai Chi or Walking

Board #14
May 31 8:00 AM - 9:30 AM
Metabolic Responses to a Battling Rope Protocol Performed in the Seated or Stance Positions
Dominisha Felder, Hannah Mitchell, 77030, Kasey Hogan, Reka Kovacs, Wayne Brewer, 77030. Texas Woman’s University, Houston, TX. (Sponsor: Alexis Ortiz PT, PhD, FACSM, FACSM)

Board #15
May 31 8:00 AM - 9:30 AM
Longer vs. Shorter Intervals Elicit Similar Cardiovascular But Significantly Different Metabolic Responses During Interval Cycling
Andrew Scott, Christopher Bennett, Jasmine Lasslett, Daniel Reeves. University of Portsmouth, Portsmouth, United Kingdom.

No relevant relationships reported
LONG. However, mean RER (1.02 ± 0.09 vs. 0.99 ± 0.04; p=0.002) was significantly lower and energy expenditure (287 ± 81 vs. 475 ± 93 kcal; p=0.001) was significantly greater following LONG. SHORT was preferred to LONG by < 9% of participants.

CONCLUSIONS: LONG elicited significantly different metabolic responses with similar cardiovascular responses to SHORT but was perceived as less enjoyable.

Near-infrared spectroscopy (NIRS) has been used to quantify oxygenation characteristics of skeletal muscle during exercise. Changes in total-[heme] and deoxy-[heme] have been used as indices of diffusive and perfusive conductance, respectively. Total-[heme] and deoxy-[heme] have been shown to reach similar values at end exercise following exercise in the severe intensity domain. It has further been suggested that time of exercise tolerance (T_{lim}) in the extreme domain (T_{lim} < 2 min) is too short for VO_{2kinetic} to reach maximum values. It is unknown if total-[heme] and deoxy-[heme] characteristics reach similar values after exercise in the exercise domain as exercise in the severe domain.

PURPOSE: We hypothesized that total-[heme] and deoxy-[heme] would be lower following exercise in the extreme domain than compared to exercise in the severe domain.

METHODS: Six men (age 22 ± 3.1 yrs, 72.5 ± 6.5 kg; 175 ± 2 cm) performed 8 bi-lateral knee extension tests to task failure. First, one-repetition maximum (1RM) was determined by progressively increasing weight until a pre-determined range of motion could not be achieved. Subjects then performed 3 exercise tests in the severe intensity domain (T_{lim} = 2 - 15 min; S1 = 25.8 ± 2.7, S2 = 33.5 ± 4.3, S3 = 44.3 ± 6.9 % IRM) and 4 in the extreme domain (60, 70, 80, 90% IRM), in random order on non-consecutive days. A 1RM was performed 5 min before each exercise bout. Changes total-[heme], deoxy-[heme], and Sat% were measured on the L. vastus lateralis.

RESULTS: Total-[heme] at end exercise was not different between exercise intensities (p > 0.05). Total-[heme] at end exercise was not different (p > 0.05) compared to peak total-[heme] of the 1RM. Total-[heme] at end exercise following severe intensity exercise (S1, p = 0.002; S2, p = 0.025; S3, p = 0.02). End exercise deoxy-[heme] and Sat% were not different (p > 0.05) compared to peak deoxy-[heme], and Sat%, respectively, of the 1RM.

CONCLUSIONS: The current study showed that total-[heme], but not deoxy-[heme] or Sat%, is intensity- or time-dependent. These data suggest that diffusive O_{2} conductance is compromised during extreme intensity exercise, whereas perfusive O_{2} conductance is able to reach similar values regardless of intensity.

Low load (30% one repetition maximum (1RM)) exercise can produce growth if taken as exercise in the severe domain.

PURPOSE: To determine the cardiovascular and perceptual responses to exercise with and without BFR.

METHODS: Participants (n=21) completed high load (70% 1RM) exercise in random order on non-consecutive days. A 1RM was performed 5 min before each exercise bout. Changes total-[heme], deoxy-[heme], and Sat% were measured on the L. vastus lateralis.

RESULTS: Total-[heme] at end exercise following severe intensity exercise (S1, p = 0.002; S2, p = 0.025; S3, p = 0.02). End exercise deoxy-[heme] and Sat% were not different (p > 0.05) compared to peak deoxy-[heme], and Sat%, respectively, of the 1RM.

CONCLUSIONS: The current study showed that total-[heme], but not deoxy-[heme] or Sat%, is intensity- or time-dependent. These data suggest that diffusive O_{2} conductance is compromised during extreme intensity exercise, whereas perfusive O_{2} conductance is able to reach similar values regardless of intensity.

Compression socks have become increasingly popular with athletes due to perceived enhancement of exercise performance and recovery. However, research examining the efficacy of compression socks to reduce exercise-associated muscle damage has been equivocal, with few direct measurements of markers of muscle damage.

PURPOSE: We investigated the influence of wearing compression socks during a marathon run on creatine kinase (CK) levels in endurance athletes running the 2013 Hartford Marathon.

METHODS: Adults (n=20) were randomized to compression sock (SOCK; n=10) and control (CONTROL; n=10) groups. SOCK was naive to wearing compression socks, and wore them during the marathon only. Age, anthropometrics, vital signs, training mileage, and finishing time were collected. Venous blood samples were collected 1 d before, immediately after, and 1 d following the marathon for analysis of plasma CK (a marker of muscle damage).

RESULTS: Baseline plasma CK levels did not differ between CONTROL (89.3±41.2 U/L) and SOCK (100.0±56.2 U/L; p=0.633), and were within normal reference ranges for males and females. Immediately following the marathon (≤1hr), CK increased 273% from baseline (p=0.000), with no difference in exercise-induced changes in CK from baseline between CONTROL (1.9±27.8 U/L) and SOCK (23.3±125.5 U/L; p=0.598 for time x group). The day following the marathon (24hr), CK further increased 1094% from baseline (p<0.000 for time), with no difference in changes in CK from baseline between CONTROL (+191.9±1194.8 U/L) and SOCK (+859.1±1700.2 U/L; p=0.529 for time x group). These similar trends between CONTROL and SOCK persisted despite controlling for potential covariates such as age, body mass index, and race finishing time (p=0.291), which was also similar between groups (CONTROL: 4:20:42±3:38 hr vs. SOCK: 4:02:33±3:38 hr; p=0.333).

CONCLUSIONS: Our results suggest the use of compression socks during a marathon do not appear to mitigate objectively measured markers of muscle damage (i.e., exercise-induced increases in CK) immediately following and 24hr after a marathon.
total eNOS (eNOS), and phosphorylated eNOS (p-eNOS)**. RESULTS: Akt, eNOS, plasma glucose, and markers of endothelial function were similar among all cohorts. As expected, plasma insulin concentration was significantly (p<0.05) higher under insulin stimulated compared to non-insulin stimulated conditions, however exercise blunted this increase (CON+ins > EX+ins; p<0.05). Similarly, pAkt** was significantly (p<0.05) higher under insulin stimulated compared to non-insulin stimulated conditions, this effect was also attenuated with exercise (CON+ins > EX+ins; p<0.05). Conversely, p-eNOS** was only significantly (p<0.05) enhanced in the EX+ins versus the EX-ins group. CONCLUSIONS: Insulin and acute exercise resulted in the greatest enhancement of p-eNOS**, signifying enhanced endothelial function. This response cannot be completely attributed to increased pAkt**, suggesting that other kinases are likely responsible for the improvement in p-eNOS** in the aorta.

**1212 Board #20 May 31 8:00 AM - 9:30 AM

Effect of Aerobic Exercise on Artery Stiffness and Cerebrovascular Pulsatility in Hypertensive and Non-Hypertensive Adults

Wesley K. Lefferts, Jacob D. DeBlois, Girolamo L. Mammolito, Elizabeth A. Dressel, Candace N. Receno, Kevin S. Heffernan. Syracuse University, Syracuse, NY. (Sponsor: Bo Fernhall, FACSM)

(No relevant relationships reported)

Large elastic arteries (i.e. aorta, carotid) buffer pulsatile hemodynamics by dampening changes in pressure and flow. Stiffer central arteries, as seen in hypertension, transmit greater pulsatile hemodynamics into fragile cerebral vessels. Aerobic exercise is recommended for hypertensives (HTN), but its effects on artery stiffness and pulsatility in this group are unclear. PURPOSE: Investigate the effect of acute aerobic exercise on artery stiffness and cerebrovascular pulsatility in HTN and non-HTN adults. METHODS: 30 medicated HTN and 30 age, sex, and body mass index (BMI)-matched non-HTN adults (56±6 yrs, BMI 28±2.9 kg/m²; 32 men) underwent hemodynamic measures pre and 10 min post a 30-min cycling bout (55% peak oxygen consumption). Aortic stiffness was measured using carotid-femoral pulse wave velocity (cf PWV) and carotid artery (CA) stiffness was assed with PWV-β via Ultrasound. Aortic mean (MP) and pulse pressure (PP; via radial generalized transfer function), and CA PP were measured by tonometry. CA and middle cerebral artery (MCA) blood velocity pulsatility index (PI) were measured using Doppler. RESULTS: cf PWV, MCA PI and CA PI increased and aortic PP decreased, post exercise compared to pre in both groups (p<0.05). Aortic MP and CA PP. PWV-β were unaltered post-exercise. Aortic MP was greater in HTN vs non-HTN. No other exercise compared to pre in both groups (p<0.05). Aortic MP and PWV-β were unaltered post-exercise. Aortic MP was greater in HTN vs non-HTN. No other significant effects were detected. CONCLUSION: Acute aerobic exercise increases aortic stiffness and cerebrovascular hemodynamic pulsatility in both non-HTN and HTN, whereas no significant changes were detected in cerebrovascular pulsatility.}

Table 1: Artery stiffness and hemodynamic pulsatility pre/post acute exercise in non-HTN and HTN subjects.

<table>
<thead>
<tr>
<th>Measure</th>
<th>non-HTN</th>
<th>HTN</th>
<th>Effects</th>
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<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
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<td>T</td>
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<td></td>
<td></td>
<td>GxT</td>
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<tr>
<td>Aorta</td>
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<tr>
<td>Mean pressure, mmHg</td>
<td>91±8</td>
<td>92±7</td>
<td>96±10</td>
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<tr>
<td></td>
<td>95±9</td>
<td>0.047</td>
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<tr>
<td></td>
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<td>0.136</td>
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<tr>
<td>Pulse pressure, mmHg</td>
<td>33±9</td>
<td>32±7</td>
<td>33±7</td>
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<td></td>
<td>30±7</td>
<td>0.175</td>
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<td>0.595</td>
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<tr>
<td>cf PWV, m/s</td>
<td>7.9±1.1</td>
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<td>8.7±1.5</td>
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<td>0.221</td>
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<td>Carotid artery</td>
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<td></td>
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<tr>
<td>Pulse pressure, mmHg</td>
<td>37±10</td>
<td>36±8</td>
<td>37±8</td>
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<td></td>
<td>35±8</td>
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<tr>
<td>Blood velocity PI</td>
<td>1.43±0.34</td>
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<td>1.34±0.26</td>
</tr>
<tr>
<td></td>
<td>1.42±0.26</td>
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</tr>
<tr>
<td>PWV-β, m/s</td>
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<td>6.6±1.3</td>
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<td>6.8±1.5</td>
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<td>Middle cerebral artery</td>
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<td>Blood velocity PI</td>
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</table>

HTN, hypertensive; cf, carotid-femoral; PWV, pulse wave velocity; PI, pulsatility index; G, group; T, time; GxT, group-by-time interaction.

**1213 Board #21 May 31 8:00 AM - 9:30 AM

Kinetics of High-Sensitivity Cardiac Troponin Release Following a Strenuous Swimming Test

Karen Schulz, Jorge Jorge Diaz-Garzon, Ricardo Navarro-Oroco, Luis E. Carranza-Garcia, Alejandro Legaz-Arrese, Eloy Cardenas-Estrada, Fred Apple, FACSM. 1Minneapolis Medical Research Foundation of Hennepin County Medical Center, Minneapolis, MN. 2Hospitalario de Jerez, Jerez de la Frontera, Spain. 3Autonomous University of Nuevo Leon, Monterrey, Mexico. 4University of Zaragoza, Zaragoza, Spain. 5Hennepin County Medical Center, Minneapolis, MN. (Sponsor: Fred Apple, FACSM)

(No relevant relationships reported)

PURPOSE: Athletes are susceptible to muscle injury during strenuous exercise. Exercise-induced release kinetics of high sensitivity cardiac troponin (hs-cTn) and hs-cTnT are unclear. We analysed hs-cTn and hs-cTnT kinetics after a maximal swimming test and examined differences between age and gender. METHODS: Fifty adolescents (25 males, 25 females) and 16 adults (7 males, 9 females) participated in a 60-min maximal swimming test. hs-cTnT (Roche, 99th percentiles male=22, female=14 ng/L) and hs-cTn (Beckman Coulter, 99th percentiles male=11, female=9 ng/L) were measured at rest, immediately post-exercise, and at 1, 3, 6, 12, and 24 h post-exercise. RESULTS: Mean baseline (0h) concentrations were: hs-cTnT male 3.4 ng/L, female 3.1 ng/L; hs-cTnT male 0.5 ng/L, female 0.5 ng/L. We observed a greater percentage of hs-cTnT results > 99th percentile vs. hs-cTn for both genders. For males, this was at 6h (44% vs. 60%), 12h (20% vs. 44%) and 24 h (18% vs. 28%). For females this was at 6h (32% vs. 39%), 12h (3% vs. 19%) and 24h (0% vs. 10%). Until 3h both hs-cTnT and hs-cTnT presented similar percentages and no result over the 99th percentile was observed for any hs-cTn value at rest. 13 subjects (10 males; 84.6%) had a maximum hs-cTnT over 50 ng/L. Medians were: hs-cTnT, 146 (IQ 89-247) ng/L and hs-cTnT, 77 (73-123) ng/L. There were no significant correlations between hs-cTnT maximum concentration and age. However, significant differences (Mann-Whitney) in maximum concentration due to gender: hs-cTnT (p=0.004) and hs-cTnT (p=0.018): hs-cTnT, (p=0.004) and hs-cTnT (p=0.018). CONCLUSIONS: We observed parallel increases, but different kinetics, between hs-cTnT and hs-cTnT in swimmers during maximal efforts. hs-cTnT appeared to increase earlier than hs-cTnT. Both assays peaked at 3h post-exercise, with higher hs-cTnT concentrations. Higher values were found in men, but no differences were found due to age. Clinicians need to be educated regarding these observations in healthy athletes.
Endothelial progenitor cells (EPCs) are thought to play a key role in vascular regeneration, endothelial repair, and restoration of endothelial function. While studies have confirmed a relationship between exercise and EPCs, the mechanisms by which exercise mobilizes EPCs into circulation remains unknown. **PURPOSE:** To evaluate the effects of vibration training (VT) on the mobilization of angiogenic circulating progenitor cells (EPCs) and hematopoietic progenitors. We hypothesized that VT would increase the acute mobilization of angiogenic EPCs and decrease inflammatory marker levels. **METHODS:** 11 healthy males [18–30 yr (n = 6) and 50–65 yr (n = 5)] performed each of the following in random order on separate days: 1) standing on a vibrating platform only; 2) dynamic leg squat exercise (without vibration); and 3) in combination, i.e., leg squat with vibration. Blood samples were taken pre-and post-activity. **RESULTS:** Angiogenic EPCs increased 33% with vibration alone (p = 0.02), 21% with exercise alone (p = 0.02), and 34% with exercise plus vibration (p = 0.004). VEGF levels were higher with vibration alone (p = 0.003); TNFα increased with vibration (p < 0.01); interleukin-6 (IL-6) approached a significant drop during vibration (p = 0.056); and higher levels of IL-10 were found with vibration alone (p = 0.03) and exercise alone (p = 0.05). A decrease in IL-10 level was found when exercise and vibration were combined. **CONCLUSIONS:** Our findings suggest vibration alone may have a pro-angiogenic effect taken together with higher VEGF and TNFα levels; more than with exercise alone or in combination. Furthermore, vibration alone may have greater anti-inflammatory effects, evidenced by a trend toward decreased inflammatory marker (IL-6) and a significant increase in anti-inflammatory marker (IL-10). Curiously, the anti-inflammatory effect was dampened when vibration was combined with exercise in that the drop in IL-6 did not approach significance and IL-10 levels were actually lowered, suggesting there may be a threshold for the optimal dose and/or combination effects. VT may be a viable option to increase stem/progenitor cell circulation levels and decrease inflammation with possible health benefits in multiple health conditions.
1219 Board #27 May 31 8:00 AM - 9:30 AM
Heart Rate Variability During Submaximal Exercise And The Impact Of Gender And Race
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PURPOSE: To examine the effect of exercise duration on heart rate variability (HRV) and whether race or sex alters HRV during exercise. METHODS: Untrained participants (n=26, 46% male, 50% African-American [AA]) underwent fasting blood lipid and glucose tests and cardiovascular assessments (flow-mediated dilatation [FMD], pulse wave analysis, and HRV). Maximal oxygen consumption (VO\textsubscript{max}) was used to prescribe a 30-min cycling bout at 50%VO\textsubscript{max}. Exercise intensity was similar across sex (Male 1.3±0.2L/min; Female 0.9±0.1L/min; P<0.001) and race (AA 1.1±0.3L/min; Cau 1.1±0.2L/min; P=0.23). HRV during exercise was assessed in 2 min increments before exercise (Pre-EX) and during steady-state submaximal exercise from 14-16 min (Mid-EX) and 28-30 min (End-EX). RESULTS: At rest, no race or sex differences were observed in blood lipids, fasting glucose, PWF or FMD (all P>0.05). VO\textsubscript{max} was significantly greater in males (29.9±6.7 vs. 25.3±4.4L/kg/min; P<0.001). During exercise, heart rate was higher in females than males at Mid-Ex and Post-Ex (P<0.01).

These initial findings supported the hypothesis that sex and race differences exist in HRV during exercise. Differences in age, sex, race, and VO\textsubscript{max} explained the differences in HRV. Conclusion: These results support the claim that exercise duration affects HRV. The impact of sex and race on HRV during exercise needs further investigation.

1220 Board #28 May 31 8:00 AM - 9:30 AM
Graduated Compression Socks Does Not Improve Cardio-respiratory Responses To Maximal Exercise
Rodrigo Villar, Alison Staniewicz, Victoria Vargas, Devin Neary, Nathaniel Presti, Stephanie Priest, Drew Bois, Robert Anzalone. Franklin Pierce University, Rindge, NH. (No relevant relationships reported)

Cardiovascular and Respiratory Research Laboratory, Franklin Pierce University, Rindge, NH
PURPOSE: The purpose of this study was to determine if the use of graduated compression socks (GCS) would improve respiratory responses to maximal exercise. METHODS: Eight healthy young participants (4 men and 4 women; age = 20.50 ± 1.41 years; height = 1.71 ± 0.12 m; weight = 72.34 ± 12.53 kg; body mass index = 24.65 ± 3.15 kg/m\textsuperscript{2}) performed a Cardiopulmonary Maximal Exercise Test (CPET) on a treadmill that consisted of 3 minutes warm-up at a speed of 4 mph at 0° grade followed by an increase in speed to 6 mph for 1 minute and then increased every minute up to 8 mph. After that, the grade increased 2° every minute until exhaustion, but the speed of the treadmill was kept constant. Each participant visit the laboratory twice to perform the CPET test in two different conditions: (1) wearing graduated compression socks (GCS); and (2) not wearing the graduated compression socks (NGCS). VO\textsubscript{peak}, peak carbon dioxide production (VCO\textsubscript{2}peak), peak respiratory exchange ratio (RER\textsubscript{peak}), peak Heart Rate (HR\textsubscript{peak}), and exercise time to exhaustion (ETE) were collected via metabolic cart. RESULTS: There were no statistical differences in VO\textsubscript{2peak} (NGCS = 49.94 ± 8.34 mL·kg\textsuperscript{-1}·min\textsuperscript{-1} and GCS = 50.55 ± 6.67 mL·kg\textsuperscript{-1}·min\textsuperscript{-1}; P=0.47); VCO\textsubscript{2}peak (NGCS = 4.19 ± 1.17 L·min\textsuperscript{-1} and GCS = 4.34 ± 1.38 L·min\textsuperscript{-1}; P=0.85); RER\textsubscript{peak} (NGCS = 1.41 ± 0.17 and GCS = 1.45 ± 0.16); HR\textsubscript{peak} (NGCS = 191.63 ± 7.25 bpm and GCS = 190.75 ± 7.63 bpm); and ETE (NGCS = 512.36 ± 149.48 s and GCS = 528.15 ± 165.17 s) between non-graduated compression socks and with graduated compression socks, respectively. CONCLUSIONS: Based on the results, there were no statistical significant differences in any variables indicating that there was no effect of the passive external compression on the cardio-respiratory responses during maximal exercise. The conclusions drawn from our data need to be analyzed with extremely caution due to small sample size (n=8). Therefore, more research need to be done to support these initial findings. Research supported by New Hampshire-INBRE through an Institutional Development Award (IDeA), P20GM103506, from the National Institute of General Medical Sciences of the NIH. (No relevant relationships reported)

Gravity powered ventilation is a concept that utilizes visceral pressure to facilitate pulmonary ventilation. Such a procedure may provide a form of complementary therapy for those with Chronic Obstructive Pulmonary Disease (COPD). METHODS: The EBET bed uses arm power to tilt the supine subject from a Trendelenburg to a reverse-Trendelenburg position with the goal of assisting breathing. Healthy volunteers (N=40) operated the device for 15 minutes. Variables of interest: A body part discomfort scale (0 = no discomfort to 5 = very uncomfortable) administered at 0 and 13 minutes, a Borg scale rating of perceived exertion (0 to 10) at 14 minutes, and an end-of-session safety rating. RESULTS: Areas with the greatest discomfort at minute 13 and the associated percent reaching ≥ level 3 follow: Left elbow (5%), right elbow (5%), left wrist (23%), right wrist (28%), left hand (16%), and right hand (15%). Of these body parts, there was a significant (p ≤ 0.01) increase in discomfort from 0 to 13 minutes. Regarding exertion: 33% reported moderate to somewhat strong levels, while 13% reported strong levels. In terms of safety, 98% felt safe on the device, and 2% were undecided. CONCLUSION: Further clinical studies with the current EBET in COPD patients are not advised due to the discomfort and exertion in healthy volunteers. Safety data indicates tilt may be a viable means to achieve gravity powered ventilation, thus device modification is recommended. Supported by grants from Exhaile Fully, LLC, and University of North Carolina Wilmington

1222 Board #30 May 31 8:00 AM - 9:30 AM
Three Weeks Of Respiratory Muscle Endurance Training Decrease the O\textsubscript{2} Cost Of Walking In Obese Adolescents
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Obese adolescents have an increased O\textsubscript{2} cost of exercise, attributable at least in part to an increased O\textsubscript{2} cost of breathing. In a previous work a short (3-wk) program of respiratory muscle endurance training (RMET) slightly reduced the O\textsubscript{2} cost of high-intensity cycling in these patients. PURPOSE: We hypothesized that the effects of RMET would be more pronounced during walking on a treadmill compared to those described during cycling. METHODS: Sixteen obese patients (age 16.0±0.8 yrs; height 1.80±0.05 m; body mass 127.7±14.2 kg; BMI 40.7±4.0 kg/m\textsuperscript{2}) participated to the study. In the experimental group (RMET, n=8), subjects followed for 3 weeks a standard RMET protocol in addition to a multidisciplinary body mass reduction program, whereas controls (CTRL, n=8) did only the latter. Among other variables, heart rate (HR), and pulmonary O\textsubscript{2} uptake (V\textsubscript{O}\textsubscript{2}) were measured during incremental exercise and 12-minute constant work rate (CWR) exercises at a moderate-intensity and 120% (high-intensity) of the gas exchange threshold (GET), determined before the interventions. The O\textsubscript{2} cost of walking (aerobic energy expenditure per unit of covered distance) was calculated as V\textsubscript{O}\textsubscript{2}walking velocity. RESULTS: Body mass decreased both in CTRL (−4 kg) and in RMET (−5 kg). All subjects completed 12 moderate-intensity CWR tests. V\textsubscript{O}\textsubscript{2} was not affected by both interventions. Both during moderate- and high-intensity walking, V\textsubscript{O}\textsubscript{2}, the O\textsubscript{2} cost of walking and HR decreased in RMET, but not in CTRL. During heavy-intensity walking the positive slopes of the V\textsubscript{O}2 and HR vs. time linear relationships from the 3\textsuperscript{rd} to the 12\textsuperscript{th} minute of exercise decreased in RMET, but not in CTRL. CONCLUSION: In obese adolescents a short RMET program significantly lowered the O\textsubscript{2} cost of moderate- and high-intensity walking and improved exercise tolerance. Funding by “Progetti di Ricerca Corrente” from the Istituto Auxologico Italiano Istituto di Ricovero e Cura a Carattere Scientifico (Milan, Italy).
CONCLUSION: Fatiguing inspiratory muscle work initiates the inspiratory muscle metaboreflex causing a time-dependent increase in muscle sympathetic nerve activity (MSNA) and a decrease in leg blood flow (Q_L). Fatiguing contractions of the expiratory muscles also facilitates an increase in MSNA. However, the effect of fatiguing expiratory muscle work on Q_L is somewhat unknown. PURPOSE: To determine the effect of inspiratory respiratory loading (IRL) compared to expiratory respiratory loading (IRL) on Q_L in healthy humans. METHODS: Five healthy men (n = 2, 3, ± 0.6 y) and women (n = 3, 29 ± 5 y) performed ERL and IRL at 65% of maximal expiratory and maximal inspiratory mouth pressure (MEP; MIP) to task failure. Respiratory frequency was maintained at 15 breaths/min with an inspiratory duty cycle of 0.5. Q_L (via Doppler ultrasound) and mean arterial pressure (MAP) were measured throughout each visit. RESULTS: All data are reported as mean ± SD. The IRL elicited a reduction in Q_L compared to the ERL (p < 0.05). The change in duty cycle with IRL resulted in a significant increase in muscle sympathetic nerve activity (α) in the Q_L response to loaded breathing. During ERL, Q_L decreased relative to baseline values at min 3 (−29 ± 20%) and min 7 (−17 ± 6%) in 2 of the 5 subjects; Q_L increased by 15 ± 7% from rest to min 7 in the remaining 3 subjects. V̇ₐₐ O₂ increased by 15 ± 7% from rest to min 7 in the remaining 3 subjects. Similarly, there was a reduction in Q_L from rest to min 3 (−23 ± 9%) and min 7 (−16 ± 3%) in 2 of the 5 subjects during IRL; Q_L increased by 60 ± 26% from baseline to min 7 in the remaining 3 subjects. There was no significant change in group mean MSNA across time during either ERL or IRL (p > 0.05). Q_L decreased. Significant individual variability in the Q_L response to loaded breathing. Using bootstrapping procedures.

Individual Variability in the Leg Blood Flow Response to Expiratory and Inspiratory Resistive Loading

BACKGROUND: Individual variability in leg blood flow response to exercise, possibly due to differences in muscle thickness, fiber type distribution, and vascular density, has been observed in past studies. PURPOSE: To characterize the distribution of leg blood flow response to incremental cycling exercise. METHODS: Thirteen healthy male and female participants (n = 7, 25 ± 5 y) completed an incremental cycle ergometer test to exhaustion on both a stationary and an open-circuit cycle ergometer. Subjects were instructed to flap their arms in a 1:1 sniffing pattern after the initial 10 s of cycling. Data from five replicated trials were averaged. Blood flow to the right leg was measured using a Doppler ultrasound device (MicroVision Medical Corporation, Westlake, Ohio). Subjects performed three incremental cycle ergometer tests, the first test as a familiarization test, and the second and third tests for analysis. RESULTS: The median leg blood flow response was 52.5 ± 10 l/min (min 0–100%) in the open-circuit cycle ergometer test. The median leg blood flow response was lower in the stationary cycle ergometer test (44.7 ± 9 l/min). The median leg blood flow response was higher in the open-circuit cycle ergometer test (52.5 ± 10 l/min). CONCLUSION: Individual variability in leg blood flow response is observed across different exercise settings. This variability could reflect differences in vascular, muscular, and neural adaptations to exercise.
During freestyle swimming, the hydrostatic pressure of water limits expansion of the lungs and chest wall, and narrows airways ~2 mm in diameter. Moreover, the horizontal position causes blood to shift from the extremities to the chest, which reduces lung compliance. Thus, during freestyle swimming, the mechanics of breathing are altered, which likely increases the work of breathing (Wb). However, no previous studies have quantified Wb during freestyle swimming.

**PURPOSE:** To compare Wb during freestyle swimming to cycling, and to characterize the differences in the cardiorespiratory responses to swimming relative to cycling in the same individuals.

**METHODS:** Seven collegiate swimmers (n=4 male, n=3 female; age: 22±2 y) performed a graded swim test while tethered to a resistance apparatus. On a separate day subjects performed a graded cycle test. During swimming and cycling, metabolic and ventilatory parameters were measured using a customized metabolic cart, and inspired Vt was quantified using an esophageal balloon catheter.

**RESULTS:** Swimming and cycling elicited statistically similar maximal oxygen uptakes (3.87±.92 vs. 4.20±.83 l/min; p=0.143). However, minute ventilation (V̇E) [118±3 vs. 154±25 l/min] and heart rate (164±19 vs. 183±8 beats·min⁻¹) were significantly lower during swimming relative to cycling (both p<0.05). Total inspired Vt was higher at V̇E of 50 l·min⁻¹ (+27±16 l·min⁻¹) and V̇E of 100 l·min⁻¹ (+53±22 l·min⁻¹) during swimming compared to cycling (both p<0.05). Periods of inter-breath apnea were observed at lower ventilations while swimming, resulting in decreased breathing frequency (V̇E=50 l·min⁻¹, 19±6 vs. 22±4 breaths·min⁻¹; p<0.05), and were not observed at higher ventilations (V̇E=100 l·min⁻¹, 37±11 vs. 35±7; p>0.05). Peak inspired flow was greater while swimming, when matched for V̇E (+2.0±0.73 l·sec⁻¹, p<0.05).

**CONCLUSION:** We found that swimming resulted in a higher inspired Vt, at a V̇E of 50 and 100 l·min⁻¹ compared to cycling. We interpret our findings to mean that the horizontal body position and hydrostatic pressure on the chest wall requires swimmers to generate greater inspiratory pressures to sustain adequate Vt during exercise.

**Funding:** Natural Sciences and Engineering Research Council of Canada

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**CONCLUSIONS:** Muscular efficiency (V̇O₂/WR slope) during cycling is similar between normal weight and obese children and does not appear to be related to relatively short-term changes in body composition.

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It has been reported that in young men high inspiratory muscle work at rest and during exercise reflexively increases muscle sympathetic nerve activity (MSNA), with corresponding increases in arterial blood pressure (ABP). This sympathoexcitation occurs through an inspiratory muscle-induced metaboreflex. Young women have attenuated inspiratory muscle metaboreflex-induced increases in ABP compared to age-matched men. One potential mechanism is less sympathetic vasomotor output in women compared to men. **PURPOSE:** We compared changes in MSNA and cardiovascular variables during leg cycle exercise with increased inspiratory muscle resistance in men and women.

**METHODS:** Eight young women (19±5.0±2) and seven men (20.3±0.3) completed the study. The subjects performed two 10-min submaximal cycle ergometer exercises in a semirecumbent position. The first 5-min was spontaneous breathing, and latter 5-min half was voluntary hyperventilation with or without inspiratory resistive breathing. Mean arterial blood pressure (MAP) was measured using finger photoplethysmography and MSNA was recorded via electromyography at the arm at the elbow. **RESULTS:** During exercise with inspiratory resistive breathing, MSNA burst frequency was significantly increased accompanied by an increase (p<0.05) in MAP in both men and women. Women had significantly less of an increase in MSNA (Women: +9.6±1.0 vs. Men: +14.4±2.4 bursts/min) and MAP (Women: +22±5.7 vs. Men: +32±2.0 mmHg) as compared to men. **CONCLUSION:** These results suggest that lesser sympathetic vasomotor outflow partially contributes the attenuated inspiratory muscle-induced metaboreflex during exercise in young women. Supported by JSPS KAKENHI Grant Number 15H13079.

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**PURPOSE:** Prolonged endurance running may acutely reduce spirometric lung function. This study examined changes in spirometric lung function before and immediately after prolonged endurance exercise (running/walking) in a large sample. This study also examined if presence or absence of exercise-induced bronchoconstriction (EIB) was related to finishing time.

**METHODS:** Recruitment was obtained at the pre-race expo, where an informed consent form was signed. Pre- and post-race spirometry measurements were obtained in seventy-nine participants who participated in the 2008 ING (Internationale Nederlanden Groep) Georgia half-marathon (n = 66) or marathon (n = 13). Mean ambient temperature was 47°F (range 43-50°F); mean ambient relative humidity was 88% (range 76-100%). Spirometry was performed 24 hours before the marathon or half-marathon and then again about 25 minutes (SD 7) after finishing it.
RESULTS: The post-race forced expiratory volume in 1 second (FEV1) and forced vital capacity (FVC) were statistically lower by ~10% compared to pre-race, and peak expiratory flow decreased by ~8% compared to pre-race. Among 30% of the participants, regardless of sex, demonstrated a post-exercise reduction in FEV1, by at least 10% compared to pre-race. EIB was the most probable explanation for the reduction in FEV1, post-race. There was no difference in spirometric lung function changes between men and women, nor between participants completing the marathon versus half-marathon. Presence or absence of a post-exercise reduction in FEV1, (i.e., EIB) did not predict finishing time, only the distance run, age, body mass index, and sex affected finishing time (adjusted R² = 0.82).

CONCLUSIONS: EIB was diagnosed in 3/20 (15%) athletes. A prior diagnosis of asthma or exercise induced asthma was reported in 5/20 (25%) athletes, yet only one of these had a decrease of >10% of FEV1 as measured by this test. Of the three EIB+, two were symptomatic (67%); and of the EIB-, 9/17 (53%) reported respiratory symptoms. Diagnosis of EIB was consistent for all three periods in all but one athlete. Mean FEV1 for the three periods was 4.08. 4.07, and 4.07 respectively.

CONCLUSIONS: Symptoms remain unreliable for diagnosis of EIB. SSFECT can be utilized for diagnosis of EIB in ice hockey athletes.

The turbine spirometer is a popular laboratory device used to measure respiratory volumes and flows during exercise, and while performing gross, voluntary respiratory manoeuvres (i.e., inspiratory capacity efforts). Indeed, these devices have been incorporated into many commercially-available pulmonary function and metabolic systems. Yet, while the turbine spirometer may provide acceptable measurements of respiratory volumes at modest-to-high flows, these devices perform poorly at low flow rates. PURPOSE: To improve the accuracy of a turbine spirometer over an extended range of low flows using the “weighted averaging technique” described by Yeh et al. (J Appl Physiol, 53(1):p280, 1982). METHODS: A commercially-available turbine spirometer was interfaced with a custom-designed microcontroller unit (MCU). The MCU recorded discrete rotations of the turbine rotor, and the corresponding rotational frequency (frot). Repeated 5-fold cross-validation was used to determine the optimal number of bins in frot and iterations used in the Weighted Averaging algorithms. This method yielded a discrete array of calibration constants (K) across a relevant range of frot (~3–1800 Hz). The accuracy of this “nonlinear” calibration curve was compared to that obtained by assuming a constant K across all frequencies (i.e., flows). Over 200 calibrations strokes were recorded using a 3 L syringe. RESULTS: By assuming a constant K (15.6 mL·pulse⁻¹), the turbine spirometer exhibited an average volume error of +94 mL (+3.1%) over a 95% confidence interval (CI95%) of -856 to +375 mL (-28.5 to 12.5%). Conversely, applying the nonlinear K curve resulted in an average volume error of -0.001 mL (-0.001%) and a CI95% ranging from -60 to +60 mL (-2.0 to 2.0%). Importantly, the nonlinear K curve provided accurate (within ±3%) volume measurements down to 0.33 Hz (~7 mL·s⁻¹). CONCLUSIONS: The “weighted averaging technique” improved the accuracy/reliability the turbine spirometer to within ±3% across an interval of flows ranging between ~0.01 to 20 L·s⁻¹.

PURPOSE: To study if cardiorespiratory fitness (CRF) evolution after high intensity interval training (HIIT) depends on training intensity relative to ventilatory thresholds (VTs).

METHODS: A sample (n=134) of sedentary participants with obesity (54±9 years, BMI 31±6±5 kg·m⁻², 42% female) trained for 16 weeks, 3 days week⁻¹ alternating bouts of 70-90% of peak heart rate (HR). CRF was evaluated before and after training using a graded cycle-ergometer exercise tests (GCT) until exhaustion. Starting at rest, oxygen consumption (VO2), power output (PO), and HR, were determined at ventilatory threshold (VT), respiratory compensation threshold (VTc) and at maximal values (VOMAX). Participants were separated in two groups according to the relationship between the training intensity (target-HR based) and the VTs location. One group (AboveVTs) was composed for those who trained above their VTs (n=74), whereas the other group (AboveVTs) for those who trained above their VTs (n=60).

RESULTS: Before intervention, age and body composition were similar in both groups. While at baseline, VO2_atVT was higher in AboveVTs (P<0.005), at VTc, and VTc was similar in both groups. After training, both groups improved their VO2peak by 11-12% (P<0.001) without differences between groups (P=0.880). However, in BelowVT group, 54% of the VO2peak improvement occurred below VTc, 12% between VTs and 33% above VTc, whereas for AboveVTs, 96% of the VO2peak improvement occurred below VTc, 0% between VTs and 4% above VTc.
CONCLUSIONS: Target-HR based HIIT improves \( VO_{2\text{peak}} \) in middle-aged individuals with obesity independently of the VTs location. However, the extent of the widening of exercise workloads tolerated and the onset of metabolic acidosis (i.e., improvements above VT) and exercise workloads supplied solely with oxidative metabolism (i.e., improvements at VT) depends if the workload chosen for training fall above or below the workload at both VTs.

1235 Board #43 May 31 8:00 AM - 9:30 AM

Corticocortical Function During Blood Flow Restricted Arm Crank Ergometry

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(No relevant relationships reported)

Low-intensity exercise with blood flow restriction (BFR-LI) may be used as an alternative to high-intensity (HI) exercise. The underlying neurophysiological mechanisms of adaptation remain elusive. PURPOSE: To examine corticocortical and metabolic function during HI and BFR-LI arm ergometry. METHODS: Twelve males (age: 23.9±3.75 yrs, BMI: 25.3±4.26 kg•m\(^{-2}\)) completed three 15-minute arm ergometry conditions: HI, low-intensity (LI), and BFR-LI. HI was completed at 60% of maximal power output, while LI and BFR-LI were completed at 30% of maximal power output. In the BFR-LI condition, cuff pressure to the proximal biceps brachii was set to 70% of occlusion pressure. Single-pulse transcranial magnetic stimulation was delivered to the left primary motor cortex to elicit corticocortical evoked potentials (MEPs) in the right biceps brachii at baseline, 1, 10, and 15 minutes post-exercise. Blood lactate (BL) was measured at baseline, immediately and 5-minutes post-exercise. Relative \( VO_2 \) and HR were recorded at 2 minute intervals during the exercise protocol. Each dependent variable was analyzed using within-subject repeated-measures ANOVA x time interactions. RESULTS: MEP amplitudes throughout exercise were not different between conditions (p = 0.883). A significant main effect of time indicated an overall elevation in all conditions in MEP compared to baseline (0.80±0.51 mV), 10 minutes (1.16±0.74 mV), and 15 minutes (1.04±0.47 mV; p < 0.001). BL following HI was 45% greater (p = 0.03) and 50% greater (p < 0.001) than the BFR-LI and LI conditions, respectively. A similar trend was seen at 5-minutes post-exercise. The HI condition resulted in HR values of (162 bpm±4 bpm) at the completion of exercise. This was higher than LI (117±5 bpm) and BFR-LI (125±5 bpm; p < 0.001). VO\(_2\) values were significantly higher with HI (24.0±1.1 ml•kg•min\(^{-1}\)) when compared to LI (11.4±1.2ml•kg•min\(^{-1}\)) and BFR-LI (13.7±0.1ml•kg•min\(^{-1}\); p < 0.001). CONCLUSION: High intensity arm ergometry elicited the highest VO\(_2\), HR, and BL values, suggesting greater metabolic demand. Despite higher physical demands, MEP amplitudes increased for all conditions, suggesting similar responses in corticospinal excitability. Supported by: 2017 International Research Opportunities Program from the University of New Hampshire.

1238 Board #46 May 31 8:00 AM - 9:30 AM

Acute Muscle Fatigue In Men And Women Following Upper-limb Low-intensity Blood-flow Restricted Exercise

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(No relevant relationships reported)

Low intensity blood flow restricted exercise (LIBFRE) elicits acute changes in torque output and muscle activation. The magnitude of these changes affect the chronic adaptations to this type of training. Despite its widespread use by men and women, it is not known whether the acute impact of LIBFRE follows a sexually dimorphic pattern. This is important because, when compared to men, women have muscle fibers of smaller diameter, higher density of type I muscle fibers, higher muscle capillarization and heightened muscle perfusion. All these factors likely influence blood flow, as well as acute muscle fatigue, during LIBFRE. PURPOSE: To explore whether muscle fatigue post-acute LIBFRE and high intensity resistance (HI) training follows a sexually dimorphic pattern. METHODS 62 healthy young persons (31 men: 21.7 ± 2.3; 31 women: 22.0 ± 2.0 yrs) were included in this study. One-repetition maximum (1RM) was determined in each participant prior to training. Participants completed 4 sets of unilateral biceps curl with (50+15±15+15 reps) and without BFR (10+10±10+10 reps). HI was performed at 75% 1RM and LIBFRE at 20% 1RM with BFR (60% of arterial occlusion pressure). Maximum voluntary contraction (MVC) was measured at pre- and post-training time points. Muscle fatigue was quantified as the percent difference between pre- and post- training MVC. RESULTS: Both HI and LIBFRE training protocols induced significant muscle fatigue in men and women from pre- to post-training (p<0.05). HI was more fatiguing than LIBFRE in both sexes (HI: ~ 35 vs. LIBFRE: ~ 25%, p<0.05). These results were sustained even after controlling
Complex training incorporates a high-load (HL) resistance exercise, such as the back-squat, with a biomechanically similar plyometric exercise, like a vertical jump (VJ), to elicit postactivation potentiation (PAP). This often results in an enhanced rate of muscle force development in the form of a higher VH. Low-load blood flow restricted (BFR) exercise resistance is an alternative modality to HL resistance exercise, but its use during complex training has never been evaluated. PURPOSE: To compare how HL complex training using low VJ height and electromyography (EMG). METHODS: Twelve healthy males that had been resistance training at least 3 times per week for the past 2 years (mean ± SD; age: 20.4 ± 0.8 years, body mass: 83.6 ± 5.7 kg, stature: 1.81 ± 0.05 m, back-squat 1RM: 147.9 ± 25.2 kg) completed two randomized exercise sessions separated by ~1 week. Prior to each session, the VJ height was randomized, then either the HL (2 sets of 5 repetitions at 85% 1RM) or BFR (2 sets of 30 at 30% 1RM with BFR) complex training sessions, with a VJ 4-minutes after each set were performed. EMG data of the left vastus lateralis and hamstrings were collected, quantified to root-mean square values, and expressed as a percentage of the 1-RM squat. PAP percent was defined as the post-squat VJ height divided by the pre-squat VJ height and multiplied by 100. Data were analyzed using a within-subjects repeated-measures ANOVA between the two conditions and sets. Post-hoc tests in the form of t-tests were conducted if data reached significance.

RESULTS: Neither condition induced PAP (PAP percent > 100%), but the HL condition was greater than the BFR condition (96.1 ± 4.8% vs. 90.8 ± 8.5%, p = 0.034). EMG activation was greater during the HL condition in the vastus lateralis (HL: 104.6 ± 27.7% to BFR: 79.6 ± 33.4%, p = 0.002) and the hamstrings (HL: 112.3 ± 59.6% to BFR: 51.9 ± 30.2%, p = 0.001). CONCLUSION: Despite EMG amplitude being greatest for the HL condition, PAP did not occur. Similarly, BFR complex training also did not produce PAP. Fatigue and unsatisfactory rest periods should be investigated in future protocols. Supported by: 2017 Summer Undergraduate Research Fellowship Grant from the University of New Hampshire.

