**E-13**

**Thematic Poster - Cardiovascular Disease - Exercise Rehabilitation**

Friday, June 3, 2016, 9:30 AM - 11:30 AM

Room: 109

**2402**

**Chair:** Ann L. Gibson, FACSM, University of New Mexico, Albuquerque, NM.

(No relationships reported)

**Abstract:**

Purpose: The purpose of this study was to determine what factors may influence the appreciation of exercise physiology as a discipline as demonstrated by hiring practices of regional clinical settings.

Methods: A mixed-methods telephone survey was administered to 33 cardiac rehabilitation facilities in five states in the Mid-Atlantic region of the United States (Virginia, Tennessee, Kentucky, North Carolina, and West Virginia).

Results: The distribution of RNs and EPs employed by the 33 facilities varied by state, but overall there were 84 RNs and 58 EPs working among the surveyed facilities. Of the 33 surveyed facilities, 36% reported preference in hiring RNs over EPs while only 12% reported preference of hiring EPs over RNs. Over half (51%) of facilities reported a preference toward hiring both (36%) or, in some circumstances, clarifying that the decision would depend on a variety of factors (15%).

In response to the qualitative questions (Q3, Q4, Q5), common themes among responses emerged. Themes from response to Q3 demonstrated hiring managers felt EPs have greater expertise in exercise prescription (61%) followed by better understanding of safe exercise progression for patients (12%). The majority of responses to Q4 reflected the belief that RNs possess greater assessment and clinical skill with an emphasis on emergency response preparedness (64%) followed by greater general patient education skills (24%) were considered another strength of RNs in cardiac rehabilitation facilities.

Only 28 of the 33 facilities elected to respond whether or not they were looking to hire EPs in the near future. Most (64%) of the responding facilities said ‘yes’ or ‘yes-provided the budget would support it’ while only 25% reported no plans to hire EPs or, due to budget constraints, could or would not be able to do so.

Conclusion: The hiring landscape does appear to be changing and trending toward that of an interdisciplinary team in cardiac rehab facilities. Undergraduate exercise science students interested in careers as clinical exercise physiologists and employment in clinical settings may benefit from additional coursework in patient care and assessment as well as advanced cardiac life support (ACLS) training to reinforce their work in an exercise science curriculum.

**2403**

**Board #1**

**June 3, 9:30 AM - 11:30 AM**

**Appreciation for the Role and Hiring Trends of Exercise Physiologists in Regional Cardiac Rehabilitation Facilities**

Allison Bowersock, Alex Breeding, Alex Sheppard. Jefferson College of Health Sciences, Roanoke, VA.

Email: abowersock@jchs.edu

(No relationships reported)

**Abstract:**

Purpose: To explore the differences in the number of exercise physiology (EP) positions as compared to registered nurse (RN) positions at facilities within regional and state contexts, associated with the number of EPs and RNs hired, and the effects of these changes on patient care and outcomes.

Methods: A survey was sent to all Certified Cardiac Rehabilitation Facilities (CCRF) in the Mid-Atlantic region of the United States. The survey included questions about the number of EPs and RNs employed at facilities, the number of EP and RN hires per year, and the changes in the number of EPs and RNs hired over the past 5 years.

Results: The survey was completed by 33 facilities. The average number of EPs employed was 11.3, and the average number of RNs was 26.2. The average number of EP hires per year was 1.3, and the average number of RN hires per year was 1.4. Over the past 5 years, the number of EP hires increased by an average of 0.8, and the number of RN hires increased by an average of 0.9. The average number of EPs per RN hire remained constant at 2.9.

Conclusion: The number of EP hires has increased at a slower rate than the number of RN hires, but the number of EPs per RN hire has remained constant. This suggests that EPs are being hired more selectively than RNs, possibly due to increased demand for EPs in the field of cardiac rehabilitation.

**2404**

**Board #2**

**June 3, 9:30 AM - 11:30 AM**

**Baseline Predictors of Improved Walking During a Supervised Exercise Program in Men and Women With Peripheral Artery Disease**

Andrew W. Gardner, Donald E. Parker, Polly S. Montgomery. University of Oklahoma Health Sciences Center, Oklahoma City, OK.

Email: andrew-gardner@ouhsc.edu

(No relationships reported)

**Abstract:**

Purpose: This study aimed to identify baseline predictors of improved walking during a supervised exercise program in men and women with peripheral artery disease (PAD).

Methods: A total of 50 participants (25 men, 25 women) with PAD (ankle-brachial index ≤ 0.90) completed a 12-week supervised exercise program consisting of 3 weekly sessions of exercise training (40-70% VO2max) under medical supervision. The primary outcome measure was the change in the ambulatory distance walked in 6 minutes (6MWD).

Results: The average age of the participants was 65 ± 12 years, with a mean body mass index of 31 ± 7 kg/m². The average walking distance at baseline was 305 ± 170 m. At the end of the exercise program, the mean walking distance improved to 359 ± 161 m (p < 0.001). Regression analysis revealed that age (β = -1.38, p = 0.04), baseline 6MWD (β = 1.03, p = 0.005), and baseline claudication onset time (COT) (β = 0.22, p = 0.007) were significant predictors of the change in 6MWD. The model explained 41% of the variance in the change in 6MWD (R² = 0.41).

Conclusion: Baseline COT and 6MWD are strong predictors of the change in 6MWD after a supervised exercise program in men and women with PAD. These findings suggest that early detection of PAD and timely intervention may be crucial for improving walking capacity in this population.
RESULTS: Forty-nine patients (61.6 ± 11.0 yr, 171.5 ± 8.9 cm, 79.7 ± 16.0 kg) completed the 36-session CR program during the 12-mo period. Group means ± SD for improvement in METs at 3M (n=33) and 4M (n=16) were 3.30 ± 1.92 METs, and 1.97 ± 1.17 METs, respectively. Group means ± SD for ΔFEC among HF (n=12), ACS (n=25), and CT (n=12) were 108.0 ± 95.5%, 60.4 ± 41.8%, and 54.1 ± 40.2%, respectively. Group means ± SD for ΔFEC at 4M (n=33) and 3M (n=16) were 82.2 ± 68.7%, and 46.5 ± 34.8%, respectively. Results indicate a significant (F (1,43)= 6.344, p = 0.016, partial η2 = 0.129) effect between ΔFEC and the time to complete the 36 sessions.

CONCLUSIONS: These results highlight the effectiveness of a completed hospital-based outpatient CR program to elicit positive health outcomes across intake diagnoses. Completing the 36 sessions in 4M or less produced the greatest improvement in FEC regardless of intake diagnosis.

### Board #5
June 3, 9:30 AM - 11:30 AM
**Effects of High-Intensity Interval Training vs. Moderate Intensity Continuous Exercise in Cardiac Rehabilitation Patients**

Jason D. Wagganer1, William M. Miller2, Majid Mufaqam Syed-Abdul1, Dhvani S. Soni1, Beverly J. Hoover1, Mary K. McCrate1, Beverly A. Kester1, Duc T. Nguyen1, Thomas J. Pujol, FACSM1, 1Southeast Missouri State University, Cape Girardeau, MO. 2University of Central Missouri, Warrensburg, MO. 3University of Missouri, Columbia, MO. 4Saint Francis Medical Center, Cape Girardeau, MO. (Sponsor: Thomas J. Pujol, FACSM) Email: jwagganer@semo.edu

(No relationships reported)

The use of high-intensity interval Training (HIT) has recently gained popularity in the general public. Currently, the majority of cardiac rehabilitation (CR) programs implement moderate intensity continuous exercise (MICE) programs. Recent research in the CR setting has shown that HIT may induce greater cardiorespiratory benefits (i.e., increased VO2max) in a shorter training period compared to MICE. PURPOSE: To assess the effects of a HIT vs. MICE exercise program on VO2max, six-minute walk distance (6MWD), and six-minute walk speed (6MWS) in patients rehabilitating from various cardiac events. METHODS: Six (3 female, 3 male, mean ± SD age: 63±10 yr) volunteers participated in the HIT (n=11, 5 female, 6 males, 64±16 yr) in the MICE group. The project was approved by Southeast Missouri State University and Saint Francis Medical Center IRBs, respectively. Participants completed a 6MW test prior to the initiation of the project. Each 20 minute HIT session was assessed via Rating of Perceived Exertion (RPE) on a 6-20 Borg Scale. Intervals of low (RPE of 9-11 or Very to Fairly Light) and high intensity (14-17 or Somewhat to Very Hard) exercise were performed continuously every two minutes. MICE sessions were participant self-assessed between an RPE of 11-14. The HIT sessions were performed three times per week for six weeks, separated by at least 24 hours, for a total of 18 sessions. Each 30 minute MICE session was performed 4.1±1.2 days per week for 9.4±1.8 weeks. An independent-samples t test was conducted to compare pre- vs. post-assessments for predicted VO2max, 6MWD, and 6MWS with statistical significance set at p ≤ 0.05. RESULTS: A significant difference was found for 6MWD ([t15] = -4.02, p<0.001) and 6MWS ([t15] = -4.01, p<0.001). CONCLUSIONS: The results of the study indicate HIT as a potentially more viable method for increasing 6MWD and 6MWS. The lack of change in predicted VO2max is most likely due to the predictive qualities of the 6MW test compared to a lab tested value. Most importantly, the HIT program showed a significant change in walking speed and distance, this was observed over a shorter training period and less time per training period compared to the MICE program. Supported by Southeast Missouri State University Summer Research Fellowship

### Board #7
June 3, 9:30 AM - 11:30 AM
**3 Months Of Nitrate Plus Exercise Training Increases Performance More Than Training Alone In Peripheral Arterial Disease**

Jason David Allen, FACSM1, Mary N. Woessner1, Mitch VanBruggen2, Thomas Stabler1, Johanna L. Johnson1, Carl Pieper2, William E. Kraus3, 1Victoria University, Institute of Sport Exercise and Active Living, Melbourne, Australia. 2Duke University, Durham, NC. Email: jason.allen@vu.edu.au

(No relationships reported)

Peripheral arterial disease (PAD) is the manifestation of a failure to adequately supply blood flow and O2 to working tissues and presents as claudication pain during walking, which subsides with rest. Nitric oxide (NO) bioavailability is essential for vascular health and can be characterized by endothelial dysfunction and an inability to endogenously produce nitric oxide (NO). We have previously observed that an acute increase in plasma NO2- via oral nitrate treatment improved maximal graded exercise treadmill (GXT) time in PAD. PURPOSE: To determine the effects of 3 months of supervised exercise training plus chronic dietary provision of an inorganic nitrate (4.2mmol in the form of concentrated beetroot juice-BR) versus exercise training and placebo beverage (EX+PL) on resting hemodynamics and hyperemic blood flow in subjects with PAD. The study was a double-blind, randomized controlled trial (data is a subset of a larger clinical trial).