Low load exercise performed to failure appears to elicit a similar skeletal muscle response to that of high load exercise. There may be a point where a load becomes too low to elicit an anabolic response. In situations where the load becomes too low, blood flow restriction (BFR) might augment the response. PURPOSE: To examine the acute skeletal muscle response to low load exercise with and without BFR. METHODS: 20 participants completed four conditions in the upper body (one condition per arm) over 2 visits. Conditions consisted of elbow flexion exercise to failure using a traditional high load [70% 1RM, (HL)], low load [15% 1RM, (LL)], low load with moderate BFR [15% 1RM + 40% BFR (BFR40)], or low load with greater BFR [15% 1RM + 80% BFR (BFR80)]. Torque and muscle thickness were measured prior to, immediately post, and 15 min post exercise. Muscle electromography (EMG) amplitude was measured throughout. Repeated measure ANOVA was used to determine differences. Results are displayed as mean (SD).

RESULTS: There was an interaction (p < 0.001) for changes in muscle thickness. Immediately post-exercise all low load conditions demonstrated greater swelling compared to the HL condition [Pre to Post Change: LL = 0.56cm (0.22), BFR40 = 0.53cm (0.19), BFR80 = 0.55cm (0.20), HL = 0.2cm (0.13)]. Muscle thickness remained elevated above baseline 15 min post exercise in all conditions, but was maintained to a greater extent in the low load conditions relative to HL exercise [Pre to 15 min post difference: LL = 0.46cm (0.16), BFR40 = 0.39cm (0.13), BFR80 = 0.44cm (0.19), HL = 0.21cm (0.12)]. There was an interaction for acute changes in torque (p < 0.001). The LL, BFR40 and BFR80 conditions decreased 20 Nm (11), 24 Nm (11), and 26 Nm (13), respectively, while the HL condition remained consistent (15 Nm (9)). Torque remained depressed at 15 min post. In the last three repetitions, there was a main effect of time (p < 0.001). EMG amplitude was greater during set 2 (70% 1RM) compared to set 1 [65 (22) %MVC], set 3 [62 (20) %MVC] and set 4 [64 (21) %MVC]. CONCLUSIONS: Very low load exercise (with or without BFR) appears to be performed in the least acute muscle fatigue and similar EMG amplitude compared to HL exercise. Further study is needed to determine if these acute changes would manifest muscular adaptations.

Arterial occlusion pressure (AOP) is typically used to normalize blood flow restriction (BFR) during low intensity blood flow restricted exercise. BFR varies as a function of individual factors such as limb circumference and systolic blood pressure (BP). Despite strong evidence for sexual dimorphism in muscle blood flow, sex-differences in AOP estimation have not been previously examined. PURPOSE: To determine whether the relationship of upper-limb AOP with arm circumference and systolic BP differs between men and women. METHODS: 62 healthy young persons (31 men: 21.7 ± 2.3; 31 women: 22.0 ± 2.0 yrs) were included in this study. Arm circumference, resting BP and AOP were taken during a single testing session. Resting BP and AOP were measured twice (post-5 and 30 min of seated rest) to examine their stability over time. Multiple linear regression analysis was used to determine whether the relationship of AOP with arm circumference and resting BP differed between sexes. Prediction accuracy was assessed with the mean absolute percent error and Bland-Altman plots. RESULTS: Men had higher systolic BP and larger arm circumference than women (p<0.05). Nevertheless, AOP was similar between sexes (men: 138.5 ± 11.8; women: 136.4 ± 11.3 mmHg). Arm circumference, systolic BP and AOP were significant predictors of upper-limb AOP (p<0.05), explaining 42% of its variance. For women, the prediction equation was: AOP = 35.278 + (1.711 x arm circumference) + (0.47 x systolic BP). For men, the prediction equation was: AOP = 35.278 + (1.711 x arm circumference) + (0.47 x systolic BP) - 5.704. The absolute percent error was similar in both sexes (men: 0.55 ± 7.12; women: 0.39 ± 6.31%, p>0.05). Bland-Altman plots showed that the mean difference between actual and estimated AOP was nearly zero in both groups (men: -0.14; women: -0.01 mmHg), with no systematic over or under-estimation. CONCLUSIONS: Arm circumference, systolic BP as well as sex are all significant predictors of upper-limb AOP. Their measurement allows the indirect estimation of BFR pressure within the context of exercise training. Supported by the Portuguese Science Foundation PTDC/DTM-DES/5714/2014.

Exercise performance is partially limited by the muscle potassium ion (K+) transport capacity, which is determined by the function of the Na+-K+ ATPase (NKA). Studies in vitro suggest high levels of reactive oxygen species (ROS) compromise NKA function, and increased antioxidant content protects against NKA dysfunction. However, it remains unknown in humans if ROS affect muscle K+ handling, and if this capability is related to the antioxidant capacity. Exercise with reduced muscle blood flow (blood flow restriction, BFR) promotes ROS production, which is important for increases in NKA and antioxidant content. Whether BFR may augment increases in muscle K+ handling and NKA content in humans is yet to be explored. PURPOSE: To examine if BFR can augment training-induced improvements in muscle K+ handling and exercise performance, and if these changes are related to an increased antioxidant capacity. METHODS: cyclists were trained in either men (25 ± 4 yrs) or women (26 ± 5 yrs) for 6 days 12h interval cycling without (CON-leg) or with BFR (170 mmHg, BFR-leg). Before and after training, catheters were inserted into the fem. artery and vein in both legs, and blood flow was assessed by ultrasound Doppler, to determine thigh K+ release was attenuated in Ex2 in the BFR-leg (p<0.05), but there was no apparent difference in Ex1. The NKA and antioxidant content in type-I and II fibres. RESULTS: Performance of the CON-leg (11%) and BFR-leg (23%) increased during training with (p<0.05), with a greater increase in BFR-leg (p<0.05, 12%). After training, K+ release was attenuated in Ex2 in the BFR-leg (p<0.05), but
not in CON-leg (p=0.05). Before training, NAC attenuated K$^+\text{ release in Ex1 (p=0.05),}$ but not in Ex2 (p=0.05), in both legs. After training, the effect of NAC was blunted and catechol activity increased in the BFR-leg only (p=0.05). NKA isoform and antioxidant content are currently being analysed. CONCLUSION: BFR training augments improvements in muscle K$^+$ handling and exercise performance in men. These effects are related to an increased muscle antioxidant capacity. In addition, ROS appear involved in the regulation of muscle K$^+$ release during submaximal exercise in humans. Supported by the Danish Ministry of Culture (FPK-2015-0017)

ThERoUs Day, May 31 2018

1243 Board #51 May 31 8:00 AM - 9:30 AM Very Low Load resistance Exercise Is Augmented By Blood Flow Restriction In The Lower Body
Matthew B. Jesse, Samuel L. Buckner, Kevin T. Mattocks, J Grant Mouser, Scott J. Dannel, Zachary W. Bell, Takashi Abe, Jeremy P. Loenneke. The University of Mississippi, University, MS

No relevant relationships reported

Low load exercise to failure has been shown to elicit muscle hypertrophy similar to high load exercise. However, if the load is very low [i.e. 15% of one repetition maximum (1RM)], the contraction intensity may not disrupt blood flow enough to induce failure. Although unknown, the application of blood flow restriction (BFR) during very low load exercise may be necessary in order to reach failure. PURPOSE: To compare the acute responses associated with a hypertrophic stimulus during lower body exercise augmented with BFR in a traditional high load (70% 1RM), very low load (15% 1RM) with no BFR, or in combination with moderate (40%) arterial occlusion pressure (AOP) or high (80%) AOP BFR pressure; coded as 70/0, 15/0, 15/40, and 15/80 respectively. METHODS: 22 participants completed 4 sets of unilateral knee extensions to failure (up to 90 repetitions) with each condition. Muscle thickness (MTh) and maximal voluntary contractions (MVC) were assessed before (Pre), immediately following (Post), and 15 minutes after exercise (15-Post). Electromyography (EMG) amplitude of the rectus femoris (RF) and vastus lateralis (VL) was assessed during the last 3 repetitions of each set. Data presented as mean (SD) with p<0.05. RESULTS: There was an interaction for MTh, however, follow up tests revealed no differences within time points. Overall, MTh increased from Pre to Post [0.48 (0.17) cm], decreased at 15-Post [0.11 (0.18) cm], but remained elevated over Pre [0.36 (0.07) cm]. There was an interaction for MVC and follow up tests revealed differences at Post [15/80 > 15/0, 15/40, < 70/0] and 15-Post [15/0 > 15/80, 70/0]. All conditions decreased MVC at Post [111.1 (48) Nm] and increased from Post to 15-Post [79.2 (43.1) Nm]. There was a main effect of condition for RF EMG, with 70/0 being greater than 15/80 [83 (37) vs. 57 (27) %MVC]. For VL EMG, there was a main effect of condition [70/0 > 15/80, 15/40, 15/0] and time [set 1 vs. 2, 3, 4]. Typically, VL EMG was greater for 70/0 [106 (70) %MVC] compared to 15/0 [73 (21)], 15/40 [72 (30)], and 15/80 [64 (21)]. CONCLUSIONS: BFR with a higher pressure seemed to augment the acute muscular response to very low load exercise, making it closer to the response observed during high load exercise. This suggests that a higher BFR pressure may be necessary to induce hypertrophy when resistance training with very low loads.

1244 Board #52 May 31 9:00 AM - 10:30 AM
The National Collaborative on Childhood Obesity Research’s Measures Registry and User Guides: Highlights and Reach
David R. Brown, FACSM$^1$, Rachel Ballard$^2$, Jill Reedy$^3$, David Berrigan$^2$, Amanda Saunders$^1$. Center for Disease Control and Prevention, Atlanta, GA. National Institutes of Health, Bethesda, MD. $^1$FHI 360, Washington, DC.

No relevant relationships reported

There are many types of physical activity and food intake measures. These measures often lack validity and reliability, making it difficult to compare findings across childhood obesity research and evaluation studies.

Purpose: The National Collaborative on Childhood Obesity Research’s (NCCOR) Measures Registry (nccor.org/mr/userguides) promotes consistent use of high-quality, comparable measures and methods across childhood obesity studies. The Registry User Guides extend the reach and usefulness of these resources. Herein we describe the Registry and User Guides and examine their reach to nutrition, physical activity, and obesity researchers and practitioners.

C-36 Free Communication/Poster - Measurement of Physical Activity and Sedentary Behavior

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1246 Board #54 May 31 9:00 AM - 10:30 AM
Comparison of Previously Used Methods for Analyzing Global Positioning System Plus Accelerometry Data from Recess
Kimberly A. Clevenger$^1$, Karin A. Pfeiffer, FACSM$^2$, Cheryl A. Howe, FACSM$^1$. $^1$Michigan State University, East Lansing, MI. $^2$Ohio University, Athens, OH.

No relevant relationships reported

Global Positioning System (GPS) receivers plus accelerometry can identify how physical activity (PA) varies by schoolyard location, but the accuracy and comparability of existing approaches to analyzing this data are unknown. PURPOSE: To compare previously used methods for analyzing GPS plus accelerometry data from PA. METHODS: Children (N=30) wore an accelerometer and GPS on their hip for two recesses to determine location and PA intensity (counts/sec or classified by cut-points). Recesses were videotaped, and location and PA intensity were coded. Five approaches for interpreting GPS and accelerometer data were used and compared to the video: 1) graduated color dot map, 2) in fence dot grid, 3) hot spot analysis with...
Direct observation (DO) is a popular objective method to describe children’s physical activity (PA) and setting context. DO is a category of methodologies that vary by the time unit of analysis (e.g., total setting time or segmented setting time) and sampling method (e.g., momentary or continuous). We propose that the DO method determines the temporal variability in data collected, and therefore defines the ecological processes that can be studied.

Purpose: To examine implications of DO methods for observing drivers of children’s PA.

Methods: Research assistants (RA) video-recorded basketball practices (n = 24) from 12 boys’ and girls’ teams (2 practices/team) where children (n = 105, 7-12y, mean ± SD = 9.4 ± 1.1y) wore ActiGraph GT1M accelerometers. RAs coded each practice using two DO systems. SOFIT uses momentary time sampling and observes every 20 seconds over total practice time (TPT) to assess percentage of TPT in PA, in different contexts types (e.g., fitness, skill), and in PA within context across TPT. Our alternate method (CLOUDEE) uses continuous sampling to define continuous context time segments during practice. Metrics calculated from CLOUDEE were frequency, duration, and order of segments, and %time spent in PA within segments. Inter-rater reliability was >85% for both methods. Differences in time spent in each zone according to GPS versus video (court: 45.2 vs. 43.7%, fixed equipment: 31.1 vs. 33.2%, field: 23.7 vs. 26.2%). Sedentary behavior was higher according to GPS versus video overall (22.1 vs. 12.1%) and for court (21.9 vs. 10.1%) and fixed equipment (19.7 vs. 7.1%). Moderate-to-vigorous PA was lower according to GPS versus video overall (42.6 vs. 68.6%) and fixed equipment (45.2 vs. 80.6%). CONCLUSIONS: GPS plus accelerometry accurately classified the location, and the PA patterns identified by dot, grid, and hot spot were similar to video. Quantification of the proportion of time in each intensity by location was not similar to video, possibly due to missing data or differences in how accelerometer and video intensity are classified. Interpolation is not an appropriate analysis for this research question and is not recommended for future use.

Funded by OU Interdisciplinary Research Grant

1247 Board #55 May 31 9:00 AM - 10:30 AM Implications Of Direct Observation Methods For Describing Drivers Of Children's Physical Activity Chelsey R. Schlechter1, Justin M. Guagliano2, Richard R. Rosenkranz, FACSM2, David A. Dzewaltowski1. 1Kansas State University, University of Nebraska Medical Center, Manhattan, Omaha, KS. 2Kansas State University, Manhattan, KS. 3University of Nebraska Medical Center, Omaha, NE. (Sponsor: Richard R. Rosenkranz, FACSM)

(Activity monitors are used to track activity and exercise intensity in the bi-pedal population, however, there is a lack of studies examining these devices for those using manual wheelchairs. PURPOSE: To assess activity monitor accuracy during wheelchair use (WC). METHODS: Forty-four subjects (non-wheelchair users; age=26.7±9.4 yr, ht=165.7±6.7 cm, wt=72.2±17.1 kg) were six commercially-available wrist activity monitors (FF, FC, & PL on the right wrist; GV, MV, & LT on the left wrist) and a heart rate (HR) monitor while walking 150m in an indoor hallway at a self-selected pace. Subjects traversed the same path in a wheelchair. Video was used to determine actual counts using a hand tally (AC). During WC, a count was recorded as the hand went forward and again as the hand recovered for each hand. Repeated measures ANOVA determined significant differences between the counts. Error was calculated as (monitor counts-actual counts)/actual counts*100. Alpha was set at .05 for all tests. RESULTS: During walking, FF, FC, PL and MV and (263.7±7.3, 270.5±29.6, 228.5±49.9, & 264.6±30.3 counts, respectively) were significantly lower than AC (281.1±37.0, 284.3±30.3, 284.3±30.3, & 284.3±30.3 counts, respectively) were significantly different than AC. During walking, PL had greatest error (20.8±15.3%), followed by FF (7.8±11.3%), MV (7.4±8.2%), LT (6.8±13.5%), and FC (6.8±13.5%). No significant differences in errors occurred except for FF (p<.05). CONCLUSION: Overall, students failed to achieve recommended amounts of MVPA during school hours and recommended amounts of P.E. of at least moderate intensity although there was opportunity to achieve both. This research provides insight to PA levels and potential health status of children during school hours, which confirms the need for enhanced attention to meeting state standards of school-related PA. Grant Funding: N/A)

1249 Board #57 May 31 9:00 AM - 10:30 AM Accuracy of Wrist-Worn Activity Monitors during Wheelchair Use John Smith. Texas A&M University-San Antonio, San Antonio, TX. (No relevant relationships reported)

Activity monitors are used to track activity and exercise intensity in the bi-pedal population, however, there is a lack of studies examining these devices for those using manual wheelchairs. PURPOSE: To assess activity monitor accuracy during wheelchair use (WC). METHODS: Forty-four subjects (non-wheelchair users; age=26.7±9.4 yr, ht=165.7±6.7 cm, wt=72.2±17.1 kg) were six commercially-available wrist activity monitors (FF, FC, & PL on the right wrist; GV, MV, & LT on the left wrist) and a heart rate (HR) monitor while walking 150m in an indoor hallway at a self-selected pace. Subjects traversed the same path in a wheelchair. Video was used to determine actual counts using a hand tally (AC). During WC, a count was recorded as the hand went forward and again as the hand recovered for each hand. Repeated measures ANOVA determined significant differences between the counts. Error was calculated as (monitor counts-actual counts)/actual counts*100. Alpha was set at .05 for all tests. RESULTS: During walking, FF, FC, PL and MV and (263.7±7.3, 270.5±29.6, 228.5±49.9, & 264.6±30.3 counts, respectively) were significantly lower than AC (281.1±37.0, 284.3±30.3, 284.3±30.3, & 284.3±30.3 counts, respectively) were significantly different than AC. During walking, PL had greatest error (20.8±15.3%), followed by FF (7.8±11.3%), MV (7.4±8.2%), LT (6.8±13.5%), and FC (6.8±13.5%). No significant differences in errors occurred except for FF (p<.05). CONCLUSION: Overall, students failed to achieve recommended amounts of MVPA during school hours and recommended amounts of P.E. of at least moderate intensity although there was opportunity to achieve both. This research provides insight to PA levels and potential health status of children during school hours, which confirms the need for enhanced attention to meeting state standards of school-related PA. Grant Funding: N/A)
Participants, aged 48-60 years, who simultaneously wore the 7164 and wGT3X-BT accelerometers at the waist in 2015-16, with wear time ≥4 of 7 days, ≥6 hr/ day. Freedon1 cut points (ct/min) were used to define sedentary (≤100), light (100-1951), moderate (1952-5724), and vigorous activity (≥5725). Paired difference tests were used to compare mean or median values between the two accelerometers. Agreement was evaluated using intra-rater correlation coefficients and Bland-Altman plots. A calibration formula was applied to the wGT3X-BT values was obtained by linear regression. RESULTS: Minute by minute within-person correlations of ct/min/day averaged r=0.74, despite the ≥10 year age of the 7164 devices. Total recorded wear time/min/day was nearly identical between the 7164 and wGT3X-BT (881.5 ± 7.9 vs. 880.3 ± 78.1, p=0.72). Linear regression of the wGT3X-BT on the 7164 ct/min/ day passed very close to the origin; therefore, the slope of the 7164 ct/min/day (1.088) was the calibration proportionality. After calibrating the wGT3X-BT values (dividing by 1.088), no differences were observed between the 7164 and wGT3X-BT in total accelerometer ct/day (310.184 ± 129.189 vs. 307.085 ± 135.362, p=0.48), average ct/min/day (349.5 ± 139.5 vs. 346.5 ± 147.2, p = 0.54), sedentary (513.2 ± 93.6 vs. 509.6 ± 98.6, p=0.23), light (333.5 ± 81.5 vs. 338.7 ± 81.1, p=0.22), or moderate min/day (31.0 ± 21.9 vs. 30.3 ± 23.4, p=0.31). A significant difference was observed for vigorous min/day in the total sample (0.2 ± 10.0 vs. 0.0 ± 0.3, p=0.01), and also among those with ≥0 vigorous min/day (N=28, 2.8 ± 4.5 vs. 1.3 ± 2.9, p=0.01).

Intra-rater correlation coefficients showed excellent agreement for all measures (ICC range = 0.97-0.99). Bland-Altman plots demonstrated acceptable levels of agreement. CONCLUSIONS: After applying a calibration formula, the 7164 and wGT3X-BT are comparable for total wear time, count based estimates, and average min/day in sedentary, light, and moderate activity, but not for vigorous activity.

Many innovative information technology applications use gestures as input. We are exploring gesture analysis for incorporation into exergames for personalized medical interventions using yoga as therapy (YT). PURPOSE: A data-driven machine learning solution for gesture detection was used to classify captured yoga poses with high accuracy. The research goal is to test whether a machine learning algorithm in a basic computer video exergame can assess yoga skill acquisition in targeted select populations as a means to promote healthy physical activity. METHODS: Convenience sample of 20 adult students, male and female of any race/ethnicity, were briefly instructed and shown poses to perform, while recorded by the Kinect attached to a PC. Three yoga sessions (pre-test, mid-way and a post-test) were captured during the regularly scheduled yoga class which met twice weekly for 75 minutes, over a 10-week period. RESULTS: We recorded 6 yoga instructors while performing a series of yoga poses, and recorded clips were tagged or labelled in all of the frames in the recordings that defined a yoga gesture by consensus of two yoga instructors. Default settings produced solutions with high True Positives (99.5%) and low False Positives (0.03%) for most yoga poses sampled. Depth stream and skeleton coordinates for the 20 participants were acquired and analyzed against the previous trained solution. Analysis of summary statistics was done for five yoga poses comparing initial, mid-session, and final session captures. Sensitivity showed consistent trends for Mountain, Forward Bend, and Upward Salute. For Mountain, Sensitivity went from 0.78 to 0.87, while the expert test clip scored 0.94. Informedness also showed similar consistent trends for those poses. Based on these results the higher sensitivity score predicts greater training and closer the poses were to the “gold standard”. CONCLUSIONS: Gesture analysis for yoga alignment training may be a useful tool for the development of home and clinical yoga therapy for hard to reach populations. The experimental exergame developed here provides a tool that scores the performance of yoga postures and provides improvement metrics. Our plans are to target special aging populations with YT, and study the potential effects of body mass and age on posture alignment and limb stretch.
MUSCULAR STRENGTH ATTENUATES ADVERSE EFFECTS OF OVERWEIGHT ON CARDIOMETABOLIC RISK FACTORS BUT NOT IN ITS COUNTERPARTS WITH HIGHER FAT AMONG COLLEGIATE STUDENTS

Robinson Ramirez-Vélez1, Jorge E. Correa-Bautista1, Antonio García-Hermoso2, Alejandro Tordecilla-Sanders1, Daniel H. Prieto-Benavides1, Carolina Sandoval-CueLLar1, Katherine González-Hez1, Elisa Andrea Cobo-Mejía1, Rocío del Pilar Castellanos-Vega1, Universidad del Rosario, Bogotá D.C. Colombia. Universidad de Santiago de Chile, USACH, Bogotá D.C., Universidad de Boyacá, Tunja, Colombia. Universidad de Manuela Beltrán, Bogotá D.C., Colombia.

PURPOSE: The aims of the study were to: 1) analyze differences in composite metabolic syndrome score (MetScore) and fatness across body mass index (BMI) categories in college students; and 2) to determine whether fit individuals have significantly lower MetScore, fewer individual metabolic syndrome components, and less fatness than unfit individuals in each BMI category. METHODS: A total of 1,795 college students (61.4% female, mean age = 20.7 ± 2.9 years old), ranging between the ages of 18 and 30 years participated in the study. Muscular strength was estimated using a hand-held dynamometer and used to classify adults as fit or unfit. A MetScore was computed as a sum of the tippled Z-scores per age and gender from the following components: waist circumference, triglycerides, high-density lipoprotein cholesterol, glucose, and systolic and diastolic blood pressure. RESULTS: MetScore, percentage of body fat, and visceral adiposity increased linearly across the BMI categories among college students (all p<0.001). Individuals who were overweight and fit had lower MetScore (-0.6 SD; P=0.02), body fat percentage (-2.6%; P<0.001) and visceral adiposity (-0.2; P=0.01) than unfit peers. Moderately fit, obese individuals had significantly lower visceral fat levels than unfit, obese peers (-3.0; P=0.03).

CONCLUSIONS: These results suggest that adequate muscular strength may help to attenuate cardiometabolic risk that is associated with being overweight and obese, and that weight loss could be recommended to all individuals with obesity, including those who are currently defined as fit.

ACCELEROMETER POSITIONING ISSUES AND IMPLICATIONS FOR CONTEMPORARY ANALYSIS METHODS

Kristen M. Metcalf, Jacob E. Simmering, Steven M. Levy, Kathleen F. Junz, FACSM. The University of Iowa, Iowa City, IA.

PURPOSE: While accelerometry is widely used to objectively measure physical activity (PA), methods are not standardized. The aim of this work was to understand how accelerometry output (vector magnitude, VM) differs between accelerometers worn on the non-dominant wrist (NDW), dominant wrist (DW), and hip, and if their relationships differ by activity type and intensity. METHODS: Forty participants (16.8 - 64.2 y) completed sedentary and PAs in a laboratory while wearing accelerometers on the NDW, DW, and hip. 1- s VM values were compared across activities by activity type and intensity. Oxygen consumption was measured with a portable VO2 analyzer. RESULTS: The figure shows mean VM for all activities, by increasing intensity. When grouped by intensity, the DW and hip had significantly different VM for light (LPA), moderate (MPA), and vigorous (VPA) PA. The NDW and hip had significantly different VM for LPA and VPA. The DW and NDW had significantly different VM for LPA and MPA. CONCLUSION: The differing trajectories, and the differential relationships between VM from the NDW, DW, and hip indicate that accelerometer output differs based on activity type and intensity. This non-systematic error prevents scaling or comparing data collected at different wear locations, including the NDW and DW. Additionally, accelerometer data were processed using the accelerometer software. MVPA estimates from the NDW, DW, and hip differed by an average of 13.8 mins (range: 0 - 36), for the 3 hours analyzed. This indicates that substantial error is possible, and analysis methods are not interchangeable across locations. Site-specific analysis methods are needed for accurate, comparable estimates of PA.

This work was funded by the University of Iowa Graduate & Professional Student Government, the National Institute of Dental and Craniofacial Research R01-DE12101 and R01-DE09551, and the General Clinical Research Centers Program from the National Center for Research Resources, M01-RR00059.

EVALUATION OF PHYSICAL ACTIVITY AND SEDENTARY TIME IN WOMEN OF VARYING BMI USING ACCELEROMETERS AND IPAQ

Samantha Banister, Elizabeth James, Adam Sparks, Travis Gladney, Edna Hamilton, Sankela Dowdell, Kate Early, Clayton Nicks, Brian Tyo. Columbus State University, Columbus, GA.

PURPOSE: To evaluate measures of physical activity in women among varying body mass index (BMI) categories using accelerometers worn on the wrist and thigh. In addition, to determine if measures of sedentary time among women are similar among BMI categories using the International Physical Activity Questionnaire (IPAQ) and an accelerometer worn on the thigh. METHODS: Thirty-five women (24.0 ± 2.7 y) participated in this study. There were 13 normal weight (18.5-24.9 kg/m2), 10 overweight (25.0-29.9 kg/m2), and 12 obese (≥30.0 kg/m2) participants that wore the ActiPal (AP) on the thigh and Actigraph GT3x-BT (AG) on the wrist twenty four hours per day for seven consecutive days. After seven days participants completed the IPAQ. RESULTS: The AG recorded significantly more steps per day than the AP within each BMI category (p<0.01). There were no differences among BMI categories for physical activity or sedentary time using objective measures (p>0.05). There was an insignificant trend for IPAQ Met minutes to increase with higher BMI categories. Sedentary time was similar among BMI categories using IPAQ (p=0.05). Conclusion: Steps per day may vary depending on the location of the accelerometer which may limit comparisons to other reported findings. Obese groups may tend to report more physical activity when using questionnaires. However, physical activity recorded using objective monitors may tend to find smaller differences among BMI categories. BMI category does not appear to impact measures of sedentary time by objective monitor (AP) or questionnaire (IPAQ).

COMPARING HIP AND WRIST ACCELEROMETER ESTIMATES OF MODERATE-VIGOROUS PHYSICAL ACTIVITY ACROSS ACTIVITY DOMAINS

Mami M. Takeda, Julian Martínez, Sarah K. Keedle. California Polytechnic State University- San Luis Obispo, San Luis Obispo, CA. (Sponsor: Todd Alan Hagopian, FACSM)

PURPOSE: Both hip/thigh and wrist-worn accelerometers are used to estimate moderate-vigorous intensity physical activity (MVPA). Few studies have directly compared these MVPA estimates in free-living environments across distinct activity domains. The purpose of this study was to compare AG wrist estimates of MVPA to AG-hip and the thigh-worn AP in five activity domains. METHODS: Fifteen adults (10F and 5M; age 18-36y) participated in two, 2-hr sessions that were categorized by activity domains; household (H, N=5), active leisure (AL, N=6), sedentary leisure (SL, N=6), work (W, N=7), and transportation/errands (TE, N=4). Participants were given general instructions (e.g., at least 45 min spent on household-related behaviors), but sessions took place in the participants’ natural environment. During the sessions, participants wore AG (non-dominant wrist, right hip) and AP on the right thigh. MVPA was estimated for AG-hip using machine learning (S3x), Freedson (F), Crouter (C2), and Sasaki (VM) methods. The AG wrist data was processed using a random forest (RF). Pearson correlations and paired t-tests were used to compare MVPA estimates across methods. Linear mixed effects models were used to test if there was a significant difference in MVPA estimates between wrist and hip methods across activity domains. P-values <0.05 were considered statistically significant.
RESULTS: Correlation between wrist RF and the hip methods ranged from R=0.63-0.66, while hip/thigh methods were all highly correlated (R=0.94-0.99). The AL domain had the highest estimate in MVPA (60.6 min), while SL (range: 1.3-15.8 min), and W (range: 2.0-23.5 min) were the lowest. Wrist estimates of MVPA were significantly higher than the S3x (+10.8 min), F (+15.3 min), AP (+12.7 min), and VM (+12.1 min), all p<0.01. The estimates of MVPA from the RF were not significantly different than C2, p=0.11. Agreement between methods did not differ by activity domain (p>0.05).

CONCLUSIONS: The wrist RF method was moderately correlated with hip/thigh measures and consistently produced higher estimates of MVPA compared to hip/thigh algorithms, across all activity types. Future research using direct observation as a criterion measure is needed. Supported by Bill and Linda Frost Fund.

1258 Board #66 May 31 9:00 AM - 10:30 AM Application of Geographic Information Systems (GIS) Methods in Walkability Assessment
Hai Yan, Weimo Zhu, FACSM. University of Illinois at Urbana Champaign, Urbana, IL. (Sponsor: Weimo Zhu, FACSM) (No relevant relationships reported)

PURPOSE: Walkability is a measure of how friendly an area is to walking. Emerging evidence has shown that neighborhood walkability has the potential to increase physical activity and reduce the risk of chronic diseases. Increasing the amount of walking is a prevalent topic for many urban planners and policymakers. A geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, and present spatial or geographic data and it offers good promise for walkability assessment. The purpose of this study was to provide a systematic overview of the applications of GIS in the measurement of walkability. METHODS: Keyword and reference searches were conducted in PubMed and Web of Science, and the inclusion criteria included: (1) studies discussing walkability studies, pre- and post- intervention studies; (2) research topic: walkability assessment through geographic information systems (GIS) methods; (3) language: articles written in English; and (4) article type: peer-reviewed articles or theses. A total of 397 articles were identified in the search, among which 328 were excluded in the title and abstract screening and 15 were excluded after full-text review. The remaining articles (n=54) were carefully evaluated and results were summarized. RESULTS: The primary applications of GIS data/methods in the walkability-related research included (1) visualization of the spatial distribution of roads, walking trails, and basic environmental features; (2) construction of advanced walkability environmental indicators; and (3) assessment and comparison of the walkability of the built environment. Study design and features, including population density, street pattern, land-use mix, access to recreational facilities, varied considerably across studies, and this is probably because of lack of established guidelines and protocols in this field. Meanwhile, unique features of GIS methods such as relating information from different sources and capability of collaborating with pedometer data had a very promising future in measuring walkability. CONCLUSIONS: The GIS-based approach has great potential to supplement walkability assessment. However, there is still little evidence supporting the efficacy of GIS, and more studies investigating this promising area of research are called for.

1260 Board #68 May 31 9:00 AM - 10:30 AM Moderate And Vigorous Intensity Walking Cadence (Steps/min) Thresholds In 41-60 Year Old Adults
Catrine Tudor-Locke, FACSM,1 Elyo J. Aguair,2 Scott W. DuCharme1, Christopher C. Moore1, John M. Schuna, Jr.,1 Tiago V. Barreira1, Stuart R. Chipkin2, John Staudenmayer1. 1University of Massachusetts Amherst, Amherst, MA. 2Oregon State University, Corvallis, OR. 3Syracuse University, Syracuse, MA. (No relevant relationships reported)

Research establishing a strong relationship between cadence (steps/min) and intensity has primarily been conducted with young adult samples. PURPOSE: To identify reasonable heuristic (evidence-based, rounded, practical) cadence thresholds associated with absolutely-defined moderate (3 metabolic equivalents; METs) and vigorous (6 METs) intensity ambulation in middle-aged adults. METHODS: Ten men and 10 women from each 5-year age group between 41-60 years of age performed a series of 5-min treadmill bouts separated by 2-min rest. Bouts began at 0.5 mph and increased in 0.5 mph increments until participants: 1) chose to run, 2) achieved 75% of their maximum heart rate, or 3) reported a rating of perceived exertion (RPE) > 13. Cadence was determined via direct observation. Oxygen consumption (VO2) was measured using an indirect calorimeter. METs were calculated from the final two minutes of each stage by dividing VO2 in mL/kg/min by 3.5. Receiver Operator Characteristic (ROC) models were used to predict moderate and vigorous intensity from cadence. Optimal cadence thresholds were identified using Youden’s index. The cadence-intensity relationship was also quantified using a segmented regression model with random coefficients. Optimal positive predictive values of candidate thresholds were assessed to determine final heuristic values. RESULTS: Data were complete for
all 80 participants (40 men, 40 women; age=50.2±1.5 years; BMI=26.0±0.4 kg/m²; height=171.0±9.2 cm). ROC cadence thresholds for moderate and vigorous intensity were 98.5 and 117.3 steps/min, respectively. All sensitivity values were over 90% and all specificity values were over 80%. The relationship between cadence and METs was explained by two distinct linear regression trends displaying a breakpoint at 97.6 steps/min. Cadence explained 78% of the overall variance in intensity. Cadence thresholds (95% Prediction Intervals) for 3 METs and 6 METs were 101.7 (54.9 - 111.8) and 132.1 (122.0 - 142.2) steps/min, respectively. Heuristic values for moderate and vigorous intensity were 100 and 130 steps/min, respectively. CONCLUSIONS: Cadences of 100 and 130 steps/min are reasonable heuristic values respectively identifying moderate and vigorous intensity walking in middle-aged adults.

1262 Board #70 May 31 9:00 AM - 10:30 AM Comparison of Physical Activity Guideline Compliance Estimates Among Active Youth Using Different Step-Based Definitions
John M. Schuna, Jr., Yu Meng, Melinda M. Manore, FACSM, Siew Sun Wong, Oregon State University; Corvallis, OR.

Among youth, several investigations have quantified steps/day thresholds corresponding to compliance with current physical activity guidelines (≥ 60 min/day of moderate-to-vigorous physical activity [MVPA]) while other reports have identified cadence (steps/min) cut-points consistent with MVPA. However, empirical applications of these two methods for use in estimating compliance to current physical activity guidelines are scant within the literature. PURPOSE: To compare physical activity guideline compliance estimates using steps/day thresholds and step-defined MVPA methods among a sample of active adolescents. METHODS: Step-based physical activity was assessed minute-by-minute using the waist-worn Fitbit Zip™ over a 7-day period among 291 adolescent soccer players (64.9% female, age: 15.2 ± 1.2 yrs, BMI: 22.1 ± 3.4 kg/m²) providing ≥ 4 days of valid data (≥ 10 h/day of wear time). Compliance to current physical activity guidelines was quantified as: 1) mean steps/day ≥ 10,500 for boys or ≥ 9,500 for girls, and 2) mean step-defined MVPA (time spent at 100+ steps/min) ≥ 60 min/day. Compliance estimates were compared between methods using McNemar’s test. RESULTS: Participants accumulated 11,100 ± 3,217 steps/day (boys: 12,201 ± 3,543 steps/day; girls: 10,506 ± 3,217 steps/day) and 36.9 ± 16.8 min/day of step-defined MVPA (boys: 42.9 ± 18.7 min/day; girls: 33.7 ± 14.8 min/day). Compliance to current physical activity guidelines among the overall sample significantly varied between the steps/day thresholds and step-defined MVPA methods (63.2% and 9.6%, respectively; χ² = 154.0, p < 0.001). Within sex, compliance estimates also varied for the steps/day thresholds and step-defined MVPA methods among boys (65.5% and 15.7%, respectively; χ² = 49.0, p < 0.001) and girls (61.9% and 6.3%, respectively; χ² = 103.0, p < 0.001). CONCLUSION: Significant heterogeneity in physical activity guideline compliance estimates was observed between the steps/day thresholds and step-defined MVPA methods. It is possible that the spurt nature of physical activity observed among youth is being obscured by the 1-min measurement epoch used herein, thereby lowering expected values of daily step-defined MVPA and associated physical activity guideline compliance estimates. Support: USDA-AFRI 2013-67001-20418

1263 Board #71 May 31 9:00 AM - 10:30 AM Physical Activity Category Classification Using The Actigraph GT9x in Youth
Samuel R. LaMunion, Paul R. Hibbing, Andrew S. Kaplan, Scott E. Crouter, FACSM, University of Tennessee, Knoxville, TN.

The ActiGraph GT9X includes an inertial measurement unit (IMU) equipped with a triaxial gyroscope which has been shown to be a perfect classifier of sedentary behavior (SB) in adults. To date, there has been no research to explore the application of the gyroscope in youth. PURPOSE: The purpose of this study was to compare the use of the accelerometer (AC) for classifying SB and continuous walking and running (CWR) in youth. METHODS: Participants (N=52, mean±SD; age, 13.3±3.1 years; BMI, 20.5±5.0 kg/m²) completed sixteen activities ranging from SB to vigorous intensity. Activities were grouped as SB (lying, computer gaming, internet, reclining, book reading), CWR (fast over-ground walking, slow over-ground walking, and running), and ambient activities (e.g. stair walking, swimming, stationary bicycling, basketball). A GT9X was worn on the right hip, both wrists, and both ankles. Primary accelerometer data were sampled at 90 Hz and converted to the Eulerian norm minus one (ENMO) in milli-G’s per second. Gyroscope data were sampled at 100 Hz and converted to vector magnitude (GVM) and reported in mean degrees per second. ENMO and GVM were assessed for classifying the following: 1) SB from all other activities and 2) SB from CWR, then CWR from the remaining 11 activities using the mean coefficient of variation (CV) per 10-s. Thresholds were developed using receiver operating characteristics (ROC) Performance was assessed using area under the curve (AUC), sensitivity, and specificity. Performance RESULTS: ENMO and GVM classify SB well across all attachment sites (AUC ≥ 95.7%).

1264 Board #72 May 31 9:00 AM - 10:30 AM Validation of Automatic Activity Detection on Wearable Activity Trackers
Diana Dorn, Ronald Ganganon, Jessica Gorzelitz, David Bell, Kelli Koltyn, FACSM, Lisa Cadmus-Bertram. University of Wisconsin Madison, Madison, WI. (Sponsor: Dane Cook, FACSM)

PURPOSE: If sufficiently valid, wearable activity trackers are promising tools for health-related research. Recent models claim to identify the type of activity being performed, but no studies have reported the validity of these features. The purpose of this study was to determine the accuracy of automatic activity detection on 4 wrist-worn, physical activity trackers; specifically, the correct type, duration, and start time of select activities. METHODS: 69 healthy adults were recruited via flyer, email, or word of mouth to complete at least one of four activity modules, comprised of activities automatically detectable by the trackers. Module A, completed on a treadmill, consisted of 3 activities separated by a 10-min rest (15-min walk, 15-min run, and 25-minute continuous series of 5-min walk, 15-min run, 5-min walk). Module B, consisted of 3 activities separated by a 10-min rest (15-min outdoor walk, 15-min outdoor run, and 15-min bout on an elliptical trainer). Module C consisted of 15 min of outdoor cycling and Module D consisted of 15 min of freestyle swimming (only one tracker was used in Module D as others are not waterproof). The actual activity type, duration, and start/stop times were recorded, then compared to device data (recognized activity type, duration, and start times). RESULTS: Participants (N=69) were 26.3 ± 8.7 years old, had a BMI of 23.8 ± 4 kg/m² and were 60.9% female. Participants reported an average rating of perceived exertion of 11.9 (6 - 19). The percentage of correctly identified activities by the four trackers was 94.7% (93.5 - 97.1) for treadmill walking, 97.9% (93.8 - 100.0) for treadmill running, 45% (35.3 - 59.4) for running in the treadmill series, 97.8% (97 - 100) for outdoor walking, 100% for outdoor running, 70.4% (3.1 - 93.9) for the elliptical, 83.1% (44.1 - 97.1) for outdoor cycling, and 87.5% for swimming. Lower accuracy for the elliptical was driven down by a low accuracy of 3.1% for one tracker. CONCLUSION: The four wearable activity trackers were best at detecting outdoor running and worst at detecting running in the 25-minute treadmill series. Overall, the trackers were better at detecting ambulatory activities, apart from running in the treadmill series, than detecting swimming, cycling, or using an elliptical. This research was funded through startup funds through UW - Madison.

1265 Board #73 May 31 9:00 AM - 10:30 AM Dominant Vs Non-dominant Wrist: A Comparison Of Steps Per Day
Susan Park. University of Tennessee, Knoxville, TN. (Sponsor: David R Bassett Jr. PhD, FACSM)

With the increased popularity of activity monitors over the past decade, step counting has become a prevalent method of assessing physical activity. Although most manufacturers suggest to wear monitors on the non-dominant (ND) wrist, some consumer-grade devices can be initialized to be worn on the dominant (D) wrist. Only one study has compared the step count accuracy of devices worn on the D and ND wrists across various treadmill speeds and it found no significant differences between the D and ND wrist step counts. However, the use of D vs ND wear on step count may be different under free-living conditions. PURPOSE: To compare...
step counts between D and ND wrist-worn devices and hand-counted steps, under
free-living conditions. METHODS: Twelve participants (mean±SD, age 53±13
years) wore an ActiGraph GT9X and Fitbit Charge (FC) on the D and ND wrists. The
FC was initialized for each participant’s D or ND wrist. A GoPro was affixed to the
participant’s chest and pointed down at the feet to video record the steps taken during
all waking hours of one day and hand-counted steps from the video served as the
criterion. Raw GT9X data were processed with the ActiLife step counting algorithm,
with and without frequency extension (AG, AGM, respectively) as well as the
company’s Moving Average Vector Magnitude algorithm (AGM). Fitbit step counts
were recorded by the participant at the beginning and end of the day and used to obtain
steps/day. Repeated measured ANOVAs were used to compare estimates between
devices (AGL, AG, AGL, FC) and wrists (D and ND). For each step counting method,
accuracy was determined by calculating percent of hand-counted steps. RESULTS:
There was no significant difference in step counts between D and ND wrist
accuracy was 4% (FC) and 11% (AGM). Percent of hand-counted steps for devices worn on the D wrist were: FC: 4%, AG: 12%, AGL: 22%, AGM: 91% and for ND wrist: FC: 77%, AG: 109%, AGL: 196%, AGM: 84%. CONCLUSION: Users of activity monitors should be aware of the
differences in steps per day when using the D and ND wrists, even for the devices
that allow the user to enter the appropriate wrist location during initialization.

1266 Board #74 May 31 9:00 AM - 10:30 AM
Revising Free Text Inputs In Physical Activity Self-report Method: Lessons From The ACT24
Robert W. Korycinski1, Brian Barrett1, Kelley Pettee Gabriel1, FACSM2, Heather R. Bowles1. 1National Cancer Institute, Bethesda, MD; 2Information Management Services, Inc., Rockville, MD; 1University of Texas Health Science Center at Houston, Austin, TX.
(No relevant relationships reported)

PURPOSE: To examine the change in total Metabolic Equivalent of Task (MET) minutes reported by the Activities Completed over Time in 24 Hours (ACT24) physical activity self-report recall for different activity types after recoding free text entries and assigning updated MET values. METHODS: Men and women aged 50-70 years participating in a measurement error study on diet and physical activity were administered 6 ACT24 recalls spaced evenly over 12 months. Participants that completed at least 1 recall (n=103) were included in the analyses. Free text activity entries were recoded and either assigned to an existing ACT24 activity category or placed into a new activity category. Recoded free text entries, pre-defined activities, and gaps (no information recorded) were then assigned MET values from the 2011 Compendium of Physical Activities. The subsequent change in MET minutes was calculated after each of these adjustments. RESULTS: Participants completed 5,311 ACT24 recalls, of which 2,712 (51.1%) contained at least 1 free text entry, free text entries constituted less than 5% of all activities. Recoding free text entries, as increased the total reported MET minutes by 0.004% (+434.8 MET minutes), and applying the updated compendium values to all entries further increased the total by 6.3% (+743,920.9 MET minutes). Recoding free text had the largest positive effect for the “burning for or playing with others” activity category (+36.3%, or +6,455.1 MET minutes), and the largest negative effect for the “shopping, errands and appointments” activity category (-15.4%, or -4,925.0 MET minutes). Updating MET values had the largest positive effect on “bicycle repairs” (+81.9%, or +1,226.5 MET minutes), and the largest negative effect on “covering plants” (-49.0%, or -202.0 MET minutes), although these activities were rarely reported (12 and 3 times, respectively). CONCLUSIONS: Recoding free text activities negligibly changes the total MET minutes reported in the ACT24, although more dramatic adjustments do occur within certain specific activity categories. Presence of free text is a data management burden that may provide little additional information, and efforts should be made for best activity classification in instrument design to eliminate the need for free text.