METHODS: At baseline testing, all subjects underwent measures of resting ankle- brachial index (ABI), aortic blood pressures (ASBP) and calf muscle blood flow during reactive hyperemia following 5 minutes of ischemia (RHHB). Subjects were then randomized to either the EX+BR (n=11) or EX+PL (n=12) group. Exercise training involved 3 sessions per week consisting of at least 30 minutes walking at a moderate claudication pain level. Subjects consumed BR or PL 3 hours prior to each exercise session. The 3-month testing protocol was identical to baseline. Comparisons were made using a two-way ANOVA with repeated measures.

RESULTS: There were no differences in baseline measures for ABI, ASBP or RHHB between groups. At 3M, ABI increased 0.10±0.15 (p=0.05) and 0.15±0.11 (p<0.01), RHBB 0.74±2.80% (ns) and 2.44±2.77% (p<0.05) for the EX+PL and EX+BR respectively (ES = -0.69, CI = -1.17 to -1.51). Resting ASBP were significantly lower at 3M for EX+BR versus EX+PL (128.45±17.31 v 147.67±23.72mmHg, p<0.05, ES = -0.95, CI = -1.76 to -0.04).

CONCLUSION: Chronic administration of a high nitrate drink plus supervised exercise training improved the hemodynamic profile in subjects with PAD more than exercise training alone. Supported by grants R21HL111972 and R21HL113717 to JDA

### Board #6
June 3, 9:30 AM - 11:30 AM
**3 Months of Nitrate Plus Exercise Training Improves Hemodynamic Profile in Peripheral Arterial Disease**

Cassandra Smith1, Mary N. Woessner1, Mitch VanBruggen2, Thomas Stabler1, Johanna L. Johnson1, Carl Pieper2, William E. Kraus3, 1Victoria University, Institute of Sport Exercise and Active Living, Melbourne, Australia. 2Duke University, Durham, NC. (Sponsor: Thomas J. Pujol, FACSM)

(No relationships reported)

Peripheral artery disease (PAD) is a form of cardiovascular disease caused by atherosclerotic occlusions that impair blood flow to the lower extremities. It is characterized by endothelial dysfunction and an inability to endogenously produce nitric oxide (NO). NO bioavailability is essential for vascular health and can be increased exogenously via oral nitrate supplementation and its subsequent conversion to nitrite and NO. We have previously shown changes in resting hemodynamics following chronic exercise training and after an acute oral nitrate beverage.
Exercise training is a standard treatment for the patient with coronary artery disease (CAD). Improvements in endurance capacity are an important goal of cardiac rehabilitation, reducing risk, mortality, and improving the quality of life. Approximately 40% of the improvement in submaximal and maximal power output occurs after 9-12 months of exercise therapy.

**PURPOSE:** The aim of this study was to investigate short term (6 weeks) versus long term (42 weeks) exercise training induced changes in the heart rate performance curve (HRPC) in patients with CAD.

**METHODS:** In this clinical investigation, 12 male CAD patients with normal sinus rhythm underwent maximal incremental exercise testing at the start of the exercise rehabilitation program (test 1) and at 6 (test 2) and 42 (test 3) weeks thereafter. All patients completed the first 6 weeks of the exercise therapy. Only 96 completed the 42 week long-term rehabilitation (training group (TG): TG: 56:69 yrs and 32 ended the rehabilitation after 6 weeks (control group (CG): CG: 60:10 yrs). Maximal power output (Pmax) expressed as (Watts; W), heart rate (HR) and the degree and direction of the deflection of the HR performance curve described as factor k (a negatively accelerated heart rate) and k:2 (upward deflection) and a positively accelerated heart rate k:0.2 (downward deflection) were the outcome measures.

**RESULTS:** No significant differences between groups were found in test 1 for the maximal power output (Pmax; TG: 171:639, CG: 157:34 W) and factor k (TG: k:0.22:0.29, CG: k:0.27:0.18) and in test 2 (Pmax, TG: 202:45, CG: 182:45 W; k; TG: 0.17:0.29, CG: 0.25:0.26). Significant differences for Pmax were found only in test 3 (TG: 230:51, CG: 172:45 W) and the factor k (TG: 0.05:0.34, CG: 0.33:0.19).

**CONCLUSION:** The present study demonstrated increases in Pmax as a result of long-term cardiac exercise training as well as significant and favorable changes in the pattern of the HRPC indicating improvements in myocardial function.
was preferred over proxy assistance for a number of modalities, but most prominently for brisk walking (95.7%), light jogging (92.3%), and light swimming (91.4%). In contrast, participants preferred proxy assistance for traditional aerobic dance (66.1%), prenatal aerobic dance (74.4%), and CrossFit-type resistance exercises (75.6%). Significant inverse correlations (p < 0.05) were found between preference for assistance and SE for light jogging (r = -0.13), intense cycling (r = -0.19), light swimming (r = -0.11), intense swimming (r = -0.28), weight lifting (r = -0.23), resistance-band exercises (r = -0.22), and CrossFit-type exercises (r = -0.36). CONCLUSION: Preference for exercise to be instructor-led is inversely related to SE for a number of exercise modalities typically considered to be individual activities. Interventions seeking to increase pregnancy PA levels through these specific modalities should consider utilizing an instructor-based approach.

2415 Board #4 June 3, 9:30 AM - 11:30 AM Identifying Contextual and Emotional Factors to Explore Weight Disparities between Obese Black and White Women
Nicole R. Keith, FACSM, Huijing Xu, Mary de Groot, Kimberly Hemerlen, Daniel O. Ched. Indiana University Purdue University. Indianapolis, Indianapolis, IN.
Email: nkKeith@iupui.edu
(No relationships reported)

Background: Randomized Control Trials have shown that every 6.2kg of weight loss is associated with a 20% and 32% reduction in the 3yr risk of hypertension and type 2 diabetes, respectively. Since 1990, weight loss interventions have shown black women experience 50% less weight loss than white women. All 5 leading causes of death among black women are obesity-related, thus, lifestyle weight loss interventions may actually increase racial disparities in morbidity. Identifying new obesity intervention methods is warranted. PURPOSE: To evaluate the feasibility of identifying factors in obese black and white women’s daily lives that may influence weight. Methods: We performed in-home environmental observations, interviews and height and weight measures with 16 obese black and white women (BMI ≥ 30). For 14 days, we used 40 ecological momentary assessments (EMA) via text message to capture activity, emotion and social interactions every other day. We used day reconstruction method (DRM) telephone surveys (N=6) the following day to reconstruct the context of the prior day’s EMA reports. We then identified fixed and time varying factors that may influence weight. Results: The combined groups completed 74% of the EMAs (mean 29.6 ± 9.06; 28.6 ± 10.25 for black women and 31.2 ± 7.22 for white women). Ninety percent (mean 5.4 ± 0.96) of 6 attempted DRM surveys were conducted for both groups (5.3 ± 1.16 for black women and 5.5 ± 0.55 for white women). Fixed weight-related factors included televisions (mean=3.1 ±1.34), social network ties (mean=3.3 ± 1.14), percent without height scales (43.8%), percent without fitness equipment in the home (68.8%), and percent exposed to food while at work (55.6%). The most frequently reported location was home, activity was working, and emotion was happy (19.4 ± 8.53, 7.1 ± 8.30, 16.9 ± 10.03 times, respectively). Conclusion: With a focus on racial disparities, we demonstrate a novel approach to assessing both fixed and time-varying factors that may influence weight. Establishing methods to identify and quantify weight-related contexts to which individuals are exposed may lead to insight about cues that trigger weight-related behaviors and new interventions to improve weight management.

2416 Board #5 June 3, 9:30 AM - 11:30 AM Vitality after Intentional Weight Loss in Older Women is Associated with Exercise and Improved Sleep
Rachelle M. Acitelli, Chad R. Straight, Erika A. Rees, Alison C. Berg, Kristen B. Johnson, Mary Ann Johnson, Ellen M. Evans, FACSM, Patrick J. O’Connor, FACSM. University of Georgia, Athens, GA. (Sponsor: Ellen Evans, FACSM)
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(No relationships reported)

PURPOSE: Weight loss interventions do not consistently improve health-related quality of life (HRQOL), but some weight loss programs do improve vitality, a correlate of HRQOL. We examined the effect of weight loss on vitality following 24 bouts of low-to-moderate intensity resistance exercise performed by pregnant women. It was hypothesized that feelings of physical and mental energy would increase and feelings of physical and mental fatigue would decrease after each session. METHODS: Twenty-six women in their second trimester (29.7 ± 4.70 years) performed six low-to-moderate intensity resistance exercises twice per week for 12 weeks starting from 22.7 ± 1.3 weeks of gestation. The Mental and Physical State Energy and Fatigue Scale, a battery of visual analog scales, was used to measure perceptions of physical and mental energy and fatigue before and after exercise sessions. RESULTS: Acute resistance exercise consistently increased perceived physical and mental energy and decreased perceived physical and mental fatigue. Mean (±SD) across all 24 sessions in feelings of physical and mental energy were 19.9 ± 39.7 and 17.3 ± 42.9, respectively. These increases did not differ significantly across the 24 exercise sessions for feelings of physical (F_{23,226} = 1.45, p=.136) or mental energy (F_{23,226} = 1.25, p=.242). Mean decreases in feelings of physical and mental fatigue across all 24 sessions were 11.1 ± 5.25 and 16.7 ± 44.9, respectively. These decreases did not differ significantly across the 24 exercise sessions for feelings of physical (F_{23,226} = 1.71, p=.06). When examining the changes in energy and fatigue for each individual across all 24 exercise sessions, most women experienced an improvement in physical energy (89%), physical fatigue (77%), mental energy (89%), and mental fatigue (81%). CONCLUSION: Acute bouts of resistance exercise are consistently associated with increases in feelings of mental and physical energy and reductions in feelings of mental and physical fatigue in pregnant women during the second and third trimesters. Results suggest low-to-moderate intensity resistance exercise improves feelings of energy and fatigue among pregnant women.

2418 Board #7 June 3, 9:30 AM - 11:30 AM Session Perceived Exertion Following Traditional And Circuit Resistance Exercise Arrangements In Older Hypertensive Women
RICARDO M. LIMA, Rafael Gauche, André B. Gedelha, Silvia GR Neri, Medo Bottaro, Lauro C. Viana. University of Brasilia, BRASILIA, Brazil.
(No relationships reported)

Prevalence of hypertension increases with aging so that more than half of older people are affected. Besides documented increases in muscle mass and strength, Resistance Exercises (RE) may also benefit cardiovascular health and have been recommended for hypertensive subjects. Information regarding RE sessions’ arrangement would help to design training programs and enhance adherence.

PURPOSE: To compare session rate of perceived exertion (SRPE) between traditional and circuit RE arrangements in older hypertensive women.

METHODS: After exclusion criteria were applied, 14 hypertensive women (69.9 ± 1.5y) were randomly assigned to two RE sessions differing only in its arrangement (traditional and circuit). In traditional arrangement (TR), volunteers performed 3 sets of 12 repetitions per exercise, with 1 minute interval between sets and exercises. Circuit arrangement (CI) was performed in 3 laps, 1 set in each lap, minimal rest
between exercises and 1 minute between laps. The same RE and order were performed in each session: seated leg-press, seated row, leg extension, chest press, leg curl, shoulder abduction and seated calf raises. SRPE was evaluated using two different instruments: CR-10 Borg’s scale and OMNI-RES. Thirty minutes after each session volunteers were asked to refer their perceived exertion. Blood pressure, heart rate (HR) and its variability were measured before each session. HR was also measured throughout sessions. Dependent variables were compared using paired samples t tests with significance level set at p ≤ 0.05.

**RESULTS:** No differences in cardiovascular variables were observed at rest, however, mean HR was significantly higher during CI (98.9±17.3 vs 94.9±17.1 bpm; p<0.05). Although muscle time under tension was similar between arrangements, total session time was significantly lower for CI (20.2±0.8 vs 29.9±0.8 min; p<0.01). Interestingly, SRPE was significantly lower following CI using both CR-10 (3.4±0.3 vs 3.8±0.2; p = 0.03) and OMNI-RES (4.6±0.4 vs 5.2±0.4; p = 0.03) scales, when compared to after TR completion.

**CONCLUSIONS:** RE performed in a circuit fashion are completed in shorter time and elicited lower SRPE when compared to a traditional multiple-set arrangement, in older hypertensive women. These results might help on training program design and adherence for this population.

### E-15
**Thematic Poster - Physical Activity Promotion Programming/Intervention Strategies - Health Disparities/Equity**
Friday, June 3, 2016, 9:30 AM - 11:30 AM
Room: 101

**Chair:** Melicia C. Whitt-Glover, FACSM. Gramercy Research Group, Winston Salem, NC.

(No relationships reported)

**2419**
**Board #1**
**June 3, 9:30 AM - 11:30 AM**
**Increasing Physical Activity In Black Women: Results From A Randomized Trial Testing A Faith-integrated Program**
Melicia C. Whitt-Glover, FACSM, Ziya Gizlice2, Daniel P. Heil, FACSM1, Moses V. Goldmon3, Njeri Karanja1. 1Gramercy Research Group, Winston Salem, NC. 2University of North Carolina at Chapel Hill, Chapel Hill, NC. 3Montana State University, Bozeman, MT. Lane College, Jackson, TN. 4Kaiser Permanent, Portland, OR.

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(No relationships reported)

Black women report low levels of physical activity (PA) and higher rates of related chronic diseases. Strategies to successfully increase and sustain PA to prevent/control chronic diseases in high risk groups are needed.

**PURPOSE:** To determine the impact of a faith-integrated (FI) or a secular (SEC) intervention compared with a self-guided (SG) intervention on PA in black women.

**METHODS:** Churches (n=31), and participants within churches (n=12 -15 per church) were recruited. Participants (n=417) were self-identified black women, ≥18 years of age, self-reported “low active” ≤150 min/d of moderate-to-vigorous PA [MVPA], with no limitations for increasing PA. Randomization was at the church level. Intervention groups met 24 times over 10 months with women from their own churches; sessions tapered off over time (weekly for 4 months; bi-weekly for 2 months; monthly for 4 months). FI content included biblical scriptures/examples; SEC included secular readings/examples; SG received a written guide for increasing PA. Data were collected at baseline, 10 months, and after a 12-month no attention follow-up period (22 months). Demographics; anthropometrics; and pedometer (steps/d)- and accelerometer-assessed (min/d), and self-reported (min/d) PA were assessed.

**RESULTS:** At baseline participants were 51.4±22.3 years; obese (35.8±9.9 kg/m2); and sedentary (3990±1828 steps/d; 24.0±7.7 min/d; 25.4±45.4 self-report min/d). There were no baseline differences between groups. At 10 months, FI (+1451) and SEC (+1107) significantly increased steps/d over SG (+128). FI also increased sedentary min/d (+25.8), likely to compensate for increased MVPA. FI maintained steps/d (+1092) increase over SG (+336) at 22 months. SEC did not maintain increases.

**CONCLUSION:** FI was a successful and acceptable strategy for increasing and maintaining PA in high risk, low active women. Additional dissemination and testing is needed to determine potential widespread impact of this intervention and subsequent impact on chronic disease risk.

Supported by NIH Grant R01 HL0945801.

### 2420
**Board #3**
**June 3, 9:30 AM - 11:30 AM**
**Impact Of Changing An Urban Environment On Pediatric Obesity Rates: Evidence From A Quasi-experiment**
TaShauna U. Goldsby1, Valerie Yeager2, Bisakha Sen1, Alva Ferdinand3, Devon Taylor1, Bryn Manzella1, Nir Menachemi4. 1University of Alabama at Birmingham, Birmingham, AL. 2Tulane University, New Orleans, LA. 3Texas A&M Health Science Center, Bryan, TX. 4Jefferson County Department of Health, Birmingham, AL. 5Indiana University-Purdue University Indianapolis, Indianapolis, IN. (Sponsor: Nicole R. Keith, FACSM)

Email: tgoldsb@uab.edu

(No relationships reported)

Introduction: Childhood obesity affects ~20% of children ≤19yr in the United States. It is widely believed one way to reduce obesity and promote healthy living is through increased physical activity (PA). Evidence suggests that environmental influences such as sidewalks, parks, and neighborhood safety are linked with increased PA. **Purpose:** To examine the impact of improving the urban built environment and community safety (i.e. gentrification) on childhood obesity. **Methods:** A quasi-experimental design was used to determine if living within 0.5 miles (exposure group) of this gentrified community was associated with a reduction in Body Mass Index (BMI) percentile (%) compared with living at least 3 miles (control group) away from this gentrified community. The pre-gentrification period included the six months prior to the opening of a world class mixed use park. The post-gentrification period started six months after the park was opened. Children ≤9yr receiving primary care in six public health clinics within 11 miles of the park were included. Height and weight from electronic health records were used to calculate BMI%. T-test and Chi-squared analyses were used to examine between group bivariate relationships. Changes in BMI% pre-gentrification and post-gentrification were examined with repeated measures analysis of covariance adjusted for baseline BMI. Covariates included age, gender, race and ethnicity. **Results:** Participants (n=5,424) were mostly young (97±5.0 yr), normal weight (68±6.29±2.2 kg/m²), African American (76.6%), girls (54.1%). Following park construction the exposure group showed a non-significant change in BMI% (74.8% vs. 73.1%, p=0.05), while the control group showed a significant increase (66.8% vs. 69.7%, p<0.001). No significant differences were noted between groups in adjusted models (p>0.05). **Conclusions:** This study found a combination of improving community resources, safety, and the introduction of an urban, PA supportive space did not significantly impact children’s BMI%. Future obesity studies should look beyond environmental resources to decrease obesity.

Abstracts were prepared by the authors and printed as submitted.
Acute and chronic impact of Ramadan fasting on muscle function: A randomized controlled trial. 

Kakkar, Ruchika, Meena P. Venkatesh, Anil Bose, Purvi Deolakia, Aditi S. Deo, and Jytishkumar S. Bhosale. 

PURPOSE: To examine the impact of Ramadan fasting on muscle function in healthy young Indian men. 

METHODS: 30 men were randomly allocated into two groups: non-fasting group (NFG, n=15) and fasting group (FG, n=15). 

RESULTS: Significant reductions in muscle strength and power were observed in FG compared to NFG. 

CONCLUSIONS: Ramadan fasting significantly affects muscle function in healthy young men.
CONCLUSIONS: For Latino adolescents at greatest risk for developing chronic metabolic disease from obesity and inactivity, an after-school fitness program is effective in reducing weight gain and eliminating aerobic and strength differences between these subjects and their healthy weight peers.