1267 Board #75 May 31 9:00 AM - 10:30 AM
Diurnal Patterns of Physical Activity Illustrate Important Time-of-Day Differences Between Younger and Older Adults
Nicolas D. Knuth1, Jennifer A. Schrack2, Devon A. Dobrosielski1. 1Towson University, Towson, MD; 2Johns Hopkins Bloomberg School of Public Health, Baltimore, MD.
(No relevant relationships reported)

Physical activity is an important risk factor for disease and functional outcomes across
the age spectrum. Measurement of objective physical activity by accelerometry has
become common in recent years and is often reported as total or average daily physical
activity. However, accelerometry data provides the opportunity to also quantify
differences in diurnal patterns of physical activity that may elucidate contributors
to changes in physical activity with aging. PURPOSE: To evaluate differences in
objectively measured PA, overall and by time of day, between younger and older

1268 Board #76 May 31 9:00 AM - 10:30 AM
Organized Physical Activity Participation From Prepuberty To Adulthood: A Longitudinal Study In U.S. Females
Jodi N. Dowthwaite1, Stephanie A. Kliethermes1, Jill A. Kanaley1, FACSM2, Tamara A. Schematic1. 1SUNY Upstate Medical University; Binghamton University, Syracuse, NY; 2University of Wisconsin, Madison, Madison, WI, 3University of Missouri-Columbia, Columbia, MO. (Sponsor: Jill Kanaley, FACSM)
(No relevant relationships reported)

PURPOSE: Physical activity yields health benefits across the lifespan. Longitudinal data are needed to evaluate trend of childhood activity patterns to adult activity
habits. We hypothesized that activity patterns would differ in gymnasts (GYM) vs.
non-gymnasts (NON), and childhood activity would correlate with young adult levels.
METHODS: Female GYM and NON were recruited in 3 cohorts: 1997/8, 2003/4,
2008/12. Organized physical activity participation (OPA h/wk) was recorded to yield
annual means, excluding physical education. Pediatric OPA was recorded quarterly
(1997-1999) and semi-annually (1999-2017), with parental assistance as needed. After
age 18 yrs, OPA was recorded annually. GYM were defined by training ≥6 h/wk for
≥1 yr. Separate GYM and NON OPA curves were generated using cubic smoothing
spline mixed effect models with 95% confidence intervals (Fig 1a, chronological age:
CA; Fig 1b, gyneological age: GA, centered at menarche= time 0). Intra-individual
(intraclasc) correlation coefficients were evaluated (ICC).
RESULTS: Data are included for 211 girls. GYM OPA is highest circum-menarche,
peaking before high school (GA 2 to +1 yrs; CA 10-15 yrs). NON OPA is highest
post-menarche, during high school (GA 0 to +5 yrs; CA 14-17 yrs). GYM OPA is
significantly higher than NON throughout school and peak lean mass accrual, but
curves converge at GA +3 yrs or CA 18 yrs. Inter- and intra-subject variability was
higher in GYM (10.4; 22.7) than NON (4.7; 8.6), with similar, medium effects for ICC
(GYM=0.32, NON= 0.35), suggesting activity level tracking across growth.
CONCLUSIONS: GYM and NON OPA differ substantially in childhood, and activity levels
continue to change through young adulthood.
While wrist-worn physical activity monitors have been used to quantify exercise volume for aerobic activities, limited research has utilized activity monitors to quantify resistance training exercises. PURPOSE: The purpose of this study was to develop an improved method for predicting repetitions during resistance training exercises. The validity of this method was tested during an unstructured training session. METHODS: While wearing a wrist-worn, accelerometer-based activity monitor, 144 participants (73 M, 71 F) completed 12 different upper- and lower-body dumbbell resistance training exercises. Each participant completed one set of 12 repetitions using a lightweight (<7 kg) set of dumbbells. This data was used to develop a repetition counting algorithm by comparing minimum and maximum values for the largest X, Y, and Z plane acceleration peak/valley during each exercise. Participants were then asked to complete an unstructured, free-living resistance training exercise session. Within the training session, they were asked to complete at least one set of at least five reps of the original 12 dumbbell resistance training exercises used in the algorithm development phase of the study. A research assistant observed the training session and recorded details about the exercises, resistance, and repetitions for each exercise. A mixed-model RM ANOVA was utilized to compare the predicted repetitions to the observed repetitions for the 12 exercises. Pairwise comparisons with Bonferroni adjustment were utilized to identify the location of differences. RESULTS: During the free-living training sessions, a total of 2293 sets of the 12 dumbbell exercises were completed by the study participants. Mixed-model RM ANOVA indicated a significant main effect (p<0.05). Post-hoc analysis indicated significant differences between the predicted and observed repetitions for five of the 12 exercises. However, the differences for all exercises were within 1.2 repetitions of the actual repetitions. Across all exercises, the predicted algorithm was within 0.3 repetitions of the actual repetitions (range: 0.0 to 1.2 reps). CONCLUSION: While some significant differences occurred for five of the 12 exercises, the repetition prediction model was a valid method for predicting repetitions for the selected dumbbell exercises.
Automated Detection of Wheelchair Propulsion Using a Single Wrist Accelerometer

Matthew N. Ahmadiline, Kati Karinharjulin, Sjaan Gomersalline, Kelly Clancyline, Sean Tweedyl, Stewart G. Trost, FACSMline. Queenslawn University of Technology, Brisbane, Australia. University of Queensland, Brisbane, Australia. Griffith University, Gold Coast, Australia. (Sponsor: Stewart G. Trost, FACSM)

(No relevant relationships reported)

Purpose: Physical activity (PA) provides important health benefits such as improved cardio-metabolic health, mental health, and cognitive functioning. However, the majority of this evidence is based on research conducted in ambulatory populations. Research informing the relationship between PA and health among manual wheelchair users (MWU’s) is limited. One of the barriers is the lack of valid and reliable PA measures for the population. In the current study, machine learning (ML) techniques were used to develop activity recognition models to automatically identify episodes of active self-propulsion in manual MWU’s wearing a single wrist-mounted accelerometer.

Methods: 11 adult MWU’s (males= 8; 7 paraplegic; 4 tetraplegic) completed a series of activity trials while wearing an ActiGraph GT9X accelerometer on the non-dominant wrist. Activities included: sitting quietly, being pushed, self-propulsion, and completing manual tasks such as drinking water, working on an iPad, and folding laundry. Trials were categorised into 3 classes: sedentary (SED), manual tasks (MT), and self-propulsion (SP). 15 time-domain features from the X, Y, and Z axis were extracted from 1 s windows with 50% overlap and input into 3 supervised learning algorithms Decision Tree (DT), Random Forest (RF), and Support Vector Machine (SVM). Performance was evaluated using leave-one-subject-out (LOSO) cross-validation. To determine if the resultant models generalized to new data, performance was also evaluated in an independent sample of MWU’s (n = 14).

Results: Cross-validation F1-scores for the DT, RF, and SVM classifiers were 0.83, 0.84 and 0.85, respectively. Classification accuracy was consistently good to excellent for SED (86.0% - 92.7%), MT (76.0% - 82.4%), and SP (76.0% - 76.8%). In the independent sample, F1-scores for the DT, RF, and SVM classifiers were 0.80, 0.81, and 0.82, respectively. Classification accuracy remained good to excellent for SED (83.9% - 92.0%), MT (70.5% - 79.3%), and SP (74.2% - 77.6%).

Conclusion: ML models trained on simple time-domain features from a single wrist-worn accelerometer can be used to differentiate active self-propulsion from other activities in MWU’s. The models generalized well to new data and could help researchers evaluate the effectiveness of interventions to promote PA in MWU’s.

1274 Board #82
Comparing Accelerometry Methods in an Older Adult Physical Activity Intervention and Associations with Health Outcomes

(No relevant relationships reported)

BACKGROUND: Advancements in accelerometry have led to different methods to process the data for physical activity (PA) in older adults.

PURPOSE: The purpose of this study was to: 1.) Compare five different methods for analyzing PA in older women; 2.) Assess the relationship between changes in PA and changes in physical function and depressive symptoms over six months for each analysis method.

METHODS: Older adult females (N=144, M = 83.3 ± 6.4yrs) wore a hip accelerometer for 6 days and completed measures of physical function and depressive symptoms at baseline and 6 months. Accelerometry data were processed by 5 different methods to estimate PA: 1) a 1041 vertical axis cut point, a 15-sec vector magnitude (VM) cut point (Evenson), a 1-sec VM algorithm (Activity Index), a machine learned (ML) algorithm from 39 features, and an individualized cut point derived from the median counts of rapid 400-meter walk. Generalized estimating equations and a confusion matrix were used to compare and contrast PA minutes/day. Linear mixed models for each processing method tested the associations between changes in PA and changes in physical function and depressive symptoms.

RESULTS: Baseline comparisons between methods for minutes/day of PA and for each minute of PA are in Table 1. There were significant differences between some methods but not others, and methods estimated 6-month change in PA from 4 minutes to over 20 minutes. All methods, except the individualized cut point had a significant positive relationship between change in PA and improved physical functioning. There was also a significant relationship between changes in PA and decreased depressive symptoms for all methods except the individualized cut point.

CONCLUSIONS: Time spent in PA differs by the choice of data processing method. Results from individualized cut points are counter to methods that use absolute cut points. Additional research is needed to understand these discrepancies.

<table>
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<th>Evenson</th>
<th>Activity Index</th>
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<td>60%</td>
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ML. Note. * indicate significant differences based on total minutes/day (p<.05); cpm: counts per minute; ML: Machine Learned; MW: meter-walk

1275 Board #83
Accuracy And Reliability Of A Consumer-grade Activity Tracker Among Older People: A Pilot Study
Catherine Patrick, Michael A. Smith, Antonio Harris, Melissa Powers. University of Central Oklahoma, Edmond, OK.

(No relevant relationships reported)

Purpose: The purpose of this pilot study was to evaluate the accuracy and reliability of step counts from a consumer-grade activity tracker by comparing step counts to a research-grade accelerometer and video recording. METHODS: Ten volunteers (mean age = 71.20±6.00 years) agreed to participate. Two participants did not complete the second round of testing. Researchers collected height, weight, and age. The activity tracker and accelerometer were set-up using manufacturer’s procedures. Participants wore the activity tracker and accelerometer as they walked 96 meters around an indoor gym floor at their normal walking pace. The walk was also video recorded to determine observational step count confirmed by two researchers. The same procedures were repeated on a second, non-consecutive day. Data collected from the activity tracker were compared to the accelerometer and observed step count. In addition, step counts from the first walk were compared to step counts from the second walk. RESULTS: At
the first walk, the activity tracker was found to significantly underestimate step counts by 16.00 steps when compared to the observed step count, \( r(7) = -2.69, p = .031 \). The activity tracker step count was not different than the accelerometer step count. At the second walk, no differences in step counts were observed between the activity tracker and the accelerometer or observed step count \( p > .05 \). In addition, no differences in step counts were observed between walk 1 and walk 2 using the activity tracker, accelerometer, and observed step count. CONCLUSION: Although preliminary, these data indicate fair accuracy and good reliability of a consumer-grade activity tracker when compared to the research-grade accelerometer and observed step count. We suggest this pilot study be extended to include additional participants and comparisons of other activity trackers. Activity trackers are widely used to measure physical activity, but their accuracy and reliability remains questionable especially among older people. Additionally, products and upgrades are made available so quickly that research on the accuracy and reliability of these devices is difficult to obtain.

### Table: Accuracy of Fitbit Surge and Smartphone Apps at Measuring Cycling Distance and Speed

<table>
<thead>
<tr>
<th></th>
<th>FB Mean Bias±SD</th>
<th>FB MAPE</th>
<th>G-Fit Mean Bias±SD</th>
<th>G-Fit MAPE</th>
<th>SH Mean Bias±SD</th>
<th>SH MAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance (miles)</td>
<td>0.02±0.01</td>
<td>2.5</td>
<td>0.03±0.06</td>
<td>7.7</td>
<td>0.02±0.01</td>
<td>2.75</td>
</tr>
<tr>
<td>Average Speed (mph)</td>
<td>0.41±0.27</td>
<td>6.1</td>
<td>0.93±0.6</td>
<td>13.2</td>
<td>0.63±0.4</td>
<td>0.1</td>
</tr>
<tr>
<td>Max Speed (mph)</td>
<td>0.83±0.53</td>
<td>6.5</td>
<td>4.17±0.6</td>
<td>33.0</td>
<td>1.65±1.36</td>
<td>14.1</td>
</tr>
<tr>
<td>Trial 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance (miles)</td>
<td>0.02±0.02</td>
<td>4.9</td>
<td>0.02±0.06</td>
<td>7.0</td>
<td>0.02±0.02</td>
<td>3.5</td>
</tr>
<tr>
<td>Average Speed (mph)</td>
<td>0.45±0.2</td>
<td>4.8</td>
<td>1.31±0.82</td>
<td>13.6</td>
<td>0.53±1.36</td>
<td>14.1</td>
</tr>
<tr>
<td>Max Speed (mph)</td>
<td>5.98±1.19</td>
<td>41.5</td>
<td>4.43±1.0</td>
<td>29.2</td>
<td>0.44±2.03</td>
<td>11.5</td>
</tr>
<tr>
<td>Trial 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance (miles)</td>
<td>0.02±0.01</td>
<td>3.1</td>
<td>0.02±0.04</td>
<td>5.4</td>
<td>0.04±0.04</td>
<td>5.3</td>
</tr>
<tr>
<td>Average Speed (mph)</td>
<td>0.29±0.26</td>
<td>5.0</td>
<td>0.43±0.32</td>
<td>7.4</td>
<td>-1.37±2.07</td>
<td>23.7</td>
</tr>
<tr>
<td>Max Speed (mph)</td>
<td>1.51±0.57</td>
<td>9.2</td>
<td>6.59±2.14</td>
<td>37.4</td>
<td>1.44±0.59</td>
<td>8.6</td>
</tr>
</tbody>
</table>

**Conclusion:**

The Fitbit Surge was most accurate at measuring speed and distance for cycling followed by the S-Health app and lastly the Google-Fit app.
Adults can participate in a variety of physical activities to meet current federal physical activity guidelines. The differences between activity patterns of cancer survivors and the general population are not well understood. This knowledge may be useful in modifying physical activity promotion guidelines specific to cancer survivors.

**Purpose:** To compare physical activity patterns of older cancer survivors living in Central Pennsylvania (CPA) to that of a national sample of Americans using the Behavioral Risk Factor Surveillance System (BRFSS) data (≥50 years old).

**Methods:** We mailed BRFSS-based questionnaires to cancer survivors living in CPA, identified using the Pennsylvania Cancer Registry. Using this data (N=541) and the 2015 BRFSS national data (N=441,456), we categorized specific types of physical activity (PA) into ten major activity types using classifications from the Compendium of Physical Activities. We fit multivariate logistic regression models to estimate the prevalence odds ratios of activity participation for each activity type. Bonferroni method was used to control for inflated error due to multiple testing (p<0.005). Effect modification by sex was analyzed for activity types that were significant in the model.

**Results:** Walking was the most common activity in both cohorts (CPA: 58% BRFSS: 49%), followed by garden/lawn activities (CPA: 19%; BRFSS: 14%), and then conditioning activities (CPA: 9%; BRFSS: 11%). A higher proportion of CPA cancer survivors reported at least one activity (87%) compared to the national sample of Americans (66%). Compared to the national sample, CPA cancer survivors were 1.5 times more likely to report walking (OR=1.5; 99.5% CI: 1.16-1.97), 1.4 times more likely to report garden/lawn activities (OR=1.43; 99.5% CI:1.03-1.97), 1.7 times more likely to report household activities (OR=1.67; 99.5% CI:1.06-2.61), and 3.8 times more likely to report fishing/hunting (OR=3.79; 99.5% CI:1.38-10.46). No significant effect modification by sex was found.

**Conclusions:** In general, CPA cancer survivors were more likely to report participating in at least one PA. Programs aimed to increase PA among CPA cancer survivors may want to focus on walking, domestic activities such as household and garden/lawn activities, as well as outdoor activities such as fishing and hunting.

**REFERENCES:**

Sponsor: Duck-Chul Lee, FACSM. 

**Board #87**

**Physical Activity Patterns Among Older Central Pennsylvania Cancer Survivors: A Comparison With BRFSS National Data**

Wayne Foo, Kathleen Schmitz, FACSM. Penn State Cancer Institute, Hershey, PA. (Sponsor: Kathleen Schmitz, FACSM)

(No relevant relationships reported)

**Purpose:** To investigate potential predictors of diagnostic variables of sarcopenia in older adults including demographic factors (e.g., age and sex), aerobic and resistance physical activity (PA), cardiorespiratory fitness (CRF), and body composition.

**Methods:** This cross-sectional study included 304 older adults ≥65 years (mean age 73, range 65-95). PA and sedentary variables were assessed using a self-report survey and daily steps using an accelerometer based pedometer (Omron HJ-321). CRF was the time to complete a 400m walk in minutes, thus higher number in minutes indicates a slower walking, which is a lower level of CRF. Body composition was percentage body fat (%BF) measured by DXA and body mass index (BMI). Diagnostic variables of sarcopenia include appendicular lean mass (ALM) (kg/height in meter3) measured by DXA, handgrip strength (kg), and gait speed (m/s) from 4 meter walk test.

**Results:** Univariate regression revealed significant relationships between ALM and CRF (p=0.012), light intensity (1.5-3.0 METs) aerobic PA (p=0.001), vigorous intensity (>6.0 METs) aerobic PA (p=0.008), age (p=0.001), male sex (p=0.001), and %BF (p=0.001). Handgrip strength was related to CRF (p=0.001), light intensity aerobic PA (p=0.002), vigorous intensity aerobic PA (p=0.002), resistance PA (p=0.031), sex (p=0.003), male sex (p=0.001), and %BF (p=0.001). Gait speed was related to CRF (p<0.001), daily steps (p=0.003), age (p=0.001), and %BF (p=0.018). Stepwise variable selection (p=0.02 to enter the model, p<0.05 to remain in the model) was used to find significant predictors of diagnostic variables of sarcopenia. ALM was predicted by CRF (β=0.15, p<0.001), %BF (β=-0.12, p<0.001), BMI (β=0.25, p<0.001), and male sex (β=0.29, p=0.001) model R2=0.93; grip strength was predicted by CRF (β=−2.50, p<0.001), age (β=−0.26, p<0.001), and male sex (β=−1.46, p<0.001) model R2=0.63; and gait speed was predicted by CRF (β=−0.11, p<0.001) model R2=0.24.

**Conclusions:** Cardiorespiratory fitness, measured by a simple 400m walk test, was identified as a significant predictor of all three diagnostic variables of sarcopenia in older adults.

**REFERENCES:**

Sponsor: Duck-Chul Lee, FACSM. 

**Board #88**

**Associations of Body Fatness and Cardiorespiratory Fitness on Central Blood Pressure in Older Adults**

Markus H. Flynn, Nathan F. Meier, Duck-chul Lee, FACSM. Iowa State University, Ames, IA. (Sponsor: Duck-Chul Lee, FACSM)

(No relevant relationships reported)

**Purpose:** To investigate the associations of percent body fat (PBF) and cardiorespiratory fitness (CRF) on central blood pressure (BP), which is suggested as a greater predictor of cardiovascular disease (CVD) than peripheral BP and more closely related to CVD risk factors.

**Methods:** This cross-sectional study included 302 older adults aged ≥65 years (mean age 72) from the Physical Activity and Aging Study (PAAS). PBF was assessed via a hand coordination, education and incomes. The self-reported questionnaire showed BMI among the three groups after adjustment of age, grip and pinch strength, eye-hand coordination, education and incomes.

**Results:** In this study, 106 older adults (34.9%) had elevated central BP. Compared to the inactive (R²=0.89) and stronger for the high (upper third; R²=0.95) CRF than moderate (middle third; R²=0.91) or low (lower third; R²=0.90) CRF groups.

**Conclusions:** The results suggest that peripheral BP is the strongest predictor of CBF for older adults.

ACSM May 29 – June 2, 2018 Minneapolis, Minnesota
**Purpose:** To investigate the cross-sectional associations of cardiorespiratory fitness (CRF) and percent body fat (PBF) with Health-Related Quality of Life (HRQoL) in older adults.

**Methods:** Participants comprised 282 older adults aged ≥65 years (mean age 74) from the Physical Activity and Aging Study (PAAS). CRF was assessed by time in minutes to complete a 400-meter walk, and PBF was assessed by Dual-energy X-ray absorptiometry (DXA) and categorized into sex-specific quartiles for each CRF level. HRQoL was assessed by the 36-Items Short Form Health Survey (SF-36) and categorized based on physical component scores (PCS) including physical health, physical role, bodily pain, and general health dimensions and mental component scores (MCS) including vitality, social functioning, emotional role, and emotional health dimensions. Average score below 50 (range 0–100) was used to define both low PCS and low MCS, indicating lower HRQoL, based on the population mean score of 50. However, due to having limited cases (n=20) for both low MCS and low PCS groups, were combined into one overall HRQoL for analysis. Logistic regression was used to calculate odds ratios (ORs) and 95% confidence intervals (95% CIs) of having a low overall HRQoL across CRF and PBF quartiles.

**Results:** Compared to the lowest CRF quartile 1 (lowest 25%), ORs (95% CIs) of having a low overall HRQoL in the next higher CRF quartiles 2, 3, and 4 were 0.29 (0.08, 1.01), 0.16 (0.03, 0.85), and 0.14 (0.02, 0.85), respectively, after adjusting for age, sex, smoking, alcohol intake, physical activity, and PBF (trend = P<0.01). This result indicates that two higher CRF levels (quartiles 3 & 4) are significantly associated with lower odds of having a low level of HRQoL, suggesting better overall HRQoL. However, PBF was not significantly associated with overall HRQoL after adjusting for the confounding including CRF in this study population (trend P=0.24). In the stratified analysis by PBF, although not significant due to further reduced number of cases, similar trends were observed for both low (lower 50%, lean) and high (upper 50%, fat) PBF groups.

**Conclusion:** This study suggests that higher CRF, independent of PBF, is associated with better HRQoL in older adults. However further exploration from prospective studies are needed.

**C-38**

**Free Communication/Poster - Nutrition Status and Assessment**

**Thursday, May 31, 2018, 7:30 AM - 12:30 PM**

**Room: CC-Hall B**

**1284 Board #92**

**May 31 8:00 AM - 9:30 AM**

**Preschool Breakfast Menus That Meet Dietary Guidelines: Comparing What Is Served And Consumed By Children**

Stacie M. Kirk, Erik P. Kirk, FACSM. Southern Illinois University Edwardsville, Edwardsville, IL.

(No relevant 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 breakfast menus meeting 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 breakfast. Prior to and immediately after consumption, a picture of the child’s tray was taken using digital photography. If a child had additional servings, 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 digital photography. If a child had additional servings, additional pictures were taken.

**RESULTS:** Children described food as yummy (77.0%), okay (9.4%), and yucky (13.6%). Consumption of vegetables (0.0%) was significantly (p<0.05) lower than dairy, (79.9%), fruits (66.1%), grains (70.8%), and meats (70.4%). Children consumed a high percentage (50.0%) of fats/sweets. **CONCLUSION:** The amount of food consumed at breakfast was significantly less than was indicated on the menu and amounts served, indicating that children were not meeting the dietary recommendations as intended, potentially contributing to long-term health consequences.

**1285 Board #93**

**May 31 8:00 AM - 9:30 AM**

**Risk Behaviors, Energy Balance and Physical Activity of University Students of a Nutrition School**

Eduardo Gómez-Infante1, Oswaldo Ceballos-Gurrola2, María Cristina Enriquez-Reyna1, University of Sonora, Hermosillo, Mexico. 1Universidad Autónoma de Nuevo Leon, San Nicolás de los Garza, Mexico. 2No relevant relationships reported

The development of chronic noncommunicable diseases during youth could affect the performance and professional achievements of university students. Differences in consumption of alcohol or tobacco, energy balance and physical activity levels may have an influencing effect in the levels of obesity that affect Mexico. **PURPOSE:** To analyze the differences regarding the consumption of alcohol or tobacco in the relationship between energy balance and the physical activity level among students of a Nutrition School.

**METHODS:** In this study, we engaged a group of 380 university students from a Nutrition School (292 female). Habitual behaviors including consumption of alcohol and/or tobacco, 24-hour reminder, energy balance (caloric-nutritional consumption between energy expenditure) and physical activity level (International Physical Activity Questionnaire) were measured.

**RESULTS:** No differences were found between the energy balance and the physical activity level in men. In the whole sample alcohol consumption (OR = 1.215, IC 95% = 0.721 - 2.045) was associated with increased risk of low physical activity level (<600 METs). In participants who consumed alcohol a negative association was found between energy balance and the physical activity level (r= -0.132, p< 0.05), with greater values for women (r= -0.184, p< 0.05). Women who consumed tobacco showed a tendency to decrease their level of physical activity (r= -0.195, p< 0.05).

**CONCLUSIONS:** Alcohol and tobacco consumption affected the energy balance and the physical activity level of university students of a Nutrition School. Especially in women, these habits should be modified to prevent the development of diet-dependent diseases.

**1286 Board #94**

**May 31 8:00 AM - 9:30 AM**

**Nutritional Status of Rock Climbers**

Emily E. Neufeld, Michael C. Meyers, FACSM. Idaho State University, Pocatello, ID.

(No relevant relationships reported)

The physically intense nature of rock climbing requires that athletes maintain optimal nutrition to meet physical demands and minimize predisposition to injury. Although the sport of rock climbing has grown, limited research has been conducted on nutritional intake of these non-traditional athletes. **PURPOSE:** To quantify nutritional intake of rock climbers. **METHODS:** Following written informed consent, 3-day food recalls were obtained from 25 female and 15 male rock climbers [mean ± SD; age = 22.4 ± 3.2 yr; ht = 170.5 ± 10.4 cm; wt = 64.9 ± 8.9 kg; basal metabolic rate (BMR) = 2687.6 ± 354.6 kcal] to ascertain energy, macronutrient, and micronutrient intake.

**RESULTS:** ManOVA's indicated a significant main effect between DRIs and rock climber nutrient intake by macronutrients (F (3, 54) = 12.24, P < 0.001), vitamins (F (3, 53) = 0.09, P < 0.001), and minerals (F (3, 53) = 20.475, P < 0.001). Post hoc analyses indicated that female climbers were significantly lower in energy intake (1878.1 ± 542.9 vs. 2400.0 kcal; P < 0.001), protein (771 ± 24.0 vs. 135.0 g; P < 0.001), carbohydrates (240.8 ± 79.6 vs. 330.0 g; P < 0.001), vitamin D (3.8 ± 5.0 vs. 15.0 μg; P < 0.001), vitamin E (5.7 ± 4.0 vs. 15.0 μg; P < 0.001), magnesium (219.7 ± 116.4 vs. 310.0 mg; P < 0.002), and potassium (1992.2 ± 803.1 vs. 7400.0 mg; P < 0.001), but higher in sodium intake (2689.1 ± 933.9 vs. 1500.0 mg; P < 0.001) than DRIs, respectively. Male climbers were significantly lower in energy intake (2124.8 ± 472.3 vs. 3000.0 kcal; P < 0.001), protein (91.5 ± 23.0 vs. 169.0 g; P < 0.001), carbohydrates (270.0 ± 76.5 vs. 413.0 g; P < 0.001), fiber (27.6 ± 12.3 vs. 38.0 g; P < 0.002), unsaturated fat (55.0 ± 20.6 vs. 69.0 g; P = 0.034), saturated fat (22.4 ± 9.3 vs. 33.0 g; P < 0.001), vitamin D (3.5 ± 3.8 vs. 15.0 μg; P < 0.001), vitamin E (8.2 ± 64.0 vs. 15.0 μg; P < 0.001), and potassium (2467.3 ± 910.7 vs. 7400.0 mg; P < 0.001), but higher in vitamin C (139.2 ± 80.3 vs. 90.0 mg; P < 0.001), riboflavin (1.8 ± 0.9 vs. 1.3 mg; P < 0.011), macin (20.9 ± 11.6 vs. 16.0 mg; P < 0.001), iron (16.2 ± 9.1 vs. 8.0 mg; P < 0.009), and sodium (2685.5 ± 684.0 vs. 1500.0 mg; P < 0.001) than DRIs, respectively. **CONCLUSIONS:** Both gender differed significantly from nutritional recommendations. Given that energy and macronutrient intake are closely related to athletic performance, ensuring that optimal nutrition is achieved must be a priority.
Background: Chronic traumatic encephalopathy (CTE) is a neurodegenerative disorder suspected to be caused by repetitive mild traumatic brain injuries from playing contact sports. Other possible etiologies linked to brain health, nutrition, and general lifestyle have received far less attention. Purpose: To compare physical health, diet, and Exercise Energy Expenditure (EEE) of retired professional contact sport athletes and healthy non contact sport controls. Methods: Participants completed an extensive battery of cognitive tests, were assessed on advanced imaging, and were evaluated for psychological and physical health. Participants completed the Yale Physical Activity Survey to determine EEE/physical activity and the Food Frequency Questionnaire to obtain a yearlong diet recall using Nutritionist Pro software.

Results: Contact Athletes (n=21, 56 ± 11 yrs, 29.7 ± 3.6 kg/m²) were significantly more overweight (n=21, 57 ± 9 yrs, 24.5 ± 2.6 kg/m², p < 0.001). Calculated kilocalorie intake was not significantly different, however, the total hours spent doing common types of physical activities was significantly lower in Contact Athletes (22.5 ± 18.7 hrs/wk vs 51.3 ± 15.0 hrs/wk, p < 0.001). No significant differences were seen in intake of macronutrients, but intake of many brain healthy micronutrients, including copper (p = 0.019), selenium (p = 0.037), folic acid (p = 0.02), manganese (p = 0.002), and riboflavin (p = 0.047) was significantly lower in Contact Athletes.

Conclusion: Although retired professional contact sport athletes have similar energy intake as controls, they spend less time doing physical activities per week and consume a diet deficient in some brain healthy nutrients. The aim of the present study was to evaluate nutritional habits and resulting body composition in international soccer referees called for the FIFA World Cup 2018. Methods: 60 soccer referees (SR) (39.2 ± 4.2 years) were enrolled in this study. The variables of body mass, height, skinfold thicknesses, body circumference (waist, hip and biceps) were collected with the purpose of estimating sum of 7 skinfold thicknesses (SKT), Fat Mass (FM %), Fat Mass, Fat Mass index (FMI kg/m²). The skinfold thicknesses are been evaluated with International Society for the Advancement of Kinanthropometry methodology. For the evaluation of nutritional habits (NH), athletes answered a 24 h food recall. The variables of carbohydrates (CHO), protein (PRO) and fat (FAT) are expressed in % and g/kg. Micronutrients in terms of vitamins and minerals are been evaluated. The data collected regarding the body composition describe a normal weight population (BMI = 23.3 ± 1.5 kg/m²), but with a FM% of 11.4 ± 2.5 and a FMI of 4.9 ± 1.3 kg/m² above the normal range. Significant differences were seen in intake of macronutrients, but intake of many brain healthy micronutrients, including copper (p = 0.019), selenium (p = 0.037), folic acid (p = 0.02), manganese (p = 0.002), and riboflavin (p = 0.047) was significantly lower in Contact Athletes.

Dancers are an at increased risk for the female athlete triad (Triad) due to the discipline required in dance training and the importance placed on aesthetic appearance. Subjective judging and body size expectations may promote restrictive eating behaviors which can lead to menstrual disturbances and poor bone mineral density (BMD). PURPOSE: To examine the prevalence of: (1) Triad components in collegiate, female dancers, and (2) low energy availability (LEA) in collegiate, female dancers with or without disorders eating. METHODS: A cross-sectional cohort study examined dancers (n=26) in a collegiate dance company (height: 165±6.9 cm; weight: 56.41±7.0 kg). Dependent variables for this study included Triad risk (e.g. LEA with or without eating disorder (ED), menstrual dysfunction, and low BMD). Participants completed a demographic survey, menstrual cycle questionnaire, Eating Disorder Inventory-3, ED symptoms checklist, a 7 day online dietary and exercise log, and were measured for height, weight, DXA scan (BMD), and resting metabolic rate (RMR) through indirect calorimetry (MedGem). Exercise energy expenditure (EEE) was calculated using Ainsworth equation and energy availability (EA) was calculated by EA= (EEEEE/Fat free mass). RESULTS: Overall, 73.0% of dancers were at risk for the Triad (1 component (69.2%); 2 components (3.8%)). Most dancers were at risk for LEA (69.2%), with 61.5% of dancers with LEA and ED risk combined. Menstrual dysfunction lasting greater than 6 months was present in 77.4% of the dancers, and no low BMD was present in any participants. Overall, 88.5% of dancers displayed ED Risks (risk by EDI-3 and/or EDI-SC). Energy assessment in dancers was 1335 RMR = 1558.2 ± 206.5 kcal/day; energy intake (EI) = 1473.9 ± 321.5 kcal/day; EEE = 884.7 ± 324.9 kcal/day, and EA = 22.3 ± 19.4 kcal/kg/FFM/day. Average bone mineral density Z-score was 1.15 ± .76. CONCLUSIONS: Almost 75% of the dancers were at risk for 1 component of the Triad. Specifically, LEA with ED risk was the most common Triad component displayed in this collegiate study. Participants completed demographic survey (age, academic status, etc.), Eating Disorder Inventory-3 (EDI-3), EDI-3 symptom checklist and menstrual cycle questionnaire. Each participant completed a DXA scan to examine BMD and completed a 7-day online dietary and exercise log. Ainsworth equation calculated exercise energy expenditure (EEE), and energy availability (EA) was calculated by EA= (EI-EEE)/FM. RESULTS: All collegiate softball athletes (n=17) were at a high risk for LEA with EA below 30 kcal/kg FFM/day for 6 of 7 days and 70.6% having LEA for 7 of 7 days of the study. Additionally, 82.3% (n = 14) were at risk for LEA with ED behaviors. None of the participants were at risk for low BMD (3.28 ± 0.9); however 29.4% (n = 5) of the participants were at risk for amenorrhea and LEA. Energy needs revealed: RMR 1974 ± 276.9 kcal, EI was 1338 ± 313.5 kcal and EEE 811 ± 130.5 kcal, and EA 7.8 ± 6.4 kcal/kg FFM. Eating Disorder behaviors consisted of 47.1% dieting, 16.7% binge eating, 5.9% purging, 11.8% diet pills, and 47.1% used exercise to control weight 25-50% of the time. Additionally, 82.3% were at risk for EDs. CONCLUSIONS: Overall softball athletes are indeed at risk for at least 1-2 Triad components, more specifically LEA with ED behaviors and LEA with menstrual dysfunction. Education on energy needs specific for their sport demands may be beneficial for long term health and overall performance. Additional prevention and intervention strategies to decrease the risk for EDs is warranted in collegiate softball athletes.
1291  Board #99  May 31 8:00 AM - 9:30 AM
Pre-competition Weight Loss Strategies To Achieve The Desired Category Weight In Combat Sports Collegiate Athletes

(No relevant relationships reported)

PURPOSE: To describe the proportion of college combat athletes that follow some dietary and non-dietary strategies to lose body weight before a competition.

METHODS: We evaluated 80 college athletes (21.1 ± 2.7 y; 51 males, 29 females) from different combat sports (wrestling 23, boxing 7, judo 21, karate 14, and taekwondo 15; 77.5% of the sample had competitions at national level and 21.3% at international level). We applied a questionnaire to account for some of the followed dietary and non-dietary strategies to achieve the desired competition weight three months before a state tournament. The questionnaire consisted of 35 items. The questions asked the subject if he/she usually perform that strategy for pre-competition weight loss. Also, the questionnaire asked the subjects about if they showed some of the most common side effects of weight loss. The results were reported as frequencies and proportions.

RESULTS: The most common dietary strategies for pre-competition weight loss were to reduce or avoid the consumption of fats and sugars and beverages (Table 1). On the other hand, the most common non-dietary strategies to pre-competition weight loss were increasing physical activity and using sauna (Table 1). The most common side effect related to pre-competition weight loss was overall fatigue (39, 48.8%), followed by low performance in trainings (30, 37.5%), susceptibility to diseases (29, 36.3%) and irritability or aggressiveness (27, 33.8%).

CONCLUSIONS: The reduction of fat consumption and the increase of physical activity were the most common strategies for pre-competition weight loss. Some extreme strategies were also reported but not as common. Some of the mechanisms of these strategies may be related to the side effects of weight loss and not just for the weight loss itself. A comparison by sex and by type of sports deserves further analysis.

Table 1. Proportion of dietary and non-dietary strategies for pre-competition weight loss

<table>
<thead>
<tr>
<th>Dietary strategies</th>
<th>(n=80) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce the amount of food consumed</td>
<td>41 (51.3)</td>
</tr>
<tr>
<td>Reduce water and beverages consumption</td>
<td>30 (37.5)</td>
</tr>
<tr>
<td>Increase physical activity and reduction of consumption of food and beverages</td>
<td>38 (47.5)</td>
</tr>
<tr>
<td>Reduce or avoid fat consumption</td>
<td>69 (86.3)</td>
</tr>
<tr>
<td>Reduce or avoid sugars and carbohydrates consumption</td>
<td>63 (78.8)</td>
</tr>
<tr>
<td>Reduce or avoid animal source foods consumption</td>
<td>13 (16.3)</td>
</tr>
<tr>
<td>Reduce or avoid dairy consumption</td>
<td>39 (48.8)</td>
</tr>
<tr>
<td>Non-dietary strategies</td>
<td></td>
</tr>
<tr>
<td>Use of sauna</td>
<td>24 (30)</td>
</tr>
<tr>
<td>Use of laxatives</td>
<td>8 (10)</td>
</tr>
<tr>
<td>Use of diuretics</td>
<td>7 (8.8)</td>
</tr>
<tr>
<td>Induce vomiting</td>
<td>1 (1.3)</td>
</tr>
<tr>
<td>Increase physical activity</td>
<td>69 (86.3)</td>
</tr>
</tbody>
</table>

1292  Board #100  May 31 8:00 AM - 9:30 AM
Fulfillment Of The Daily Protein Intake Recommendations In College Athletes Compared By Sex

(No relevant relationships reported)

PURPOSE: To compare by sex the proportion of college athletes that consume protein below, inside and above the recommended amount.

METHODS: We evaluated 341 athletes (192 males and 149 females) from different sports. Food intake was evaluated through a 24-hour reminder for a habitual training day. Afterwards, daily protein intake was estimated and then calculated for kg body weight. Afterwards, subjects were categorized into one of three categories according to their daily protein intake: below (<1.4 g/kg/day); inside (1.4 to 2.0 g/kg/day), and above (>2.0 g/kg/day) the recommended amount (as suggested by the International Society of Sports Nutrition). The results were counted and expressed as percentage of subjects at each category. The 95% confidence interval (CI) was calculated for each percentage. This analysis was performed in both male and female athletes and compared by sex.

RESULTS: The general characteristics of the evaluated subjects for age, weight, height and BMI were 21.2 ± 2.1 y, 74.7 ± 14.1 kg, 176.2 ± 6.9 cm, 24.0 ± 3.8 kg/m² for males, and 20.6 ± 1.9 y, 61.5 ± 12.1 kg, 163.4 ± 6.6 cm, 23.0 ± 3.7 kg/m² for females, respectively. We observed that the number of male athletes that consumed protein below and inside the recommended amount was the same (61 subjects each; 31.8%, CI 25.2 - 38.5), and the remaining 70 subjects (36.4%, CI 29.5 - 42.3) consumed above the recommended amount of protein. Similarly, the majority of the female athletes consumed above the recommended protein amount (55 subjects; 36.9%, CI 29.1 - 44.7), followed for those who ingested below (53 subjects; 35.6%, CI 27.8 - 43.4) and inside (41 subjects; 27.5%, CI 20.2 - 34.8) the recommended amount. There were no significant differences by sex (p > 0.05).

CONCLUSIONS: The proportion of athletes consuming protein below, inside and above the recommended amount were similar regardless of sex. Most of the male and female athletes consumed more than 2.0 g/kg/day.

1293  Board #101  May 31 8:00 AM - 9:30 AM
Adequacy Of The Nutritional Intake In Volleyball Male College Athletes After Receiving Nutritional Counseling

(No relevant relationships reported)

PURPOSE: To compare the adequacy of nutritional intake in male volleyball athletes after receiving nutritional counseling for two different training sessions.

METHODS: 13 volleyball male college athletes were enrolled. The athletes carried out a training plan which was based on training volleyball only (VO) 4 days/week and volleyball plus resistance training (VR) 2 days/week for 12 weeks. Athletes received nutritional plans according to the nutritional requirements for both VO and VR. We evaluated their food intake with a 24-h diet recall. This evaluation was performed three times for each training day. The days evaluated were randomly selected during the study. The mean intake for each training type was calculated and compared with the indicated nutritional plan to calculate the % of adequacy. Data were reported as median, minimum - maximum, and compared between training types.

RESULTS: Only 7 athletes completed the study. It was observed that the athletes were closer to 100% of the total energy (ENG) requirement on VO (112.6%, 89.9-140.4) compared to VR (130.4%, 108.4-157.3), although there wasn’t a significant difference (p = 0.10). For carbohydrates (CHO), the days of VO were closer to 100% (99.5%, 76.1-123.9) while in VR they were above (110.9%, 85.3-185.3), but not significantly different (p = 0.29). Otherwise, the protein intake (PRO) was adequate on VR (103.4%, 63.2-133.8) compared to VO (81.1%, 58.4-108.7) which were below the indicated and different compared with VR (p = 0.01). Fat intake were well above the indicated amount for both training types, nonetheless there was a significant difference (p = 0.01) between the days of VO (200.9%, 132-293.3), which were closer to the indicated plan than the VR days (280.2%, 176-354.7) (Figure 1).

CONCLUSIONS: In this study, subjects showed better adequacy to the indicated plan for protein intake on VR days, the opposite was true for fat intake. Similar adequacy was observed for carbohydrate and energy regardless of the day.
Comparison Of Blood Markers In College Athletes With Different Protein Intake

Brenda Guadalupe Sanchez-Conchas, Alejandro Gaytan-Gonzalez, Roberto Gabriel Gonzalez-Mendoza, Sergio Alejandro Copado-Aguila, Marisol Villegas-Balcazar, Francisco Torres-Naranjo, Juan R. Lopez-Taylor. Universidad de Guadalajara, Guadalajara, Mexico.

PURPOSE: To compare the concentration of several blood markers between different absolute and relative protein intake groups by sex in college athletes.

METHODS: We evaluated 248 athletes (138 men [21 ± 3 y, 74 ± 14 kg, 176 ± 7 cm], 110 women [21 ± 2 y, 62 ± 12 kg, 164 ± 7 cm]) that competed at national level. We estimated the protein intake by a 24-hour reminder of a habitual training day. Subsequently the ingestion of absolute (g/day) and relative (g/kg/day) protein of each athlete was estimated. Then, the sample was divided by sex and by quartiles (Q) of protein intake (absolute and relative). In addition, blood chemistry was performed to evaluate urea, uric acid, creatinine, cholesterol, and triacylglycerides, which were compared between sex and Q. We only analyzed the data of subjects who had the 24-hour reminder and their blood chemistry within a period of no more than 30 days difference.

RESULTS: The concentrations in creatinine, urea, uric acid and cholesterol in males showed no significant differences between absolute protein intake Q. However, there was a trend (p = 0.10) for differences on triacylglycerides concentrations between 2Q and 4Q of absolute protein intake. No blood marker showed significant differences between Q of relative protein intake. In the case of females, no blood marker had a significant differences between Q of absolute protein intake. Similarly, there were no significant differences in the concentration of creatinine, uric acid, triacylglycerides and cholesterol among Q of relative protein intake. However, there was a significant difference (p=0.04) in urea concentrations between Q2 and Q4 of relative protein intake. All the mean concentrations fell within the normal ranges.

CONCLUSIONS: In this study, no significant differences were found in blood markers among both male and female college athletes who consumed more protein than those consuming less. However urea may differ with different protein intake levels in female athletes.