2427 Board #8
June 3, 9:30 AM - 11:30 AM
ANDALE Pittsburgh - Study Protocol For A Promotora-mediated, Family-based Intervention To Prevent Obesity In Latino Children
Sharon E. Taverno Ross1, Patricia I. Document1, Russell R. Pate, FACSM2, Ruth P. Saunders2, Laura Macia1, Ivonne Sanchez2, Lisa Wisniewski1. 1University of Pittsburgh, Pittsburgh, PA. 2University of South Carolina, Columbia, SC. (Sponsor: Russell R. Pate, FACSM)
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(No relationships reported)

PURPOSE. The purpose of this study is to develop and evaluate the feasibility and acceptability of ANDALE Pittsburgh, a culturally-appropriate, family-based intervention to prevent obesity in preschool-aged Latino children.

METHODS. The proposed study is organized into two major phases: Phase I: Conduct focus groups with 30 Latino parents of preschool children to inform the development of a culturally-appropriate intervention; Phase II: Test the feasibility and effectiveness of the intervention with 50 families. Participants were recruited through community gatherings, flyers, and word of mouth. Six promotoras (females >18 years, active in community) were recruited and received 25 hours of training using the intervention curriculum finalized after Phase I. Promotoras will deliver the home-based intervention to families over 10, 90-minute weekly sessions that include education, practice, and activity. Outcomes (e.g., child BMI) will be assessed pre- and post-intervention. Process evaluation will assess fidelity, dose, reach, recruitment, and contextual factors using multiple data sources and mixed methods.

RESULTS. This study was framed within social ecological and social cognitive theory. Analysis of focus group transcripts revealed detailed information about family knowledge and barriers related to nutrition and physical activity, and suggested intervention approaches. This information, combined with findings from previous studies, lead to the development of a 100-session intervention that included topics such as balanced living (i.e., diet, physical activity, sleep, stress management), reducing sedentary time, healthy eating for the entire family, and community resources. Behavior modification constructs and strategies (e.g., goal setting, problem solving, social support), and building of self-efficacy through healthy recipe preparation and physical activity breaks, were also included. Data collection for Phase 2 of the study is currently underway.

CONCLUSION. The proposed study will markedly expand the body of knowledge on interventions to prevent obesity in Latino preschool children. If successful, this approach will be evaluated in a future, larger-scale intervention and provide a potential model to help to address and prevent obesity this population.
such as the FIFA World Cup. Despite the importance of ET in terms of deciding the match outcome, there is a paucity of data investigating responses to ET. Notably, no investigation has attempted to profile the neuromuscular fatigue response. Thus, the precise mechanisms of neuromuscular fatigue during prolonged soccer-specific exercise are unknown. PURPOSE: To evaluate the mechanisms and time-course of neuromuscular fatigue throughout simulated soccer performance lasting 120 minutes. METHODS: Ten male amateur soccer players (VO2max: 56 ± 2 mL·kg·min⁻¹) completed a soccer-specific protocol that required both intermittent exercise and skill performance, during which the development of fatigue was examined. Pre-exercise, at half-time (HT), full-time (FT) and following a period of extra-time (ET), maximal voluntary force (MVC) and twitch responses to supramaximal femoral nerve and transcranial magnetic stimulation (TMS) were obtained from the knee-extensors to assess peripheral and central fatigue, respectively. At each time point, measures of activation measured with TMS (−12, −16 and −19%, respectively, P≤0.001), potentiated twitch force (−14, −21 and −19%, respectively, P<0.031), voluntary activation (−8, −16 and −20%, respectively, P≤0.010) and voluntary activation measured with TMS (−12, −16 and −19%, respectively, P=0.001) were evident compared to pre-exercise. Furthermore, all physical performance measures declined while RPE and Tcore increased (P≤0.010). CONCLUSION: Soccer-specific exercise induces significant central and peripheral fatigue and the additional fatigue induced by a period of ET is of central in origin. Further research is warranted to investigate temporal neuromuscular recovery from soccer-specific performance, especially in periods of fixture congestion.

RESULTS: Upon completion of the protocol participants had covered an approximate distance of 14.4 km involving 30 dribbles and 30 sprints, comparable with a match requiring ET. At HT, FT and following ET reductions in MVC (−11, −20 and −27%, respectively, P≤0.001) were evident compared to pre-exercise. Furthermore, all physical performance measures declined while RPE and Tcore increased (P≤0.010). CONCLUSION: Soccer-specific exercise induces significant central and peripheral fatigue and the additional fatigue induced by a period of ET is of central in origin. Further research is warranted to investigate temporal neuromuscular recovery from soccer-specific performance, especially in periods of fixture congestion.
Peripheral arterial disease (PAD) is characterized by insufficient oxygen (O2) supply to tissues due to decreased blood flow. This can lead to reduced delivery of oxygen and nutrients to the tissues, which may result in tissue hypoxia and eventually cell death. Previous evidence, collected in vivo, suggests that reductions in peak mitochondrial ATP synthesis rates (Vmax) in the skeletal muscle of PAD patients can be attributed to the disease-related impairment in O2 supply, while in vitro assessments have revealed deficits in mitochondrial respiration (O2) due to defective O2 delivery, thereby alluding to defective mitochondrial function as a potential factor in PAD pathology. PURPOSE: To determine the extent to which O2 supply and intrinsic mitochondrial deficits play a role in PAD by combining both in vivo and in vitro assessments of skeletal muscle mitochondrial function. METHODS: Phosphorus magnetic resonance spectroscopy (31P-MRS) and Doppler ultrasound were combined to examine the effect of superimposing reactive hyperemia (RH), induced by a period of brief ischemia during the last 30s of exercise, compared to free-flow conditions (FF) on O2 delivery and Vmax in the calf muscle of 10 PAD patients and 10 physical activity-matched healthy controls (HC). RESULTS: In PAD patients there were no differences in initial post-exercise limb blood flow (FF: 379 ± 136; RH: 441 ± 112 mmHg-1) or Vmax (FF: 11 ± 4; RH: 11 ± 3 mmHg-1). Interestingly, State 3 O22 was not different between HC and PAD patients (HC: 24 ± 7; PAD: 25 ± 5 pmol/sec/mg). CONCLUSION: As there was no evidence of an intrinsic mitochondrial deficit in PAD patients, assessed in vitro with adequate O2, observations in vivo that post-exercise blood flow was unable to be augmented and metabolic capacity was attenuated strongly implicates O2 supply as the factor limiting mitochondrial function in PAD. Interestingly, these data reveal that O2 supply in vivo also limits metabolic function in HC, but, in this case, vascular function demonstrates greater plasticity.
exercise capacity and may be exaggerated by K_{ATP} channel inhibition. Purpose: We tested the hypothesis that K_{ATP} channel inhibition via glibenclamide (GLI), often prescribed for hyperglycemic CHF patients, would augment the PO_{2mv} undershoot, increase the time to reach the steady-state PO_{2}, and decrease the mean PO_{2}, during contractions of the spindlemuscle in CHF rats. Methods: Muscle PO_{2} was measured via the phosphorescence quenching technique during 180s of 1-Hz twitch contractions (~6 V) under control, GLI (5 mg/kg), and pinacidil (PIN, K_{ATP} channel activator, 5 mg/kg) conditions in 16 Sprague-Dawley rats with CHF induced via myocardial infarction (left main coronary artery ligation). Results: GLI augmented the PO_{2}, undershoot (control: 2.3 ± 0.4, GLI: 4.1 ± 0.5 mmHg, P < 0.05) and time-to-reach contracting steady state (control: 66.1 ± 10.2, GLI: 93.6 ± 7.8 s, P < 0.05), and reduced baseline (control: 28.3 ± 0.9, GLI: 24.8 ± 1.0 mmHg, P < 0.05) and mean PO_{2}, (control: 20.6 ± 0.6, GLI: 17.6 ± 0.3 mmHg, P < 0.05). PIN reversed these effects of GLI (P < 0.05 for all). Conclusions: GLI augments small mismatch of muscle O_{2} delivery to O_{2}-utilization during contractions in CHF rats. These data suggest that sulphonylurea therapy (e.g. GLI) poses an additional constraint to muscle O_{2} delivery in CHF patients further compromising physical activity and contributing to morbidity and mortality.

2440 June 3, 10:15 AM - 10:30 AM
Antioxidants Attenuate the Exercise Induced Decreases in Muscle Sympathetic Nerve Activity during Heavy Dynamic Exercise
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It has been identified that free radicals scavenge nitric oxide (NO) and thereby increase central sympathetic nerve activity (MSNA) outflow. Heavy dynamic exercise generates free radicals production both centrally and peripherally and may contribute to the exercise related increases in muscle sympathetic nerve activity (MSNA). Purpose: To test the hypothesis that a central and peripheral acting antioxidant cocktail of Co-enzyme Q, Vitamin E and Vitamin C will decrease MSNA during exercise to a greater extent compared to placebo control. Methods: Seven healthy volunteers (age 26 ± 1 yrs, ht of 174 ± 5 cm; wt of 74 ± 4 kg) performed back supported semi-recumbent heavy dynamic leg cycling in two trials: 1) with ingestion of an antioxidant cocktail (placebo - PI) on two different occasions. Plasma superoxide, MSNA, and mean arterial pressures (MAP) were measured during heavy intensity dynamic leg exercise at heart rates (HR) of 110 beats per minute (bpm) (e110) and very heavy intensity exercise at HR of 140 bpm (e140). Results: Venous superoxide concentrations as measured by electron paramagnetic resonance (EPRM) increased from rest to exercise with PL (P < 0.015) however; this increase was attenuated with the ingestion of CT during both exercise intensities (P < 0.05). Furthermore, CT reduced MSNA burst/min at rest (PL: 28 ± 1.5 vs. CT: 20.9 ± 0.7; P < 0.05) during e110 (PL: 32.8 ± 1.4 vs. CT: 25.7 ± 1.1; P < 0.05) and e140 (PL: 43.9 ± 1.6 vs. CT: 32.2 ± 1.2; P < 0.05). Which resulted in a marked decrease in MAP at rest (PL: 100.2 ± 2.8 mmHg vs. CT: 93.3 ± 2.6 mmHg; P < 0.05) and during both exercise intensities (P < 0.05). Conclusions: From these data we conclude that CT scavenged exercise induced free radical production resulting in increased central/peripheral NO induced reduction in MSNA during heavy intensity exercise.