Table 1. Blood markers according to different protein intake levels by sex

<table>
<thead>
<tr>
<th>Sex</th>
<th>Q1 g/day</th>
<th>g/kg/day</th>
<th>Q2 g/day</th>
<th>g/kg/day</th>
<th>Q3 g/day</th>
<th>g/kg/day</th>
<th>Q4 g/day</th>
<th>g/kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creatinine</td>
<td>0.97±0.08</td>
<td>0.89±0.08</td>
<td>1.04±0.18</td>
<td>1.01±0.16</td>
<td>1.04±0.08</td>
<td>1.00±0.21</td>
<td>0.99±0.08</td>
<td>1.01±0.21</td>
</tr>
<tr>
<td>Urea</td>
<td>21±3</td>
<td>29±4</td>
<td>29±2</td>
<td>28±3</td>
<td>29±4</td>
<td>28±3</td>
<td>29±4</td>
<td>28±3</td>
</tr>
<tr>
<td>Uric acid</td>
<td>4.6±1.1</td>
<td>4.6±1.1</td>
<td>4.6±1.0</td>
<td>4.7±1.1</td>
<td>4.2±1.0</td>
<td>4.3±1.2</td>
<td>4.6±1.0</td>
<td>4.5±1.0</td>
</tr>
<tr>
<td>Triacylglycerides</td>
<td>79±31</td>
<td>82±33</td>
<td>70±26</td>
<td>75±31</td>
<td>76±24</td>
<td>79±30</td>
<td>97±47</td>
<td>87±42</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>170±27</td>
<td>171±25</td>
<td>164±21</td>
<td>159±22</td>
<td>163±28</td>
<td>167±34</td>
<td>169±32</td>
<td>168±26</td>
</tr>
</tbody>
</table>

Table 1. Blood markers according to the vegetable/animal protein intake rate by sex

<table>
<thead>
<tr>
<th>Sex</th>
<th>Blood marker</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea</td>
<td>29±4</td>
<td>28±3</td>
<td>33±4</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>Uric acid</td>
<td>4.6±0.9</td>
<td>4.4±1.1</td>
<td>0.36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creatinine</td>
<td>10.3±21</td>
<td>0.97±0.16</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triacylglycerides</td>
<td>94±44</td>
<td>81±34</td>
<td>0.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cholesterol</td>
<td>159±33</td>
<td>167±31</td>
<td>0.36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucose</td>
<td>73±10</td>
<td>72±9</td>
<td>0.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urea</td>
<td>29±3</td>
<td>27±3</td>
<td>0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uric acid</td>
<td>4.5±1.4</td>
<td>3.8±1.2</td>
<td>0.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creatinine</td>
<td>0.95±0.16</td>
<td>0.85±0.15</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triacylglycerides</td>
<td>75±29</td>
<td>83±36</td>
<td>0.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cholesterol</td>
<td>162±29</td>
<td>167±19</td>
<td>0.59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucose</td>
<td>75±10</td>
<td>75±9</td>
<td>0.92</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

American football athletes are exposed to repetitive head impacts (RHI) that, even in the absence of a clinically obvious head injury, result in quantifiable neurological damage. Pre-clinical studies using rodent models indicate that traumatic brain injuries (TBI) can cause a reduction in neuronal omega-3 fatty acids (n-3FAs), specifically docosahexaenoic acid (DHA). Pre-injury administration of n-3FAs, however, has shown to effectively ameliorate the pathological response to TBI. Furthermore, one study has demonstrated the potential neuroprotective effect of DHA supplementation in American football athletes evidenced by a marked reduction in blood biomarkers of axonal injury. Given that the American diet is scarce in the n-3FAs DHA and eicosapentaenoic acid (EPA), the potential neuroprotective effect of n-3FA supplementation may uniquely benefit American football athletes. PURPOSE: This descriptive study sought to examine the omega-3 index, an indicator of n-3FA status, in American collegiate football athletes not supplementing with n-3FAs. METHODS: One hundred twelve (n=112) athletes participated in this study. Blood was obtained via finger stick and collected on blood spot cards pre-treated with an antioxidant cocktail. The dried blood samples were analyzed by gas chromatography for fatty acid levels. A regression formula (r = 0.98) was used to estimate the percentage of DHA and EPA in red blood cell phospholipids (omega-3 index) relative to total omega-3 index of DHA and EPA, and alpha-linolenic acid (ALA) were (mean ± SD) 2.27% ± 0.01% (range = 1.1% - 5.2%), 0.39% ± 0.00% (range = 0.2% - 1.2%) and 0.39% ± 0.00% (range = 0.1% - 1.0%), respectively. Mean omega-6 levels were 9.55 ± 1.72 (range = 4.5 - 13.9) times higher than n-3FAs levels. The mean omega-3 index was 4.35% ± 0.01% (range = 2.8% - 8.0%). Sub-optimal n-3FAs levels (i.e., an index < 8.0%) were observed in 99.12% of participants. CONCLUSION: These data suggest that dietary intake of the n-3FAs DHA and EPA may not be adequate in American collegiate football athletes. Though the current evidence relates n-3FA deficiency to an increased risk for cardiovascular risk, American football athletes may derive neuroprotective benefit from n-3FA supplementation with little to no risk.
**Purposes:** We aimed to evaluate the macronutrient and supplementation distribution of athletes training to an Ironman triathlon.

**Methods:** 13 athletes of both genders were training to the 2017 Florianópolis Ironman and were selected to be part of the study. We registered the complete food and supplements amount ingested during one day of training (~5h). All records were calculated for calories and divided in 3 periods, before, during and after the training session (and the rest of the day). We calculated total carbohydrate ingestion and the macronutrient distribution was related to each athlete body weight. **Results:** Before: All athletes had most of the calories from carbohydrates, and in 77% of the athletes, protein ingestion was less than 15% of the ingested amount for this period. During: 92% of the reports showed that carbohydrate was more than 70% of the ingested calories to this period. 85% of the athletes ingested up to 10% of protein and 61% up to 10% of lipids, and 23% of the athletes ingested 0 calories from lipids during the training session. After: Protein was heavily ingested after the training session when compared to the other periods, however the most prevailing nutrient of the period was still the carbohydrates. Total consumption: all athletes consumed more than 50kcal/kg of body weight, with most of the calories coming from cars. Regarding the supplements, more than half of the evaluated group consumed palatinose before and/or during the training. Beta alanine, glutamine and BCAA were also reported by most of the group. **Conclusion:** Our study reassures the importance of the use of an energy source to endure exercise and puts in evidence the importance of nutritional advising in this kind of activity, since most of the athletes have problems with feeding during the competitions, fact that reinforces the importance of training the intestine to tolerate a larger amount of carbohydrate during exercise.

**Results:** As the global burden of cardiovascular disease (CVD) rises, public health-related interventions aimed at prevention have gained increased attention. Physicians and public health officials may be unaware that CVD or cardiac events are related to more than half of the line-of-duty deaths in firefighters (FF). Diet is one of the main modifiable CVD risk factors, yet poor diet and the risk factors it contributes to, including obesity, continue to be an issue as the prevalence of obesity is high in firefighters, and being overweight is the main modifiable CVD risk factors. This study reassures carbohydrates as the most used energy source to endurance activities and puts in evidence the importance of nutritional advising in this kind of activity, since most of the athletes have problems with feeding during the competitions, fact that reinforces the importance of training the intestine to tolerate a larger amount of carbohydrate during exercise.
1069 Board #113 May 31 9:00 AM - 9:30 AM
Food Intake And Fluid Balance Varies Between Individuals During A 120 Km Running Race
Floris Wardenaar1, Daan Hoogervorst2, Arizona State University, Phoenix, AZ. 1Cordes Fysiotherapie, Voorhout, Netherlands.
(No relevant relationships reported)

Continuous data collection on fueling and food strategies of ultramarathoners during competition is scarce. Existing publications mostly report nutrient intake without much detail of fluid balance and foods consumed.

PURPOSE: To provide an overview of the consumption of carbohydrates and fluids, fluid balance and types of foods during a race comprising 10-14 hours of continuous exercise.

METHODS: Pre-race height, cm (Cescorf stadiometer) and pre- and post-race body weight, kg (Seca scale S760 mechanically) were measured. All food products were labeled and weighed (g) pre- and post-race (Creata, CKS750). Continuous observation of food and beverage intake was performed as all runners were accompanied by a research team member on a bicycle using pre-defined lists and action cams (SICAM, SJ4000) to record all items consumed. Fluid excretion collection was done using urine bags (Roadgrip®). Results are expressed as mean±SD and range (min-max) or as percentage (%).

RESULTS: The average temperature was 7.0°C with a humidity of 67%. Five runners performed the 120 km run with an average duration of 12:19±1:29 hours (9:50-13:49). They reported 38±10 (25-48) food and beverage consumption events over the race which consisted of 4-7 different preferred food items per person. This resulted in an average carbohydrate intake of 44±19 g/h and fluid intake of 421±127 ml/h. Runners lost 2.5±1.6 kg (0.2-3.8) of total weight during the race. The average urine specific excretion was 0.8±0.5 kg (0.3-1.4). This resulted in an estimated sweat loss of 6.6±2.3 kg (4.6-10.1) and four out of five runners reported a lower post-race body weight of 4±2% (0.6). During the first 60 km of the race the preferred foods and beverages were energy gels, water and sports drinks. After this, food preferences suggested a more mixed pattern including the use of cola, chocolate milk and fruit.

CONCLUSIONS: Runners consume, on average, fewer carbohydrates and fluids than recommended due to a high variability in intake. As urine excretion was relatively low, mostly a high sweat rate contributed to a lower post-race weight. Although non-specific sports nutrition foods and beverages were used, runners preferred the use of commercial sports nutrition products the most. Supported by regional grant Eat2Move of the province of Gelderland, The Netherlands.

C-39 Free Communication/Poster - Correlates and Behavioral Aspects of Physical Activity
Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1305 Board #113 May 31 9:00 AM - 9:30 AM
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Floris Wardenaar1, Daan Hoogervorst2, Arizona State University, Phoenix, AZ. 1Cordes Fysiotherapie, Voorhout, Netherlands.
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Parkinson’s disease (PD) is a chronic neurodegenerative disease of the brain, characterized by motor symptoms-tremor, rigidity, bradykinesia, slowness/smallness, and postural instability—as well as non-motor symptoms including anxiety, depression, sleep disorders, and cognitive deficits. Physical activity (PA) may slow the progression of PD and improve the health-related quality of life (HRQoL) of patients. PURPOSE: This observational cross-sectional study examined correlates of lifestyle behaviors and health-related quality of life by analysis of the relationships between demographic, PA, and psychosocial variables in this population of 500 idiopathic PD patients.

METHODS: Study aims included examining: the relationship of self-efficacy (SE), outcome expectations (OE), and self-regulation (SR) with PA and HRQoL; the relationship between PA and HRQoL; determination if social cognitive theory (SCT) constructs mediate the relationship between PA and HRQoL in Parkinson’s patients. Statistical analysis included: descriptive statistics on all variables; bivariate correlations to determine the significance of relationships between SCT constructs, PA, and HRQoL using Pearson’s correlations for scale level data and Spearman’s correlations for ordinal data. Data analysis of primary study aims was conducted using multiple linear regression analysis. The indirect effects in the mediation model were analyzed using Dr. Andrew Hayes’ PROCESS. RESULTS: Participants self-reported a mean of slightly over 200 minutes of moderate to vigorous physical activity (MVPA) per week. SE and SR were the most significant predictors of PA (p<0.001). SE, OE, and SR were predictive of physical HRQoL (p<0.001). Results further indicated that SCT correlates mediated the relationship of PA and physical HRQoL (r=0.0851).

CONCLUSIONS: These results suggest self-selected participation based on a high interest in PA. Self-reported average weekly mMVPA was much higher than expected. Future studies should attempt to validate self-reported physical activity with some type of validated exercise measurement tool. These results suggest further consideration of SCT constructs in the design of interventions targeted to Parkinson’s patients.

1308 Board #116 May 31 9:00 AM - 10:30 AM
Self-Selected Intensity of Four Different Modes of Aerobic Exercise in Sedentary Adults
Lake Haile1, Heather J. Porter2, Curt B. Dixon, FACSM1. 1Bloomsburg University, Bloomsburg, PA; 2Penn State University, State College, PA; 3Lock Haven University, Lock Haven, PA. (Sponsor: Curt Dixon, PhD, FACSM)
(No relevant relationships reported)

The prescription of self-selected intensity (SSI) exercise has shown promise as a method to increase physical activity and cardiorespiratory fitness. SSI allows control over the exercise stimulus, promotes positive affect, and is often an intensity known to induce health-fitness benefits.

PURPOSE: To compare SSI between Treadmill, Elliptical, Upright Cycle, and Recumbent Cycle exercise in sedentary adults (~90 min of aerobic activity per week).

METHODS: Ten subjects (8 w, 2 m; 31 ± 10 yr, VO2max: 33 ± 9 ml·kg·min⁻¹) completed five submaximal exercise trials on separate days. The first four, one trial per mode completed in random order, were 30-min each: 5 min warm-up, 20 min main cool-down. Oxygen consumption (VO2), Heart rate (HR; Polar) were monitored continuously. Ratings of perceived exertion (RPE; OMNI Scale) and affective responses (AR; Feeling Scale) were collected every 5 min. The fifth trial was a submaximal graded treadmill test to predict VO2max. The mean values from the 20-min SSI were compared between modes using repeated-measures ANOVA. Pairwise comparisons were performed using Bonferroni corrections for significant ANOVAs.

RESULTS: ANOVAs were significant for VO2 (F(2,5) <8.6, p<0.05), %VO2 Reserve (F(2,5) >7.8, p<0.05), Kcal (F(2,5) >9.7, p<0.05), and HR (F(2,5) >4.2, p<0.05). For each, Elliptical was significantly greater than Recumbent Cycle (20±4.5 vs 15±4.3).

Abstracts were prepared by the authors and printed as submitted.
Flexible Nonlinear Periodization (FNLP) was developed to preserve training quality and the benefits of exercise dependence and eating disorders, and these dangerous and poorer eating attitudes. If left unchecked, novice PTs may be at risk of developing IPT but not EPT ($r = 1.8, 3.8, 0.60, p = 0.08$), Reduction in Other Activities ($r = 6.9$) and discomfort ($t=8.66, p<0.0001$) with a trend for perceived hydration ($t=-1.72, p=0.09$).

**RESULTS:** The results showed that there were significant differences between individuals who did not exercise and who exercised at least once a week on the following variables: age (M=69.8, SD=17.6) than those who did not post about PA on SM (M=64.5, SD=17.6). The older Chinese adults in the rural areas were more likely to exercise if they were younger, had higher income and education level, had a partner, and had no difficulties on physical functions.

**CONCLUSION:** The older Chinese adults in the rural areas were more likely to exercise if they were younger, had higher income and education level, had a partner, and had no difficulties on physical functions.

**Purpose:** Sharing about physical activity (PA) on social media (SM) provides an opportunity for receiving social support from online social networks and may be related to PA levels (Pinkerton et al., 2017). People desire to be perceived positively by others, this is particularly true for SM users (Kaplan & Haenlein, 2010). As an individual shares the content that is shared over SM networks, that individual may idealize their character rather than presenting an authentic version (Goffman, 2002). This study examines what percentage of individuals who post about PA on SM differ in their PA levels and self-presentation efficacy (SPE) when compared to those who do not post. A secondary purpose was to describe the type of SM use across both shoppers and non-shoppers. Methods: A convenience sample of 113 kinesiology students (62M, 44F) completed a cross-sectional survey that included the Godin Leisure Time Exercise Questionnaire (Godin & Shepard, 1985) and the self-presentation efficacy scale (15 items; Gammage, Hall, & Gins, 2004). This scale asked about confidence to present themselves in a positive fashion with regards to specific outcomes such as ‘being in good shape’ and ‘looking fit and toned’ in terms of SPE. Independent t-tests were conducted to compare shoppers with non-shoppers. Results: Students self-identified as shoppers of PA on SM (n=39, 34.5%; 23M, 16F) or non-shoppers (n=66, 58.4%; 32M, 34F) on SM. There were significantly different levels of PA, with those who posted about PA on SM reporting higher levels of activity (M=51.4, SD=22.5) than those who did not post about PA on SM (M=32.1, SD=17.6). There were also significantly different levels of SPE, with those who posted about PA on SM having higher levels of SPE (M=75.1, SD=17.6) than those who did not post about PA on SM (M=64.5, SD=22.4). Minutes spent on SM reported was between similar ranges (M=66.2min/day, SD=60.8) and non-shoppers (M=104.8min/day, SD=84.9; p<.245). The most commonly used SM platforms for both shoppers and non-shoppers were Instagram (users = 34, 87.2%; non-shoppers = 57, 86.3%) and Snapchat (shoppers = 33, 8.4%; non-shoppers = 54, 81.8%). Conclusion: Students who use SM to post about PA had higher levels of SPE and PA, suggesting the need for future research to explore how SM use may affect or be affected by self-presentation and PA levels.

**Purpose:** The purpose of the study was to explore factors that are associated with exercise behavior among the older Chinese adults in the rural area. **Method:** The data of 2586 older Chinese adults (males=1320, females=1259, age M=69.65, SD=8.0) in the rural area were analyzed from the National Health Service survey in Fujian, China. The t-test and z2-test were carried out to compare the differences between older Chinese adults living in the rural area who did not exercise and who exercised at least once a week, on age, family income, education level, whether having partner, whether having chronic disease or pain, as well as the physical function levels. All data were collected in 2013. **Results:** The results showed that there were significant differences between individuals who did not exercise and who exercised at least once a week on the following variables: age (M=69.8, SD=8.1, M=68.6, SD=7.1, respectively, p=0.01), family income (M=32178, SD=3440, M=38017, SD=30991, respectively, p<0.05), education level (with elementary education or above, 49.5% vs. 68.3% respectively, p<0.001), having a partner (72.9% vs. 80.8%, respectively, p<0.05), having difficulties on movement (16.0% vs. 8.4%, respectively, p<0.05), having difficulties on self-care (10.7% vs. 5.8%, respectively, p<0.05), and having difficulties on daily activity (14.6% vs. 7.2%, respectively, p<0.01). There were no significant differences between individuals who did not exercise and who exercised at least once a week, on the following variables: having at least one chronic disease (44.7% vs. 45.3%, respectively) and suffering from pain (28.1% vs. 22.7%, respectively), both p>0.05. **Conclusion:** The older Chinese adults in the rural areas were more likely to exercise if they were younger, had higher income and education level, had a partner, and had no difficulties on physical functions.
Flexible Non-Linear Periodization (FNLP) was designed by Kraemer & Fleck to optimize athletic performance and prevent burnout by basing athletes’ daily training regimens on their personal “readiness to train” (physical/mental states pre-exercise). FNLP-based prescriptions may be an effective approach in improving exercise behavior of inactive adults. However, it is necessary to operationally define readiness in specific populations, particularly between genders.

### METHODS

Identify and compare the underlying themes relating to readiness to complete low-demand (LDB) and high-demand (HDB) aerobic bouts between men and women who do not engage in regular aerobic activity. METHODS: Via Qualitrics, 1,059 respondents completed the online survey. After quality control, 166 respondents (49.2±3.4 yrs, 61.4% female) met the criteria of reporting >90 min/week of moderate aerobic activity (25.7±26.3 min/week). Respondents described mental/physical states necessary to complete a LDB (10-min slow stroll) and a HBD (60-min jog). Data were analyzed using content and thematic analysis.

### RESULTS

To complete the LDB and HDB, themes among men and women included body integrity (free from pain/injury) and positive affect. A unique theme emerged for the LDB, in that many men and women indicated it could be completed under normal or worse circumstances. A primary difference between genders is, to complete the LDB, women needed to feel rested, which was not reported by men. While a theme relating to motivation emerged for both bouts, it appears motivation to complete the LDB is rooted in a need for change (change of scenery, clear head), whereas motivation for the HDB related more to completing the bout itself (focused, determination, committed). For the HDB bout only, men and women indicated a need to feel fueled (enough food, hydrated), adequately conditioned, and energized.

### CONCLUSIONS

Little difference was noted between inactive men and women regarding indices of readiness. Three uncovered themes (body integrity, fueled, energized) parallel factors from Kraemer & Fleck’s proposed six-item readiness checklist: injury status, hydration level, and fatigue ratings. These factors represent the more personal, non-performance aspects of the checklist, providing initial support for adapting FNLP for inactive populations.

### Perceptions

Perceptions that pregnant women have towards physical activity (PA) appear to affect levels of participation. Qualitative findings indicate that past adverse prenatal experiences may elevate pregnant women’s PA concerns regarding the health of the baby. PURPOSE: We investigated whether pregnant women differed among pregnant women with past miscarriage or infertility experiences compared to pregnant women without. Additionally, we examined whether moderate-to-vigorous PA (MVPA) and PA discussion with a healthcare provider (HCP) differed between these two groups. METHODS: Pregnant women (N=497) completed an online survey and answered multiple questions about past pregnancy experiences, and current PA perceptions and behavior specific to various PA modalities. These included: walking, light and intense jogging, cycling, and swimming, prenatal yoga, aerobic dance, and resistance training exercises. PA outcome expectancy for each modality was assessed on an 11-point Likert scale. Participation in each was defined as PA >0 min/wk. MVPA was dichotomized as meeting the guideline (MVPA ≥150 min/wk) or not. Participants were also asked questions regarding PA discussion with a current HCP. Mann-Whitney U-tests were performed to examine outcome expectancy differences between women with past adverse prenatal experience and those without. Chi-square analyses were conducted to examine differences in meeting the MVPA guideline, HCP discussion, and PA modality participation. RESULTS: A total of 170 women (30.5%) reported past miscarriage or infertility experiences. PA outcome expectancy for these women did not significantly differ from women without past adverse prenatal experience for any specific modality of activity. However, women with past miscarriage or infertility were less likely to meet the current MVPA guideline ($\chi^2 (1) = 4.32$, $p=0.04$). Participation in specific PA modalities was not significantly greater for women without past adverse prenatal experience, nor was the occurrence of PA discussion with a HCP. CONCLUSIONS: Pregnant women with past miscarriage or infertility did not perceive PA differently but did perform less MVPA than women without past adverse experiences. Longitudinal examinations of PA perception and behavior are needed among this subpopulation.
The benefits of physical activity extend across the lifespan, but the psychological processes supporting active aging are not often addressed for older adults. This research explores older adults’ narratives of health and physical activity experiences and applies a Self-Determination Theory (SDT) framework for understanding how basic needs are accommodated in physical activity contexts. PURPOSE: To examine the life-history narratives of older adults with regard to physical activity, sport participation, and health.

METHODS: Narrative interviews were conducted with 51 older adults (65-95 yrs) to elicit life-history narratives regarding 1) experiences in physical activity and sport; 2) current perceptions of health; and 3) identity as a healthy or unhealthy person. The semi-structured interviews ranged from 1-3 hours and fostered in-depth accounts of individual’s life histories. Interviews were transcribed verbatim and data was subjected to thematic narrative analysis.

RESULTS: Data supported a SDT approach (Ryan & Deci, 2001; Ryan, Huta, & Deci, 2006) to understanding the connection between goal pursuits, achievement, and well-being. Contexts and activities that supported participants’ perception of autonomy (e.g., “I have choices about the activities that are available”), competence (e.g., “I can successfully participate”), and sense of belonging (e.g., “The people are very supportive and I feel welcome”) were related to participants’ articulation of healthy activity as a first-order, intrinsic goal (e.g., “I golf because I love movement, not for any other reason”). Participants demonstrated an age-related shift in understanding physical activity and health. Older participants (88.5 yrs) more often narrated physical activity as a first-order, intrinsic goal (e.g., movement for movement’s sake), whereas younger participants (70.5 yrs) more often narrated physical activity as a lower-order, extrinsic goal (e.g., “I am physically active because my doctor told me I needed exercise and/or I want to be healthier”). CONCLUSIONS: This research supports the SDT contention that intrinsic goal pursuits relate to greater well-being and highlights the importance of fostering perceptions of autonomy support, competence, and relatedness for physical activity among older adults.

Examination Of The Association Between Values And Physical Activity In A Behavioral Program


PURPOSE: To examine the association between values and physical activity in adults enrolled in a 6-month behavioral weight loss intervention.

METHODS: Baseline data for 67 participants (age = 44.2±9.0 years; body mass index = 32.6±4.0 kg/m²) and 58 participants at 6 months (age = 43.9±9.2 years; body mass index = 32.6±4.0 kg/m²) were analyzed. The 6-month behavioral weight loss intervention included prescribed moderate-to-vigorous physical activity of 150 to 200 min/wk. Only participants prescribed physical activity within the intervention were included in the statistical analysis. Assessments at baseline and 6 months included: 1) self-reported leisure-time physical activity, 2) personal values, 3) perception of engagement in physical activity would have on their values.

RESULTS: At both baseline and 6 months, the three most frequently identified values were marriage/couples/intimate relationships (75.9%), family (60.3%), and parenting (56.9%). Spearman correlation coefficients were not statistically significant between change in leisure-time physical activity and perception of the impact engaging in a physical activity will have on their values at baseline (range of r’s: -0.029 to 0.154, p’s range: 0.364 to 0.927) and 6 months (range of r’s: -0.018 to 0.098, p’s range: 0.564 to 0.916).

DISCUSSION: Self-reported values did not change following participation in a behavioral weight loss intervention. Perceptions of how engagement in physical activity would alter values were also not associated with change in leisure-time physical activity. These results suggest that linking physical activity to values would not impact the magnitude of improvement in leisure-time physical activity within the context of a comprehensive behavioral weight loss intervention. However, this warrants additional investigation to determine if interventions specifically linking values to physical activity would elicit similar effects.

1319 Board #127 May 31 9:00 AM - 10:30 AM Anthropometry, Physical Functioning, And Quality Of Life In The Exercising Diabetic Patient

Lena K. Perry1, Cynthia Villalobos1, J. Mark VanNess1, Paul D. Vosti2, Courtney D. Jensen. University of the Pacific, Stockton, CA. St. Joseph Hospital, Stockton, CA.

PURPOSE: To evaluate QOL predictors in subjects with type 2 diabetes undergoing structured exercise. METHODS: 61 subjects with diabetes were randomized into one of two 10-week exercise interventions; 38 subjects completed the program. Group 1 (n=23) participated in organized interval training with professional supervision twice weekly; group 2 (n=15) performed the same supervised interval training but also performed two 60-min unaccompanied walking sessions per week. At baseline and follow-up, demographic, anthropometric, functional, and QOL data were collected. Multiple linear regression determined the effect of exercise, physical functioning, and anthropometric indices on QOL outcomes. RESULTS: At baseline, subjects were 67.9 ± 9.1 years of age, 42.1% male, and they had a total QOL score of 58.9 ± 18.1. Older age and three assessments of physical functioning associated with higher baseline QOL; obesity associated with a trend for higher QOL (p=0.054). From baseline to posttest, QOL improved 17.7% (p=0.001). Group assignment was not a significant predictor of this change (p=0.998). Women improved more than men (p=0.031), and improvement in physical function associated with greater improvements in QOL. At the end of the intervention, age (p=0.022) and physical function corresponded to elevated QOL. Group assignment was not a significant predictor (p=0.93; p=0.098). At baseline (p<0.001), change scores (p=0.021), and at follow-up (p=0.001), the six-minute walk was the most pronounced variable of physical functioning to correspond to QOL. CONCLUSION: Exercise improved QOL for subjects with diabetes. Additional walking didn’t help. Older men and especially women improved more. This may be a consequence of attention, as supervised sessions provided marked improvement. It may be important for exercise aimed at improving psychological wellbeing to include companionship.
TITLE: Mindfulness and Intrinsic Exercise Motivation: The Mediating Role of Exercise Self-Efficacy

AUTHORS: Savannah Neace, Allie Hicks, Marci DeCaro, Paul Salmon

University of Louisville, Louisville, KY

Purpose: We examined the role of mindfulness in predicting exercise motivation. Mindfulness is associated with health, but its influence on exercise motivation is largely unexamined. We tested the relationship between mindfulness and exercise motivation, using self-efficacy as a possible mediator of this relationship.

METHODS: Undergraduates (N = 100; 84% Female, 80% Caucasian) completed online questionnaires assessing demographics, Mindfulness (MAAS), exercise self-efficacy (SEE), and exercise motivation (EMI-2).

RESULTS: Hierarchical regressions controlling for age, sex, and minority status examined relationships among mindfulness, exercise self-efficacy, and exercise motivation. Mindfulness was positively associated with intrinsic (β = -0.210, p < 0.05), but not extrinsic motivation (β = 0.086, p > 0.438). Mindfulness was also positively associated with exercise self-efficacy (β = -0.244, p < 0.05). Exercise self-efficacy was positively associated with both intrinsic motivation (β = 0.484, p < 0.000) and extrinsic motivation (β = 0.218, p < 0.05). Mediation analysis revealed that exercise self-efficacy fully mediated the relationship between mindfulness and exercise motivation (β = -0.210, p < 0.05; β = -0.186, p < 0.285). Exploratory analyses examined correlations between facets of the EMI-2 and mindfulness and exercise self-efficacy. Mindfulness was significantly correlated with two intrinsic facets [Revitalization (r = 0.229, p < 0.028), Enjoyment (r = 0.254, p < 0.011)]. Exercise self-efficacy was significantly correlated with five intrinsic facets [Revitalization (r = 0.500, p < 0.000), Enjoyment (r = 0.499, p < 0.000), Challenge (r = 0.508, p < 0.000), Affiliation (r = 0.216, p < 0.05), Positive Health (r = 0.284, p < 0.01)] and one extrinsic facet [Competition (r = -0.344, p < 0.000)].

Conclusions: Mindfulness is moderately predictive of intrinsic exercise motivation, however, exercise self-efficacy largely mediates this relationship.

Subjective well-being (SWB) is a critical indicator of positive youth development. Physical activity (PA) has been identified as a potential correlate of SWB. But the underlying mechanism for the association between PA and SWB has remained largely unexplored.

Purpose: To examine the association between the PA and SWB in college students, and to determine if the perceived health mediated the association between them.

Methods: 1209 college students (631 male and 578 female, mean age = 19.63 years) voluntarily completed a questionnaire consisting of four parts: Subjective Happiness Scale with five 7-point Likert items measuring life satisfaction, two questions adopted from the National Health and Nutrition Examination Survey (NHANES) asking the time (in minutes) spent on PA per week, and one 5-point Likert item adapted from NHANES measuring the perceived health. According to a widely used procedure to test mediation, three multiple regression models were performed. First, the perceived health (mediator) was regressed on the PA (independent variable). Second, happiness and life satisfaction (dependent variables) were respectively regressed on the PA (independent variable). Finally, happiness and life satisfaction (dependent variables) were respectively regressed on both the PA (independent variable) and perceived health (mediator). Age, gender, and weight status were obtained by self-report and added to all models as covariates.

Results: The first model revealed that PA was a significant predictor of perceived health (r = -0.50, p < 0.01). In the second model, PA significantly contributed to the happiness (r = -0.43, p < 0.01) and life satisfaction (r = -0.36, p < 0.01), respectively. However, after including the perceived health to the second model, the coefficient of PA was no longer significant for both happiness and life satisfaction (p > 0.05). Our results showed that PA had no effect when the mediator was controlled, suggesting a mediating effect of the perceived health on the relationship between PA and SWB.

Conclusions: The increased time spent on PA is associated with a higher level of SWB among college students. Moreover, this positive association is mediated by the individual level of perceived health.

As racial health disparities persist in the U.S., for conditions that can be mitigated by regular exercise (e.g., cardiovascular disease, type 2 diabetes), identifying the types of motivation that drive various racial groups to participate in exercise may be a strategy to help inform intervention efforts and reduce these health disparities.

Purpose: To identify racial differences in the types of motivation (autonomous, controlled, or amotivation) that influence regular participation in indoor group cycling classes.

Methods: Twenty-one indoor group cyclists currently participating in classes ≥ 1 day/week for ≥ 3 consecutive months (non-Hispanic Whites (NHW) = 14, non-Hispanic Black (NHB) = 4, mixed-race = 3; age: 43.6 ± 14.5 years; body mass index: 26 ± 3.8 kg/m²) were recruited for this study. Participants completed the Treatment Self-Regulation Questionnaire (TSRQ) using a 7-point Likert scale to indicate why they continue to utilize indoor group cycling classes as an exercise modality. Average TSRQ scores of autonomous and controlled motivation, and amotivation were examined by race. One-way ANOVA was used to examine between-group differences. Significance was accepted at p < 0.05.

Results: There were no racial differences in autonomous (p = 0.44) or controlled motivation (p = 0.84) by race, but there was a significant difference in amotivation (p = 0.02). Tukey post hoc analyses showed that NHB had higher amotivation (3.5 ± 1.0) compared to NHW (2.0 ± 1.1) and mixed-race (1.3 ± 0.4) participants.

Conclusions: Compared to the other race groups in this sample, NHB had higher amotivation despite continued participation in indoor group cycling. This suggests that other factors (e.g., group dynamics, environment) may be driving NHB to continue participation. Further research using racially diverse samples is needed to identify possible factors related to motivation in NHW and race groups, as they may be valuable in the development of culturally relevant exercise programs.
1325 Board #133 May 31 9:00 AM - 10:30 AM Cardiorespiratory Fitness, Physical Activity, and Psychological Effects of an Acute Bout Of Cycling Exercise in People with Epilepsy
Kristen E. Johnson, Patrick J. O’Connor, FACSM. University of Georgia, Athens, GA. (Sponsor: Patrick O’Connor, FACSM)
(No relevant relationships reported)

PURPOSE: The primary purpose of this study was to test if an acute bout of cycling exercise in a sample of young adults with epilepsy would improve feelings of energy and enhance executive function. Secondary aims included evaluating cardiorespiratory fitness and physical activity level. METHODS: A within-participants crossover design was used to compare seated rest to 20 minutes of moderate-intensity cycling. Ten people diagnosed with epilepsy completed the Profile of Mood States (POMS) and the Wisconsin Card Sorting Task (WCST) before and twice after the treatments. Cardiorespiratory fitness was assessed with a standardized, graded maximal cycling exercise test. Physical activity level was assessed with a hip-worn accelerometer (ActiGraph GT3X+) and a self-reported past-year physical activity questionnaire (CARDIA Physical Activity History). RESULTS: Within-participants repeated-measures ANCOVAs controlling for initial values and order of treatments showed a significant interaction for POMS Vigor, F(2,32)=4.21, p<.024. Immediately after exercise, vigor scores were higher than before exercise. WCST performance was not influenced by acute exercise. Independent t-tests revealed that this sample of people with epilepsy was similarly fit and similarly active compared to reference groups of young adults without epilepsy. CONCLUSION: Acute cycling transiently increases feelings of energy without altering executive functioning in normally active and fit people with epilepsy.

1326 Board #134 May 31 9:00 AM - 10:30 AM Machines versus Free Weights: Does Exercise Mode Influence Affect and Perceived Exertion?
Daniel J. Cavarretta, Walter R. Bixby, FACSM, Eric E. Hall, FACSM. Elon University, Elon, NC.
(No relevant relationships reported)

Resistance exercise reduces the risk of chronic disease and promotes numerous health benefits. Due to the low rates of participation in resistance exercise, research is needed to create a more positive affective response from exercise. This has been shown to increase rates of adherence in aerobic exercise. PURPOSE: To compare the affective responses of performing resistance exercise on machines (MA) and free weights (FW). METHODS: Nineteen participants (4 Males: 20.8±0.5yrs; 75.2±2.1kg; 180±2.4cm; 14 Females: 25.7±0.8yrs; 67.9±1.9kg; 163±5.6cm) completed a MA workout consisting of the leg press, row, chest press, and leg curl and a FW workout consisting of a goblet squat, row bench, and stiff leg deadlift. Each exercise was performed at 80% 10RM for 3 sets of 9-11 repetitions with 90 secs of rest between each set. Feeling Scale (FS) and Felt Arousal Scale (FAS) were assessed before exercise, after the completion of the 7th repetition of the 2nd set of each exercise, after the 3rd set of each exercise, immediately after, 30 min after, and 60 min after. RESULTS: Repeated measures ANOVA from before to after exercise revealed a condition x time interaction for FS where FS in the MA condition increased immediately and 60 minutes following exercise, while there was no change across time for FW, and FS for MA was significantly higher at 60 minutes following exercise than FW, F(2,31) = 3.26, p = .040. For FAS before and after exercise, FAS significantly increased immediately following exercise and then decreased to below exercise levels at 30 and 60 min regardless of condition, F(2,31) = 11.91, p = <.001. Repeated measures ANOVA for RPE during the exercise revealed a condition x time interaction where RPE was higher in FW for all exercises except those of the chest where RPE was higher for MA, F(2, 119) = 3.285, p = .015. CONCLUSION: The more positive affective response from the MA workout immediately and 60 minutes after exercise suggests that MA exercises may be better for novice lifters when beginning a resistance training regimen.

1327 Board #135 May 31 9:00 AM - 10:30 AM The Impact of Body Fat Percentage on Appearance and Weight Management Related Motivations to Exercise in College Age Men
Elizabeth A. Easley, Molly N. Melton, Rhannon J. Schofield, Ashley M. Garris, Sarah H. Sellhorst, William F. Riner, FACSM. University of South Carolina Lancaster, Lancaster, SC.
(No relevant relationships reported)

Physical activity and exercise levels have been shown to decline throughout childhood and adolescence with a noticeable decrease occurring during the transition to college. The Exercise Motivation Inventory-2 (EMI-2) has been used to identify factors that potentially affect exercise levels in adults. There is little known research regarding the motivation to exercise in college students at a rural, commuter-based, two-year University campus. PURPOSE: The purpose of this study was to determine whether differences exist in enjoyment, appearance, and weight management related motivations and MVPA based on body fat percentage levels in male college students. METHODS: Thirty-nine, traditional-age (18-25 y), full-time (~12 credit hours) male college students were recruited for this study. The participants completed the EMI-2 instrument and then anthropometric measures (height, weight, and BF%) dual energy x-ray absorptiometry) were collected. All participants were then divided into two groups, a healthy body fat group, (HBF; ≤ 22 BF%, n = 16) and an overweight group (OB; > 22 BF%, n = 23). A one-way MANOVA was used to determine differences in exercise motivations and physical activity levels based on body fat percentage. RESULTS: A significant main effect was determined for body fat category, Wilkes’ lambda=.533, F(4, 34) = 4.743, p = .01. Pairwise comparisons of EMI-2 scores determined that OB men had higher motivation scores based on appearance (3.565 vs. 2.703, p = .026) and weight management (3.685 vs. 2.817, p = .001) compared to their healthy-fat counterparts. There were no significant differences in enjoyment scores (3.533, OB vs. 3.203, HBF, p = .465) or time spent in MVPA (OB, 289 min/week vs. HBF, 371 min/week, p = .064). CONCLUSION: Body fat percentage can impact the motivations to exercise in college age men. OB reported stronger motivations to exercise based on appearance or weight management compared to the HBF. Despite these stronger motivations, this did not translate into greater time spent in MVPA compared to their HBF counterparts. More research is necessary to determine motivation and barriers to exercise in this population, while considering the impact of body composition.

1328 Board #136 May 31 9:00 AM - 10:30 AM Self-Reported Wellness Benefits of Recreational Sports Use in College Freshmen
Kerri L. Vasold1, Samantha J. Deere2, James M. Pivarnik, FACSM1. ‘Michigan State University, East Lansing, MI. 1 Saginaw Valley State University, University Center, MI.
(No relevant relationships reported)

Previous research has shown a positive relationship between academic success and recreational sports participation. Few studies have investigated the relationships between recreational sports participation and psychosocial/physical health indicators. PURPOSE: To investigate the impact of recreational sports on psychosocial and physical health indicators in college freshmen, and determine differences in impact between high and low users. METHODS: Participants included freshmen students who participated in an online survey and consented to recreational sports usage tracking. Usage was collected via ID card swipe each time the student utilized the University fitness centers, group fitness classes, and participated in intramural sports games. Users were categorized as high or low (median split) based on total usage during their 1st year. The survey was administered during the 2nd semester of participants’ 1st year. Participants reported the impact (1=newly very 5=very positively) of their usage on psychosocial and physical health variables. Responses were categorized into negative/no impact (1-3) and positive impact (4, 5). Frequencies were calculated for variables of interest. Logistic regression was utilized to investigate the impact of recreational sports use on psychosocial and physical health variables. RESULTS: The sample (N=131) was 51.1 percent male and primarily Caucasian (82.4%). On average, high users had 48.1±39.2 ID card swipes per week; low users had 6.1±3.3. Most participants reported that recreational sports participation had a positive impact on psychosocial and physical health: overall well-being (86.3%); sense of belonging (83.2%); stress management (77.9%); self-confidence (77.9%); time
College students often see a decline in their physical activity, in part with an increase in psychological stress. Many universities aim to increase physical activity and spark new interest by offering a wide variety of health and physical activity classes for all students.

**PURPOSE:** To explore demographic differences among students in the physical activity classes and to examine how stress relates to how students self-select into different types of physical activity classes.

**METHODS:** Potential participants were students who self-enrolled in physical activity classes at the University. Participants (n=155) completed consent forms, a demographics questionnaire, and two surveys within Qualtrics during the first, ninth, and fifteenth week of the semester. The surveys assessed psychological stress, both academically related (Academic Stress Scale) and non-academically related (Perceived Stress PSS-10). Between group differences were analyzed using One-Way ANOVA’s to find using SPSS.

**RESULTS:** Results of the One-Way ANOVA of the Academic Stress showed female students (mean = 9.61) to have statistically significant higher academic stress levels compared to male students (mean = 7.82) (p < .001). While not significant, the students on the spectrum of gender identity reported higher academic stress levels than both male and female students (mean = 9.82). Females also reported higher overall (non-academic) stress (mean = 17.53) than males (mean = 15.42) (p < .030). Female students reported more academic stress (mean = 9.67) than males (mean = 7.63). Students in the College of Education reporting the highest overall stress (mean = 20.33) on the Perceived Stress Scale. Time point three will be analyzed to assess changes in stress through the semester.

**CONCLUSIONS:** This study explored the descriptive statistics of students self-enroll in physical activity classes and examine differences in their stress levels through the semester. The results of this study can be used to reach students who’s major may not require physical activity classes. Results can also be used to try to get more students involved in physical activity classes, or which courses certain colleges should consider requiring students to take.

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**Board #138**

**May 31 9:00 AM - 10:30 AM**

**Gender Differences In College Student Physical Activity Based On The Use Of Wearables, Apps, And Social Media**

Oliver W. Wilson, Melissa Bopp, FACSM, Samantha Shields, Zack Papalia, Michele Duffey. The Pennsylvania State University, State College, PA. (Sponsor: Dr. Melissa Bopp, FACSM)

(No relevant relationships reported)

College students Physical Activity (PA) continues to remain low and decline, whilst the utilization and availability/accessibility of wearables, apps and social media continues to increase. Understanding the relationship between the use of such technologies and PA may provide insight valuable to college student PA promotion.

**PURPOSE:** To investigate gender differences in PA between students and non-users of wearables, physical activity and weightless apps, as well as those who shared their PA on social media and those who did not.

**METHODS:** This cross-sectional study collected data using an online survey from a volunteer sample of students enrolled in a PA class. The survey examined a range of variables, including demographic information, self-reported PA levels and height, weight, as well as the use of wearables, PA apps, weightloss apps, and social media to share about PA. Basic descriptors were computed, and differences in technologies usage were assessed using independent sample t-tests

**RESULTS:** The final sample included 2341 participants, 56% women; 78.7% Non-Hispanic White, with an average age of 21.1±1.5y. Among students, 85.9% met or exceeded PA recommendations, 27.1% reported using a wearable, 30.1% a PA app, and 16.7% a weightloss app, and 12.7% reported sharing their PA on social media. Wearable users reported greater GPA (p<.001), PA app users reported greater MPA (p<.005, r²=.006), and weightloss app users reported higher BMIs (p<.004, r²=.004) compared to non-users of such technologies respectively. Those who shared their PA on social media reported greater GPA (p<.033, r²=.002), and VPA (p<.001, r²=.011). Among males, wearable users reported greater MPA (p<.001, r²=.015), whereas female users reported greater MPA (p<.005, r²=.006), and VPA (p<.001, r²=.013). Male PA app users had higher BMIs, (p<.018, r²=.008) and reported more moderate PA (p<.012, r²=.007), whereas female PA app users reported significantly higher MPA (p<.050, r²=.003), and VPA (p<.001, r²=.012). Males who shared about PA on social media reported higher MPA (p<.004, r²=.009), and VPA (p<.001, r²=.013), whereas females reported only higher VPA (p<.001, r²=.016). CONCLUSION: Technologies had positive associations with PA, indicating that they have the potential to increase and or sustain PA in certain individuals.

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**Board #139**

**May 31 9:00 AM - 10:30 AM**

**Cellular Telephone Use Predicts the Likelihood of Being an “Active Couch Potato” in College Students**

Hannah Altman, Andrew Lepp, Jacob E. Burkley. Kent State University, Kent, OH. (Sponsor: Ellen Glickman, FACSM)

(No relevant relationships reported)

The term “active couch potato” was developed to describe individuals who participate in regular, planned physical activity yet are also highly sedentary. These individuals are of interest as participation in excessive amounts of sedentary behavior, even in individuals which are regularly physically active, increases the risk for cardio-metabolic disease. Our group has demonstrated that cellular telephone (cell phone) use is positively associated with sedentary behavior, but not related to physical activity. Therefore, it is possible that individuals who use their cell phone heavily may participate in large amounts of sedentary behavior while also regularly participating in physical activity. This cell phone use may predict the likelihood of being an “active couch potato.” **PURPOSE:** To assess the relationship between cell phone use and the likelihood of being an “active couch potato.”

**METHODS:** A sample of 228 college students completed validated survey items to assess their daily cell phone use, physical activity, and sedentary behavior. Tertile splits were performed and participants were categorized into low, moderate or high groups for each of these three variables. Participants were then categorized as “active couch potatoes” if they were a) in the high physical activity group and also in a high or moderate sitting group, or b) in the moderate physical activity group and also in the high sitting group. Mann-Whitney U tests compared the number of “active couch potatoes” across the three cell phone use groups and binary logistic regression was used to test if cell phone use group predicted being an “active couch potato.”

**RESULTS:** There were a greater (Z=1.9, p ≤ 0.05) number of “active couch potatoes” in the moderate (n = 21) and high (n = 28) cell phone use groups versus the low (n = 11) use group. The likelihood of being an “active couch potato” was significantly (Z=2.1, p ≤ 0.05) associated with cell phone use. Specifically, individuals in the moderate and high cell phone use groups were 2.3 and 3.5 times more likely (Wald ≥ 3.9, p < 0.05), respectively, to be an active couch potato than low users.

**CONCLUSION:** Among a sample of college students, moderate and high cell phone users were significantly more likely to being categorized as “active couch potatoes” than their low use peers.

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**Board #140**

**May 31 9:00 AM - 10:30 AM**

**Motivations for Moving: An Analysis of Physical Activity in Residential College Students**

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(No relevant relationships reported)

Physical activity (PA) habits developed in college can have health effects that extend well into adulthood. **PURPOSE:** To examine the relationship between social and ecological determinants of PA in residential college students. **METHODS:** A random sample of 162 students from a liberal arts college was surveyed. A 35-question web survey was used to collect data about on-campus residence, demographics, access to walking resources pre-college, knowledge and use of the college PA resources, and PA patterns. A hot spot analysis was conducted to determine geographic patterns of PA level or use of PA resources. The Wilcoxon signed-rank test was used to compare median energy expenditure (METs) per week between demographic groups. Multiple linear regression was used to find predictors of log METs per week based on demographic groups that were found to have significantly different median METs per week; a log transformation was used to correct for a skewed distribution. Logistic regression was used to find predictors of respondents having used the cardiovascular exercise room (CR). **RESULTS:** Residence halls and apartments closest to the CR were more likely to have residents who had used the CR. Having used the CR was significantly positively related to log METs (p<.05). There was a trend for a positive relationship (p<.05) between having used the racquetball courts and log METs and a trend for a negative relationship (p<.054) for having access to a gym before attending the college and log METs. Holding other variables constant, the odds of having used the CR were 15% higher among respondents who lived in apartments (betar=16, odds=1.17) vs. those who lived in residence halls, 50% higher among respondents who had used the weight room (betar=41, odds=1.50), 58% higher among only white respondents (betar=46, odds=1.58) vs. non-white respondents, 67% higher...
among multiracial white respondents (beta=.51, odds=1.67) vs. non-white respondents, and 15% higher among respondents who had not used exercise equipment in the residence halls (odds=1.15). CONCLUSIONS: Colleges may be able to enhance participation in PA by providing well-distributed resources throughout campuses. Colleges should be aware that social and ecological factors may also influence PA and associated health benefits.

Eating and exercise behaviors among college students remains an area of interest as habits formed during these years may affect future behavior. Additionally, males and females who engage in extreme eating and exercise behaviors may be at risk for compromised health and well-being. PURPOSE: To investigate the relationship between obesity, exercise attitudes, and perceived body image among collegiate males and females. METHODS: 222 females aged 20.1 ± 1.9 yrs, and 136 males aged 20.1 ± 2.2 yrs voluntarily completed a demographic questionnaire, the Obligate Exercise Questionnaire (OEQ), Compulsive Exercise Test (CET), Social Physique Anxiety Scale (SPAS), and the Eating Attitudes Test (EAT). Variables were analyzed with one-way ANOVA and Pearson product coefficient correlations. RESULTS: Overall 15% of women and 6% of men scored higher than 20 on the EAT indicating a high level of concern about dieting, body weight or eating behaviors where counseling is recommended. One-way ANOVA revealed that men were more obligated to exercise than women (47.7 ± 8.4 vs. 44.7 ± 9.3, p < 0.004), men had lower SPAS scores compared to women (28.7 ± 10.9 vs. 36.5 ± 11.3, p < 0.001), and men had lower scores on the EAT (7.2 ± 6.3 vs. 10.5 ± 9.3, p < 0.001). Correlations by sex revealed that men had a significant correlation for OEQ and CET (r = 0.618, p < 0.001), CET and EAT (r = 0.313, p < 0.001), and SPAS and EAT (r = 0.234, p < 0.007). Women had a significant correlation for OEQ and CET (r = 0.685, p < 0.001), OEQ and EAT (r = 0.261, p < 0.001), SPAS and CET (r = 0.328, p < 0.001), SPAS and EAT (r = 0.490, p < 0.001), and CET and EAT (r = 0.446, p < 0.001). CONCLUSION: While it may appear that a low percentage of participants had concerning scores on the EAT, this sample indicated that approximately 1 in 10 college students may need proper counseling in this area. Although women were more likely to have higher scores on EAT and SPAS, both males and females demonstrated relationships between OEQ, CET, SPAS, and EAT. Further investigation is warranted to determine the extent of these relationships and to possibly use these data to direct health and wellness initiatives on campuses to best serve young adults.

Physical activity self-efficacy (PASE) and the school’s physical environment (SPE) can influence children’s moderate-to-vigorous physical activity (MVPA) participation. How PA and SPE are associated has not been directly established in this population. PURPOSE: To evaluate the relationship between PASE and SPE among elementary school children in Puerto Rico. METHODS: Sixty-eight girls and 63 boys (ages 7.8 ± 0.7 years) completed a questionnaire to assess PASE by interview. 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 and time spent in each. Children wore a GT3X+ accelerometer during 5 consecutive school days to determine MVPA and sedentary time (ST) during school time. MVPA and ST data was included if participants were accelerometers ≥3 school days for ≥3 h/day. Correlation analysis was conducted to test the relationship between the use of facilities and PASE. Mann–Whitney U-test was conducted to test the difference in PASE by recess time and Krasul-Walls test was used to evaluate difference in PASE by physical education time. Secondary correlation analyses were conducted to test the relationship between 1) PASE and MVPA (min/wk); and 2) PASE and ST (hr/wk). RESULTS: Participants accumulated 110.94 ± 21.81 min/wk in MVPA and 3.48 ± 0.48 hr/wk ST. No significant correlations were observed between: 1) use of facilities and PASE (r = 0.122, p = 0.22); 2) PASE and MVPA (r = 0.010, p = 0.91); and 3) PASE and ST (r = 0.068, p = 0.45). No significant differences were found in PASE by recess time (U = 1815.00, p = 0.86) and by physical education time (H(2) = 0.830, p = 0.66). CONCLUSIONS: Sanitary time allowed the participants to comply with one fourth of the PA recommendation (60 min/day = 420 min/wk). Lack of relationship between SPE and PASE could be explained by an overall high PA self-efficacy score, which requires further investigation. Funded by University of PR - FIPIT Institutional Grant.

Purpose: The transition from childhood to adolescence is marked by a dramatic decrease in physical activity (PA). While many mediating factors have been suggested to explain this drop, one of the most influential may be the experiences children derive from physical education (PE). Scholars have been voicing concerns about the potential long-term implications of early PE experiences for nearly 100 years. However, there has been surprisingly little empirical investigation into this subject. Using a retrospective survey, we examined whether memories of enjoyment or non-enjoyment of PE as a child was significantly and positively associated with present-day attitude and intentions for PA, among adults. METHODS: An online questionnaire was completed by 1,028 adult respondents (18-45 years), representing 47 of the 48 contiguous United States. The participants rated their retrospective enjoyment of PE and their present attitudes and intentions for PA, as well as their present PA and sedentary behavior. In addition, participants recorded their best and worst PE memories in an open-ended fashion. RESULTS: Retrospective enjoyment of PE as a child was significantly and positively associated with present-day attitude (r = .37) and intention (r = .23) for PA, days per...
week engaging in vigorous-intensity PA ($r=-.11$) and moderate-intensity PA ($r=-.13$), as well as negatively associated with sedentary time both on the weekdays ($r=-.13$) and on the weekend ($r=-.14$). Of the worst memories, 34% related to embarrassment during PE, 18% to lack of enjoyment, 17% to bullying, 14% to social-physique anxiety, 16% to injury, and 2% to being punished by the PE teacher. “Worst” memories increased sharply between 6th and 10th grades. Notably, participants reported being ridiculed by teachers or peers and feeling that they lacked physical competence for the sport or fitness tests. CONCLUSIONS: An important relationship may exist between childhood memories of PE and present-day PA attitude and behavior as an adult. As also demonstrated in other domains of development, negative PE experiences during childhood may be influential throughout the lifetime. Intensified research efforts should be directed toward understanding the factors and processes that lead to the formation of negative memories of PE.

Adolescents report low efficacy in healthy behavior engagement, and are disproportionately affected by obesity. Short-term interventions, such as behavior change summer camps, may positively influence psychological correlates of healthy behavior, particularly Exercise Identity (EI) and Healthy Eater Identity (HEI). However, previous studies lack family involvement, and do not take into consideration potential disparities in EI and HEI based upon weight status (healthy vs. obese). PURPOSE: To determine if the combination of a 1-week intervention and an 8-week family-oriented eHealth program will increase EI, HEI, and subsequent healthy behaviors in adolescent girls. Additionally, we sought to determine if EI and HEI scores differ between normal-weight and obese groups. METHODS: Twenty-one participants (age=11.3±1.0 years, BMI=20.2±6.4 kg/m$^2$) were recruited from a prevention camp (no BMI inclusion criteria), and twenty participants (age=12.4±1.5 years, BMI=31.6±6.6 kg/m$^2$) were from a treatment camp (elevated BMI inclusion criteria). Both camps were 1-week in duration, and had similar intervention components. Participants self-reported EI, HEI, physical activity, screen-time, and dietary behavior at baseline and post-intervention. All families were given access to an 8-week eHealth program, and measures were repeated three months following camp. RESULTS: EI and HEI role-identities significantly differed between the prevention and treatment groups at baseline ($\Delta EI=4.0$, $p=0.007$; $\Delta HEI=-4.5$, $p=0.001$). Positive trends in increasing EI and HEI scores were seen in both groups following the 1-week intervention; however, mean role-identity disparities remained between groups. Participation in the eHealth program was low-moderate. At follow-up, the treatment group had increased EI and HEI role-identities in such that the groups no longer significantly differed ($\Delta EI=-3.0$, $p=0.161$; $\Delta HEI=-1.5$, $p=0.464$). Minimal changes in health behaviors were experienced in each group. CONCLUSION: Findings indicate that EI and HEI role-identities may differ in adolescent girls based upon weight status; 1-week interventions may positively influence EI and HEI, mitigating these differences. Further investigation is warranted to address eHealth compliance, and subsequent changes in health behavior.

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Compared to boys, adolescent girls have a higher prevalence of obesity, are more sedentary, and suffer more from psychosocial distress. It has been theorized that girls imitate their mothers’ body image concerns and physical activity habits. PURPOSE: The aim of this study was to explore the relationship between adolescent girls’ and mothers’ perceived physical and emotional health. METHODS: Adolescent girls (N = 44) and their mothers (N = 19) participated in seven and four focus groups, respectively. Each focus group lasted 30-45 minutes and included an average of six and five participants for girls and mothers, respectively. Questions focused on physical activity behaviors of mothers and daughters as well as their perceptions of body image and self-esteem. The focus groups were analyzed using “Framework Analysis”. Intercoder reliability was addressed through an iterative coding process (initial coding, code modification, recoding) whereby three of the authors developed and agreed upon the codes and subsequent collapsed themes. RESULTS: The thematic analysis resulted in four major themes and five subthemes: 1) Health related conversations are complex and result in a) daughters feeling frustrated and b) mothers feeling confused, 2) Social expectations influence body image through a) social networks and b) women’s changing bodies, 3) Social comparison is common in women and girls in a) their comparison of one another which influences the daughter’s perception of herself, and 4) Mothers’ health behaviors are noticed by daughters who report very little physical activity participation with mothers. CONCLUSION: Results from this study highlight the importance of health communication that mothers and daughters perceive as most challenging; daughters struggled with indirect conversations with their mothers about health, whereas their mothers struggled with direct communication about health. Potential implications of this research include the support for targeting mothers, in addition to adolescent girls, in interventions aimed at improving mother-daughter communication as well as adolescent girls’ health. Other possible implications include targeting psychosocial health (e.g., body image) and including a mothers’ educational component for programs aimed at improving adolescent girls’ health.

Youth sport coaches set the stage for athletes’ and parents’ future sport involvement, experiences, and perceptions as well as attitudes toward playing safely. If youth level coaches do not see safety as a priority, athletes and parents may not either. PURPOSE: To determine youth sport coaches’ safety perceptions and prioritization. METHODS: Youth sport coaches (males: n=28; females: n=2; age=46.2±12.1yrs; yrs coached=12.1±10.6y) from 10 sports completed a validated survey and participated in a qualitative focus group (FG) examining prioritization, challenges, and barriers related to implementing safety policies. Coaches reported their agreement level (1=opposed, 5=strongly agreed) to 5-6 statements evaluating their perceptions of sport safety. Coaches’ overall agreement level was determined by calculating the mean agreement of all statements. Results from this study highlight the importance of health communication that mothers and daughters perceive as most challenging; daughters struggled with indirect conversations with their mothers about health, whereas their mothers struggled with direct communication about health. Potential implications of this research include the support for targeting mothers, in addition to adolescent girls, in interventions aimed at improving mother-daughter communication as well as adolescent girls’ health. Other possible implications include targeting psychosocial health (e.g., body image) and including a mothers’ educational component for programs aimed at improving adolescent girls’ health.

Young children should be provided with physical activity (PA) opportunities that promote both skill and cognitive development. Unstructured free play, both indoors and outdoors, allows young children to accumulate PA while engaging in diverse types of play behaviors, which include social and cognitive components. Cognitive play behaviors focus on the purpose of the children’s activity and are classified as constructive, exploratory, functional, and game play. METHODS: To determine PA levels and cognitive play behaviors in toddlers during indoor and outdoor free play time. PARTICIPANTS: Children were 25 toddlers (2.9±0.6y) enrolled in a university laboratory school, who were observed for four 20-min free play segments (2 indoor and 2 outdoor). PA was assessed using the ActiGraph GT3X+ accelerometer worn on the right hip. Each free play assessment was video recorded for analysis using the Noldus Observer XT system. The Play Observation Scale was used to classify cognitive play behaviors (constructive, dramatic, exploratory, functional, and game play). RESULTS: The type of PA varied by environment (indoors vs. outdoors) and PA type. Group composition (with or without equipment) and fixed equipment contexts were included in the analyses. Group composition (indoors vs. outdoors) and PA type, environment (indoors vs. outdoors) and group composition as well as any interactions among these variables. RESULTS: The children spent 5.6% more time sitting/standing indoors (p<0.05). The children spent 7.6% more time on fixed equipment and in sociodramatic play compared to using manipulatives/portable equipment. CONCLUSION: The study highlighted youth sport coaches’ safety perceptions and prioritization.

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Previous research has examined contexts which may promote playing physically interactive video games (exergames) in place of traditional, sedentary video games in children. In one such study the presence of a friend did not increase children’s motivation to play an exergame versus a sedentary alternative. This lack of an effect may have been due to the competitive goal structure of the exergame studied. Children may prefer a cooperative game structure when playing with a friend. PURPOSE: To examine physiologic response and relative reinforcing value (RRV, i.e., motivation) for playing an exergame with a friend under two different goal structures: competitive and cooperative. METHODS: Participants (N = 7, 7.9 ± 1.5 years old) and a same-sex friend each completed three, 10-minute conditions: supine rest, competitive, and cooperative game play. During competitive game play, participants played Nintendo Wii Tennis against their friend. During the cooperative condition, subjects and their friend stood opposite one another, and played Tennis cooperatively. There were no differences (p > 0.05) between competitive and cooperative game play for VO2, liking, or O2 consumption. (No relevant relationships reported)
The utility of physical activity, fitness to improve cognition and academic achievement is important to make pleasant learning efforts and difficulties. PURPOSE: To verify the effects of three months of interdisciplinary physical education program on academic achievement and selective attention in children. METHODS: 60 boys and girls from 4th grade of public elementary brazilian school, underwent a Education by Movement group (EduMove) (n=39; 9.7±3y; 31.6 ± 6.2 kg; 1.4 ± 0.1 m; 17.9 ± 7.2 %body fat) with math, written and reading classes through physical education activities during a school journey (172.8±16.31bpm) (60min each class, twice a week), and a control group (Con) (n=21; 9.9±0.8y; 30.0 ± 5.1 kg; 1.4 ± 0.1 m; 17.1 ± 8.6 %body fat) which participated at traditional classes (92±8.9bpm). Children performed an academic achievement standardized test (reading, writing and math), selective attention test (Stroop, Go/NoGo) and anthropometric measures before and after three months. RESULTS: ANOVA revealed significant improvements in EduMove in comparison with Con at post test (11.8 ± 5.6 vs 12.7 ± 5.3; p=0.008), it was observed higher physical activity level for EduMove vs Con (Δ 23.3 ± 2.9 METs; p=0.09). Children showed better results at reading capacity for EduMove vs Con (65.2 ± 4.9 vs 64.7 ± 3.0; p=0.038). Regarding selective attention EduMove was faster and committed less mistakes in comparison with pre test (236.1 ± 39.9 vs 327.9 ± 45.88 min/c; Δ-90%ts 12% of mistakes) (p=0.09). CONCLUSIONS: A short term interdisciplinary physical education program can improve reading capacity, and selective attention in children. These results may suggest that activity breaks during a school journey could contributing to learning.

Previous research has showed the majority of high school adolescents are not physically active and fit (CDC, 2016). The literature indicates that individuals’ goal orientations would influence their healthy behavior (Elliot et al., 1999). The 3 × 2 Achievement Goal Model aims to understand individuals’ six goal orientations (i.e., task-, self-, other-approach, task-, self-, other-avoidance; Elliot et al., 2011). Therefore, it is important to identify high school adolescents’ goal orientations toward their physical activity and fitness. PURPOSE: Guided by 3 × 2 achievement goal approach, this study attempted to examine the adolescents’ goal orientations toward their physical activity and fitness. Achievements Goal Model aims to understand individuals’ six goal orientations (i.e., task-, self-, other-approach, task-, self-, other-avoidance; Elliot et al., 2011). Therefore, it is important to identify high school adolescents’ goal orientations toward their physical activity and fitness. PURPOSE: To identify high school adolescents’ goal orientations toward their physical activity and fitness.METHODS: 762 Chinese adolescents (432 females; 360 males; M_{age} = 16.9) enrolled into four high schools in Shanghai completed previously validated questionnaires assessing their TPB variables, PA, and depressive symptoms. Correlations were used to examine the relationships among the variables, and the hypothesized model was tested using structural equation modeling (SEM; AMOS 22). RESULTS: Correlation analysis revealed significant positive associations among TPB variables and PA, while depression was negatively related to TPB variables and PA. The SEM analyses indicated that the hypothesized model produces a good fit to the data (χ²/df = 33.9/6, p < .01; NFI = .98; IFI = .98; RMSEA = .08; 90% CI [.05, .10]). Specifically, the model accounted for 23.8% and 1.0% of the variance in PA and depression, respectively. Path coefficients suggested that attitude (β = .33), subjective norm (β = .21), perceived behavioral control (β = .28) were positively associated with intention. Intention (β = .11) and perceived behavioral control (β = .42) significantly predicted PA. PA negatively predicted depression (β = -.09). CONCLUSION: The findings support the theoretical tenets of TPB and provide empirical evidence of the relationships among key TPB variables, PA, and depressive symptoms in Chinese adolescents. These findings have significant practical implications for PA intervention strategies aimed at promoting adolescents’ PA and reducing depression.

A female ultrarunner’s ability to cope with stressful situations during competition is crucial for optimal development. Therefore, the ability to cope under these circumstances is essential for creating a strong mental capacity that leads to competitive success. PURPOSE: To quantify the athletic coping skills of female ultra runners. METHODS: Following written informed consent, 76 female ultra runners (mean age 38.9 ± 4.4) completed the Athletic Coping Skills Inventory (ACSI; Smith et al., 1995): coping with adversity (COPE), peaking under pressure (PEAK), goal-setting/mental preparation (GOAL), concentration (CONC), freedom from worry (FREE), confidence and achievement motivation (CONF), coachability (COAC), and personal coping resources (PCR). Data were grouped by distance (≤50 miles, 50-99 miles, 100+ miles), experience in years (novice-3, 4-9,10+), age (20-39 years, 40+ yrs), number of ultra races completed (1-2, 3-4, 5+), ethnicity (Caucasian, other), and competitive injuries (0, 1-2, 3+). RESULTS: MANOVA’s (Wilks’ λ) indicated significant main coping affects by distance (F(14,134) = 1.912; P = 0.039), experience (F(14,134) = 2.123; P = 0.014), and age (F(7,68) = 2.329; P = 0.034); but not by ultra competitions completed (F(14,134) = 1.239; P = 0.255), ethnicity (F(7,68) = 1.83, P = 0.324), and number of competitive injuries (F(14,134) = .899; P = 0.562). Post hoc analyses (T scores; T = 50, SD = 10) indicated 100+ ultra milers responded significantly higher in FREE (44 vs 34 vs 41; p = 0.011) and COAC (34 vs 30 vs 30; p = 0.019) than middle distance class runners, respectively. Runners with 10+ years of experience responded significantly less than those experienced (4-9 and Novice-3) in GOAL (58 vs 54 vs 51; p = 0.013), CONF (53 vs 48 vs 44; p = 0.012) and COAC (50 vs 46 vs 41; p = 0.022), respectively. Runners 40+ yrs responded higher in COPE (51 vs 47;
Quality of instruction significantly influences skill acquisition and performance in sport related tasks, such as golf putting. Instruction for novice individuals should promote external focus, and constantly emphasize the relationship between motor action and task outcome. PURPOSE: To analyze the influence of an anchoring bias, while also examining the learning benefits of integrating action-perception external foc. METHODS: The putting protocol consisted of three trials: pre-test, acquisition, and post-test. Each trial was performed from a distance of eight feet on artificial turf. Subjects (6 males, 6 females) did not receive instructions or cues for any of the ten putts during the pre- or post-tests. Two counter balanced groups were made upon the completion of the pre-test. Immediately before the start of the acquisition trial subjects were provided an anchor number and asked to estimate whether their average putt would stop closer or further than the number. Group one (High) was given an anchor of 12 inches and group two (Low) was given an anchor of 3 inches. External cues were positioned in front of and behind the starting point of the ball to facilitate club and ball path for the acquisition trials. The subjects were not made aware of the cues or instructed to use them in any way. The acquisition trial contained five blocks of twenty putts with a three-minute break between each block. Twenty-four hours after the completion of the acquisition trial subjects returned to complete the post-test. Distance from the target was measured as the average sum of horizontal and vertical distance. RESULTS: The high anchor group responded with an average of 5.55 inches (3.31-9.16 vs. 3.75-11.78, p < 0.05) more than the low anchor group. This difference was found to be significant, demonstrating that anchor values may have an influence on estimation. Error was reduced in both the High (50.1±18.07 vs. 40.8±9.71, p < 0.05) and Low (58.72±18.59 to 35.71±7.99, p < 0.05) groups from pre-test to post-test. Differences between groups were not found to be statistically significant (p = 0.262). CONCLUSION: Individuals used the provided anchor values to adjust their estimate of predicted performance. Significant differences in putt performance from pre to post test showed improvement in both groups. Improvement between groups were not significant.

Mindfulness includes the ability to be attentive and aware of present events and experiences without making judgments based off prior beliefs. There is evidence that mindfulness is related to grit and academic performance but has not been well studied in the collegiate athletic population. PURPOSE: The purpose of this study was to determine if grit, academic confidence and demographic factors were predictive of mindfulness in collegiate student-athletes. METHODS: 149 (19.6±1.23yrs; 191 male, 158 female) varsity student-athletes completed the Mindfulness Attention Awareness Scale, Academic Confidence Scale, and short grit scale as part of the baseline concussion testing protocol. 177 were classified as contact and collision student-athletes (Football, Lacrosse, Soccer), 75 as contact student-athletes (Basketball, Baseball, Softball), and 86 as limited contact student-athletes (Cross Country, Track and Field, Tennis, Golf, Volleyball). These classifications are used by the NCAA and may influence levels of mindfulness. A stepwise multiple regression was conducted to determine if grit, academic confidence and demographic factors were predictive of mindfulness in collegiate student-athletes. RESULTS: 94 (19.6±1.23yrs; 191 male, 158 female) varsity student-athletes completed the Mindfulness Attention Awareness Scale, Academic Confidence Scale, and short grit scale as part of the baseline concussion testing protocol. 177 were classified as contact and collision student-athletes (Football, Lacrosse, Soccer), 75 as contact student-athletes (Basketball, Baseball, Softball), and 86 as limited contact student-athletes (Cross Country, Track and Field, Tennis, Golf, Volleyball). These classifications are used by the NCAA and may influence levels of mindfulness. A stepwise multiple regression was conducted to determine if grit, academic confidence and demographic factors were predictive of mindfulness in collegiate student-athletes. METHODS: The putting protocol consisted of three trials: pre-test, acquisition, and post-test. Each trial was performed from a distance of eight feet on artificial turf. Subjects (6 males, 6 females) did not receive instructions or cues for any of the ten putts during the pre- or post-tests. Two counter balanced groups were made upon the completion of the pre-test. Immediately before the start of the acquisition trial subjects were provided an anchor number and asked to estimate whether their average putt would stop closer or further than the number. Group one (High) was given an anchor of 12 inches and group two (Low) was given an anchor of 3 inches. External cues were positioned in front of and behind the starting point of the ball to facilitate club and ball path for the acquisition trials. The subjects were not made aware of the cues or instructed to use them in any way. The acquisition trial contained five blocks of twenty putts with a three-minute break between each block. Twenty-four hours after the completion of the acquisition trial subjects returned to complete the post-test. Distance from the target was measured as the average sum of horizontal and vertical distance. RESULTS: The high anchor group responded with an average of 5.55 inches (3.31-9.16 vs. 3.75-11.78, p < 0.05) more than the low anchor group. This difference was found to be significant, demonstrating that anchor values may have an influence on estimation. Error was reduced in both the High (50.1±18.07 vs. 40.8±9.71, p < 0.05) and Low (58.72±18.59 to 35.71±7.99, p < 0.05) groups from pre-test to post-test. Differences between groups were not found to be statistically significant (p = 0.262). CONCLUSION: Individuals used the provided anchor values to adjust their estimate of predicted performance. Significant differences in putt performance from pre to post test showed improvement in both groups. Improvement between groups were not significant.

Deception is a psychological approach to manipulate the exercise expectation (EE) before or during self-paced exercise (SIE). PURPOSE: Verify if negative expectations would alter pacing strategy, performance and psychophysiological responses to an all-out sprint interval exercise (SIE). METHODS: Participated of the study, eleven cyclists (34 ± 6 years old, 173 ± 4.8 cm, 73 ± 5.8 kg, 52.9±8.1 ml/kg/min, 298.4±29.9 Wpeak). After characterize the cyclists, the pre-test was performed: (1) control (CON) composed by a ten all-out sprints, with 0.1 kg body mass workload, interspersed by a 60 s of passive recovery, without manipulating the EE, (2) two more demanding exercise expectation (MDEE), with the same exercise configuration as in the CON, but the cyclists were informed that the EE have a higher demand than in CON, based on the information of they would rest for 50 s between the sprints, however they actually rested for 60 s. Performance as a peak (PPO) and mean (MPO) power output and physiological measurements (heart rate (HR), VO2 and lactate (BLC)) were recorded continuously over the SIE and psychophysiological measurements (PFE, felling scale (FS) and felt arousal scale (FAS)) were collected during each recovery period. RESULTS: The manipulation of EE was not found on performance, however the MDEE session show a higher PPO in the last sprint (p = 0.019). EE main effect was also detected for FS (p < 0.001) but not for FAS (p = 0.26) responses. Although we did not detect an effect of EE on performance between experimental sessions (CON vs MDEE), affect and pacing performance (MPO) were related. These correlations seems to indicate that either valence or the arousal have better associations either for the CON (r = 0.20, P = 0.05) and to maintain a mental balance that allows them to be successful in their personal life and to perform well, to deal positively with stress and pressure associated with competitions, to what is observed is MDEE. Main effect of exercise expectation was also found in HR (p = 0.002) but not for VO2 (p = 0.067) and BLC (p = 0.38). CONCLUSIONS: The manipulation of pre-EE, it seems to influence psychophysiological but not physiological responses, in two all-out SIE with the same exercise configuration.

Flow state (FS) and motivation (M) are among the most studied psychological conditions that may affect athletes’ performance. Highly intrinsically motivated players who are fully synchronized and absorbed into their game have greater chances to perform well, to deal positively with stress and pressure associated with competitions, and to maintain a mental balance that allows them to be successful in their personal life as well. Among the strategies that athletes, or their coaches, adopt to promote a positive mental condition before and after trainings and competition, listening to music has become a widespread trend. PURPOSE: to determine motivational and flow profiles of athletes based on their use of music before and after trainings and competitions. METHODS: A sample of 263 athletes participating in the 2017 University Olympics of Mexico filled a questionnaire on music habits and preferences, the Sports Motivation Scale, and the Flow State Scale. Two cluster analysis was performed to explore athletes’ music-related profiles. RESULTS: The analysis highlighted the presence of two main groups: Music Enthusiasts (ME), athletes who listen to music often in

Abstracts were prepared by the authors and printed as submitted.
training and match situations, are characterized by high intrinsic (20.2), low extrinsic motivation (9.3), and null amotivation (7.5); also, they have high levels of flow state (FS = 18); and Music Intrinsic Motivation (MIM), athletes who listen to music seldom or never have low intrinsic (5.1), high extrinsic motivation (20.4), as well as high amotivation (19.3); although MIM’s flow profile is similar as ME’s in many dimensions, the formers show moderate balance between personal skills and task challenges (12.2), moderate focus on their tasks (13.1), and tend to have low self-awareness (9.9).

CONCLUSIONS: Listening to music seems to trigger an optimal mental state before trainings and competitions, as well as it allows athletes to maintain a psychological balance after their performance.

For an athlete whose identity is contingent upon their participation in sport, an injury that forces them to cease participation can represent a significant loss. As a result, grief models are often applied to the context of sport injury. However, most models may be outdated, and little empirical research has been done to test their applicability to sport injury. PURPOSE: The effectiveness of grief-response models in describing emotional responses to injury was evaluated in collegiate student-athletes. Additionally, the role of social support in determining emotional response was investigated. METHODS: 14 collegiate student-athletes (9 female, 5 male) across five Division I sports participated in this study by completing a semi-structured interview regarding the individual’s injury experience. RESULTS: Athletes most frequently reported feeling upset, frustrated in multiple stages of recovery. Additionally, results identified a need for increased availability of social support resources on campus, as well as, training for coaching staff on how to better meet the expectations and needs of injured athletes. For an athlete whose identity is contingent upon their participation in sport, an injury that forces them to cease participation can represent a significant loss. As a result, grief models are often applied to the context of sport injury. However, most models may be outdated, and little empirical research has been done to test their applicability to sport injury. PURPOSE: The effectiveness of grief-response models in describing emotional responses to injury was evaluated in collegiate student-athletes. Additionally, the role of social support in determining emotional response was investigated. METHODS: 14 collegiate student-athletes (9 female, 5 male) across five Division I sports participated in this study by completing a semi-structured interview regarding the individual’s injury experience. RESULTS: Athletes most frequently reported feeling upset, frustrated in multiple stages of recovery. Additionally, results identified a need for increased availability of social support resources on campus, as well as, training for coaching staff on how to better meet the expectations and needs of injured athletes.

**RESULTS**

compared by sport type and sex.

In four categories: "Low risk" (≤50), "Moderated risk" (≥51 <60), "High risk" (≥61 <70) and "With burnout" (>70). The frequencies and proportions were counted and presented higher proportion of "Moderated risk" to suffer burnout in the EE indicator of "With burnout" in EE was observed for individual than team sports (p=0.06). On the other hand, statistically significant differences were found in three factors between females and males. Males showed higher frequency of "Low risk" in EE compared to females (p=0.06), also females presented higher proportion of "Moderated risk" to suffer burnout in the EE indicator than males (p=0.02). In the D factor, males reported a higher proportion of "High risk" to suffer burnout than females (p=0.03). Table 1 presents the proportion of burnout indicators by sport type and sex.

<table>
<thead>
<tr>
<th>By sport type</th>
<th>Team sports (n=124)</th>
<th>Individual sports (n=112)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EE</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>EE</td>
<td>D</td>
</tr>
<tr>
<td>Low risk</td>
<td>53.2% (n=66)</td>
<td>43.6% (n=54)</td>
</tr>
<tr>
<td>Moderate risk</td>
<td>33.9% (n=42)</td>
<td>34.7% (n=43)</td>
</tr>
<tr>
<td>High risk</td>
<td>11.3% (n=14)</td>
<td>13.7% (n=17)</td>
</tr>
<tr>
<td>With burnout</td>
<td>1.6% (n=2)</td>
<td>8.1% (n=10)</td>
</tr>
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**CONCLUSION**

the primary source that the student-athletes wished they had received more support. Both of their parents as their greatest source of social support, while coaches were

**METHODS:** To investigate differences in motivation types in NCAA Division II student-athletes (SAs) over three time points. METHODS: Overall, 530 SAs (n=530, n = 175) with an age range of 18 to 23 (M = 19.40, SD = 1.33) from 21 teams voluntarily completed a demographic questionnaire and the 18-item Sport Motivation Scale II used to measure six motivation types: intrinsic (IR), integrated (INTR), identified (IDR), introjected (INT), external (EXT), and amotivation (AMR) regulation. Six, one-way, repeated measures Analyses of Variance with Bonferroni post hoc tests were used to analyze SA motivation types over the pre-season (PS), in-season (IS), and off-season (OS). An alpha level of p ≤ .05 was set for statistical significance. RESULTS: Analyses revealed statistically significant differences in IR, INTR, IDR, and AMR types over time. For IR, a difference was seen, F(2,710) = 3.66, p = .026, between the PS and IS (p = .028) with lower scores in the IS (M = 16.11, SD = 4.21) versus the PS (M = 16.67, SD = 4.13). For INTR, differences were seen, F(1,95, 691.39) = 15.75, p < .001, between both the PS and IS (p < .001) and between the PS and OS (p < .001) with lower scores in the IS (M = 16.69, SD = 3.69) and OS (M = 16.53, SD = 4.05) versus in the PS (M = 17.58, SD = 3.29). For IDR, a difference was seen, F(1,92, 680.470) = 5.89, p = .003, between the PS and IS (p = .004) with higher scores in the IS (M = 16.43, SD = 4.09) versus in the PS (M = 17.12, SD = 3.62). For AMR, differences were seen over time, F(1,97, 699.89) = 8.21, p < .001, between both the PS and IS (p < .001) and between the PS and OS (p < .001) with higher scores in the IS (M = 7.82, SD = 4.31) and OS (M = 7.78, SD = 4.73) versus lower scores in the PS (M = 6.93, SD = 4.11). CONCLUSIONS: Findings demonstrated that more self-determined motivation (IR, INTR, IDR) was highest in the PS while increasing AMR scores predominated over time extending into the IS and OS. This is consistent with the athlete burnout/SDT literature where motivation extremely low in internalization (i.e., AMR) is positively associated with burnout and motivation extremely high in internalization (i.e., IR) is negatively associated with burnout (Cresswell, 2009; Cresswell & Ekland, 2005a, 2005b).
The National Collegiate Athletic Association has over 250,000 students competing in Division I (DI) and Division III (DIII) programs. DI colleges comprise 32% of the association while DIII accounts for 40%. Previous studies of individuals within the same collegiate level have uncovered a positive correlation between the hours of deliberate play and athletic skill level. To date, there have been no studies on comparing the two aforementioned divisions. PURPOSE: To investigate the quantity of deliberate play that contributes to achieving the DI and DIII methods.

METHODS: Using an online interview as proposed by Côté, Ericsson, and Law (2005), all student-athletes from both Rice University (DI) and State University of New York (SUNY) in Plattsburgh (DIII), were recruited via email. Sixty-three participated from DI (track and field, basketball, and football) and 90 from DIII (track and field, basketball, hockey, soccer, softball, and tennis). The response rate was 17% and 29%, respectively. Descriptive statistics and parametric tests were used in the analysis. RESULTS: Differences with statistical significance (p<0.05) were found in: (a) height (when you play 6 days or more per week), (b) GPA (when you play 6 days or more per week), (c) participation in early activities of art (17 to 37%), organized games with rules (72 to 86%), and other sport-related activities (48 to 74%), (c), parents being top athletes (24 to 48%), and (d) the current activities of sleeping (25 to 52 hours per week), socializing (9 to 21 h.), school/work (8 to 21 h.), and studying (9 to 15 h.). CONCLUSIONS: In both divisions, we further attest to the suggestions of Côté et al. (2003) about participation of youth in multifarious activities. Our results also align with past work from Landers et al. (2011), which has underscored the competitive advantage of athletes with longer levers over their shorter peers. The comparison of current activities indicate that a DI school may be promoting a more wellness lifestyle (including all its dimensions, such as social, physical, occupational, and mental). Possible limitations of this study are the use of convenience and unequal samples, self-reported data, and of retrospective methods. Future research, comparing more cases of different-division schools, is recommended.
1363 Board #171 May 31 9:00 AM - 10:30 AM

**Muscle Dysorphic Disorders, Body Dissatisfaction and Eating Disorder in Male Bodybuilders**

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(No relevant relationships reported)

Muscle dysorphic disorders (MDD) have been described as a body image disorder, characterized by a perceived lack of muscularity, and largely affect males. **PURPOSE:** The study aimed to determine the rates and relationships among MDD, body image disturbance and eating disorders in both competitive/professional and non-competitive/recreational male bodybuilders. **METHODS:** The participants consist of 120 bodybuilders (competitive, n=62 (mean age 25.63 ± 6.67 yr) recruited from 4 bodybuilding gym centers in Ankara, Turkey. Weight, height and body fat percentage were measured with BIA (Tanita, TBF - 300). To assess symptoms of eating disorders, muscle dysmorphia, and body dissatisfaction, the participants were asked to answer four questionnaires, including Eating Attitude Test (EAT)-40, Muscle Dysmorphia Disorder Inventory (MDDI), and Bodybuilder Image Grid (BIG)-Original (BIG-O) and Scale (BIG-S), the instruments to measure the perceptual body images disturbance and perceived attractiveness. A multiple linear regression model was used to identify independent factors associating eating disorders. **RESULTS:** 81 bodybuilders (67.5%) had EAT-40 scores above its cut off point, indicating having eating disorders, and there was no significant difference between competitive and non-competitive bodybuilders (p>0.05). The average scores of BIG-O and BIG-S showed statistically significant differences (p<0.01) in current and ideal body fat and muscle mass, indicating the most bodybuilders desire to be leaner (less fat) and muscular than their current body sizes. According to MDDI, 70 bodybuilders (58.3%) had a risk of having MDD. Furthermore, there was a significant positive correlation between EAT-40 and MDDI total scores (r = 0.614, Φ = 0.713, p<0.001) in both competitive and non-competitive bodybuilders. A linear regression analysis predicts that the eating disorder was a relative risk factor for MDDI and muscle-related body dissatisfaction in male bodybuilders. **CONCLUSIONS:** Eating disorder psychopathology is positively related with body dissatisfaction and body dysmorphic disorders. The screening tools, EAT-40, MDDI, and BIG-O and BIG-S may provide early detections of body dissatisfaction and eating disorders in male bodybuilders.

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**Training Mental Toughness In Sport: A Review And Meta-analysis**

Andreas Stamatis1, Peter W. Grandjean, FACSM2, Grant B. Morgan2, 1SUNY Plattsburgh, Plattsburgh, NY; 2Baylor University, Waco, TX. (Sponsor: Dr. Peter Grandjean, FACSM)

(No relevant relationships reported)

In January 2017, after a week of strenuous, military-style, and accedentially-based workouts designed to test the level of mental toughness (MT), three Pac-12 football players were diagnosed with rhabdomyolysis. In sporting environments, are there any safe and effective, empirically-based MT interventions? To date, there has been no attempt to collate all available empirical evidence in regards to development of MT in Sport.

**PURPOSE:** To summarize evidence relating to MT training programs in developing MT levels.

**METHODS:** Cross-sectional designs and pre- and post-test experiments were included. No publication date restriction was imposed. Participants of any age, gender, sport, or level were included. This search was applied to Embase, Scopus, PubMed, and SPORTDiscus. Two reviewers assessed the risk of bias using: (a) for RCTs, the PEDro scale, (b) for before-after studies with no control group, the ‘Before-After (Pre-Post) Studies With No Control Group’, and (c) for single-subject research study, the ‘Quality Indicators’. The outcomes of primary interest were the scores of MT, which were translated into standardized variables (SMD). The meta-analysis was completed using a random-effects model.

**RESULTS:** Nine studies were included in the systematic analysis and seven in the meta-analysis. The methodological quality of those nine studies was not high. Common areas that increased the risk of bias include: (a) RCT’s: allocation was not concealed, key outcomes were self-reported, no blinding of all subjects/assessors, and no random allocation of subjects; (b) Before-After Studies With No Control Group: No enrollment of all subjects who meet the inclusion/exclusion criteria, no blinding of assessors, and no reporting of relevant information; and (c) Single-subject design: fewer than three data points per phase without justification. MT scores increased by 0.88 standard deviation between competitive and non-competitive male bodybuilders (95% CI). The values contained within the confidence interval were at least medium effect sizes and the variance of this estimate was 0.23.

**CONCLUSIONS:** A strong positive effect was observed. Therefore, the results are promising. Nevertheless, the authors believe that conclusions cannot be drawn due to limited number of reliable results, which creates a high level of uncertainty. However, this finding itself is of value.

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**Relationships among Perceived Recovery, Vertical Jump And Change In Repeated Sprint Performance**

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(No relevant relationships reported)

Recovery may be determined by using a counter movement vertical jump (CMJ). While a CMJ has been shown effective to evaluate recovery, there may be more efficient, less physically taxing alternatives such as the Perceived Recovery Status (PRS) Scale. The PRS is a non-invasive, and accurate psychophysiological tool designed to measure recovery and its correlation to performance. **PURPOSE:** To determine the efficacy of CMJ and PRS as methods for monitoring recovery between repeated sprint efforts. **METHODS:** Eight college-aged individuals (age=23±0.9 years; height=1.66±0.11 meters; weight=67.1±3.4 kg; percent body fat=17.5±4.8%) performed repeated sprints. The protocol consisted of three sets of eight 30 meter sprints on a non-motorized treadmill with 45 seconds of rest between each sprint. The sets were separated by 5 minutes of passive rest. Mean power output (MP) was measured during each sprint. RPE (overall) was recorded immediately following each sprint. Immediately before the next set of sprints PRS was recorded and a CMJ was performed on a force plate where maximal height was calculated. RESULTS: A 1-way repeated measures ANOVA showed a significant main effect of sprint set on RPE (p<0.04) and PRS (p<0.01). Subsequent pairwise comparisons revealed significant differences for RPE between sprint sets 1 and 2 (p<0.05), and in PRS between sprint sets 1 and 2 (p<0.001), and sprint sets 1 and 3 (p<0.02). Correlations showed the relationship between PRS and delta MP to be moderate, and significant (R2=0.32) while the relationship between CMJ and MP was weak (R2<0.04). **CONCLUSION:** Current results suggest PRS may demonstrate a stronger relationship with change in repeated sprint performance within a session than CMJ. However, neither index of recovery was robust, and may indicate that these measures may be more appropriate for monitoring between day-to-day training sessions (as previous research established) and not necessarily to gauge recovery as in the current paradigm.