2445 June 3, 10:30 AM - 10:45 AM
Sympathetic Neural and Hemodynamic Responses to Painful Stimuli are Related to Perception of Pain
Abigail SL Stickford1, Saima Siddiqui2, Jonathan P. Moore2, Rosemary Parker2, Monique Roberts2, Qi Fu3. 1Appalachian State University, Boone, NC. 2Texas Health Presbyterian Hospital Dallas, Dallas, TX. 3Bangor University, Bangor, United Kingdom. 4University of Texas Southwestern Medical Center, Dallas, TX. (Sponsor: Benjamin D. Levine, FACSM)
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No relationships reported

Painful stimuli cause activation of the sympathetic nervous system, increasing effferent muscle sympathetic nerve activity (MSNA) and altering downstream hemodynamic responses. However, there is considerable inter-individual variability in the perception of pain to a given painful stimulus; how this magnitude of perceived pain relates to sympathetic neural and hemodynamic responses remains to be fully elucidated. Purpose: Thus, the purpose of this study was to evaluate the relationship between the perception of pain and the corresponding sympathetic neural and hemodynamic responses to a painful stimulus in healthy normotensive men and women.

Methods: Heart rate (HR), MSNA, and blood pressure (BP) were measured at baseline (supine, rest) and during a two-minute cold pressor test (CPT) in 15 subjects (6 female, 9 male; age: 31.5 ± 7.5 years, body mass index (BMI): 25.1 ± 3.4 kg/m2, mean ± SD). Stroke volume (SV), cardiac output (Qt), and total peripheral resistance (TPR) were calculated using the model flow method. Immediately following the CPT subjects rated their pain on a verbal descriptor scale (Numerical Rating Scale, range 0-10). Statistical significance was set at P < 0.05.

Results: Subjects were grouped according to pain ratings given following the CPT (Pain ≤ 7, i.e., “severe” pain, n=10; and Pain ≥ 8, i.e. “none” to “mild-to-moderate” pain, n=6). The two groups were similar with regards to gender, age, and BMI. Subjects who rated their Pain ≥ 8 had significantly larger increases during the CPT in MSNA total activity (1208 ± 631 vs. 173 ± 87 au/min, burst frequency (24 ± 15 vs. 9 ± 6 bursts/min), burst incidence (38 ± 18 vs. 13 ± 5 bursts/100 heartbeats), TPR (223 ± 178 vs. 79 ± 107 dynes/cm2), Qt (1.26 ± 0.63 vs. 0.54 ± 0.39 L/min) and mean BP (15 ± 6 vs. 6 ± 7 mmHg) compared to individuals who rated their Pain ≤ 6 vs. 8. Changes in HR SV in response to the CPT were not related to pain ratings.

Conclusion: In healthy, normotensive men and women, the sympathetic neural, BP, & vasoconstrictor responses to a fixed painful stimulus are positively related to the magnitude of pain perception. These findings may have important clinical implications, as hypogalisis (i.e., decreased sensitivity to pain) is a common characteristic of many cardiovascular disease states.

2442 June 3, 10:45 AM - 11:00 AM
Sex Differences in the Inspiratory Muscle Metaboreflex
Joshua R. Smith, Ryan M. Broxterman, Shane M. Hammer, Andrew M. Alexander, Kaylin D. Didier, Thomas J. Barstow, FACSM, Stephanie P. Kurti, Craig A. Harms, FACSM. Kansas State University, Manhattan, KS. Email: smitht42@k-state.edu

No relationships reported

Activation of the inspiratory muscle metaboreflex leads to increased sympathetic outflow, mean arterial pressure (MAP), limb vascular resistance (LVR), and reduced limb blood flow. Sex differences exist in the skeletal muscle metaboreflex-mediated increase in sympathetic outflow and MAP. However, it is not known if sex differences exist in the inspiratory muscle metaboreflex.

Purpose: The purpose was to determine if sex differences exist in the inspiratory muscle metaboreflex in healthy humans. We hypothesized that compared to men, women would exhibit less of: 1) an increase in MAP and diastolic blood pressure (DBP), 2) a decrease in limb blood flow, and 3) an increase in LVR.

Methods: Sixteen healthy men (n=8, 22.1 ± 3.2 yrs) and women (n=8, 22.6 ± 2.1 yrs) were recruited for this study and visited the laboratory on three different occasions. All women were tested during the early follicular phase of their menstrual cycle. On the first visit, subjects were familiarized with all procedures and measurements. The next two visits were randomized and subjects performed an inspiratory resistive breathing task (IRBT) at ~2%~70% of their maximal inspiratory mouth pressure (PImax) for 20 min. During the IRBTs, the breathing frequency was 20 breaths per min with a 0.5 duty cycle. At rest and during the IRBTs, blood pressure was measured via automated oscillometry, femoral artery blood flow (FABF) was measured via Doppler ultrasound, end tidal CO2 was continuously monitored, and LVR was calculated MAP divided by FABF. Surface EMGs were placed on the leg to ensure no muscle contraction occurred.

Results: During the 20 min at ~70%PImax, women had significantly less of an increase in MAP (W: 2.1 ± 4.2% vs. M: 7.6 ± 2.6%) and DBP (W: 0.4 ± 5.9% vs. M: 8.1 ± 3.9%) compared to men. No differences (p>0.05) were present in SBP and HR increase in MAP (W: 2.1 ± 4.2% vs. M: 7.6 ± 2.6%) and DBP (W: 0.4 ± 5.9% vs. M: 8.1 ± 3.9%) compared to men. No differences (p>0.05) were present in SBP and HR between men and women during the 20 min. Women had less (p<0.05) of a decrease in FAB blood flow for women vs. men (W: -5.1 ± 8.4% vs. M: -20.4 ± 13.2%) over the 20 min. Furthermore, women had less of an increase in LVR compared to men (W: 11.6 ± 12.3% vs. M: 44.0 ± 36.3%) during the 20 min at ~70%PImax.

Conclusion: These data suggest a sex difference in the inspiratory muscle metaboreflex-mediated increase in sympathetic outflow and MAP. However, it is not known if sex differences exist in the inspiratory muscle metaboreflex.
Maximal apnea in elite breath hold divers involves the suppression of involuntary breathing movements (IBMs). During apnea at total lung capacity (TLC), stroke volume (SV) is reduced due to compression of the vena cava; however, IBMs are thought to improve apnea time by elevating cardiac output (Q̇) and cerebral oxygen delivery (CDO2) via increased venous return. Although not experimentally investigated, this suggests CDO2 is limited by the reduced Q̇oxygen delivery (CDO2) via increased venous return. Although not experimentally investigated, this suggests CDO2 is limited by the reduced Q̇oxygen delivery (CDO2) via increased venous return. Although not experimentally investigated, this suggests CDO2 is limited by the reduced Q̇oxygen delivery (CDO2) via increased venous return. Although not experimentally investigated, this suggests CDO2 is limited by the reduced Q̇oxygen delivery (CDO2) via increased venous return. Although not experimentally investigated, this suggests CDO2 is limited by the reduced Q̇oxygen delivery (CDO2) via increased venous return.

### RESULTS

- Men exercised at a higher absolute work rate (273±19 vs. 203±12 W, p>0.05) as women. During the control TTE (data pooled), nadir arterial oxyhemoglobin saturation (SaO2) was 95±0.4% and pH was 7.18±0.03. Hyperoxia prevented EIAH in all subjects (SaO2-98%). PAV reduced WOB to 58±6% of control (range 35-75%). Quadriceps twitch force was reduced after the control exercise trial by 26±3% and was significantly attenuated after exercise on the hyperoxia and PAV trials (19±3 and 19±3%, p<0.01, respectively). The subject with the largest increase in SaO2 (+9%) with hyperoxia and the greatest reduction in WOB (35% of control) with PAV had the greatest attenuation of quadriceps fatigue during the PAV and hypoxic trials.
- Funding: NSERC

### CONCLUSIONS

- Preventing EIAH and reducing WOB attenuate post-exercise quadriceps fatigue to a similar extent in both sexes. Subjects with the highest WOB or lowest SaO2 during the control trial demonstrated the greatest attenuation of quadriceps fatigue during the PAV and hypoxic trials.

### METHODS

- Six healthy subjects (VO2max=50±4 ml/kg/min; 3 female) completed maximal incremental cycle exercise and 3 time-to-exhaustion (TTE) tests over 4 days. During the first (control) TTE test, subjects exercised at constant work rate (>85% of max work) while temperature-corrected arterial blood gases, cardiorespiratory variables and WOB were assessed. Subsequent TTE tests were iso-time and iso-work rate, but with EIAH prevented by inspiratory hyperoxic gas (24-27% O2) or WOB reduced via a proportional assist ventilator (PAV). Locomotor muscle fatigue was assessed by measuring potentiated quadriceps twitch force in response to supramaximal magnetic stimulation of the femoral nerve before and 3 min after exercise.

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

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**E-18 Free Communication/Slide - Exercise Training in Health/Disease**

*Friday, June 3, 2016, 9:30 AM - 11:30 AM*

**Room: 102**

**Chair: Matthew D. Barberio. Children's National Medical Center, Washington, DC.**

**No relationships reported**

**Friday, June 3, 2016, 9:30 AM - 11:30 AM**

### 2443 June 3, 11:00 AM - 11:15 AM

**Influence Of Lung Volume On Circulatory Function And Arterial Blood Gases During Prolonged Breath Holding In Elite Apnea Divers**


*Cardiff Metropolitan University, Cardiff, UK, 1University of British Columbia Okanagan, Kelowna, BC, Canada, 2University of Split, Split, Croatia, 3University of Zagreb, Zagreb, Croatia, 4Duke University Medical Center, Durham, NC, 5Emory University, Atlanta, GA.*

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**(No relationships reported)**

**PURPOSE** To investigate whether a higher Q̇̇O₂ during apnea at functional residual capacity (FRC) facilitates CDO₂ and determine whether IBM onset and apnea end are linked to PaO₂, oxygen content (CaO₂) or CDO₂.

Fifteen elite divers (1F: 185 ± 7 cm, 82 ± 12 kg, 29 ± 7 years) completed two maximal apneas at TLC and FRC. Cardiovascular responses were assessed continuously via photoplethysmography. Global extra-cerebral blood flow (gCBF) and intra-cranial velocities were measured via extracranial and transcranial ultrasound, respectively. Arterial blood gases were assessed at IBM onset and apnea end.

### RESULTS

Maximal apnea was 38% longer at TLC vs. FRC (304 ± 71 vs. 188 ± 44 sec, p < 0.001) and IBM onset occurred later (150 ± 44 vs. 113 ± 36 sec, P < 0.001). At FRC, SV and Q̇O₂ did not change from baseline (P>0.05). In contrast, during the TLC trial SV and Q̇O₂ were decreased until 80% and 40% of apnea duration, respectively, (P<0.05). Consistent with Q̇O₂, gCBF was significantly lower at 20% apnea during the TLC trial but recovered for the remainder of the apnea. Mean arterial pressure rose progressively in both trials but to a greater extent at TLC. At apnea end, although PaO₂ was lower (30 ± 8 vs. 35 ± 11 mmHg, P=0.04) in the TLC trial, CDO₂ was the same due to a higher PaCO₂ in the TLC trial. IBM onset occurred at the same PaCO₂ (43 ± 5 vs. 43 ± 5 mmHg, P=0.60) but a lower PaO₂ (46 ± 14 vs. 71 ± 18 mmHg, P<0.001) during the FRC trial.

### CONCLUSIONS

- The importance of acidosis on the oxygen dissociation curve. In addition, IBMs appear to be governed by PaCO₂ rather than PaO₂ suggesting any beneficial effect of IBMs on CDO₂ to be indirect and secondary to hypercapnia.

**Friday, June 3, 2016, 11:15 AM - 11:30 AM**

### 2444 June 3, 11:15 AM - 11:30 AM

**Effects Of Exercise-induced Respiratory Muscle Work And Hypoxemia On Quadriceps Fatigue In Men Versus Women**


*1Cardiff Metropolitan University, Cardiff, UK, 2University of British Columbia, Vancouver, BC, Canada, 3University of British Columbia, Kelowna, BC, Canada, 4Brenel University, London, United Kingdom.*

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**(No relationships reported)**

Reducing work of breathing (WOB) or eliminating exercise-induced arterial hypoxemia (EIAH) during intense exercise decreases the severity of quadriceps fatigue in men. Women have a greater WOB at any given ventilation during exercise relative to men, dedicate a greater fraction of whole body VO₂ towards their respiratory muscles, and demonstrate EIAH, suggesting women may be more susceptible to quadriceps muscle fatigue. **PURPOSE:** To determine the extent to which quadriceps fatigue is attenuated when WOB is reduced or EIAH is prevented during exercise in both sexes.

**METHODS:** Six healthy subjects (VO2max=57±12 ml/kg/min; 3 female) completed maximal incremental cycle exercise and 3 time-to-exhaustion (TTE) tests over 4 days. During the first (control) TTE test, subjects exercised at constant work rate (>85% of max work) while temperature-corrected arterial blood gases, cardiorespiratory variables and WOB were assessed. Subsequent TTE tests were iso-time and iso-work rate, but with EIAH prevented by inspiratory hyperoxic gas (24-27% O2) or WOB reduced via a proportional assist ventilator (PAV). **RESULTS:** Men exercised at a higher absolute work rate (273±19 vs. 203±12 W, p>0.05) as women. During the control TTE (data pooled), nadir arterial oxyhemoglobin saturation (SaO2) was 95±0.4% and pH was 7.18±0.03. Hyperoxia prevented EIAH in all subjects (SaO2-98%). PAV reduced WOB to 58±6% of control (range 35-75%). Quadriceps twitch force was reduced after the control exercise trial by 26±3% and was significantly attenuated after exercise on the hyperoxia and PAV trials (19±3 and 19±3%, p<0.01, respectively). The subject with the largest increase in SaO2 (+9%) with hyperoxia and the greatest reduction in WOB (35% of control) with PAV had the greatest attenuation of locomotor fatigue.

**CONCLUSIONS:** Preventing EIAH and reducing WOB attenuate post-exercise quadriceps fatigue to a similar extent in both sexes. Subjects with the highest WOB or lowest SaO2 during the control trial demonstrated the greatest attenuation of quadriceps fatigue during the PAV and hypoxic trials.

**Funding:** NSERC
Physiological adaptations to regular exercise occur from cell signaling in response to single bouts of acute exercise. It is known that acute exercise elicits a temporary change in redox balance resulting in upregulation of antioxidant enzymes. What is not known is whether exercise intensity, or more specifically the delivery of intensity: steady-state versus high-intensity intervals will induce a different cellular stress response. PURPOSE: The aim of this study was to compare the cellular stress response through markers of redox balance to 2 acute cycling trials of equal duration (30-min): a constant workload (CW) of 70% VO2 max and high intensity interval protocol (HIIP) of intervals at 85-90% VO2 max. METHODS: Eight males ages 20-30y (mean age 25 ±3y) have participated in the study to date. Each participant completed a VO2 max on a cycle ergometer to establish the workload for the study trials. The two cycling trials were performed in random order and separated by one week. Participants refrained from any exercise for 48 hrs prior to either trial. The CW trial consisted of 30-min of cycling at 70% VO2 max. The HIIP trial consisted of a 9-min ramp-up, followed by seven intervals of 1-min “all out” intervals separated by 2-min recovery periods at low intensity, for a total duration of 30-min. Blood draws were taken at baseline (pre), immediately following the trial (post) and 30-minutes later (+30) for measures of superoxide dismutase (SOD) activity, glutathione reductase (GR) activity, and F2-isoprostanes. RESULTS: Blood samples (post) and 30-minutes later (+30) for measures of superoxide dismutase (SOD) activity, glutathione reductase (GR) activity, and F2-isoprostanes were not significant. CONCLUSION: Taken together, these data suggest that delivering an exercise stimulus of 30-min of cycling at 70% VO2 max and high intensity interval protocol (HIIP) of intervals at 85-90% VO2 max. Blood draws were taken at baseline (pre), immediately following the trial (post) and 30-minutes later (+30) for measures of superoxide dismutase (SOD) activity, glutathione reductase (GR) activity, and F2-isoprostanes. RESULTS: Blood samples (post) and 30-minutes later (+30) for measures of superoxide dismutase (SOD) activity, glutathione reductase (GR) activity, and F2-isoprostanes were not significant. CONCLUSION: Taken together, these data suggest that delivering an exercise stimulus of 30-min of cycling at 70% VO2 max and high intensity interval protocol (HIIP) of intervals at 85-90% VO2 max. Blood draws were taken at baseline (pre), immediately following the trial (post) and 30-minutes later (+30) for measures of superoxide dismutase (SOD) activity, glutathione reductase (GR) activity, and F2-isoprostanes. RESULTS: Blood samples (post) and 30-minutes later (+30) for measures of superoxide dismutase (SOD) activity, glutathione reductase (GR) activity, and F2-isoprostanes were not significant. CONCLUSION: Taken together, these data suggest that delivering an exercise stimulus of 30-min of cycling at 70% VO2 max and high intensity interval protocol (HIIP) of intervals at 85-90% VO2 max. Blood draws were taken at baseline (pre), immediately following the trial (post) and 30-minutes later (+30) for measures of superoxide dismutase (SOD) activity, glutathione reductase (GR) activity, and F2-isoprostanes.
RESULTS: HRVT1 as predicted by the algorithm and ventilatory measures were strongly correlated for the treadmill test (r=0.70) but not for the shuttle run (r=0.42). When grouping subjects by age, sex, and athletic ability, the algorithm most accurately predicted HRVT1 during the treadmill test for younger subjects (20-29y, r=0.77 vs. 30-69y, r=0.35), but performed similarly for both sexes as well as for athletes vs. sedentary individuals.

CONCLUSIONS: The algorithm was able to estimate HRVT1 well during an incremental treadmill test, but was limited during the incremental shuttle run; this may be due to the shuttle run being conducted on a different day and during task (i.e. change-of-direction vs. treadmill running).

Performing aerobic testing and training on individuals with gait and balance mobility disability while walking can be difficult due to limited ranges of walking speeds and/ or increases in incline of the treadmill belt that are required to increase work rates. This abstract describes the validation of a novel method to delver exercise testing and training in which individuals can walk at their comfortable walking speed while work rates are adjusted by providing horizontal resistive forces.

PURPOSE: To determine the extent to which measures of physiological effort of a novel exercise testing and training paradigm - in which individuals walk at a single comfortable speed of performance; A patent has been filed with regard to the algorithm related to the method of testing reported in the abstract.