1366 Board #174 May 31 9:00 AM - 10:30 AM

**Cross-cultural Invariance Of The Mental Toughness Inventory Among American And Greek Athletes**

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(No relevant relationships reported)

The popularity of the term mental toughness (MT) in sporting environments, at least in the U.S., has been established. However, its worldwide cultural relevance remains to be fully uncovered. Recently, Gucciardi et al. (2016), using the Mental Toughness Index (MTI), reported intra-cultural invariance of MT in Australia. To date, there has been no effort to uncover the extent of the universality of the term between Europe and USA via MTI.

**PURPOSE:** To examine the invariance of MT across two different cultural groups of athletes and to further validate MTI. **METHOD:** The MTI was completed by 99 Greek and 173 US athletes via Qualtrics. The MTI consisted of eight items with a seven-point response scale. Both samples consisted of roughly half male and half female athletes from a number of sports, including American football, basketball, baseball, softball, volleyball, golf, tennis, soccer, track and field, swimming. Judo was only reflected in Greek sample.

Invariance testing was conducted using multiple group confirmatory factor analysis with increasingly restrictive models. We first fitted a unidimensional model within each sample to ensure good model-data fit. Then we estimated configurual (equal number of dimensions), metric (configural + equal loadings), and scalar invariance models (metric +equal intercepts). Scalar invariance is the minimum type of invariance to infer cross-cultural equality. To test whether the model-data fit for use between day-to-day training sessions (as previously established) and not necessarily to gauge recovery as in the current paradigm.
Conclusion: The results of this analysis provide evidence for the partial scalar invariance of the MTI across cultural samples. This implies that the meaning of the MT construct and the levels of the underlying items are equal in both cultures. As a result, the two cultures can be directly compared on their scores in the latent variable.

In recent years, there has been an increased emphasis on improving athlete recognition of signs and symptoms associated with concussion. Despite these empirical advances, approximately 50% of concussions at the collegiate level are believed to go unreported. In order to understand the motivational aspect of reporting concussions, it is crucial to identify factors contributing to an athlete’s intentions to report. Athletes that more strongly identify with their role in their sport may be less likely to report a concussion because they fear losing their athletic identity. PURPOSE: To examine the relationship between athletic identity and concussion reporting intentions in student-athletes. METHODS: Student-athletes from 3 universities in the state of Georgia were invited to complete a survey via Qualtrics (n=298/498 response rate = 59.7%, male=41.8%). The previously validated survey included questions to assess indirect (8 items) and direct (3 items) concussion reporting intentions and the Athlete Identity Measurement Scale which includes 10 athletic identity (AI) items. All items were answered on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Two separate simple linear regressions were used to determine whether AI predicted intentions (alpha=0.05). A one-way ANOVA was used to compare reporting intentions between athletes (high and low AI). RESULTS: Athletic identity did not significantly predict indirect (R2=0.09; F(1,265)=0.65; p=0.12) or direct (R2=0.002; F(1,265)=2.54; p=0.42) concussion reporting intentions. There were no significant differences between groups for indirect (low AI mean=5.1, high AI mean=5.8, F(1,265)=3.14, p=0.07, low AI 95% CI [5.41, 6.02], high AI 95% CI [5.12, 5.51]) or direct (low AI mean=6.30, F(1,265)=1.07, p=0.30, low AI 95% CI [5.53, 7.85], high AI 95% CI [5.89, 6.21]) intention to report a concussion. CONCLUSIONS: Although AI does play an important role in predicting outcomes following sport-related injuries, it does not seem to significantly predict concussion reporting intentions in the current study. Results of this study suggest the importance of considering the multiple factors that may explain athletes’ intentions to report concussions beyond how highly they identify themselves with their sport.

Purpose: To compare by sex and by type of sport the proportion of college athletes that show the probability of Anxiety and Depression Disorders among screening psychological instrument. METHODS: 237 college athletes from a high performance program were evaluated. They were catalogued into two sports modalities, Individual sports (Athletics, Boxing, Fencing, Aerobic Gymnastics, Weightlifting, Wrestling, Taekwondo, Table Tennis, Archery and Triathlon) and Team sports (Basketball, Football, Soccer, Handball, Softball, Beach Volleyball and Indoor Volleyball). The instrument used was the Goldberg Anxiety and Depression Scale (a screening test, to evaluate two subscales of Anxiety and Depression). Subsequently, subjects were categorized with “No anxiety” (score ≤4), “Probable anxiety” (score ≥4 <7), and “Probable severe anxiety” (score ≥7), and with “No depression” (score <2), “Probable depression” (score ≥2 <6), and “Probable severe depression” (score ≥6). Then frequencies and proportions were counted and compared by sex and by type of sport. RESULTS: We found most of the total sample showed “Probable depression”, and in the area of anxiety, most of them showed “No anxiety”. Statistically significant differences were found by sex, where women showed higher proportion of “Probable severe depression” than men (p = 0.01). In the area of anxiety, men showed higher “No anxiety” proportion than women (P = 0.003), and women showed higher proportion of “Probable anxiety” than men (P=0.03). For the comparison between type of sport, no statistically significant differences were found (Table 1).

Conclusions: The results showed that women had a higher proportion of probable anxiety and depression compared to men. The type of sport was not a significant factor for differences in the presence of anxiety and depression. However, the evaluation was done by a screening instrument, so it is advisable to carry out a thorough assessment to obtain a better diagnosis.

| Table 1. Proportion of probable depression and anxiety diagnosis by sex and sport |
|---------------------------------|---------------|---------------|---------------|
|                                | Total sample  | By sex        | By sport      |
|                                | Females      | Males         | Individual   | Team            |
| Depression                      |              |               |               |                 |
| No depression                   | 41.4% (n 98) | 31.6% (n 24) | 46.0% (n 74) | 43.8% (n 49)    | 39.2% (n 49)    |
| Probable depression             | 50.6% (n 120)| 54.0% (n 41) | 49.1% (n 79) | 50.9% (n 57)    | 50.4% (n 63)    |
| Probable severe depression      | 8.0% (n 19)  | 14.5% (n 11)  | 5.0% (n 8)   | 5.4% (n 6)      | 10.4% (n 13)    |
| Total                           | 100% (n 237) | 100% (n 76)  | 100% (n 161) | 100% (n 112)    | 100% (n 125)    |
| Anxiety                         |              |               |               |                 |                 |
| No anxiety                      | 52.3% (n 124)| 38.2% (n 29) *| 59.0% (n 95) *| 56.3% (n 63)    | 48.8% (n 61)    |
| Probable depression             | 33.8% (n 80) | 43.4% (n 33) *| 29.2% (n 47) *| 30.4% (n 34)    | 36.8% (n 46)    |
| Probable severe depression      | 13.9% (n 33) | 18.4% (n 14) | 11.8% (n 19) | 13.4% (n 15)    | 14.4% (n 18)    |
| Total                           | 100% (n 237) | 100% (n 76)  | 100% (n 161) | 100% (n 112)    | 100% (n 125)    |

*Significant differences by sex (p<0.05)
The purpose of this cross-sectional study was to examine the relationship between short-passing ability and anxiety and self-confidence among collegiate soccer players. The purpose of this study was to assess the effects of prolonged use of smartphones, which causes mental fatigue, can reduce the physical and technical performance of young footballers. Therefore, it is necessary to educate to the conscientious use of technology.

Competitive soccer players are required to perform various physiological movements including short passing under the stressful conditions of a match. Individual self-confidence and ability to perform under pressure may impact on a successful match outcome. PURPOSE: The purpose of this cross-sectional study was to examine the relationship between short-passing ability and anxiety and self-confidence among collegiate male and female soccer players. METHODS: Participants included 17 Division III collegiate soccer players (19 ± 1 years, 65% female, 35% male) who completed the following questionnaires on a computer to assess competitive anxiety and self-confidence: The Illinois Competitive State Anxiety Inventory-2 (CSAI-2R), Sport Competition Anxiety Test (SCAT), and Trait Sport-Confidence Inventory (TSCI). Soccer skills were then assessed indoors as measured by total time on Loughborough soccer passing test (LSPT), which consisted of 16 short passes completed as fast as possible. Data were analyzed using descriptive statistics and Spearman’s rho correlation. Results: Mean short-pass total time was 55.7 ± 12.0 seconds. We observed positive relationships between SCAT and LSPT total time (r = .51, p < .004) and CSAI-2R and LSPT total time (r = .52, p < .004) as anxiety increased; so did total time on the passing tests. Additionally a strong negative relationship was found between TSCI and LSPT total time (r = -.68, p < .004): as self-confidence increased, total time on the passing test decreased. Conclusions: Increased anxiety and decreased confidence lead to poorer short-passing performance in collegiate soccer players. Coaches should consider interventions to decrease anxiety and improve self-confidence in preparation for soccer competition.

Mobile devices (i.e., smartphones and tablets) have acquired important functions in both interpersonal and individual spheres. For this reason, they can cause a true dependence for the young people. Moreover, prolonged periods of cognitive activity may cause mental fatigue, which influences their performances in team sports. PURPOSE: The purpose of this study was to assess the effects of prolonged use of smartphones on physical and technical performance of young footballers. METHODS: In total, 16 young male footballers (15 ± 1 years) were randomly assigned to two studies, Study 1 (S1, n=8) or Study 2 (S2, n=8), in which the Yo-Yo Intermittent Recovery Test level 1 and the Loughborough Soccer Passing Test were performed, respectively. The soccer-specific physical and technical performance was assessed for S1 and S2. In both studies, the participants underwent mental fatigue through the use of smartphones (Brain It On App) for 30 minutes, and to the control condition (normal activities) after at least 48 hours. A crossover study design and a paired t-test (p<0.05) were used. RESULTS: S1 performed shorter running distances in the state of mental fatigue than under the control condition (1610 ± 135 vs. 1780 ± 249 m, Δ=-10.56%, p = .046). In addition, mental fatigue significantly increased the performance time in S2 compared with the control condition (51 ± 6 vs. 43 ± 2.2 s, Δ=15.7%, p = .003). CONCLUSION: Our findings suggest that prolonged use of smartphones, which causes mental fatigue, can reduce the physical and technical performance of young footballers. Therefore, it is necessary to educate to the conscientious use of technology.
self-paced TT under 4 environmental conditions at random: SLTN, SL hot (SLH; 250 m, 35°C, 30% RH), altitude thermoneutral (ATN; 3,000m, 20°C, 30-50% RH) and altitude hot (ALT; 3,000 m, 30°C, 30% RH). Performance was assessed by the total amount of work (kilojoules, kJ) completed during each TT. Heart rate (HR) and rate of perceived exertion (RPE) were recorded during the TTs. RESULTS: The CV was 2.6% for familiarization trials. Differences existed in total work completed during the 15 min TT between SLTN vs ATN (167 ± 32 vs 148 ± 28 kJ, P < 0.05). SLTN vs ALT (167 ± 32 vs 149 ± 32 kJ, P < 0.05), and SLH vs ALT (159 ± 32 kJ vs 139 ± 29 kJ, P < 0.05). No differences existed in mean HR during the TT, or in RPE at the end of exercise (P > 0.05) for both between any of the conditions. Pacing at 3 min increments was not different between environments (P > 0.05).

CONCLUSION: Self-paced TT performance was negatively impacted by exposure to altitude, but not heat. The combination of heat and altitude did not lead to a further decrement in exercise performance than that caused by either of the two environments acting alone.

Disclaimer: The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or reflecting the views of the Army or the Department of Defense.

Objective and subjective measures of the stress response have been shown to increase in response to exercise in sea-level thermoneutral (SLTN), hot, or altitude environments. However, responses to a combination of these stressors remain unclear.

PURPOSE: To determine if the responses of objective (serum cortisol [CORT] and subjective (perceived strain index [PeSI]) stress indices are further increased in a combined environment of heat and altitude. METHODS: Six participants (1 F, 5 M) completed 30 min of steady state (SS) exercise on a cycle ergometer at 50% of SL VO\(_2\)max in four separate environmental conditions: 1) SLTN (250 m, 20°C, 30-50% RH); 2) Sea-level hot (250 m, 35°C, 30% RH); 3) Altitude thermoneutral (3,000 m, 20°C, 30-50% RH); and 4) Altitude hot (3,000 m, 35°C, 30% RH) in randomized order, separated by ~1 week. Blood samples were drawn via an indwelling venous catheter: upon arrival to the laboratory (baseline, BL); 1 hr upon reaching target environmental condition but before SS (PRE); and immediately following SS exercise (POST). A seated posture was maintained for at least 20 min prior to each draw. PeSI, a product of rating of perceived exertion (RPE) and perceived thermal stress (TS), \(5*(TS/16) + 5*(RPE-6)/14\), was calculated PRE and POST SS exercise.

RESULTS: CORT (ng/ml, mean ± SD) response to SS exercise did not differ among any of the four environmental conditions at any time point (P>0.05); however, there was a main effect of time on CORT levels as shown by an increase over both BL and POST (110 ± 64 vs. 120.32 ± 72 p<0.05) and PRE and POST (113 ± 66 vs 120 ± 72, p<0.05). Similarly, no differences in PeSI (mean ± SD) were observed among any of the environmental conditions (P<0.05), yet there was a main effect of time on PeSI (P<0.05) as demonstrated by an increase from PRE (1.36 ± 0.40) to POST (4.68 ± 1.65) SS exercise. CONCLUSION: During SS exercise, the combination of heat and altitude resulted in similar objective and subjective stress responses compared to any singular environmental stressor, suggesting that, exercise, and not environmental condition, is responsible for any observed differences.

PURPOSE: To determine if consuming fluid equal to fluid loss has an impact on performance at moderate simulated altitude. The researcher aimed to determine if consuming fluid equal to fluid loss prior to and during every 15 min appears to reduce the negative relationship between eNO and systolic pulmonary artery pressure during acclimatization to high altitude. These data suggest that eNO plays a role in pulmonary acclimatization.

Funding: This study was funded by The North Face Company, The National Geographic Society, and Mayo Clinic.

PURPOSE: The purpose of the current research was to clarify approaches to fluid parameters that may improve exercise performance at moderate simulated altitude. The researcher aimed to determine if consuming fluid equal to fluid loss has an impact on performance at moderate simulated altitude. The researcher aimed to determine if consuming fluid equal to fluid loss prior to and during every 15 min appears to reduce the negative relationship between eNO and systolic pulmonary artery pressure during acclimatization to high altitude. These data suggest that eNO plays a role in pulmonary acclimatization.
increased more from Pre to Post (60%) and 1hr-Post (83%) in Hypoxia than in Normoxia (33% & 57%, respectively). Significant main effects were also shown for IL-6, ICAM-1, CD14, and MCP-1. All were higher in Hypoxia (p < 0.05). MPO increased at Post in Normoxia (121%, p = 0.05) but did not increase until 1hr-Post in Hypoxia (129%, p = 0.02).

CONCLUSIONS: Preliminary data suggest exercise at altitude may increase gastrointestinal barrier damage and leukocyte activation, as indicated by higher levels of IL-6, ICAM-1, CD14 and MCP-1. Increased CD14 and ICAM-1 suggest TLR4-mediated inflammatory signaling may also be elevated, but the delayed increase in MPO following exercise at altitude warrants further investigations.

The cerebral blood flow velocity (CBFV) response to acute hypoxia has been known to increase. But, how CBFV might respond to exercise in hypoxic condition and be associated with EEG remains unclear. PURPOSE: To evaluate the effects of exercise in hypoxic condition corresponding to the altitudes of 4000m on cerebral blood flow velocity and EEG. METHODS: In a randomized, double-blind, balanced crossover study, ten healthy volunteers (19±6.0 years) were asked to perform the incremental bicycle ergometer exercise twice in hypoxic and control (sea level) condition with a week interval, respectively. Exercise intensity was set initially at 50W and increased by 25W every 2 minutes to 125W. Acute normobaric hypoxic condition was maintained for 45 minutes using low oxygen gas mixture. EEG was recorded from 6 scalp sites (frontal, temporal and occipital lobe of the international 10-20 system) leading to analysis of theta (4-7Hz), alpha (8-13Hz), beta (13-30Hz), and gamma (30-50Hz) relative activities. All data were analyzed using two-way ANOVA with repeated measures and Pearson’s correlation. RESULTS: CBFV in MCA in hypoxic condition was significantly higher than in control group (3850 m: 74 ± 4%, 4830 m: 88 ± 4%). CBFV in MCA in hypoxic condition was significantly lower than in control group immediately after exercise (0.28 ± 0.07 vs. 0.20 ± 0.07 µV, p<.05). Gamma wave activity of frontal lobe in hypoxic group was significantly higher than in control group immediately after exercise (0.25 ± 0.12 vs. 0.12 ± 0.08 µV, p<.05). Theta wave activity of left frontal lobe in hypoxic group was significantly lower than in control group at 20 minutes recovery (0.08±0.05 vs. 0.15±0.05 µV, p<.05). CONCLUSION: These results suggest that acute exposure to mild hypoxic condition may amplify the change of EEG activities which has been commonly observed during exercise.

Electroencephalography (EEG) during exercise has been unknown. PURPOSE: To determine the compensatory heart rate response (%Δ heart rate (HR)) to steady-state cycling during combined heat and altitude exposure. METHODS: Seven subjects (2F, 5M, age: 27 ± 5 yrs, height: 175 ± 10 cm, weight: 80 ± 19 kg, SL VO2peak: 42 ± 5 ml kg⁻¹ min⁻¹) performed 30 min of steady-state cycling at an identical power output (50% of SL VO2peak) in 4 randomly assigned environmental conditions in a hypobaric chamber: SL-thermo-neutral (SLTN; 250m, 20°C, 30-50% rh), SL hot (SLH; 250m, 35°C, 30% rh), altitude-thermo-neutral (ATN; 3000m, 20°C, 30-50% rh) and altitude and hot (AH; 3000m, 35°C, 30% rh). There was a minimum of 3-5 days between experimental trials. HR and VO2 were measured throughout exercise. %Δ HR and %Δ VO2 were calculated relative to SLTN (control) at the 24th min of exercise. RESULTS: %Δ VO2 was reduced (P<0.05) from SLTN for ATN (-12.1 ± 3.3%) and AH (-11.3 ± 2.9%) but not for SLH (-0.7 ± 0.5%). %Δ HR was increased (P<0.05) from SLTN for SLH (10.0 ± 5.2%), ATN (10.5 ± 2.0%), and AH (16.7 ± 5.5%). The %Δ HR for AH also was greater (P<0.05) compared to either SLH or ATN. CONCLUSION: Exposure to either heat or altitude resulted in a ~10% HR compensatory response compared to exercise at SL in a thermo-neutral environment. The combination of both environments resulted in a potentiated compensatory %Δ HR ~17% which was less than the summation of %Δ HR for both environments. These results suggest that the combination of heat and altitude evoked other compensatory adjustments (e.g., increased stroke volume or myocardial contractility; greater splanchnic vasoconstriction, etc.) in order to meet the combined demands of increased skin blood flow for thermoregulation and O2 delivery during 30 min of moderate intensity, steady-state exercise in either chamber. The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or reflecting the views of the Army or the Department of Defense.

Between individual variability in arterial pulse oximetry (sSpO2) is well known and has been proposed for field assessment of altitude acclimatization. Sleep SpO2 (sSpO2) is known to be lower than sSpO2 at high altitude, but the between individual variability in sSpO2 is not as well known. PURPOSE: Compare between individual variability and relationship between sSpO2 and sSpO2 during a 6-day ascent of Mt. Kilimanjaro. METHODS: In 18 (12 men/6 women), age range 18-62 yr, low-altitude residents over 5 of 6 nights sSpO2 was assessed using a finger sensor recording pulse oximeter and compared to a morning sSpO2 measured for 1 minute while the subject was quietly seated. Each individual’s mean SpO2 was calculated for their sleep and awake measurements. Correlations (Pearson product-moment) between sleep and awake SpO2 were evaluated. RESULTS: Between individual variability in awake arterial pulse oximetry (sSpO2) is well known and has been proposed for field assessment of altitude acclimatization. Sleep SpO2 (sSpO2) is known to be lower than sSpO2 at high altitude, but the between individual variability in sSpO2 is not as well known. PURPOSE: Compare between individual variability and relationship between sSpO2 and sSpO2 during a 6-day ascent of Mt. Kilimanjaro. METHODS: In 18 (12 men/6 women), age range 18-62 yr, low-altitude residents over 5 of 6 nights sSpO2 was assessed using a finger sensor recording pulse oximeter and compared to a morning sSpO2 measured for 1 minute while the subject was quietly seated. Each individual’s mean SpO2 was calculated for their sleep and awake measurements. Correlations (Pearson product-moment) between sleep and awake SpO2 were evaluated.
Exposure to high altitude could increase sweating responses as a result of widening the air-to-skin water vapor pressure gradient. Previous laboratory studies have reported both lower and higher sweat losses at altitude. PURPOSE: To determine if exposure to altitude in a thermo-neutral environment, and exposure to altitude in the heat will alter the onset time of sweating (OTS) and sweat rate (SR) during 30 minutes of steady state exercise (SS) exercise. METHODS: Seven healthy volunteers (2F, 5M, age: 27 ± 5 yrs, height: 175 ± 10 cm, weight: 79.7 ± 18.5 kg, sea level (SL VO_{2\,peak}: 41.8 ± 4.6 ml kg^{-1} min^{-1}) completed 30 minutes of SS cycling exercise (50% SL VO_{2\,peak}) in four randomly assigned conditions: SL thermo-neutral (SLTN; 250m, 20°C, vapor pressure (VP): 5-3.8 mmHg), SL hot (SLH; 250m, 35°C, VP: 12.7 mmHg), altitude thermo-neutral (ATN; 3,000m, 20°C, VP: 5-3.8 mmHg), altitude hot (AHT; 3,000m, 35°C, VP: 12.7 mmHg). Prior to exercise, a ventilated sweat cap (surface area: 15.9 cm²), air flow: 2 standard liters/min was applied to the suprasternal forearm of the volunteer. Ambient temperature (°C) and relative humidity of the capsule interior were recorded throughout SS exercise. The time at which OTS occurred (minute) and SR (mg cm^{-2} min^{-1}) were calculated. RESULTS: OTS and SR were not different (P > 0.05) between SLTN vs. ATN conditions (7.58 ± 2.90 vs. 7.45 ± 2.90 min; 0.70 ± 0.32 vs. 0.78 ± 0.33 mg cm^{-2} min^{-1}, respectively). Furthermore, in the heat OTS and SR were not different (P > 0.05) between SLH vs. AHT conditions (1.28 ± 1.64 vs. 1.83 ± 1.31 min; 1.55 ± 0.25 vs. 1.51 ± 0.20 mg cm^{-2} min^{-1}, respectively). CONCLUSION: Both exposure to altitude in a thermo-neutral environment and exposure to altitude in the heat did not alter either OTS or SR. This suggests that the water vapor pressure gradient at 3,000m was not great enough to have a marked effect on sweating responses. Disclaimer: The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or reflecting the views of the Army or the Department of Defense.
Physiological acclimatization to hypoxia. The study set undertook to quantify exercise-induced oxidative stress recovery during lab-simulated hypoxic and hyperoxic conditions following a common bout of exercise.

**METHODS:** At a base elevation of 975m, physically active participants (n=16), ages 18-40, were informed consent to perform 60 minutes of cycle ergometry at 70% watts max. Using a randomized counter-balanced crossover design participants recovered for 4 hours in 3 lab-simulated conditions: 100nm normobaric normoxia (NN, 675mmHg, 18.8%FiO2), 4400nm normobaric hypoxia (NH, 675mmHg, 12%FiO2), or 4400nm hypobaric hypoxia (HH, 440mmHg, 12%FiO2). O2 saturation was confirmed via pulse oximetry throughout the 3 exercise-recovery trials. Blood samples were collected in heparinized vacutainer tubes at time points Pre, Post, 2 Hours Post, and 4 Hours Post exercise. Blood plasma was analyzed for the quantification of oxidative stress to proteins (protein carbonyls, PC, 3-nitrotyrosines, 3NT), lipid peroxidation (lipoxygenase, LOOH), nNOS-synthase, and antioxidant capacity (ferric reducing ability of plasma, FRAP; trolox equivalent antioxidant capacity, TEAC).

**RESULTS:** Plasma TEAC, FRAP, 3NT and PC were unaltered by exercise and recovery environments (p>0.05). Exercise-induced increases in LOOH and 8-ISO were observed, although time-by-trial differences were not present.

**CONCLUSIONS:** These data indicate that exercise recovery in simulated conditions of NH and HH do not impact a common panel of blood oxidative stress measures.

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**PURPOSE:** Hypoxia and hypoxia exert independent effects on exercise-induced oxidative stress in blood, while the hypoxic influences are not well defined. The current study was undertaken to quantify exercise-induced oxidative stress recovery during lab-simulated hypoxic and hyperoxic conditions following a common bout of exercise.

**METHODS:** At a base elevation of 975m, physically active participants (n=16), ages 18-40, were informed consent to perform 60 minutes of cycle ergometry at 70% watts max. Using a randomized counter-balanced crossover design participants recovered for 4 hours in 3 lab-simulated conditions: 100nm normobaric normoxia (NN, 675mmHg, 18.8%FiO2), 4400nm normobaric hypoxia (NH, 675mmHg, 12%FiO2), or 4400nm hypobaric hypoxia (HH, 440mmHg, 12%FiO2). O2 saturation was confirmed via pulse oximetry throughout the 3 exercise-recovery trials. Blood samples were collected in heparinized vacutainer tubes at time points Pre, Post, 2 Hours Post, and 4 Hours Post exercise. Blood plasma was analyzed for the quantification of oxidative stress to proteins (protein carbonyls, PC, 3-nitrotyrosines, 3NT), lipid peroxidation (lipoxygenase, LOOH), nNOS-synthase, and antioxidant capacity (ferric reducing ability of plasma, FRAP; trolox equivalent antioxidant capacity, TEAC).

**RESULTS:** Plasma TEAC, FRAP, 3NT and PC were unaltered by exercise and recovery environments (p>0.05). Exercise-induced increases in LOOH and 8-ISO were observed, although time-by-trial differences were not present.

**CONCLUSIONS:** These data indicate that exercise recovery in simulated conditions of NH and HH do not impact a common panel of blood oxidative stress measures.
cycling exercise at 60% VO_{max}. Furthermore, MPR significantly increased from the beginning of exercise, suggesting an increase in action potential conduction velocity.

### 1391

#### Board #199

**May 31 8:00 AM - 9:30 AM**

**Habituation to the Cold Pressor Test**

**Alyssa Leger, David Bellar. University of Louisiana at Lafayette, Lafayette, LA.**

*No relevant relationships reported*

During acute cold exposure, a stress response is induced. **PURPOSE:** The purpose of this study was to see if daily, cold water exposure to the dominant hand causes habituation to the stress responses that occur due to cold exposure. **METHODS:** Fourteen seemingly healthy men (age=22±2 years, height=70±3 cm, body fat % 17.5±12.9%) participated in the study. Subjects performed the cold pressor test (CPT) a total of 20 times for 4 weeks (5 times per week). Data was collected during the first and final day of the 20-day habituation period. Blood glucose levels were measured before and immediately after the CPT. Subjects were asked to respond to both pain and thermal sensation scale every 30 seconds during the CPT testing. **RESULTS:** A repeated measures ANOVA showed a significant main effect for time for glucose, day 1 versus the final day (F=5.16; p<0.05). A paired t-test also revealed a significant difference between the changes in glucose levels (pre-CPT-post-CPT), day 1 versus the final day (mean difference=1.64±0.05 mg/dL, p=0.007) and higher than Rec3, Rec15, Rec30 and Rec60 (Rec15 (0.43 ± 0.05 L∙min\(^{-1}\)), Rec3 (2.06 ± 0.10 L∙min\(^{-1}\)), MOD at Rec30 (0.33 ± 0.03 L/min), and on the final day 1±0.047). **CONCLUSION:** This study found a significantly decreased glucose response after 20 days of cold water exposure to the hand. This demonstrates habituation to the stress response. The perception of pain decreased significantly, but not thermal discomfort. More studies are needed to further the investigation on the physiological processes that habituated due to repeated cold exposure.

### 1392

#### Board #200

**May 31 8:00 AM - 9:30 AM**

**Afterdrop Effect during Recovery after Aerobic Exercise in a Cold vs Moderate Temperature Environment**

**Jeremiah A. Vaughan, Brittany N. Followay, Savannah R. Hall, Joseph A. Laudato, Elliott Arroyo, Cody S. Dulaney, Adam R. Jajtner, Ellen L. Glickman, FACSM. Kent State University, Kent, OH.**

*No relevant relationships reported*

**PURPOSE:** To examine the effect of after drop following a bout of aerobic exercise and exposure to a cold vs moderate environment on perceived ratings of exertion. **METHODS:** Twenty-four active men (24.8 ± 2.9 yrs; 183.1 ± 6.2 cm; 80.8 ± 4.5 kg; 11.3 ± 0.8% body fat, 17.5±12.9%) participated in the study. Subjects performed the cold pressor test (CPT) a total of 20 times for 4 weeks (5 times per week). **RESULTS:** A repeated measures ANOVA showed a significant main effect for time for pain scale, but there was no significant main effect for time for thermal sensations (pain scale: F=27.39; p<0.01) (thermal sensation: F=68; p<0.72). Pain scale responses decreased significantly while thermal sensations remained unaltered. The average pain score significantly dropped on day one was 4.1±0.5, and on the final day 1±0.047. **CONCLUSION:** This study found a significantly decreased glucose response after 20 days of cold water exposure to the hand. This demonstrates habituation to the stress response. The perception of pain decreased significantly, but not thermal discomfort. More studies are needed to further the investigation on the physiological processes that habituated due to repeated cold exposure.
and whole immunoglobulin output from plasma cells are unaffected by long-duration spaceflight, indicating that plasma cell immune competency is maintained in microgravity and risk of infection does not appear to be magnified.

1395 Board #203 May 31 8:00 AM - 9:30 AM Power But Not Fatigue Is Influenced By Hot And Cold Immersion Prior To Vigorous Cycling

Donald L. Hoover 1, Samuel K. Knott 2, Christopher A. Bidwell 2, Carrie A. Revlett 3, Sarah E. Parks 3, Daren T. Webb 4, Lawrence W. Judge 1, Elizabeth Norris 1, Scott W. Arnett 1. 1 Western Michigan University, Kalamazoo, MI. 2 Western Kentucky University, Bowling Green, KY. 3 Western Kentucky University, Bowling Green, KY. 4 Ball State University, Muncie, IN. (No relevant relationships reported)

PURPOSE: The impact of hot and cold immersion upon vigorous physical activity is not fully understood. Increased body temperature has been linked to improved performance during vigorous activities, whereas lower body temperature has been noted as detrimental during maximal exercise. A deeper understanding of the effect of hot and cold immersion on fatigue characteristics during the Wingate Anaerobic Test (WAnT) may better understand how on best how to construct training and rehabilitation programs. The purpose of this study was to explore the effects of hot and cold immersion on measures of power and fatigue while completing a maximal bout of anaerobic cycling.

METHODS: Thirty apparently healthy and physically active women (23.0±2.67 yr, 165.7±17.5 cm, 61.9±10.6 kg) completed this study. Participants visited the laboratory on three occasions. Using a countertobalance design, each completed the WAnT following three immersion protocols: HOT, COLD, and no immersion (CON). Each then rode an electronically-braked cycle ergometer at maximal intensity for 30 seconds. Conditions were controlled and measured by computer. Indices of peak power (PP), mean power (MP), and fatigue index (FI) were calculated using 5-second time periods. Repeated measures ANOVA were used for statistical analysis. Statistical significance was set at the p ≤ .05 level.

RESULTS: Significant differences were found between conditions for PP [F(2,28)=3.918, p≤0.032] and MP [F(2,28)=101.71, p≤.000], respectively. Pairwise comparisons using the Bonferroni correction indicated that PP (p=0.024) was significantly different between HOT and COLD conditions, and MP (p<0.001) was significantly different between HOT, COLD, and CON conditions. Non-significant differences were found between the warm-up conditions for FI [F(2,28)=0.32, p=0.968].

CONCLUSIONS: The measures for PP and MP were improved following heat immersion. These findings suggest heat immersion had a stimulatory effect upon performance in this study. Conversely, no differences were found between conditions regarding FI. This element suggests that the types of immersion therapy used in this study were essentially neutral in affecting staying power during maximal cycling.

1396 Board #204 May 31 8:00 AM - 9:30 AM Central Chemosensitivity is Augmented during Thermoneutral Head Out Water Immersion in Healthy Adults

James R. Sackett, Zachary J. Schlader, Christopher L. Chapman, Blair D. Johnson. University at Buffalo, Buffalo, NY. (Sponsor: Dave Hostler, FACSM) (No relevant relationships reported)

Carbon dioxide (CO₂) retention occurs during water immersion and increases the risk of CO₂ toxicity. The central chemoreceptors primarily mediate the rise in ventilation during hypcapnia. However, it is unknown if central chemosensitivity is altered throughout two hours of head-out water immersion (HOWI) in healthy adults.

Purpose: We tested the hypothesis that central chemosensitivity is blunted throughout two hours of HOWI in healthy adults. Methods: We assessed central chemosensitivity in 17 subjects (age 22±1 y, BMI: 25±2 kg/m², 7 women) during a thermoneutral (35°C/0°C) HOWI trial and a time-control dry trial at baseline, 10 min, 60 min, 90 min, 120 min, and post. The partial pressure of end tidal CO₂ (PETCO₂; capnograph) and minute ventilation (pneumotachometer) were recorded continuously. Central chemosensitivity was evaluated via a rebreathing test. Subjects rebreathed 7% CO₂ and 93% O₂ from a 1 L bag for 3.5 min. Central chemosensitivity was calculated as the slope of the linear regression line of minute ventilation vs. PETCO₂, every 30 s throughout the trial. Data are reported as a change from baseline (mean ± SD). Results: PETCO₂ increased from baseline during HOWI at 10 min (+1.1±2 mmHg), 60 min (+2.1±2 mmHg), 90 min (+2±2 mmHg), and 120 min (+2±2 mmHg) (all p<0.01). The change in PETCO₂ was greater during HOWI vs. control at 10 min, 60 min, 90 min, and 120 min (all p<0.01). The change in minute ventilation did not differ over time (p=0.50) or between conditions (p=0.09). Central chemosensitivity increased from baseline during HOWI at 10 min (+0.68±0.51 L/min/mmHg), 60 min (+0.70±0.69 L/ min/mmHg), 90 min (+0.73±0.92 L/min/mmHg), 120 min (+0.85±1.00 L/min/mmHg), and post (+0.39±0.72 L/min/mmHg) (all p<0.01). Central chemosensitivity also increased from baseline during control at 120 min (+0.36±0.52 L/min/mmHg, p=0.04). The change in central chemosensitivity was greater during HOWI vs. control at 10 min, 60 min, 90 min, and 120 min (all p<0.01). Conclusion: These findings indicate that central chemosensitivity is augmented during two hours of thermoneutral HOWI. Thus, it is unlikely that changes in central chemosensitivity contribute to CO₂ retention during water immersion.

1397 Board #205 May 31 8:00 AM - 9:30 AM The Role of Diver Hydration Status on Performance Following Head Out Water Immersion

Hayden Hess 1, David R. Pendergast 2, Zachary J. Schlader 2, Lindsey N. Russo 1, Brian M. Clemency 2, Mary G. Carey 2, David Hostler, FACSM. 1 University at Buffalo, BUFFALO, NY. 2 University of Rochester, Rochester, NY. (Sponsor: Dave Hostler, FACSM) (No relevant relationships reported)

Water immersion results in a diuresis, which could potentially limit exercise performance after egress to land. PURPOSE: We examined the effect of three rehydration strategies on an endurance run to exhaustion, cardiovascular stability, and overnight recovery following a four-hour head out water immersion (HOWI) in thermoneutral water.

METHODS: Twelve male subjects (22.7±1.8 y) completed a crossover design consisting of three rehydration strategies: no rehydration (NH), hourly replacement of fluid loss during immersion (RD), and replacement of fluid after the immersion period (RA). Following immersion, subjects ran to exhaustion at ~80% maximum heart rate. After completing the run, each subject submitted to a head up tilt test (HUTT). Vital signs and ECG were monitored overnight.

RESULTS: HOWI resulted in a transient diuresis in NH and RA protocols, while it was sustained throughout immersion in the RD protocol resulting in greater total urine volume (l) output (1.27±0.48 (NH), 2.32±0.77 (RD), and 1.18±0.43 (RA); p<0.001). Body mass change (% ) from fluid loss was greater in NH than RD, but not RA (-1.58±0.56 (NH), -0.66±0.47 (RD), and -0.92±0.76 (RA)). Run time was 17% and 13% shorter in NH than RD and RA, respectively, but were not statistically different. Time to orthostasis, heart rate, and blood pressure during the HUTT did not differ by condition. Right heart rate variability and mean arterial pressure were not different between rehydration strategies.

CONCLUSIONS: Loss of body water during thermoneutral HOWI was modest and rehydration strategies minimally affected aerobic performance, cardiovascular stability, and overnight recovery in young, healthy males. Rehydration during water immersion resulted in a large, sustained diuresis without improving performance or recovery after exiting the water.

1398 Board #206 May 31 8:00 AM - 9:30 AM Effects Of Concurrent Exercise During Simulated Microgravity On Soleus Muscle Fiber Myonuclear Content

Kaylie R.M. Zapanta 1, Joshua A. Cotter 2, Andrew J. Galpin 2, James R. Bagley 3, 4. 1 University of Southern California, Los Angeles, CA. 2 California State University, Long Beach, Long Beach, CA. 3 California State University, Fullerton, Fullerton, CA. 4 San Francisco State University, San Francisco, CA. (No relevant relationships reported)

Introduction: Exercise countermeasures administered on the International Space Station are time-consuming and use large/expensive equipment. Aerobic exercise has shown to maintain oxidative capacity of muscle fibers, while resistance exercise mitigates de-conditioning during ULLS (unilateral lower limb suspension, simulated microgravity) but resulted in differences in fiber-type responses (i.e., fast-twitch vs slow-twitch). This current study provides additional analyses of muscle samples used in Cotter et al. (2015), investigating soleus muscle (mostly slow-twitch) myonuclei. Modulations in fiber size and myonuclear domain (MND; the area each myonuclei controls) may provide mechanisms for preventing unloading decrements. Purpose: Our aim was to determine if simulated microgravity affects soleus muscle fiber size and MND size and if CE training mitigates these changes. Sixteen subjects were separated into two groups, 10-day ULLS and 10-day ULLS + CE. Methods: Muscle biopsies were taken pre- and post- intervention, which were isolated into individual fibers (muscle cells), stained for myonuclei, three-dimensionally imaged, and analyzed for fiber size and MND size. 2×2 ANOVAs determined potential differences in fiber size and MND size between groups, before and after ULLS. Results: No significant differences in fiber size or MND size after 10 days of ULLS were observed. These findings suggest that, while 10 days of ULLS may cause a decline in muscle function (as seen in Cotter et al., 2015), it may not significantly affect soleus muscle fiber size or MND size. However, individual variability occurred, suggesting that some people may be responders (or non-responders) to ULLS and ULLS+CE. Conclusion:
Reliability of the Portable Metabolic Gas Analysis System used on the International Space Station

Alan D. Moore, FACSM1, Meghan E. Downs2, Shannon L. Jordan3, Alan H. Feiveson3, Jamie R. Guined3, Stuart MC Lee3
1Lamar University, Beaumont, TX; 2KBRwyle, Houston, TX; 3NASA-Johnson Space Center, Houston, TX; 4University of Houston, Houston, TX.

(No relevant relationships reported)

Metabolic gas analysis is utilized for both research and medical operations purposes on the International Space Station (ISS). Data regarding reliability of metabolic gas analysis system used on board the ISS, the Portable Pulmonary Function System (PPFS – Danish Aerospace Corporation, Odense, DK), has not been reported. PURPOSE: To determine the reliability and intra-subject repeatability of metabolic gas analysis data collected by the PPFS. METHODS: Subjects (n=5; 5M, 3F) performed 3 peak cycle tests, consisting of three 5-minute stages designed to elicit 25%, 50%, and 75% peak oxygen consumption (VO_{2peak}) followed by stepwise increases of 25 W/min until reaching volitional exhaustion. Metabolic gas analysis was performed using the PPFS during these tests. Intraclass correlation coefficients (ICC), within-subject standard deviations (WS SD), and coefficients of variation (CV %) were calculated. RESULTS: The ICC, WS SD and CV % for peak exercise are contained in the table below. Across all exercise stages, the ICC values for oxygen consumption (VO_2), carbon dioxide production (VCO_2), and ventilation (V_e) ranged from 0.79 to 0.99; however, the ICC for respiratory exchange ratio (RER) indicated poorer agreement between trials (ICC=0.11 to 0.51). The CV values for all dependent variables ranged from 2.6% to 6.6%, which are consistent with reported values obtained using other metabolic gas analysis devices.

<table>
<thead>
<tr>
<th>Variable</th>
<th>ICC</th>
<th>WS SD</th>
<th>CV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VO_2peak (L/min)</td>
<td>0.98</td>
<td>0.11</td>
<td>3.6</td>
</tr>
<tr>
<td>VO_2peak (ml/kg/min)</td>
<td>0.92</td>
<td>1.91</td>
<td>4.6</td>
</tr>
<tr>
<td>VCO_2peak (L/min)</td>
<td>0.94</td>
<td>0.18</td>
<td>5.4</td>
</tr>
<tr>
<td>RER</td>
<td>0.51</td>
<td>0.05</td>
<td>4.0</td>
</tr>
<tr>
<td>V_e (L/min)</td>
<td>0.94</td>
<td>6.34</td>
<td>5.6</td>
</tr>
<tr>
<td>Peak Watts</td>
<td>0.96</td>
<td>10.32</td>
<td>3.7</td>
</tr>
</tbody>
</table>

CONCLUSIONS: The PPFS appears to yield reliable metabolic gas analysis data. Lower reliability of RER measurements are reported in the literature using other devices as is not likely a function of the PPFS. The PPFS should provide accurate and reliable data for research and monitoring of human adaptation to spaceflight.

C-45 Free Communication/Poster - Heat/Hydration
Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

Physiological Response in Time to Exhaustion Trial Across Varied Environmental Conditions

Savannah R. Hall, Ellen L. Glickman, FACSM, Jeremiah A. Vaughan, Brittani N. Followay, Elliott Arroyo, Cody S. Dulaney, Joseph A. Laudato, Adam R. Jajtner. Kent State University; Kent, OH.

(No relevant relationships reported)

Purpose: To examine different environmental conditions on the physiological response to aerobic exercise preformed to exhaustion. Methods: Recreationally active men (n=5, 24.2 ± 2.6yrs, 183.6 ± 6.2 kg, 97.7 ± 2.8%BF; 48 ± 2.6 ml kg^{-1} min^{-1}) completed an exercise protocol under two conditions: high temperature (HT, 35ºC) and moderate temperature (MT, 22ºC). The protocol consisted of 60 minutes of cycling at 60% VO_2max (CT_60), a 15-minute rest period, and a time to exhaustion trial at 90% VO_2max (TTE). Mean skin temperature (T_s; ºC), core temperature (T_c; ºC), and thermal sensation (TS) were evaluated before CT_60 and at minutes 3, 20, 40, and 60. Metabolic heat production (M; W·m^{-2}) was evaluated at BL and at minutes 3, 15, 30, 45, and 60. Tissue insulation (I, m^2·K·W^{-1}), a physiological strain index (PSI) were evaluated at minutes 3, 30, and at CT_60. T_c, T_s, TS, PSI, and I were measured before (PRE) and after (POST) TTE. T_m was measured at PRE_TTE, during TTE (MD_TTE), and at POST_TTE. Changes were analyzed using a two-factor (time x trial) within-subjects repeated measures ANOVA. RESULTS: For MT, T_c was lower at all timepoints relative to BL (p<0.01–0.009). T_s was significantly higher in HT compared to MT at minutes 3, 20, 40, and 60 (p<0.001) relative to PRE. T_s was higher at all timepoints relative to BL (p<0.01–0.001) during CT_60 and was significantly higher during HT compared to MT (p<0.003). In HT, T_c decreased from PRE (60.3±11.4ºC) relative to PRE_TTE (57.0±6.6ºC); W·m^{-2} was significantly higher in HT compared to MT at minutes 3, 20, 40, and 60 (p<0.001–0.009) and at POST (0.033). M was higher at minutes 3, 30, 45, and 60 relative to 3 min (p<0.001–0.047) and increased at MD_TTE and POST_TTE (p<0.001) relative to PRE_TTE. PSI was significantly lower during HT compared to MT at minutes 3, 30, and 60 (p<0.001–0.009). was lower at POST_TTE relative to PRE_TTE (0.025). PSI was lower during HT compared to MT at 20 min, 40, and 60 (p<0.001–0.009). CONCLUSION: As expected, tissue insulation is decreased, and physiological strain index is increased during exercise in the heat.

Effect Of Wrist Cooling On Balance And Cognitive Performance In The Heat

Rachel K. Katch, Ryan Curtis, Anders Almeraya, Rebecca L. Stearns, Douglas J. Casa, FACSM. University of Connecticut, Storrs, CT. (Sponsor: Dr. Douglas J. Casa, FACSM)

(No relevant relationships reported)

Many cooling modalities exist in the literature claiming to improve performance in the heat; however, there’s a paucity of literature regarding wrist cooling’s effects on balance and cognitive performance after a bout of exercise in the heat. Purpose: To examine the effects of wrist cooling influences on balance and cognitive performance after a bout of cycling exercise in the heat. METHODS: Fourteen male participants (age, 22±4yrs; height, 182±7cm; body mass, 75.4±8.7kg; body fat %, 10.7±3.4%) were analyzed. In an environmental heat chamber (39.5±0.9ºC, 38.6±3.2% RH) participants underwent three randomized 135-minute cycling trials, which included: one wrist cooling device (W1), two wrist cooling devices (W2), and no wrist cooling device (W0) during exercise. Cognitive measures (Balance Error Scoring System [BESS], Letter Digit Substitution Test [LDST], Trail Making Test [TM]) were conducted immediately post-exercise, and delta scores were calculated from a baseline familiarization session. Rectal temperature (T_Rx) was taken every 15 minutes during exercise. A group x time

Abstracts were prepared by the authors and printed as submitted.
repeated measures ANOVA was conducted to determine group differences, and paired samples t-tests were used to determine mean differences. **RESULTS:** No statistical difference between Tc and W0 occurred (F=0.615; p=0.435; η²=0.020), nor a main effect of time (F=0.655; p=0.595; η²=0.141), or trial (F=0.515; p=0.616; η²=0.014) in BW. A main effect of trial was observed in WATER (F=29.156; p=0.001; η²=0.879). WATER was lower in LT (399.2 ± 186.9 ml) than MT (903.9 ± 302.6 ml; p=0.001) and HT (1386.0 ± 216.8 ml; p=0.021), and greater in HT than MT (p=0.013). There was no trial x time interaction nor main effect of trial or trial x treatment interaction. **CONCLUSIONS:** Cycling resulted in a greater PVS at REC for LT, compared to HT and MT. For MT and HT, PVS were reduced at REC when compared to 60 and TTE, revealing a resolution of plasma volume post-tEqual. As expected, water intake increased as trial temperature increased.

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**1404** Board #212 May 31 8:00 AM - 9:00 AM
**Effect of Thermal Stress on Cycling and Plasma Volume Shifts, Body Weight and Water Intake**
Joseph A. Laudato, Euan L. Glickman, FACSM, Brittany N. Falloway, Jeremiah A. Vaughan, Elliott Arroyo, Cody S. Dulaney, Savannah R. Hall, Adam R. Jajtner. Kent State University, Kent, OH. (Sponsor: Ellen Glickman, FACSM) (No relevant relationships reported)

**PURPOSE:** To examine the effects of environmental stress while cycling, and its influence on hydration status. **METHODS:** Recreationally active men (n=5, 242 ± 2.6 years; 183.6 ± 5.6 cm; 80.0 ± 4.9 kg; 11.7 ± 2.5 %BF; 3.9 ± 0.3 L·min⁻¹) completed 4 trials, with the first consisting of a VO₂ max test, and the remaining 3 trials involving cycling at 5°C (LT), 23°C (MT), and 34°C (HT) in a counterbalanced manner. Each trial consisted of 60 min of cycling at 60% VO₂ max, 15-min rest, and a time to exhaustion (TTE) at 90% of VO₂ max. Blood was drawn prior to (PRE), immediately following (60), after TTE and 1-hr post-treatment (REC). An automated hematol...
Bias ± random error contained within ± 0.35°C (daily variation in RT of ± 0.25°C + sensors measurement error of ± 0.1°C) around the zero line was deemed acceptable between sensors. The rate of change in temperature during phases 1, 2, 3, 4 and 5 was respectively of -0.008 ± 0.007°C/min and -0.006 ± 0.004°C/min, 0.003 ± 0.005°C/min and 0.002 ± 0.004°C/min, -0.011 ± 0.002°C/min, 0.057 ± 0.010°C/min and 0.054 ± 0.008°C/min and -0.141 ± 0.124°C/min and -0.091 ± 0.065°C/min. Mean biases (WRP - TRP) and random errors during phases 1, 2, 3, 4 and 5 were of 0.12°C ± 0.15°C, 0.15°C ± 0.22°C, 0.12°C ± 0.26°C, 0.21°C ± 0.34°C and 0.24°C ± 0.66°C, respectively. CONCLUSION: The use of TRPs (HQ Inc.) as suppositories tracked slow and rapid increases in RT and slow decreases in RT as measured by WRP, but did not detect the rapid decrease in RT. In all instances, however, the absolute difference between WRTP and TRP exceeded ±0.35°C. Therefore, we conclude that a TRP inserted as a suppository to act as a rectal probe does not provide acceptable absolute measurement of RT.

Measurement of core temperature at the gastrointestinal level with an ingestible telemetric pill (ITP) is increasingly used in research. But, unlike core temperature measured at the rectum via a rectal probe (RP), data contamination due to water or food ingestion remains a limitation of ITP. Rapid generation of a heat sink at the stomach and upper-intestinal level (duodenum to ileum), as can be obtained, for example, following shaved-ice ingestion, could potentially differentially impact RP and TRP temperature measurements. In fact, the closer proximity of ITP to the heat sink than RP could result in a more important and faster rate of energy loss for ITP than RP. PURPOSE: To examine the impact of shaved-ice ingestion following exercise-induced increase in core body temperature on the degree of agreement between ITP and RP temperature measurements. METHODS: 8 healthy young men (33 ± 8 yrs, 75 ± 6 kg, 176 ± 5 cm) underwent a passive sitting period of 20 min at 20°C, after which they completed 2 exercise periods (cycling or running) at 75% of estimated maximal heart rate in a hot-dry environment (31 ± 1°C, 32% RH) with the goal of increasing rectal temperature by 1°C over baseline level. Following each exercise period, subjects passively sat in a 20°C ambient temperature for 45 min while ingesting, over the first 30 min, either 7.5 g of water provided at rectal temperature/kg body mass (after the first exercise) or 7.5 g of shaved-ice provided at -1°C/kg body mass (after the second exercise). Rectal (YSI 401) and gastrointestinal temperatures (HQ Inc.) were measured continuously during the experiments. ITPs were ingested 10 h prior to arrival time at the laboratory. RESULTS: The rate of decrease in RP and ITP temperatures during water ingestion was respectively of 0.017 ± 0.006°C/min and 0.018 ± 0.008°C/min, compared to 0.025 ± 0.006°C/min and 0.026 ± 0.006°C/min for shaved-ice ingestion. Mean biases (RP - ITP) and 95% limits of agreement during the passive sitting period, first exercise period, water ingestion period, second exercise period and shaved-ice ingestion period were respectively of 0.10°C ± 0.35°C, 0.69°C ± 0.31°C, 0.17°C ± 0.66°C, 0.12°C ± 0.38°C and 0.16°C ± 0.64°C. CONCLUSION: The present results indicate that the creation of a heat sink at the stomach and upper-intestinal level does not alter the degree of agreement between RP and ITP.

Environmental temperatures perceived as comfortable in the summer season are often perceived as uncomfortably warm during the winter, and vice versa. During rest, behavioral thermoregulation is driven by thermal discomfort, which is largely mediated by changes in skin temperature. Thus, it is likely that seasonal acclimatization shifts behavioral thermoregulation is driven by thermal discomfort, which is largely mediated by changes in skin temperature. Thus, it is likely that seasonal acclimatization shifts behavioral thermoregulation functions via meta-analysis. METHODS: Human studies were identified through databases (PubMed, Psych Info, Sport Discus, Scopus, ISI Web of Science, Medline, ProQuest Dissertation & Theses). Thirty-one studies were identified, providing 256 ES estimates from 388 subjects with the magnitude of DEH ranging from 1 to 6% BML. Outcome variables (accuracy, reaction time), cognitive domains, and methods to induce DEH (exercise and/or heat stress and/or fluid restriction) varied. ES were calculated using standardized mean differences and a meta-analysis completed using a random-effects model. Results: Impairment on overall task performance (all domains/outcomes) with DEH was small (ES = -0.24; 95% CI = [-0.38, -0.10]) but significant (p = 0.002) and due primarily to outcomes based on accuracy (ES = -0.24; [-0.39, -0.10]) versus reaction time (ES = -0.16; [-0.34, 0.02]), although these two ES were not different (p = 0.47). Intercepts of heterogeneity (τ² = 0.19, F = 69.9%) reflected moderate to large variation across studies. Cognitive impairment

Dehydration (DEH) is believed to impair cognitive functions but which processes (e.g., from executive control to simple reaction time) are affected and at what magnitude of body mass loss (BML) remains unclear. PURPOSE: To systematically review the literature and examine factors influencing the effect size (ES) of DEH on cognitive functions via meta-analysis. METHODS: Human studies were identified through databases (PubMed, Psych Info, Sport Discus, Scopus, ISI Web of Science, Medline, ProQuest Dissertation & Theses). Thirty-one studies were identified, providing 256 ES estimates from 388 subjects with the magnitude of DEH ranging from 1 to 6% BML. Outcome variables (accuracy, reaction time), cognitive domains, and methods to induce DEH (exercise and/or heat stress and/or fluid restriction) varied. ES were calculated using standardized mean differences and a meta-analysis completed using a random-effects model. Results: Impairment on overall task performance (all domains/outcomes) with DEH was small (ES = -0.24; 95% CI = [-0.38, -0.10]) but significant (p = 0.002) and due primarily to outcomes based on accuracy (ES = -0.24; [-0.39, -0.10]) versus reaction time (ES = -0.16; [-0.34, 0.02]), although these two ES were not different (p = 0.47). Intercepts of heterogeneity (τ² = 0.19, F = 69.9%) reflected moderate to large variation across studies.
following DEH was greater (p = 0.02) for executive functions (ES = −0.38; 95% CI: [−0.60, −0.17]) compared to simple/choice reaction times (ES = −0.02; [−0.16, 0.11]). Based on meta-regression, the magnitude of BMI was not associated with impairment of executive functions (slope = −0.03, p = 0.02, p = 0.68). Sub-group estimates of cognitive impairment when %BMI was ≤2% (ES = −0.20; [−0.40, −0.002]) versus >2% (ES = −0.30; [−0.50, −0.10]) were not different (p = 0.38) based upon 134 and 122 outcomes, respectively. CONCLUSIONS: Despite variability among studies, the adverse effect of DEH on human cognition appears to be small to moderate. Tasks requiring executive functions appear more vulnerable to DEH compared to tasks utilizing lower-order cognitive domains, but lacking a dose-response relationship. A minimum threshold of DEH that impairs human cognition was also not evident.

1411 Board #219 May 31 8:00 AM - 9:30 AM Dehydration is How You Define It: Comparison of 318 Blood and Urine Spot Checks Tamara Hew-Butler, FACSM, Christopher Eskin, Jordan Bickham, Mario Russnak, Melissa VanderMeulen. Oakland University, Rochester, MI.

(No relevant relationships reported)

Clinical medicine defines dehydration using blood markers which confirm hypertonicity (serum sodium concentration [Na+] >145mMol/L) and intracellular dehydration. Sports medicine equates dehydration with a concentrated urine as defined by any urine osmolality (UOsm)>700mOsom/kg,H2O or urine specific gravity (USG) ≥1.020. PURPOSE: To compare blood versus urine indices of dehydration in a cohort of athletes undergoing routine screenings. METHODS: 318 collegiate athletes (193 female) provided blood and urine samples and asked to rate how thirsty they were on a 10-point visual analogue scale. Serum was analyzed for [Na+] while urine osmolality was measured using an osmometer. USG was measured using a Chemstrip. Data were categorized into Dehydrated versus Hydrated groupings based upon the above-mentioned UOsm and USG thresholds. RESULTS: Athletes from seven sports teams were represented (combined: height 1.75±0.1m; weight 71.9±13.3kg; body mass index 23.2±2.5kg/m²). Overall, female athletes had lower USG vs. male athletes (1.014±0.006 vs. 1.015±0.006; p=0.03). Using the UOsm >700mOsom/kg,H2O threshold to define dehydration, 55% of athletes were classified as dehydrated. Using any USG ≥1.020 to define dehydration, 27% of these same athletes were classified as dehydrated. No athlete met the clinical definition for dehydration (hypertonicity; serum [Na+] >145mMol/L). Normonatremia (serum [Na+] between 135-145mMol/L) was maintained in 99.7% of athletes (mean serum [Na+] 139.9±2.1; range 134-145mMol/L). A significant correlation was confirmed between serum [Na+] versus UOsm (r=0.18; p=0.001). However, urine concentration at the extreme ranges of dehydration did not reflect clinical abnormalities in serum markers or thirst rating (mean rating 4.4±1.8; range 0-10). CONCLUSION: Urine concentration thresholds (commonly used by sports medicine) classified 27.5%-55% of collegiate athletes as dehydrated, while no athlete was dehydrated according to serum [Na+] measurement. Practitioners should caution against using urine indices, as isolated measurements, to diagnose or monitor dehydration because urinary output is largely a response rather than a reflection of physiologically regulated blood tonicity.

1412 Board #220 May 31 8:00 AM - 9:30 AM Thirst Perception and Fluid Intake are not Affected by Knowledge of Water Losses During Exercise Catalina Capitán-Jiménez, Luis Fernando Aragón-Vargas, FACSM, FACSM. University of Costa Rica, CARTAGO, Costa Rica.

(Sponsor: Luis Fernando Aragón-Vargas, FACSM)

(No relevant relationships reported)

Thirst perception has been studied as an indicator of acute dehydration during exercise, however, as a perception, it could be affected by the information received about water (sweat) losses. Purpose: To identify if thirst perception (TP) can be affected by knowledge of water losses during exercise. Methods: 11 males exercised intermittently in the heat on two occasions (30 min bicycle-30 min treadmill, at 70-80%VO2max), to a dehydration of 3.9±0.4% and 3.8±0.4% body mass (BM). TP and heat sensation were measured every 30 minutes during exercise. During session one (S1) they received real information about their water losses (60% of their real losses). Information was given every 30 minutes; the order of the sessions was randomly assigned. After finishing the exercise, they ingested water ad libitum for 30 minutes. Urine osmolality was measured preexercise, postexercise and at the end of each trial. Data were analyzed using Student’s t and analysis of variance, as appropriate. Results: Preexercise conditions were not statistically different between sessions (Table).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Real Information</th>
<th>False Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Mass (kg)</td>
<td>76.7±5.2</td>
<td>76.8±5.2</td>
</tr>
<tr>
<td>USG (a.u)</td>
<td>1.019±0.07</td>
<td>1.018±0.07</td>
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<tr>
<td>Uosm</td>
<td>699.6±256.8</td>
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<tr>
<td>Thirst perception (mm)</td>
<td>15.09±9.6</td>
<td>22.15±7.7</td>
</tr>
<tr>
<td>WBTG (°C)</td>
<td>28.8±0.1</td>
<td>28.9±0.3</td>
</tr>
</tbody>
</table>

Thirst perception and fluid intake were not different between sessions (S1 & S2; f=0.982; p=0.360) or over time (f=2.88;p=0.140). Urine was not different between sessions 659.94±80.59 and 636.09±79.76 for S1 and S2; f=0.134; p=0.722. Water ingestion was the same between sessions (1220±2486 ml and 1229±2413 ml; t=0.949). Conclusion: the results suggest that thirst perception is not affected by knowledge of water losses during exercise.

1413 Board #221 May 31 8:00 AM - 9:30 AM Fluid Intake Pattern, Dehydration, And Performance In Young Athletes During A Triathlon In Tropical Climate Anita M. Rivera-Brown, FACSM1, José R. Quiliones-González2, Patricia Pagán-Lassalle2, ‘University of Puerto Rico School of Medicine, San Juan, Puerto Rico. ’Syracuse University, Syracuse, NY.

(No relevant relationships reported)

Mild dehydration is associated with increased core temperature and reduced performance during endurance events in adult athletes. Little is known about hydration practices, hyperthermia, and the effects of insufficient fluid replacement on performance in young athletes during real-life competitions. PURPOSE: Examine voluntary fluid intake, the relation between dehydration and performance, and core temperature in adolescents during a triathlon competition in tropical climate. METHODS: 15 junior (14-15 yr) and 21 senior (16-18 yr) athletes competed in a triathlon (750 m swim, 18 km cycle and 4 km run) in a hot and humid environment (WBTG =27.9°C; water temp=29.0°C), in July, between 7:30 to 9:30 am. Urine specific gravity (UoSM) was measured upon waking the day of competition. Water and sports drinks were carried in bottles on the bike, and available for each athlete in a fluid station during the run. Sweat loss was calculated from change in body weight [BW] (corrected for urine output) and fluid intake. Dehydration was calculated as % change in BW. Core temperature was measured in two athletes pre-competition, and at the end of the swim, cycle, and run portions, using ingestible sensors. RESULTS: Mean UoSM (1.025 ± 0.001 g/mL) indicated that athletes were not in an adequate state of hydration upon waking. Fluid intake (juniors=471.8 ± 161.4 and seniors=551.3 ± 263.2 ml) replaced 46% of the sweat loss and was higher during run (juniors=10.2 ± 3.5 and seniors=12.3 ± 8.2 ml/min) compared to cycle (juniors=6.1 ± 2.5 and seniors=8.0 ± 3.4 ml/min), P < 0.05. At the end of the competition, 26% of juniors and 52% of seniors had dehydrated ≥1.5%. Dehydration was associated with finishing time in senior boys (r = −0.70; P = 0.01) who also showed the highest sweat rate (1.3 ± 0.8 L/h) and faster times. Core temperature rose to 40.1°C in the girl who placed 2nd, and to 39.6°C in the boy who placed 3rd. No athletes showed symptoms of heat illness. CONCLUSIONS: Young athletes participating in a triathlon in tropical climate show mild to moderate levels of dehydration. Higher dehydration in senior athletes may be due to higher sweat rates and faster racing. Competition organizers should be aware that young, dehydrated athletes may become hyperthermic during triathlons in tropical climate, and should be prepared for medical interventions if needed.

1414 Board #222 May 31 8:00 AM - 9:30 AM Effects of Hypohydration on Markers of Catabolism in Females Following Resistance Exercise Joshua J. Gann1, Thomas L. André2, Brooke L. Roemer, Darryn S. Willoughby, FACSM1, ‘University of Louisiana-Monroe, Monroe, LA. ’Clayton State University, Morrow, GA; ’Baylor University, Waco, TX.

(No relevant relationships reported)

BACKGROUND: Cortisol is elevated in times of stress and works as an inhibitor of muscle protein synthesis through binding to its glucocorticoid receptor (GR). This GR is expressed throughout the body and regulates the expression of glucocorticoid responsive genes that are involved in catabolic pathways. PURPOSE: The purpose of this study was to determine the effects of previous night dehydration on markers of catabolism in resistance-trained females following resistance exercise. METHODS: Ten healthy, resistance trained females (age 22.0 ± 2.1 years; height 164.5 ± 5.0 cm; mass 61.9 ± 19.0 kg; body fat 26.7 ± 2.9%) completed 2 bouts of resistance exercise,
either dehydrated (~3% body weight) (DT) or heat exposed with fluid replacement (HT). Each exercise bout consisted of one rep maximum (1RM) followed by 5 sets to failure of 75% of 1RM for muscle press and leg press. Muscle press and leg press samples were obtained prior to and 1 hr following exercise. Blood samples were obtained to examine cortisol. From each muscle sample, glucocorticoid receptor DNA (GR-DNA) binding and mRNA expression were determined. Data was analyzed with separate 2 (trial) x 2 (time) analysis of variance (ANOVA). Significant interactions were further analyzed with paired t-tests. RESULTS: There were no significant interaction or main effects for session and time for serum cortisol. There was a significant main effect for session for GR-DNA binding (p = .043). GR-DNA binding was significantly elevated post exercise for DT (p = .016). CONCLUSION: Hypohydration appears to have little effect on proteolytic gene expression even though GR-DNA binding was increased. It is possible that gene expression was suppressed due to participants being resistance-trained. Further research is needed to determine if hypohydration affects proteolytic gene expression in untrained individuals. Theoretically, if an individual were to be chronically hypohydrated, a reduction in resistance training volume and increase in GR-DNA binding could diminish the anabolic response to resistance exercise and potentially lead to muscle atrophy. This study was supported by a doctoral research grant from the National Strength and Conditioning Association.

1417 Board #225 May 31 8:00 AM - 9:30 AM Bilateral Differences in Muscle Activation Associated with Cycling in Varying Environmental Conditions
Adam R. Rajtej, Brittany N. Followay, Jeremiah A. Vaughan, Elliott Arroyo, Savannah R. Hall, Cody S. Dulaney, Joseph A. Laudato, Ellen L. Glickman, FACSM. Kent State University, Kent, OH.
(No relevant relationships reported)

PURPOSE: To examine the influence of ambient temperature on bilateral differences (DF) in muscle activation. METHODS: Five recreationally active men (24.2 ± 2.9 yrs; 1.84 ± 0.06m; 80.0 ± 4.7kg; 11.7 ± 2.8 %BF; 3.89 ± 0.34 L·min⁻¹) completed four experimental visits: a VO2 max test, and cycling in 5°C (LT), 23°C (MT) and 34°C (HT) in a counterbalanced fashion. Cycling consisted of 60 minutes at 60% of their previously determined VO2 max (TC₅₀), and a time to exhaustion trial at 90% of their VO2 max (TTI). Electromyography (EMG) was monitored on the vastus lateralis of both legs from 0-2min, 8-10min, 18-20min, 28-30min, 38-40min, 48-50min, and 58-60min during TC₅₀, as well as at the initial (PRE), middle (MID) and last (POST) 30-second periods during the TTE. Rectified EMG (RMS) and power spectra analysis (MPF and MedPF) were normalized to a standard 2-min cycling bout at 60% of VO2 max in a thermoneutral condition. DF between legs were calculated (dominant - non-dominant), and data analyzed via a within-subjects repeated measures ANOVA.

RESULTS: During CT₅₀, a main effect of trial (F = 5.34; p = 0.034) and time (F = 0.597; p = 0.004). During TTE, no interactions were observed for RMS (F = 1.755; p = 0.227; η² = 0.305). An interaction (F = 2.883; p = 0.033; η² = 0.419) was observed for MPF during CT₅₀. No differences were observed across time in LT (p = 0.597) or MT (p = 0.287), though it HT 48-50min (10.17 ± 7.79%) was different (p = 0.05) from 8-10min (-1.91 ± 3.77%), 18-20min (2.40 ± 4.63%), and 28-30min (4.12 ± 2.97%). Additionally, at 8-10min, HT was different from MT (10.61 ± 5.14%; p = 0.004). During TTE, no interactions were observed for RMS (F = 0.660; p = 0.629; η² = 0.142) or MPF (F = 0.840; p = 0.520; η² = 0.174). An interaction was observed for MedPF (F = 3.808; p = 0.023; η² = 0.448) during TTE. Post hoc analysis indicated that during the LT trial, DF was different at MID (2.63 ± 8.34%) compared to PRE (3.12 ± 8.51%; p = 0.004) and POST (2.54 ± 7.77%; p = 0.004).

CONCLUSIONS: During prolonged exercise in cold conditions, there appears to be a greater propensity to activate muscle from the dominant limb. Similarly, as an individual fatigues in a hot condition, it appears the rate of action potential depolarization may increase more in the dominant limb.
Changes in plasma osmolality (P\textsubscript{\text{osm}}) and arginine vasopressin (AVP)-mediated signaling regulate thirst and drinking behavior. Copetin is a peptide derivative of the AVP preprohormone and thought to be more stable and measurable than AVP as a biomarker of the hydration process. PURPOSE: This investigation aimed to evaluate hydration biomarkers, including copetin, responses to exercise-induced dehydration and partial rehydration. METHODS: Fifty-two registrants (mean age: 52y, range: 21-72) in a 161km cycling event under warm and humid environmental conditions (mean = 26°C, 76%RH; maximum = 30°C, 93%RH) participated. P\textsubscript{\text{osm}}, urine specific gravity (U\textsubscript{\text{sg}}), urine osmolality (U\textsubscript{\text{osm}}), thirst, and plasma copetin were measured at 3 time points before (PRE) and shortly after (POST) the ride, and one hour following a 650mL water bolus at ambient temperature consumed in 6 increments within 3min (POST\textsubscript{\text{1h}}). Subjects consumed their typical diet during, but were not permitted to eat or drink during ride completion and the 1h post period. RESULTS: Subjects lost 2.2 ± 1.1% body mass at POST, and all variables significantly increased from PRE to POST (P\textsubscript{\text{osm}} = 295.8 ± 3.9 to 299.1 ± 5.6 mOsm kg\textsuperscript{-1}; U\textsubscript{\text{osm}} = 1.017 ± 0.005 to 1.021 ± 0.006; U\textsubscript{\text{sg}} = 3 ± 1 to 5 ± 2; copetin = 7.50 ± 4.9 to 42.33 ± 35.74 pmol L\textsuperscript{-1}; thirst = 3 ± 1 to 5 ± 2; all p < 0.05). At POST, (body mass = 20.0 ± 1.1%) P\textsubscript{\text{osm}} returned to PRE (294.4 ± 5.7 mOsm kg\textsuperscript{-1}), while U\textsubscript{\text{osm}} (1.021 ± 0.006), U\textsubscript{\text{sg}} (5 ± 2), and thirst (5 ± 2) remained elevated compared to POST (all p < 0.05). Copetin remained elevated at POST\textsubscript{\text{1h}} vs. PRE (P (0.001) but decreased from POST to POST\textsubscript{\text{1h}} (POST\textsubscript{\text{1h}} - POST\textsubscript{\text{1h}} = 28.57 pmol L\textsuperscript{-1}; p < 0.0001). CONCLUSION: Well-studied hydration biomarkers and the more recent biomarker copetin tracked with partial rehydration, while P\textsubscript{\text{osm}}, U\textsubscript{\text{osm}}

### Table 1. Body fluid balance and subjective feelings of thirstiness and bloating by rehydration rate

<table>
<thead>
<tr>
<th>Minute</th>
<th>0</th>
<th>30</th>
<th>60</th>
<th>90</th>
<th>120</th>
<th>150</th>
<th>180</th>
<th>210</th>
<th>240</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body fluid balance (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H30</td>
<td>-1.90</td>
<td>0.97</td>
<td>0.77</td>
<td>0.58</td>
<td>0.30</td>
<td>0.17</td>
<td>-0.17</td>
<td>-0.24</td>
<td>-0.51</td>
</tr>
<tr>
<td>H60</td>
<td>-1.80</td>
<td>-0.25</td>
<td>0.76</td>
<td>0.75</td>
<td>0.23</td>
<td>-0.06</td>
<td>-0.15</td>
<td>-0.21</td>
<td>-0.57</td>
</tr>
<tr>
<td>H120</td>
<td>-1.86</td>
<td>-0.99</td>
<td>-0.41</td>
<td>0.12</td>
<td>0.43</td>
<td>0.00</td>
<td>-0.22</td>
<td>-0.45</td>
<td>-0.75</td>
</tr>
</tbody>
</table>

**Thirstiness (mm)**

<table>
<thead>
<tr>
<th>Body fluid balance (%)</th>
<th>65.4</th>
<th>9.7</th>
<th>17.3</th>
<th>22.5</th>
<th>23.5</th>
<th>27.5</th>
<th>38.3</th>
<th>46.3</th>
<th>51.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>H30</td>
<td>62.1</td>
<td>37.6</td>
<td>23.7</td>
<td>25.9</td>
<td>28.0</td>
<td>30.6</td>
<td>36.3</td>
<td>26.6</td>
<td>24.6</td>
</tr>
<tr>
<td>H60</td>
<td>29.1</td>
<td>31.7</td>
<td>37.8</td>
<td>39.6</td>
<td>45.1</td>
<td>36.0</td>
<td>27.7</td>
<td>17.1</td>
<td>8.1</td>
</tr>
</tbody>
</table>

**Bloating (mm)**

<table>
<thead>
<tr>
<th>Body fluid balance (%)</th>
<th>20.0</th>
<th>76.3</th>
<th>58.2</th>
<th>47.8</th>
<th>41.8</th>
<th>33.7</th>
<th>21.6</th>
<th>14.6</th>
<th>6.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>H30</td>
<td>61.2</td>
<td>37.6</td>
<td>23.7</td>
<td>25.9</td>
<td>28.0</td>
<td>30.6</td>
<td>36.3</td>
<td>26.6</td>
<td>24.6</td>
</tr>
<tr>
<td>H60</td>
<td>29.1</td>
<td>31.7</td>
<td>37.8</td>
<td>39.6</td>
<td>45.1</td>
<td>36.0</td>
<td>27.7</td>
<td>17.1</td>
<td>8.1</td>
</tr>
</tbody>
</table>

Different lowercase letters denotes significant differences (p<0.05) between rehydration rates at the same time.
PURPOSE: The purpose of this investigation was to compare the physiological responses to running in veteran professional drivers and amateur drivers. METHODS: Four male sports car drivers, two professionals (PRO) and two amateurs (AM) participated in seven nationally sanctioned sports car races in the IMSA series. Rate of perceived exertion (RPE) was collected on the Borg scale (scale of 6-20) after their driving stint. Blood lactate was measured both before and after their driving stint. Pre and post nude body weights were collected as a measure of fluid loss. RESULTS: Over the course of the seven races, there was no significant difference in RPE between the professionals and amateurs. However, there was a significant difference in blood lactate following a driving stint (PRO 4.82 mmol/dl ±0.95; AM 5.2 ±0.98 mmol/dl; p=0.05). There was also significant difference (P=0.03) in fluid loss with the PRO losing 3.05 ±0.78 lbs of sweat while the AM lost 4.09 ±0.78 lbs. CONCLUSIONS: These findings suggest that the level of racing experience plays a critical role for a driver in the amount of work done in a race car and the associated fluid loss. These factors indicate that AM could become fatigued faster and result in a decrease in driving performance.

Table 1. Thermoregulatory, physiological and perceptual responses

<table>
<thead>
<tr>
<th></th>
<th>COOL</th>
<th>HOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectal temperature (°C)</td>
<td>37.3 ±(0.4)</td>
<td>37.4 ±(0.3)</td>
</tr>
<tr>
<td>HR (bpm)</td>
<td>62.0 ±(9.3)</td>
<td>64.2 ±(13.1)</td>
</tr>
<tr>
<td>Thermal comfort (°C)</td>
<td>2.6 ±(0.9)</td>
<td>3.9 ±(1.2)</td>
</tr>
<tr>
<td>Average error (degrees)</td>
<td>0.63 ±(0.2)</td>
<td>0.57 ±(0.1)</td>
</tr>
</tbody>
</table>

PURPOSE: To compare the whole-body sweating rate and percentage of weight loss by dehydration in two different types of indoor training in male college volleyball players. METHODS: 8 male college volleyball players were evaluated from February to March 2017. We calculated the whole-body sweating rate and the percentage of weight lost by dehydration in two different training session [Volleyball training (VO) and Volleyball training plus resistance training (VR)]. To evaluate the whole-body sweating rate, body and sport bottle were weighed before and after training to calculate changes in body mass and fluid intake (subjects were allowed to drink ad libitum during trainings). Subjects had to wear minimal clothing, to dry their skin with towels and to void their bladders before being weighted. Active time of each training was evaluated employing a stopwatch. Results are shown in median, minimum and maximum. RESULTS: The active time for VO were 117 min (72 - 135); on the other hand, for VR were 107 min (97 - 126) (p= 0.96). A higher whole-body sweating rate was found from VO (11.8 ml/min, 5.7 - 13.3) than VR (10.1 ml/min, 7.0 - 12.3) but were not significantly different (p=0.42). Conversely, a lower percentage of weight loss by dehydration was found from VO (0.7, 0.3 - 1.4 %) than VR (0.8, 0.2 - 1.3 %), but again were not significantly different (p=0.69).

CONCLUSIONS: In this study we found the sweating rate and body weight loss by dehydration were similar despite the training sessions were different. Maybe this happened because the active time was the same. However, it is known that intensity also plays a role in sweating rate, but it wasn’t measured here, and therefore, the differences in training intensity may soft the differences in sweating rate and body weight loss despite there were the same active time.
E-bikes have become a growing alternative to traditional bikes. E-bikes are often used for transportation to and from the workplace, thus, in the initiative to promote adoption, advanced features such as appropriate assistance to eliminate the onset of sweat would be appealing to most users. PURPOSE: To provide a starting point for the development of a regression equation that can predict sweat onset. METHODS: Ten participants volunteered for this study. Participants committed to 5 experimental cycling sessions that varied by workload and climate. Participants cycled on an indoor bike trainer at 2 power outputs (25W and 75W) and 2 climatic conditions (25°C @ 60% RH and 30°C @ 60% RH) until sweating commenced. Physiological measures included: electromyography, heart rate, skin temperature, core temperature, galvanic skin response, and VO₂. RESULTS: The average subjective sweat onset time for the 75W condition was 14.05 ± 1.44 minutes for the low and high temperatures, respectively. A regression equation was developed and is able to predict subjective sweat onset with 61.5% of the variance explained. CONCLUSION: For the conditions simulated in this study, external temperature had less of an influence on sweat onset times than cycling workload. Sweat onset can be predicted with 61.5% of the variance explained using only two input variables. Heart rate was a poor indicator of sweat onset and simply using power output would be a better starting point. Overall, workload proved to be the most influential variable for predicting sweat onset.

This project was funded by the Natural Sciences and Engineering Research Council

Engage Grant

Board #233  May 31 8:00 AM - 9:30 AM

Predicting The Onset Of Sweat During Cycling In Simulated Environments

F. Michael Williams-Bell¹, Garrison Forman², Shilpa Dogra³, Martin Agelin-Chaab³, Michael W.R. Holmes¹. ¹Durham College, Oshawa, ON, Canada. ²Brock University, St. Catharines, ON, Canada. ³University of Ontario Institute of Technology, Oshawa, ON, Canada. (No relevant relationships reported)
During exercise recovery, autonomic thermoeffectors return to pre-exercise levels despite elevations in core temperature. It is unknown if thermal behavior follows a similar trajectory or compensates for elevated core temperature in lieu of autonomic thermoeffector withdrawal. PURPOSE: To test the hypothesis that thermal behavior during recovery remains engaged despite autonomic thermoeffector withdrawal. METHODS: In a 24 ± 1°C, 45 ± 10% RH environment, 10 subjects (6 females, 22 ± 1 y) cycled for 60 min (225 ± 6 W metabolic heat production), followed by 60 min passive recovery. Weighted mean skin (10 site) and intestinal temperatures, skin blood flow (forearm; laser Doppler), average local sweat rate (upper arm, trunk; ventilated capsule), and weighted mean skin wetness (4 site) were measured continually. Subjects controlled the temperature of their dorsal neck to their perceived thermal comfort using a custom-made fluid filled tubing device. Device temperature provided an index of thermal behavior. Mean body temperature, calculated as the unweighted average of mean skin and intestinal temperatures, provided an index of the stimulus for thermal behavior. To directly determine the effect of prior exercise, post-exercise data were analyzed the minute mean body temperature recovered to pre-exercise levels within a subject. RESULTS: Mean body temperature returned to pre-exercise levels 28 ± 20 min into recovery (Pre: 33.5 ± 0.2, Post: 33.5 ± 0.2°C, P=0.20). At this point, mean skin temperature had recovered (Pre: 29.6 ± 0.4, Post: 29.5 ± 0.5°C, P=0.20), yet intestinal temperature (Pre: 37.3 ± 0.2, Post: 37.5 ± 0.3°C, P=0.01) and skin wetness (Pre: 0.2 ± 0.1, Post: 0.3 ± 0.0.a.u., P=0.02) were elevated. Post-exercise, skin blood flow (Pre: 58 ± 78, Post: 26 ± 25 PU, P=0.10) and local sweat rate (Pre: 0.05 ± 0.25, Post: 0.13 ± 0.14 mg/cm²/min¹, P=0.09) returned to pre-exercise levels, while neck device temperature was depressed (Pre: 27.4 ± 1.1, Post: 21.6 ± 7.4°C, P=0.03). CONCLUSIONS: Mean body temperature and autonomic thermoeffectors returned to pre-exercise levels, yet thermal behavior was active during recovery. Thermal behavior may compensate for autonomic thermoeffector withdrawal in the presence of elevated intestinal temperature and mean skin wetness post-exercise. Supported by lululemon athletica inc.

C-C Chemokine Receptor 2 (CCR2) is required for monocyte chemotaxis to inflamed areas. Monocytes undergo diapedesis and differentiate into inflammatory M1 or anti-inflammatory M2 macrophages. Skewing of M1/M2 balance toward M1 may lead to sustained inflammation and disease development, including cardiovascular disease (CVD). CCR2 activation increases phosphorylation of extra-cellular regulated kinase 1 and 2 (pERK) which is necessary for M2 polarization but not M1. PURPOSE: To evaluate the differences and time course of CCR2 and pERK in fit (FIT) and unfit (UF) males following acute exercise. METHODS: 5 FIT (VO2peak = 450 mLO2/min) and 5 UF (VO2peak = 400 mLO2/kg/min) males performed 30 minutes of cycling. Intensity was adjusted to maintain an average blood lactate concentration of 8mM/L. Results: VO2peak of the FIT and UF groups were 450 ± 70 and 400 ± 60 mLO2/kg/min, respectively. VO2peak at 5 min and body temperature were significantly higher in the FIT group compared to UF at all time points. CONCLUSIONS: Higher VO2peak and body temperature in FIT males may increase monocyte recruitment and differentiation to the M2 macrophage phenotype. This likely helps maintain M1/M2 macrophage balance which may decrease the incidence of CVD.

PURPOSE: Telomeres protect the ends of cellular chromosomes from degradation. Although telomere length within immune cells shorten naturally with age, increasing risk of disease and all-cause mortality, physical activity preserves telomere length by increasing mRNA expression of the telomerase component, telomerase reverse transcriptase (hTERT). Therefore, this study examined the influence of aerobic training status on the capacity of peripheral blood mononuclear cells (PBMCs) to express hTERT mRNA following palmitate stimulation. METHODS: PBMCs were isolated from 12 trained (T) and 11 untrained (UT) subjects pre- and post-maximal exercise, and stimulated with or without palmitate (4 hours) to examine changes in hTERT mRNA expression. RESULTS: hTERT mRNA expression remained unaltered following palmitate stimulation in T subjects at rest and in response to maximal exercise. To the contrary, palmitate-induced hTERT mRNA expression was elevated at rest relative to unstimulated PBMCs in UT subjects and following maximal exercise was suppressed relative to unstimulated PBMCs and pre-exercise expression levels (F[2, 25] = 7.84, p = 0.006). In addition, cardiorespiratory fitness (VO2peak) was negatively associated with the percent change in hTERT mRNA expression in unstimulated PBMCs (r = -0.496, p = 0.022) and positively associated with the percent change in hTERT mRNA expression following palmitate stimulation (r = 0.468, p = 0.032). CONCLUSION: This data suggests that aerobic training may preserve the capacity of immune cells to protect against inflammatory-induced telomere shortening following acute physiological stress.
1433 Board #241 May 31 8:00 AM - 9:30 AM
Association Between Actn3 R577X Polymorphism And Weight-lifting Performance In Japanese And Italian Athletes.
Naoki Kikuchi1, Myosotis Massidda2, Tatsuru Miyamae1, Shunsuke Suzuki1, Akihito Inoue1, Naoyuki Kobatake1, Daniele Masala3, Carla M. Calo4, CM3, Koichi Nakazato1. 1Nippon Sport Science University, Tokyo, Japan. 2University of Cagliari, Cagliari, Italy. 3University of Cassino and Southern Lattium, Cassino, Italy.

CONCLUSIONS: In conclusion, our data indicates an association between Actn3 R577X polymorphism and weight-lifting performance, with carriers of the RR and RX genotype showing the highest records of snatch and clean & jerk than athletes with XX genotype in both Japanese and Italian groups.

RESULTS: The genotype frequencies in Japanese and Italian controls were 21%, 48%, 31% and 30%, 58%, 12% for RR, RX, and XX, respectively. There were no significant differences in the ACTN3 R577X genotype frequency distribution between athletes and controls in either Japanese and Italian cohorts. Athletes with RR genotype showed higher records of snatch and clean & jerk than athletes with XX genotype in both Japanese and Italian groups.

METHODS: METHODS: The study subjects were patients with chronic plantar heel pain. The study was conducted at Ilsanpaik Hosp., Inje Univ, Goyang, Korea, Republic of.

PURPOSE: Both genetic and environmental factors contribute to individual differences in physical activity. However, it remains uncertain whether the home environment can modify the effects of genetic factors on physical activity. We examined to what extent the psychosocial home environment in childhood and adolescence modifies the genetic influences on leisure-time physical activity in young adulthood by using Finnish twin data. METHODS: Families with twins born between 1983 and 1987 took part in the population-based FinnTwin12 study. The psychosocial home environment was assessed by twins at ages 12, 14, and 17, as well as by their parents when the twins were age 12 using an 8-item questionnaire. At age 24, twins assessed their leisure-time physical activity based on a series of structured questions, which were used to calculate leisure-time MET hours per day. Data of 3,305 twins were analyzed using a TaqMan approach for the ACTN3 (rs1815739) polymorphism.

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RESULTS: The genotype frequencies in Japanese and Italian controls were 21%, 48%, 31% and 30%, 58%, 12% for RR, RX, and XX, respectively. There were no significant differences in the ACTN3 R577X genotype frequency distribution between athletes and controls in either Japanese and Italian cohorts. Further studies in large cohort are required to confirm the association between genetics and weight-lifting performance.

CONCLUSIONS: In conclusion, our data indicates an association between Actn3 R577X polymorphism and weight-lifting performance, with carriers of the RR and RX genotype showing the highest records of snatch and clean & jerk than athletes with XX genotype in both Japanese and Italian groups.

METHODS: METHODS: Both genetic and environmental factors contribute to individual differences in physical activity. However, it remains uncertain whether the home environment can modify the effects of genetic factors on physical activity. We examined to what extent the psychosocial home environment in childhood and adolescence modifies the genetic influences on leisure-time physical activity in young adulthood by using Finnish twin data. METHODS: Families with twins born between 1983 and 1987 took part in the population-based FinnTwin12 study. The psychosocial home environment was assessed by twins at ages 12, 14, and 17, as well as by their parents when the twins were age 12 using an 8-item questionnaire. At age 24, twins assessed their leisure-time physical activity based on a series of structured questions, which were used to calculate leisure-time MET hours per day. Data of 3,305 twins were analyzed using a TaqMan approach for the ACTN3 (rs1815739) polymorphism.

RESULTS: The genotype frequencies in Japanese and Italian controls were 21%, 48%, 31% and 30%, 58%, 12% for RR, RX, and XX, respectively. There were no significant differences in the ACTN3 R577X genotype frequency distribution between athletes and controls in either Japanese and Italian cohorts. Further studies in large cohort are required to confirm the association between genetics and weight-lifting performance.

CONCLUSIONS: In conclusion, our data indicates an association between Actn3 R577X polymorphism and weight-lifting performance, with carriers of the RR and RX genotype showing the highest records of snatch and clean & jerk than athletes with XX genotype in both Japanese and Italian groups.
CONCLUSIONS: This study has introduced retrocalcaneal approach of ultrasound guided posterior tibial nerve block. It can be as effective as, and even safer than the conventional method because visualization of the entire needle is possible and the needle is advanced from the opposite direction to the posterior tibial artery.