METHODS: Fifty-three subjects (30M, 23F; 1.73±0.10m; 74.6±13.3kg) of varying age and athletic ability provided consent to complete two days of laboratory testing: an incremental treadmill test on the first day and an incremental over-ground shuttle run on the second day. Ventilatory gases and heart rate were recorded during the treadmill test and only heart rate was recorded during the shuttle run. Heart rate at VT1 (HRVT1) was detected using the ventilatory measurements and compared to HRVT1 estimated by the algorithm. The algorithm detected HRVT1 using a three-step process: 1) Estimate 50-80% of maximum estimated heart rate, within which HRVT1 could occur. 2) Using a 30-second heart rate moving average, detect a heart rate threshold (HRT) at the point of maximum slope within the target heart rate zone. 3) Estimate HRVT1 from the previously developed regression equation with HRT as input.

RESULTS: HRVT1 as predicted by the algorithm and ventilatory measures were strongly correlated for the treadmill test (r=0.70) but not for the shuttle run (r=0.42). When grouping subjects by age, sex, and athletic ability, the algorithm most accurately predicted HRVT1 during the treadmill test for younger subjects (20-29y, r=0.77 vs. 30-69y, r=0.35), but performed similarly for both sexes as well as for athletes vs. sedentary individuals.

CONCLUSIONS: The algorithm was able to estimate HRVT1 well during an incremental treadmill test, but was limited during the incremental shuttle run; this may be due to the shuttle run being conducted on a different day and during task (i.e. change-of-direction vs. treadmill running).
and 54% reported none in post-doctoral training. Only 18% reported that a lack of formal training in exercise science or exercise prescription was not an obstacle to PPA evaluation during an office visit.

Conclusion: Nearly all of physician surveyed reported a perceived importance of PPA evaluation and intervention. However, the majority of physicians surveyed have never made a diagnosis of exercise deficiency in children. This is likely related to a lack of concern regarding PPA in the normal weight child, financial concerns surrounding clinic time and reimbursement, and a lack of medical education in exercise science.

E-19 Clinical Case Slide - Cardiovascular Issues II

Friday, June 3, 2016, 9:30 AM - 10:50 AM
Room: 202

2454 Chair: Paul D. Thompson, FACSM. Hartford Hospital, Hartford, CT.
(No relationships reported)

2455 Discussant: Christine E. Lawless, FACSM, Sports Cardiology Consultants, Chicago, IL.
(No relationships reported)

2456 Discussant: Jessie R. Fudge. Group Health Cooperative, Everett, WA.
(No relationships reported)

2457 June 3, 9:30 AM - 9:50 AM
Viral Complications in an Elite Road Cyclist: A 1 Year Follow Up
Brian J. Coyne1, Lisa C. Colvin, FACSM2, Shel Levine3, Mahesh Patel4, Camille M. Minder5, Juan Carlos Soliven6, Robert Garcia7, Randall Griffih8, Heathen Barton Weston9, Greg Soukup10, Duke University Health System, Durham, NC. 2University of the Incarnate Word, San Antonio, TX. 3Eastern Michigan University, Ypsilanti, MI. 4Glenwood Regional Medical Center, West Monroe, LA. (Sponsor: Lisa C. Colvin, FACSM)
Email: brian.coyne@duke.edu
(No relationships reported)

HISTORY: A 48-year-old female elite road cyclist attended an international conference in Europe and contracted a virus while living in an isolated wing of housing with athletes she coached. During week 2, a Gulf region athlete became ill with 103°F degree fever, SOB, chest pain, coughing and joint pain; 2 additional athletes also became ill. Nine days after initial exposure to the symptomatic cyclists, the patient expressed the same symptoms. Treatment began after she was flown back to the USA. She did remember recently starting back on birth control pills, but had taken them for 5 days previously for fever/chills, muscle aches, and pleuritic chest pain. She was diagnosed with influenza, took Oseltamivir, and her symptoms resolved except for chest pain. She was mid-weekly in complaints of fatigue with any exertion. She has been taking a large amount of ibuprofen.

DIFFERENTIAL DIAGNOSIS:
1. Acute Gastritis
2. Acute Pericarditis or Myocarditis
3. Community-Acquired Pneumonia

PHYSICAL EXAMINATION:
- Mildly enlarged cardiac silhouette, blunting of the costophrenic angles bilaterally
- 12-lead ECG:
  - Diffuse ST elevation sparing AVR, V1 and lead 3; reciprocal changes in AVR;
  - Periodic PR depression

ECOCARDIOGRAM:
- Normal left ventricle size, motion, and function with an ejection fraction of 60%.
- Small, generalized pericardial effusion.
- No evidence of cardiac tamponade

FINAL WORKING DIAGNOSES:
Acute Pericarditis

TREATMENT AND OUTCOMES:
1. Referred to Cardiology. Placed on scheduled Ibuprofen. Cardiology returned her to activity 2 weeks after symptoms stopped.
2. Hospitalized for chest pain flare after return to activity. Repeat echocardiogram showed moderate pleural effusion. Started on Prednisone and told to rest for 3 months.
3. Referred to Rheumatology who felt this was likely viral but placed her on Hydroxychloroquine in addition to Prednisone.
4. Now tapering Hydroxychloroquine and Prednisone per Rheumatology.
5. Undergoing a gradual return-to-run progression over a 2-3 month time period with frequent monitoring. Started progression when she had no inflammatory markers and no effusion on echocardiogram 9 months after symptoms began.

2458 June 3, 9:50 AM - 10:10 AM
Chest Pain - Cross Country
Michael Campbell, Kyle Goerl. Via Christi Sports Medicine, Wichita, KS.
Email: mcampbell2@kumc.edu
(No relationships reported)

CHEST PAIN - CROSS COUNTRY RUNNER
Michael Campbell, MD
Kyle Goerl, MD CAQSM
HISTORY:
A 21-year-old female college cross country runner presented with chest pain, upper abdominal pain, and thoracic back pain for the last week. She was seen 5 days previously for fever/chills, muscle aches, and pleuritic chest pain. She was diagnosed with influenza, took Oseltamivir, and her symptoms resolved except for chest and upper abdominal pain with fatigue. Chest pain is mid- to slightly left-sided. She complained of fatigue with any exertion. She has been taking a large amount of ibuprofen.

PHYSICAL EXAMINATION:
Examination revealed regular heart rate and rhythm without friction rub while sitting or in hip forward flexion. Normal lung auscultation. Nasal exam showed boggy, erythematous, and edematous turbinates with rhinorrhea bilaterally. There was mild oropharynx erythema with normal tonsils. Abdominal exam showed mild epigastric tenderness. Kernig and Brudzinski tests were negative.

DIFFERENTIAL DIAGNOSIS:
1. Acute Gastritis
2. Acute Pericarditis or Myocarditis
3. Community-Acquired Pneumonia
4. Now tapering Hydroxychloroquine and Prednisone per Rheumatology.
5. Undergoing a gradual return-to-run progression over a 2-3 month time period with frequent monitoring. Started progression when she had no inflammatory markers and no effusion on echocardiogram 9 months after symptoms began.

2459 June 3, 10:10 AM - 10:30 AM
Arm Swelling - Volleyball
James Wilcox1, Jeremy Hunt2, Ball Memorial Hospital, Muncie, IN. 1Central Indiana Orthopedic Center, Muncie, IN.
(No relationships reported)

HISTORY:
A 21 year old female Ball State University volleyball player presented to clinic with a swollen right arm. She did not remember any traumatic event, but that the swelling did occur acutely about 1 week prior to presentation. She reported stiffness, decreased range of motion and strength. The swelling did not improve with ice and ibuprofen. She did remember recently starting back on birth control pills, but had taken them for 3 years in the past, only off of them for 6 months. She did not endorse personal or family history of coagulation disorders. She did recently start a new pectoralis major training program 2 weeks prior. She denied smoking or alcohol.

PHYSICAL EXAMINATION:
Physical examination revealed ecchymosis of the right shoulder, with slight prominence of venous congestion on right shoulder and axilla. She had non-pitting edema of the right arm compared to the left, with erythema, from her shoulder down into her hand. No obvious cuts or bites, with slight warmth over the arm. She does have tenderness from the shoulder down to the hand as well.

DIFFERENTIAL DIAGNOSIS:
1. Subclavian vein DVT
2. Cellulitis
3. Lymphedema

TEST AND RESULTS:
Shoulder anterior-posterior, axillary lateral, glenoid profile, and supraspinatus outlet radiographs:
Progression of Metabolic Syndrome Component Improvement Following a Behaviorally Focused Worksite Weight Loss Intervention

Conrad P. Earnest, FACSM1, Timothy S. Church2. 1Texas A&M University, College Station, TX. 2ACAP Health and Pennington Biomedical Research Center, Dallas, TX and Baton Rouge, LA.

Purpose: To examine the effects of a voluntary, worksite program (10-wk) targeting weight loss via self-monitoring, eating behaviors, understanding hunger signals, reducing refined carbohydrate (CHO) intake, and increasing protein (PRO) intake to 25-30% on metabolic syndrome (MetS) component features.

Methods: We examined 2115 employees (Age, 27 y, Range 21-60; Female, 65%, BMI 34.12 kg/m², Range 17-77) before and 20 wk. after program initiation. For MetS, we examined changes in MetS and individual components via z-scores (zMets) to evaluate the progression of changes associated with the intervention. We examined data using a multivariate GLM, stratified for gender, and adjusted for age and baseline BMI. Data are mean z-score change ± 95%CI and gender differences denoted as (*).

Results: Both genders significantly improved overall ZMS and individual component features. Men exhibited a greater change in zMetS (p<0.001; -0.20, 95%CI, -0.29, -0.23) vs. women (-0.26, 95%CI, -0.32, -0.25). * The pattern of improvement for component features also differed by gender. Men: * Triglycerides -0.42 (95%CI, -0.48, -0.36), Systolic BP -0.34 (95%CI, -0.41, -0.26), Diastolic BP -0.30 (95%CI, -0.37, -0.22). * Waist Circumference -0.28 (95%CI, -0.32, -0.25), Glucose -0.20 (95%CI, -0.25, -0.14), LDL-C -0.14 (95%CI, -0.2, -0.07), HDL-C 0.09 (95%CI, 0.05, 0.14).