PURPOSE: Quadriceps dysfunction following ACL reconstruction contributes to the development of knee osteoarthritis. Individuals with ACLR express long-term disability that is attributed to quadriceps weakness. The purpose of this study was to determine the relationship between indices of quadriceps function and self-reported disability. METHODS: Isometric peak torque (PT; Nm/kg) and rate of torque development (RTD; Nm/kg/sec) and isokinetic (180°/sec) PTs (Nm/kg) were measured in 46 individuals with ACLR (74% female; age = 22.1±2.8 years; height = 1.70±0.09 m; mass = 71.6±15.7 kg) and 38 control participants (74% female; age = 21.9±1.2 years; height = 1.69±0.09 m; mass = 66.2±11.7 kg). Significant disability was assessed using the International Knee Documentation Committee (IKDC) instrument. Dependent variables were compared between the involved and uninvolved limbs using paired t-tests, and involved and uninvolved limbs were compared to control limbs using independent t-tests (adjusted α = 0.017). Pearson correlation was used to determine the relationship between indices of quadriceps function and IKDC (a priori α = 0.05). RESULTS: Involved limbs had lower isometric PT (2.27±0.55 vs. 2.57±0.73 Nm/kg; p = 0.01), RTD (11.75±9 vs. 15.31±6.9 Nm/kg/sec; p < 0.01) and PT at 180° (1.72±0.48 vs. 1.91±0.47 Nm/kg, p < 0.01) compared to control limbs. Uninvolved limbs had lower PT (2.90±0.53 vs. 2.75±0.73 Nm/kg; p = 0.02), RTD (10.75±5.1 vs. 15.3±6.9 Nm/kg/sec; p < 0.001) and PT at 180° (1.60±0.41 vs. 1.91±0.47 Nm/kg; p < 0.01) compared to control limbs. No differences were found between involved and uninvolved limbs in PT (p = 0.43), RTD (p = 0.07), or PT at 180° (p = 0.16). Greater PT at 180°/sec (r = 0.33, p = 0.02), and greater RTD 1000 (r = 0.28, p < 0.05) were associated with higher IKDC score. Isometric PT was not associated with IKDC (r = 0.15, p = 0.31). CONCLUSION: Bilateral quadriceps weakness was found compared to control participants. Greater isometric PT and RTD were associated with higher levels of self-perceived knee joint function while maximal isometric strength was not. Assessment of maximal isometric strength following ACLR may not comprehensively evaluate quadriceps impairment after ACLR.

PURPOSE: To evaluate the response of muscle damage markers to acute heavy exercise in different ovarian hormone secretion.

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RESULTS: In CYC, week-2 estradiol (E2) levels during exercise were significantly higher than those of week-1 (336.7±104.6 vs 69.5±44.2 and 109.8±28.7 pg/mL). During rest, week-1 E2 levels were significantly lower than those of weeks 2 and 3 (63.2±36.9 vs 116.2±18.1 and 198.8±19.7 pg/mL). In OVS, E2 levels did not differ between involved and uninvolved limbs before, immediately after exercise in week 1 (178.3±12.8 vs 218.2±39.7 U/L) and 3 (189.7±8.1 vs 207.0±7.6 U/L). CK in OVS significantly increased immediately and 30 min after exercise when compared with its level before exercise in every week (week 1: before exercise 191.1±114.0 vs immediately after 256.4±112.2 vs 30 min after 239.4±111.5; week 2: 196.3±11.0 vs 244.0±8.1 vs 239.4±13.1; week 3: 199.9±8.8 vs 240.6±5.4 vs 234.0±9.4 U/L).

CONCLUSION: Ovarian suppression in athletes may lead to severer muscle damage because of lack of muscle protection by estradiol.

Introduction: The use of musculoskeletal ultrasonographic (US) measurements in Physical Therapy (PT) has recently increased and been reported to assist in the diagnosis of supraspinatus impingement syndrome (SIS). It has been proposed that the acromion-greater tuberosity distance (AGT) measurements with US may be used to determine the efficacy of PT interventions aimed at increasing AGT in patients with SIS. Limited data has been reported on the intratracer and intertracer reliability of AGT measurements performed by novice testers. METHODS: Participants were 7 males and 13 females (26 years; 21-38 years) with an average BMI of 24.4 (18.9-32). Two PT students took measurements with a portable ultrasound device in brightness mode (B-mode) with an 8-13 MHz linear transducer. Ultrasound images (3) were taken with participants placed in a standardized position with transducer placed on lateral surface of the right shoulder aligned with long axis of humerus. AGT was measured using on-screen calipers from the inferolateral edge of the acromion to the nearest margin of the superior aspect of the greater tuberosity. Each participant was then instructed to move out of the standardized position and 3 more images were taken. A second reader repeated the process. The average of the 3 measurements were used for data analysis. Intratracer and intertracer reliability of measuring AGT was determined by calculating intraclass correlation coefficients (ICC), with 95% confidence intervals. RESULTS: Intratracer reliability for Rater A: .872 (CI: .683-.949) with AGT distance of 2.17 cm (1.68-2.59 cm). Intratracer reliability for Rater B: .804 (CI: .503-.923) with AGT distance of 2.27 cm (1.94-2.91 cm). Interrater reliability for both raters was .741 (CI: .349-.897). Conclusions: This study demonstrates that intratracer and interrater measurements of AGT are very reliable in healthy individuals when performed by novice testers.

PURPOSE: Cryotherapy is a common intervention used to treat acute and chronic injuries, and it can be used to facilitate rehabilitation exercises. A common practice in athletic training is allowing a patient to return to activity after the application of some type of cryotherapy. However, the effect of applying cryotherapy to a muscle or a joint on functional performance is unclear. PURPOSE: To investigate if cooling a muscle compared to a joint affects functional performance in healthy, active individuals. METHODS: Forty-five healthy, college student volunteers (21 males; 24 females) with ages ranging from 18 to 23 years (M = 20.67; SD = 1.09) were randomly assigned to muscle (low leg cryotherapy), joint (ankle) cryotherapy, or control (no cryotherapy) intervention for 20 minutes. After a 10 minute warm-up, subjects performed practice trials of a shuffle run and squat jump (SLVJ). Subjects performed three trials of a shuffle run (4–6 m sprints) for time, and performed three trials of a SLVJ for height measured prior to and immediately following the intervention. A mixed model ANOVA with a Bonferroni Correction was used to determine significant interactions between intervention groups and times with a priori α = 0.05. RESULTS: For the SLVJ, there was a significant interaction between the intervention groups and time; F(2,42)=3.349, p = 0.045; however, group differences were unable to be determined. The muscle intervention group had a significant decrease in jump height between pre- (M=12.24, SD=3.61) and post-test (M=10.89, SD=2.31); p = 0.01. For the shuffle run test, there were no significant interactions between group and time; F(2,42)=0.747, p = 0.480. The joint (pre-M=7.43, SD=0.77; post-M=7.56, SD=0.70); p = 0.036, and muscle (pre-M=7.63, SD=0.71; post-M=7.79, SD=0.78); p = 0.013 intervention groups had a significant increase in run times between pre- and post-test.

CONCLUSIONS: Cryotherapy application for 20 minutes to a muscle significantly decreased SLVJ
Previous research has reported decreased physical activity levels in those with Chronic Ankle Instability (CAI). The impact of this decrease in physical activity is known in CAI subjects. PURPOSE: To measure VO\textsubscript{max} in those with CAI compared to healthy matched controls. METHODS: Sixteen subjects participated in the study. Eight subjects with CAI were matched by age (22.4±2.8 yr and 22.3±3.0 yr, respectively), height (165.3±8.5 cm and 167.8±8.2 cm), weight (68.5±8.2 kg and 65.5±8.2 cm) and gender (five females and 3 males / group), to subjects with no history of ankle injury. All subjects reported to the Health Risk Assessment lab for one session. Subjects completed the foot and ankle disability measure (FAAM and FAAM sport) and the NASA physical activity questionnaire. After the preliminary measurements, the subjects performed a treadmill maximal exercise test. Heart rate was monitored by ECG, while oxygen consumption and carbon dioxide production were monitored using standard techniques. Every minute of the test the subjects rated their effort of exertion using the Borg RPE scale (a 6 to 20 scale). For the treadmill test we used a two-minute progressive test until volitional exertion was attained. RESULTS: No differences were observed between groups for age (p=0.93), height (p=0.56), and weight (p=0.48). VO\textsubscript{max} (mL/kg/min) was significantly different between injured and Control groups (p=0.0005, 32.5±5.1 and 50.5±11.0, respectively). Time to maximal exercise test completion (p=0.26), maximal RER (p=0.57), and VE\textsubscript{max} (p=0.44) were not different between groups. Although maximal HR (p=0.30) and peak RPE (p=0.13) were not different between groups, resting HR was observed to be different between the Injured and Control groups (75.2±11.7 and 58.9±7.5, respectively). FAAM (p=0.001), FAAM Sport (p=0.0001) and NASA (p=0.0001) were all observed to indicate differing activity levels between the groups. CONCLUSIONS: These findings suggest one’s physical fitness level, as assessed by VO\textsubscript{max}, and resting HR differs in college-aged subjects with CAI, suggesting the reoccurrence of this musculoskeletal injury at a young age is serious enough to reduce physical activity levels and result in decreased fitness levels.

Rotational motion at the tibia is important for both knee and ankle function. Normative values for Tibial rotation vary greatly and the ability to accurately assess this motion lacks reliability and clinical applicability. Increasingly, clinicians are using smartphone apps for assessing ROM. PURPOSE: To assess the reliability of a smartphone compass app and goniometer for measuring tibial rotation ROM. Secondarily, to compare average values for the two devices. METHODS: Two evaluators used a test-retest study design. Seventeen (11 male, 6 female) healthy subjects (21.0±1.3yrs, 177.2±10.0cm, 82.0±23.3kg) volunteered with a total sample of 31 qualifying limbs. Maximum internal (IR) and external rotation (ER) ROM was assessed in a seated position simultaneously using a smartphone compass app secured to the shank using an armband and with a goniometer secured to the floor. Participants sat on an adjustable stool with the limb in neutral and knee flexed to 90°. Evaluators separately recorded 3 trials of IR and ER from the goniometer and compass app. The average of 3 trials was used for analysis. Interclass correlation coefficients (ICC) were used to assess reliability. Two MANOVAs (2 devices x 2 raters x 2 times) were used to compare IR and ER ROM. RESULTS: ICC values from the app ranged from 0.78-0.84 and 0.78-0.88 for the goniometer. No significant differences for rater or time were found for either IR or ER. Significant differences in both IR (p=0.001) and ER (p=0.001) ROM were found between devices. Tibial IR and ER were significantly lower for the smartphone (IR=12.7±5.4°, ER=25.1±8.2°) than the goniometer (IR=39.7±8.4°, ER=43.6±7.7°). CONCLUSIONS: While both devices demonstrated excellent reliability, some of the differences in normative values may be attributed to the device used and/or measurement techniques. Reliability values for the smartphone app compared similarly to a previously published study using the Myrn Goniometer™, an expensive, needle-based goniometer that is no longer manufactured or sold. Assessing tibial motion using a compass app is a reliable and efficient way to assess a patient’s tibial rotation, although values will vary compared to traditional goniometers. Clinicians must ensure they utilize the same measurement technique and device to accurately track this motion. In 2015-2016, over 214,000 female athletes competed at the collegiate level in the U.S. The NCAA collects injury data; however, breast related injuries do not have a specific reporting category. The exact sequence of breast injury is unknown; however, a relationship between breast injury and fat necrosis, which mimics breast carcinoma, is documented outside of sport participation. Breast injuries related to motor vehicle collisions, seatbelt trauma, and blunt trauma have been reported. For these reasons, it is important to investigate female breast injuries in collegiate sports. PURPOSE: The objectives of this study are to report the prevalence of self-reported breast injuries in female collegiate athletes, explore injury type and treatment, and investigate breast injury reporting and impact on sports participation. METHODS: A cross-sectional study of female collegiate athletes at four U.S. Universities participating in basketball, soccer, softball, or volleyball. The main outcome measure was a questionnaire regarding breast injuries during sport participation. RESULTS: Almost half of the 194 participants (47.9%) reported a breast injury during their collegiate career, less than 10% reported their injury to health personnel with 2.1% receiving treatment. Breast injuries reported by sport include softball (59.5%), basketball (48.6%), soccer (46.7%), and volleyball (34.6%). CONCLUSION: The long-term effects and sequelae of breast injuries reported by female collegiate athletes during sport play is unknown. Nearly 50% of participants had a breast injury during sport. Although 18.2% indicated that breast injury affected sport participation, only 9.6% of the injuries were reported to medical personnel with 2.1% receiving treatment. From a clinical perspective, this information can be used to heighten the awareness related to female breast injuries and encourage health professionals to create an environment that encourages disclosure of injuries that may be perceived as embarrassing or encouraging to discuss. Supported by an Internal Grant - University of Michigan-Flint Physical Therapy Department.
Ankle sprains remain one of the most common orthopedic injuries, with a significant percentage of patients developing chronic ankle instability (CAI). The impact CAI has on overall health is unknown. PURPOSE: To measure body composition in those with CAI compared to healthy matched controls. METHODS: Sixteen subjects participated in the study. Eight subjects with CAI were matched by age (22.4 ± 2.8 y and 22.3 ± 3.0 y, respectively), height (165.3 ± 8.5 cm and 167.8 ± 8.2 cm), weight (68.6 ± 8.2 kg and 65.5 ± 8.2 cm) and gender (five females and 3 males / group), to subjects with no history of ankle injury. All subjects reported to the Health Risk Assessment lab for one session. Subjects completed the foot and ankle disability measure (FAAM and FAAM sport) and the NASA physical activity questionnaire. Body composition was measures with DEXA. Subjects laid on the DEXA table supine, arms placed down by their side and fully clothed for approximately 15 minutes while the machine conducted a whole body scan. The following measurements were obtained: lean tissue mass (muscle), total/regional body fat, and bone mineral density. Bone mineral density in the form of AP Spine (5th lumbar vertebrae) and Dual Femoral (left and right pelvic joints).

RESULTS: No differences were observed between groups for age (p=0.93), height (p=0.56), weight (p=0.48). Percent fat was different between Injured and Control groups (p=0.016; 35.6±6.1% and 25.1±8.3%, respectively). Fat mass was significantly different (p=0.024) while lean mass was found to be similar (p=0.89) between groups. Android/Gynoid was not different (p=0.58), suggestive of no differences in regional fat deposition between groups in college-aged subjects. Total BMD was not significantly different between the Injured and Control groups (p=0.055; 1.23±0.08 and 1.32±0.10, respectively). FAAM (p=0.0001), FAAM Sport (p=0.0001) and NASA (p=0.0001) were all observed to indicate differing activity/functional levels between the groups.

CONCLUSIONS: These findings suggest CAI results in decreased physical activity levels in college-aged subjects that appears to be resulting in increased adiposity, a trend towards altered total bone mineral density, and no changes in lean body mass.

Percent Body Fat Differs between those with Chronic Ankle Instability and Healthy Matched Controls

Tricia Hubbard-Turner, FACSM, Jimmy Joyner, Anyea King, Aregasus Theodros, Michael Turner, FACSM. University of North Carolina @ Charlotte, Charlotte, NC.

(No relevant relationships reported)
C-48 Free Communication/Poster - Cardiac and Pulmonary Rehabilitation

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

Purpose: To identify predictors of baseline measures of health-related quality of life (HRQoL) in symptomatic patients with peripheral arterial disease (PAD) from objective markers of severity of PAD, clinical and demographic characteristics, comorbid conditions, cardiovascular risk factors, objectively measured physical activity, and patient-based measures of physical function. Methods: HRQol measurements of 216 symptomatic men and women with PAD were assessed with the Medical Outcomes Study Short-Form 36 survey. Patients were further characterized on demographic variables, comorbid conditions, cardiovascular risk factors, ankle/brachial index, peak walking time (PWT) during a maximal treadmill test, 6-minute walk distance (6MWD), gait speed, ambulatory activity monitored during one week, activities of daily living (ADL), mini-mental state examination questionnaire, and walking ability (6MWD) during a maximal treadmill test. The present study assessed the effect of a mobile phone-based CR program on exercise capacity and clinical outcomes in Chinese revascularized patients. Previous studies have documented a favorable effect of cardiac rehabilitation (CR) on patients undergoing percutaneous coronary intervention (PCI). However, participation in CR is sub-optimal, especially in China. Innovative models of CR are needed to improve participation. Purpose: The present study assessed the effect of a mobile phone-based CR (MBCR) program on exercise capacity and clinical outcomes in patients undergoing PCI. Methods: Totally 212 patients following PCI referred to the Cardiologic Clinic of Chinese PLA General Hospital, between Jul, 2015 and Apr, 2016, were divided into 2 groups, to participate in MBCR (n=107) or usual care program (control, n=105). Individualized exercise prescription and educational materials were sent to the participants in the MBCR group by the App named “Heartguard” regularly. Cardiopulmonary exercise testing and questionnaires were measured in 12 months. Results: Compared with those in the control group, participants in the MBCR group showed a greater increase in peak exercise capacity (+0.74 vs -0.08 METs, +16.4% vs +4.5%, p<0.001). VO2 at anaerobic threshold, and dWR, with a greater decrease in VE/VO2 slope in 12 months. Range of blood pressure lowering, angina symptoms and life quality in both groups were similar, but the proportion of smoking participants in the MBCR group was lower (20.7% vs 36.3%, p=0.048). More significant lowering of low density lipoprotein, uric acid, as well as homocysteine was also showed in the MBCR group. During a median follow-up of 18 months, a lower incidence of unselected target vessel revascularizations, rehospitalizations, worsening angina, and combined endpoint (9/107 vs 23/105, p=0.005) was also found in the MBCR group. Multivariable Cox regression analysis of correlation showed participation in MBCR was associated with a trend decreased clinical events (HR=0.32, 95% CI=0.14-0.73) after adjustment for many factors. Subgroup analysis demonstrated that patients with a history of smoking were more likely to benefit from the MBCR program. Conclusions:
A progression of muscle atrophy (secondary sarcopenia, etc.) in lower extremity function in cardiovascular disease (CVD) inpatients leads to a high need for medical and nursing care. Previous study reported that the Short Physical Performance Battery (SPPB) may be an effective assessment tool for strength and lower extremity function in CVD inpatients (male patients and outpatients). However, it is unclear the SPPB can be used to evaluate mobility capability for only CVD inpatients, although which require special attention to nutrition status and body composition. PURPOSE: The purpose of this study was to examine if the SPPB can validated assessment tool for strength and lower extremity function and the relationships between the SPPB and clinical and laboratory factors for CVD inpatients. METHODS: CVD male (n=318) and female (n=172) inpatients were recruited. A stepwise multiple-regression analysis was performed to predict total SPPB scores and assess variable factors (physical characteristics, functional and morphological assessments, etc.). RESULTS: There were significant correlations between knee extensor strength and total SPPB scores for CVD male and female inpatients (both p<0.001). There were significant correlations between mid-thigh MTH and total SPPB scores for CVD male and female inpatients (both p<0.001). To predict total SPPB scores, the predicted handgrip, Controlling Nutritional Status score, % body fat, anterior mid-thigh muscle thickness (MTH), standing height and systolic blood pressure were calculated for males and anterior mid-thigh MTH, BMI, knee extension and fat mass were calculated for females. CONCLUSIONS: Total SPPB scores are an effective assessment tool for the functional and morphological evaluation for CVD male and female inpatients. Notably, quadriceps femoris MTH may play an important role in high SPPB scores in CVD inpatients regardless of gender.
INTRODUCTION: Patients with cystic fibrosis (CF) exhibit high levels of oxidative stress that contribute to multiple systemic dysfunctions, including exercise intolerance. Antioxidant supplementation has been shown to mitigate oxidative stress and improve exercise intolerance in other populations. Recently, our group has described that patients with CF exhibit impairments in skeletal muscle metabolism that may contribute to exercise intolerance. Whether or not antioxidants can impact muscle metabolism during exercise in patients with CF, however, has yet to be elucidated.

PURPOSE: This study sought to test the hypothesis that 4 weeks of oral antioxidant supplementation will improve skeletal muscle metabolism during maximal exercise in patients with CF.

METHODS: Eight patients with CF (25 ± 11 yrs.) completed an incremental exercise test on a cycle ergometer before (Pre) and after 4 weeks of oral supplementation with an antioxidant cocktail (AOC; vitamin C, vitamin E and α-lipoic). Skeletal muscle metabolism was evaluated at rest and during maximal exercise (max) through: (I) O2 extraction (O2Ex), calculated using a derivation of the Fick equation, (II) muscle O2 utilization (HHb), using near-infrared spectroscopy and (III) exercise factor (EF), as the relative contribution of O2 supply to O2 consumption.

RESULTS: A significant (p < 0.039) increase in O2Exmax was observed after 4 weeks of AOC when compared to baseline (Pre: 57 ± 8%, AOC: 64 ± 7%). In addition, HHbmax (μM) significantly increased (p = 0.046) greater (Pre: 0.97 ± 3.4 μM, AOC: 5.9 ± 2.9 μM) and EExmax was significantly (p = 0.048) reduced (Pre: 7.1 ± 1.4 AU; AOC: 6.3 ± 1.3 AU) after completing the AOC treatment. No changes in resting skeletal muscle metabolism (p > 0.446) were observed following 4 weeks of supplementation.

CONCLUSIONS: For the first time, we have documented that four weeks of AOC supplementation improves skeletal muscle metabolism during maximal exercise in patients with CF. These findings suggest that oxidative stress may partially be involved in the reduced O2 extraction and muscle O2 utilization during exercise observed in patients with CF. Future studies are warranted to investigate the long term effects of antioxidants on muscle metabolism and exercise tolerance in CF. Supported in part by CFFT Harris IA40 (RAH).
1462 Board #270 May 31 9:00 AM - 10:30 AM Does Estimated Cardiorespiratory Fitness Accurately Predict Directly Measured VO2peak In Breast Cancer Survivors?

Meghan Michalski, Catherine Capaci, Kylie Rowed, Richard Happel, Jessica Scott. Memorial Sloan Kettering Cancer Center, New York, NY.

The ACSM walking equation used to estimate maximal aerobic capacity (VO2maxest) was developed nearly 4 decades ago and based on relatively few (<100), young (19 to 26 years old) participants. The validity of estimated VO2maxest in clinical populations remains uncertain.

**PURPOSE:** To compare estimated VO2peak with actual VO2peak derived from maximal treadmill testing in breast cancer survivors. **METHODS:** In the context of a randomized controlled trial, 115 survivors (mean age, 59 ± 7 yr) performed an incremental walking treadmill test to volitional fatigue with gas exchange to determine VO2peak. Estimated VO2max was calculated using the ACSM walking equation and compared with actual VO2peak by examining the constant error (CE) and correlation coefficient (r). **RESULTS:** The ACSM equation significantly overestimated VO2peak (CE: 6.3 ± 5.0 mL/kg/min, p<0.001; r=0.65, p<0.001). **CONCLUSION:** Alternative estimated VO2max models should be considered given that low VO2peak is associated with a higher prevalence of acute and chronic treatment-related toxicities, higher symptom burden, and increased risk of all-cause and cancer-specific mortality. Supported by National Institutes of Health (CA-142566)

Cardiorespiratory fitness (CRF = VO2max) is known to significantly influence the risk of morbidity and mortality from chronic diseases. Comparing CRF relative to body weight in different population groups is common. However, CRF relative to lean body mass (LBM) could be more informative due to its energy demanding characteristic; a relevant aspect in people living with debilitating chronic diseases associated with muscle wasting such as HIV infection.

**PURPOSE:** To compare absolute VO2max, and VO2max relative to body weight and relative to LBM among community dwelling HIV+ and HIV- Hispanic women; and determine the percent VO2max variance explained by body weight vs. LBM. **METHODS:** Measures of total mass, LBM, fat, and percent fat were conducted with DEXA scanning in a group of 32 HIV+ and 15 HIV- Hispanic women. **RESULTS:** No between group differences were observed for the following variables, age (45.1±10.4 yrs vs. 41.1±14.2 yrs), weight (73.6±15.2 vs. 72.0±12.3 kg), BMI (28.8±5.9 vs. 28.0±6.3 kg/m2), DEXA fat (41.1±7.2 vs. 43.3±4.8 %), DEXA LBM (41.6±5.7 vs. 39.6±6.7 %), absolute VO2max (1.40±0.34 vs. 1.53±0.34 L/min), VO2max relative to body weight (19.3±3.6 vs. 21.4±4.2 mL kg·min⁻¹), and VO2max relative to LBM was observed among HIV+ compared with HIV- Hispanic women (34.4±5.3 vs. 38.6±6.3 mg·L⁻¹·min⁻¹, P=0.006). Body weight explained 38% and LBM explained 50% of the variance in CRF. **CONCLUSION:** These results suggest that VO2max relative to LBM should be considered as the standard for VO2max comparison, particularly among HIV+ women at risk of experiencing reduced muscle mass. Supported by NIHHD S12MD010830, R21MH095524, U54MD007587-04, R25MD007607.
Impact of Primary Disease Status on Six-Minute Walking Distance.

Ulif G. Bronas, Cynthia Fritschi, Karen Vuckovic, Laurie Quinn, Eileen Collins. University of Illinois at Chicago, Chicago, IL. (No relevant relationships reported)

PURPOSE: The 6-minute walk distance (6MWD) is one of the most commonly used outcome assessments of physical function in exercise research. The 6MWD is predictive of health outcomes across many chronic health conditions, however, the impact of health conditions on 6MWD remains unclear; limiting its use as a clinical tool. The purpose of this study was to assess the differences in 6MWD across multiple chronic health conditions in older adults.

METHODS: We assessed the 6MWD in 337 community dwelling older adults (mean age 65 years, 225 males, 158 African American, BMI=29.4), following ATS guidelines. We separated groups by primary disease status (type 2 diabetes only (DM, n=117), moderate/severe chronic obstructive pulmonary disease (COPD, n=119), chronic kidney disease (CKD, n=40), peripheral artery disease (PAD, n=16), and moderate chronic heart failure (HF, n=45)).

RESULTS: The mean 6MWD across groups was 389 (103) meters. By disease, the mean 6MWD was 222 (78) m for HF, 364 (25) m for PAD, 425 (108) m for COPD, 458 (110) m for CKD, 477 (104) m for DM. Normative values of older adults are commonly considered to be ≤154 meters with the 10th percentile reported at approximately 134.61 meters. Our finding of a mean 6MWD of 389 m suggests low physical functioning status across older adults with chronic disease. Only the HF group met criteria for being in the 10th percentile although the PAD group also showed significant decline in physical function. A 6MWD of less than the 25 percentile (<470 m) is considered low functioning status. Our mean 6MWD was substantially lower than the 25th percentile in all groups except for the DM group.

CONCLUSIONS: We found that the mean 6MWD is lower in patients with HF and PAD, placing these patients at a high risk for loss of ability to conduct activities of daily living and eventually loss of independence, however all groups exhibited reduced physical function. This study highlights the importance of interpreting the 6MWD based on individual health conditions and that generalization based on 6MWD cannot be made without taking individual health conditions into account. Establishing a data register would capture data based on health conditions and enable the 6MWD to be used across disease states in a clinical setting and when prescribing exercise therapy for older adults with chronic disease.

Firefighters and Physical Function: Should There Be Annual Testing?

Hyosung Han, Alexis C. King, J. Mark VanNess, Cynthia Villalobos, Courtney D. Jensen. University of the Pacific, Stockton, CA. (No relevant relationships reported)

There are more than a million actively employed firefighters in the United States. To qualify as a firefighter, one must pass the Candidate Physical Ability Test (CPAT), a rigorous assessment of strength and endurance. Following the CPAT, there is no national or state mandate to evaluate fitness or uphold a standard of minimum physical competency. Although strength, endurance, and mobility are critical to job performance, data concerning the preservation of function throughout a firefighter’s career are scarce. PURPOSE: To evaluate the physical functioning of firefighters.

METHODS: We enrolled 35 firefighters in California, collected demographic data, and performed a battery of tests, which included anthropometric assessments, grip strength, sit-and-reach, shoulder flexibility, vertical jump, push-ups, curl-ups, and VO2 max. We compared mean data to normative data and used multiple linear regression to test the effect of age on physical functioning, holding potential confounders constant.

RESULTS: On average, firefighters were 33.5 ± 11.8 years of age and performed 23.9 ± 3.1 curl-ups, 32.2 ± 12.3 push-ups, had a vertical jump of 59.6 ± 10.4 cm, mean L/R grip strength of 66.0 ± 12.9 kg, arm-reach of 5.2 ± 9.1 cm, shoulder flexibility of 20.2 ± 6.8 cm, and VO2 max of 40.1 ± 10.8 ml/kg/min. Compared to normative data, the mean firefighter had excellent grip strength, excellent push-ups, above average vertical jump, average shoulder flexibility, below average curl-ups, poor sit-and-reach, and poor VO2 max; 94.1% of firefighters were classified as poor or very poor in VO2 max. Linear regression did not find age to be a significant predictor of sit-and-reach (p=0.167) or VO2 max (p=0.319) holding other significant predictors constant.

CONCLUSION: In general, firefighters performed consistently in assessments of strength, but poorly in flexibility and aerobic capacity. Age was not a significant predictor of performance in either assessment; the implication is that duration spent as a firefighter is not related to functional decline. There may not be a need for firefighters to complete periodic CPAT assessments, but they should be encouraged to improve capacities of endurance and flexibility.
The six-minute walk test (6MWT) is a popular submaximal exercise test used in cardiac rehabilitation (CR) programs. Patients in CR characteristically have several cardiovascular risk factors present; therefore, the selection of the 6MWT over maximal treadmill testing reduces the likelihood of adverse events. Several established prediction equations exist for predicting VO_{2peak} from six-minute walk speed (6MWS) and/or distance (6MWD). PURPOSE: To compare the predicted VO_{2peak} values, calculated from 6MWS, obtained from CR patients using established equations. METHODS: Seventeen volunteers (age = 64 ± 16 yr) completed a pre- and post-6MWT prior to a High-intensity Interval Training (n = 6) or moderate intensity continuous exercise (n = 11) program. The Burw et al. (2011), Cahalan et al. (1996), and Ross et al. (2010) VO_{2peak} prediction equations were examined for validity and reliability. A repeated measures analysis of variance (ANOVA), with subsequent paired sample t-tests, was conducted to compare differences within and between 6MWT the VO_{2peak} prediction equations. A 3 x 2 mixed-design ANOVA was performed to examine the effects across VO_{2peak} and time (pre- and post-). RESULTS: The repeated measures ANOVA revealed statistical significance within pre- [F(2.32) = 121.40, p < 0.001] and post-program VO_{2peak} values [F(2.32) = 7.82, p < 0.001]. Sequential paired sample t-tests showed a significant difference between the three equations for both pre- and post-program VO_{2peak} values (df = 16, p < 0.001). The 3 x 2 mixed-design ANOVA observed no significant differences in VO_{2peak} values across the two time points. CONCLUSION: The three prediction equations demonstrated reliability pre- and post-programming. However, insufficient literature exists comparing the validity and reliability of VO_{2peak} prediction equations. Future research should include the sample size and consider the use of criterion measurement system (i.e., wearable metabolic system which can measure gas exchange).

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C-50 Exercise is Medicine®/Poster - EIM: Counseling and On-Campus

Cardiovascular disease and risks factors are worldwide concerning problems leading to public health policies and strategies to avoid high costs and low outcomes to populations. Physical inactivity is a major risk factor and play an important role that should lead to global public health strategy for its cost-efficiency and cost-effectiveness. The main issues are the specific country-based public health policies, which continuously leads to campaign to avoid sedentary behavior and physical inactivity, and not population-based exercise programs policies. Purpose: The purpose of our study was to share data from a community-based exercise program (“Move it”) contextualized on the Brazilian public health policy (SUS) for the last 20 years. Methods and Results: The program “Move it” is a multidisciplinary program that runs on primary care facilities of a inner state city of São Paulo (Botucatu), Brazil, that has been implemented 25 years ago. So far, 2% of the city population has been involved (2800 participants; 55±9 years, 74% females and 68,7% under 60 years of age), participating on protocols that runs on city’s facilities (parks, public gyms and squares), involving diagnosis, fitness analysis and exercise program (80 minutes, 3 times a week). Metabolic Syndrome (ATP criteria) prevalence is 35%, with a successful response to the program of 20% after 10 weeks. VO_{2} max (Balké...
PERCEIVED PHYSICAL LITERACY IN COLLEGE AGED STUDENTS

Victor Andrews, Kansas State University, Manhattan, Kansas

Individuals who fail to acquire adequate competencies in regards to physical activity may develop barriers that limit physical activity later in life. Physical literacy (PL) is a descriptive that is used to measure one’s competence, confidence, and motivation in regards to physical activity. The goal of PL is to have all youth to be considered competent by 12 years of age in order to allow them to be physically active throughout their life-course. PURPOSE: To investigate the perceived physical literacy levels of college aged students. METHODS: The Physical Literacy Self-Assessment was distributed to college aged students to measure perceived PL through e-mail and social media. RESULTS: 94 college students responded (21 ± 3 years, 38 male, 56 female). SPSS v24 was used for frequency analysis and two independent samples t-test. Perceived PL scores were then divided into 4 graded categories: Very Low, Low, High, Very High. 49% of respondents were placed in the “Very High” category, 47% of respondents were categorized at “High”, 3% of respondents were categorized as “Low”, 1% of respondent was categorized as “Very Low”. The results indicate that there is not statistically significant difference between the PL score for male and females (t = 1.88, p = 0.63). CONCLUSION: The goal of PL is to have all individuals meet the criteria to be considered “Very High”. Individuals graded into categories other than “Very High” are considered in need of further education and support until they are perceived to be competent in all elements of PL. PL is still a new concept within the USA. Further research is needed to better understand PL within the USA population and relationships with current physical education levels in college aged populations.

PREGNATAL PHYSICAL ACTIVITY PROVIDER BEHAVIOR AND NUTRITION DISCUSSIONS ACCORDING TO BMI

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Research suggests healthcare providers (HCP) do not regularly discuss physical activity (PA) and nutrition during patient interactions, particularly when patients are considered overweight/obese by body mass index (BMI). It is unknown if this trend extends to obstetric HCPs. PURPOSE: To investigate the differences in 1) patient value of prenatal HCP advice, and 2) the likelihood of prenatal HCP discussion/recognition of PA/nutrition behaviors according to BMI. METHODS: Participants (n=46) included pregnant women enrolled in a PA/nutrition behavioral intervention. A survey assessed 1) demographics, 2) pre-pregnancy height and weight, 3) the degree (1=do not value to 5=highly value) participants valued their prenatal HCP’s opinions, and 4) whether the patient’s prenatal HCP discussed PA behaviors, recommended PA participation, or gave nutritional advice. Means(SD) and percentages were calculated. Participants were categorized into BMI categories of normal weight (<25 kg/m²) and overweight/obese (≥25 kg/m²). An independent samples t-test and chi-square analyses were utilized to assess differences in the value of HCP’s opinions, and whether or not the patient’s HCP discussed PA behaviors, recommended PA participation, or gave nutritional advice according to BMI category. RESULTS: Most participants were Caucasian (82%), married (70%), and college graduates (59%). Participants were 28.3(4.4) years of age, had a pre-pregnancy BMI of 28.0(9.7) kg/m² and valued their HCP’s opinions 4.6(0.6). Most participants discussed current PA habits (61%), received a PA recommendation (57%), and received nutritional advice (59%) from their prenatal HCP. Normal (45.6%) and overweight/obese (54.4%) participants valued their HCP’s advice similarly: 4.6(0.6) and 4.6(0.64), respectively (p=0.71). Although not statistically significant, more normal weight participants discussed PA and received a PA and nutrition recommendation than overweight/obese participants (p=0.10-0.50). CONCLUSION: Our sample highly valued prenatal HCP opinions. HCPs discussed/recommended PA/nutrition behaviors to women across BMI categories, yet many participants received no PA/nutrition advice. Future research should explore ways to consistently incorporate PA/nutrition discussions in obstetric appointments.

Physical activity is key for prevention of most chronic disease. In response, a global initiative called Exercise is Medicine was launched to encourage physicians to treat physical activity participation as a vital sign. However, medical students may not receive the necessary training which may inhibit the future physician’s likelihood to assess or recommend physical activity participation. PURPOSE: To determine if a five day exercise education rotation affects medical student’s opinion regarding a physician’s role in recommending physical activity. METHODS: Third year medical students (n=169) completed a mandatory exercise education rotation as part of general primary care clerkship. This rotation included included basic fitness assessment and consultation, one-hour observation of a clinical supervised exercise program, exercise prescription education for special populations, explanation of the Exercise is Medicine Initiative and mandatory attendance to five group exercise classes. All exercise activities were led by an ACSM certified exercise physiologist at a University based fitness facility. The medical students completed an 8-item Likert scale pre-post survey (1 to 4, strongly disagree, disagree, agree, strongly agree, respectively) to assess their level of agreement with statements about a physician’s role in exercise prescription and personal fitness (Table 1). A paired t-test was used to compare the pre and post scores for each individual item. Significance was set at < 0.05. Results: Table 1.
There are many opportunities for PA professionals to work with primary care providers in the field. There is a need for improving medical education related to PA counseling. There was weak agreement among healthcare providers that primary care professionals had a clear understanding of how to talk to patients about the importance of various PA counseling tasks, and their competency to do each task. Specifically, participants wanted doctors to motivate people, for example by becoming personally involved in physical activity levels just like other vitals signs. There was strong interest in taking an elective for primary care professionals, being able to refer patients to specialists, and help with common solutions they proposed to overcome these barriers were more education lack of education, time, support system for patients, and cost/billing. The most common barriers to PA counseling were patient motivation/compliance, being important (59.4-76.7% agreed/strongly agreed), but reported low confidence in their education and abilities to do them (19.7-51.3% agreed/strongly agreed).

**Conclusion:** The findings demonstrate that a five-day exercise education rotation favorably impacts medical student’s opinion regarding a physician’s role in exercise consultation with patients. More importantly, there was a significant increase in agreement was observed in the students’ agreement that a physician should consider physical activity levels as a vital sign, consistent with the Exercise is Medicine initiative.

**Purpose:** To learn about the knowledge and perceptions that students in primary health care professions had regarding the education and perceptions of medical providers related to PA counseling. **METHODS:** Students currently enrolled in a DO or MD medical school, physician assistant, or nurse practitioner program were recruited to take an online survey. Incorporating two previously validated surveys, subjects were asked about their own PA counseling training they have received, the importance of various PA counseling tasks, and their competency to do each task. Data analyses were performed on each Likert scale question. Open ended questions were analyzed thematically. **RESULTS:** Of the participants who completed the survey (n=72), 6.8% were MD, 52.3% were DO, 21.6% were physician assistant, and 18.2% were nurse practitioner students. Primary care students rated many aspects of PA as being important (59.4-76.7% agreed/strongly agreed), but reported low confidence in their education and abilities to do them (19.7-51.3% agreed/strongly agreed). The most common barriers to PA counseling were patient motivation/compliance, lack of education, time, support system for patients, and cost/billing. The most common solutions they proposed to overcome these barriers were more education lack of education, time, support system for patients, and cost/billing.

Chronic diseases are among the most common and costly health problems in the U.S. Physical activity (PA) has been shown to be effective in treating and preventing many chronic diseases. The Exercise is Medicine initiative aims to promote PA counseling among healthcare providers. However, little is known about the education and perceptions of medical providers related to PA counseling. **PURPOSE:** To learn about the knowledge and perceptions that students in primary health care professions had regarding the education and perceptions of medical providers related to PA counseling. **METHODS:** Students currently enrolled in a DO or MD medical school, physician assistant, or nurse practitioner program were recruited to take an online survey. Incorporating two previously validated surveys, subjects were asked about their own PA counseling training they have received, the importance of various PA counseling tasks, and their competency to do each task. Data analyses were performed on each Likert scale question. Open ended questions were analyzed thematically. **RESULTS:** Of the participants who completed the survey (n=72), 6.8% were MD, 52.3% were DO, 21.6% were physician assistant, and 18.2% were nurse practitioner students. Primary care students rated many aspects of PA as being important (59.4-76.7% agreed/strongly agreed), but reported low confidence in their education and abilities to do them (19.7-51.3% agreed/strongly agreed). The most common barriers to PA counseling were patient motivation/compliance, lack of education, time, support system for patients, and cost/billing. The most common solutions they proposed to overcome these barriers were more education lack of education, time, support system for patients, and cost/billing.

**Conclusion:** The findings demonstrate that a five-day exercise education rotation favorably impacts medical student’s opinion regarding a physician’s role in exercise consultation with patients. More importantly, there was a significant increase in agreement was observed in the students’ agreement that a physician should consider physical activity levels as a vital sign, consistent with the Exercise is Medicine initiative.
**1480 Board #288 May 31 9:00 AM - 10:30 AM**

**Exercise Is Medicine On Campus 2017: Increasing Off-campus Outreach And Community Collaboration**

Zack Papalia, Melissa Bopp, FACSM, Michele Duffey, Lori Gravish-Hurtack, Christopher M. Bopp, Nancy Williams, FACSM, Alexandra Telech, Britni De Castro. Pennsylvania State University, State University Park, PA. (Sponsor: Melissa Bopp, FACSM)

*No relevant relationships reported*

**PURPOSE:** Exercise is Medicine on Campus (EIM-OC) is an initiative promoting physical activity (PA) on college campuses. Pennsylvania State University, promoting EIMOC since 2010, has held an annual EIMOC Week since 2012. A focus of the EIMOC committee in 2017 was to expand its off-campus reach and community collaboration throughout the commonwealth of Pennsylvania and beyond. The purpose of this study is to analyze and describe the logistical challenges and lessons learned from expanding an EIMOC initiative to off-campus and out of town locations.

**METHODS:** During fall 2017, EIMOC events were expanded from one, on-campus week, to a month of activities including a day of coordinated events with off-campus local businesses, travel to commonwealth campuses, and a week of collaboration with alumni-led organizations nationwide. The logistical challenges of coordinating remote events were documented and evaluated. Observational data from each event assessed popular activities and feedback from participating partners regarding the planning and execution of events was gathered.

**RESULTS:** Analysis addressed three new initiatives. Partnership with local, off-campuses businesses, known as “EIM Off Campus Day,” involved local fitness centers offering no-cost access to students, faculty, and staff for one day, promoted via social media and our website. Reach was assessed through social media analytics (i.e., likes, retweets), website visits and unique page views. Traveling events to commonwealth campuses occurred during “Mobile EIM Week” and were assessed based on the type of activities included, number of partners involved, and number of participants engaged, as well as feedback regarding the perceived success of each event and suggestions to improve future collaborations. Finally, a week-long initiative engaged alumni nationwide (EIM Everywhere Week) relying on email campaigns and social media to spread the word and gauge participation.

**CONCLUSIONS:** The current study offered insights on the challenges and successes in leveraging an existing EIMOC program to spread the message into the community, including timing of advertising and better communication. Despite this, the new initiatives proved both popular and successful, and improving their execution will significantly benefit the future impact of EIMOC.

**1481 Board #289 May 31 9:00 AM - 10:30 AM**

**Preliminary Results Of An In-depth Investigation Of Exercise Is Medicine On Campus**

Olive Wilson, Nishat Bhuian, Melissa Bopp, FACSM, Zack Papalia. The Pennsylvania State University, State College, PA. (Sponsor: Dr. Melissa Bopp, FACSM)

*No relevant relationships reported*

Widespread implementation of Exercise is Medicine on Campus (EIM-OC) has potential to address college student physical inactivity, however, limited research has comprehensively assessed how EIM-OC is operationalized at campuses. **PURPOSE:** To assess EIM-OC implementation, development, and outcomes at various academic institutions. **METHODS:** A survey was developed in consultation with key EIM-OC stakeholders and administered online among EIM-OC representatives. Data collected included: institutional information; promotion, education, and healthcare system integration; partnerships; challenges; and goals. **RESULTS:** Initial responses (n=24) were received from a diverse group of academic institutions ranging in size (<10,000 to >50,000 students) and type (public, private). Campus health and recreation were considered the most important EIM-OC partners, which was attributed to these partners providing the most opportunities for and having the most interactions with students. A lack of time and wanting to focus on existing relationships were cited as reasons for not yet establishing working relationships with other partners. Multiple respondents cited lack of time, awareness, funding, and/or resources as the biggest challenges faced by their program. Bureaucracy surrounding the collaboration between university departments was also cited as a major challenge. Implementing the physical activity vital sign emerged as a common issue, with many institutions having no protocol in place for arranging a follow-up between students and physical fitness professionals after referral acceptances (n=5), and no protocol existing for referral declinations (n=9). Despite a stated desire for greater collaboration with other universities, particularly sharing of information and ideas (n=9), most respondents (83%) had not collaborated with other programs. Social media was under-utilized, with over a third (n=9) of respondents not utilizing any social media platforms. **CONCLUSION:** EIM-OC programs at various institutions experienced similar challenges. This research will serve to inform and improve upon the implementation, development, and outcomes of EIM-OC programs and ultimately contribute to helping academic institutions increase the physical activity of students and their local communities.