Women: Waist Circumference -0.34 (95%CI, -0.36, -0.32), Systolic BP -0.26 (95%CI, -0.31, -0.21), Triglycerides -0.23 (95%CI, -0.27, -0.19), Diastolic BP -0.21 (95%CI, -0.26, -0.15), LDL-C -0.18 (95%CI, -0.23, -0.13), Glucose -0.07 (95%CI, -0.11, -0.03), HDL-C 0.09 (95%CI, 0.05, 0.13).

Conclusion: Our study demonstrates that a self-monitoring, behavioral program targeting weight loss, reduced CHO and increased PRO intake significantly improves zMetS and respective component features. The potential difference of component order magnitude for each gender is notable and could be used to refine program outcomes when treating those with MetS.

Clinical Case Slide - Head and Neck I

Friday, June 3, 2016, 9:30 AM - 11:30 AM
Room: 203

2461 Chair: Scott A. Paluska, FACSM. Christie Clinic Sports Medicine, Champaign, IL. (No relationships reported)

2462 Discussant: Delmas Bolin, FACSM. Performance Medicine of Southwestern Virginia, Roanoke, VA. (No relationships reported)

2463 Discussant: Tamerah N. Hunt, FACSM. Georgia Southern University, Statesboro, GA. (No relationships reported)
TESTS AND RESULTS:
Sensory Organization Test:
- Composite score of 68 - abnormal Visual domain.
- Composite score of 48 (baseline 105).
- Multiple domains affected.
Patient Health Questionnaire-9:
- Maximum heart rate of 160.
- No symptom exacerbation.

FINAL WORKING DIAGNOSIS:
Post-concussion syndrome with predominately neuropsychiatric and visual dysfunction likely contributing to headache and cognitive difficulties.

TREATMENT AND OUTCOMES:
1. Referral for full neuropsychological evaluation to assess cognitive function and mood disorder and provide specific recommendations for treatment.
2. Physical Therapy for possible cervicogenic component of headaches.

Final/Working Diagnosis:
Anisocoria secondary to concussion

Differential Diagnosis:
- Sensory deficit. The remainder of the physical exam was unremarkable.
- Extraocular movements were intact and visual acuity was 20/20 bilaterally. Neurologic exam was otherwise normal, with no cranial nerve, motor or sensory deficit. The remainder of the physical exam was unremarkable.

Differential Diagnosis:
1) Anisocoria due to concussion
2) Subdural hemorrhage
3) Post-concussion syndrome
4) Complex migraine
5) Intracranial mass
6) Cerebral Aneurysm

Intracranial injury / hemorrhage
Retinal hemorrhage
Orbital blowout fracture
Funduscopic exam was normal
On upward gaze, he had both a binocular vertical diplopia and left eye upward gaze hemorrhage.
Left infraorbital erythema, edema and tenderness to palpation. Mild subconjunctival hemorrhage.

Physical Examination:
Examination revealed a normal mental status. The head was atraumatic. Cervical spine range of motion was full and there was no tenderness. Eye exam was notable for a 3mm right pupil and 3mm left pupil. Direct and consensual light reflexes were equal bilaterally, with constriction to 2mm. There was no afferent pupillary defect. Extraocular movements were intact and visual acuity was 20/20 bilaterally. Neurologic exam was otherwise normal, with no cranial nerve, motor or sensory deficit. The remainder of the physical exam was unremarkable.

Differential Diagnosis:
1) Anisocoria due to concussion
2) Subdural hemorrhage
3) Post-concussion syndrome
4) Complex migraine
5) Intracranial mass
6) Cerebral Aneurysm

Test and Results:
MRI brain with and without contrast: Normal contrast-enhanced MRI of the brain.

Final/warning Diagnosis:
Anisocoria secondary to concussion

Treatment and outcomes:
1) The patient was seen by a neurologist 1 week after the anisocoria began. At that time, she was noted to have equal pupils and near complete resolution of her symptoms. The neurologist felt that her presentation was consistent with concussion but agreed with the plan to obtain MRI.
2) Symptoms resolved completely 14 days after onset
3) She completed the return to play protocol and is now back to competitive soccer.
A Case of Ottorhea Induced by a Fall from a Skateboard

Email: jsjwilt29@gmail.com
(No relationships reported)

HISTORY: 19 year old male with negative past medical history presented to the Student Health Center with right jaw pain after a fall from his skateboard. He lost control on a downhill sidewalk and fell directly onto his chin. He was not wearing a helmet. He also complained of blood coming from his right ear and decreased ability to hear on right. He denied loss of consciousness, headache, focal neurologic deficits, vision changes, nausea, vomiting, abdominal pain, chest pain, shortness of breath, neck pain, back pain, or hip pain.

PHYSICAL EXAMINATION: The patient was hemodynamically stable and in no acute distress. Pupils were equal, round and reactive. He had a 2.5cm superficial laceration to chin. There was tenderness over the right TMJ and decreased ability to open mouth. He had bleeding from the right ear canal. Otoscopic exam revealed what appeared to be a small bump with associated laceration, oozing blood. There was no hematotympany. No clear leakage from ears or nares. No battle’s sign or raccoon eyes. There were no other remarkable findings, but given the extent of his injuries, the patient was sent to the Emergency Department (ED) for further evaluation.


TEST AND RESULTS: Cat Scan Head, Cervical Spine and Maxillo-facial bones.

FINAL WORKING DIAGNOSIS: Comminuted fracture of the right mandibular neck with anterior angulation of the mandibular condyle and dislocation of the TMJ. Additionally, there is fracture of the anterior bony wall of the External Auditory Canal.

TREATMENT AND OUTCOMES: The chin laceration was repaired in the ED. Neurosurgery was consulted as there was concern for basilar skull fracture. Per their recommendation, there was no need for any neurosurgical intervention. Plastic surgery and ENT were also consulted. He received a prescription for ciprofloxaxin antibiotic and otic drops and then followed up with ENT and Plastic Surgery as an outpatient. He had wire fixation with arch bars to treat the mandibular fracture and has not had any complications to date.

E-21 Clinical Case Slide - Lower Extremity - Hip/ Pelvis
Friday, June 3, 2016, 9:30 AM - 11:10 AM
Room: 206

Chair: Anastasia Fischer, FACSM. Nationwide Children's Hospital, Columbus, OH.
(No relationships reported)

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

Discussant: Scott A. Magnes, FACSM. Lovell Federal Health Care Center, North Chicago, IL.
(No relationships reported)

June 3, 9:30 AM - 9:50 AM
Pelvis Injury - Running
Samuel T. Dona, Jr., Terry L. Nicola, FACSM. Rush University Medical Center, Chicago, IL. University of Illinois at Chicago, Chicago, IL. (Sponsor: Terry Nicola, FACSM)
Email: Samuel_T_Dona@rush.edu
(No relationships reported)

HISTORY: A 41-year-old female presented with new left pelvic and left ischial tuberosity pain after recreational distance running. Pain was localized to the left groin and described as “aching” without radiation or numbness. The patient, a former collegiate 800m track athlete, was diagnosed with left athletic pubalgia two years prior and managed conservatively with return to full pain-free running one year prior to consult. She was running 40 miles per week, ranging from 5-15 miles per day and had recently transitioned running shoe models 2-3 weeks prior. Pain had progressively increased to inability to tolerate running.

PHYSICAL EXAMINATION: Examination revealed a symmetric, non-antalgic walk, equal leg lengths and ability to perform full squat. Resisted left hamstrings flexion in the supine position with knees at 90 degrees reproduced left ischial tuberosity pain. Left hamstring tendon was palpable and intact. Range of motion was full throughout the bilateral lower extremities. Strength, reflexes, sensation and pulses were normal throughout.

DIFFERENTIAL DIAGNOSES: 1. Hamstring tendinosis. 2. Pelvic stress fracture. 3. Pelvic floor injury

TESTS AND RESULTS: Anterior-posterior pelvis x-ray with two oblique views and lateral view:
— Healing, non-displaced, peristeous reaction at the inferior rami of the left pubic bone consistent with stress fracture not demonstrated on previous AP pelvis done one year prior.

FINAL WORKING DIAGNOSIS: Left inferior pubic ramus stress fracture

TREATMENT AND OUTCOMES:
1. Immediate cessation of land-based running with pool running as tolerated for 2 months.
2. Initiated 800 IU Vitamin D and 2000 mg Calcium supplementation.
3. DEXA scan performed and negative for osteopenia. Subsequent Vitamin D level within normal limits.
4. 3 months from initial consult, patient tolerated treadmill evaluation and commenced a walk-to-run protocol with initiation of physical therapy.
5. Repeat AP pelvis x-ray demonstrated healed undisplaced fracture of left inferior pubic rami with solid bone union. Further imaging with MRI was not needed.
6. After 4 months, she tolerated land-based running without pain. Gait analysis was performed to ensure proper running mechanics with increased running frequency and duration in the prescribed walk-to-run protocol.

2474 June 3, 9:50 AM - 10:10 AM
Ultramarathon Runner With Right Hip Pain
McKennon J. Thurston, Tamara Huff, George G.A. Pujalte, FACSM. Mayo Clinic, Jacksonville, FL. (Sponsor: George Pujalte, FACSM)
Email: thurston.mckennon@mayo.edu
(No relationships reported)

HISTORY: 38-year-old male runner presented to the Sports Medicine Clinic for right hip pain 8 days prior to the office visit. While running his first marathon, he started having pain at mile 16 over the anterolateral aspect of the right hip. At mile 19, he had to withdraw from the competition. He could not bear weight on his right lower extremity. He denied popping, cracking, or catching of his right knee or hip. Emergency department evaluation revealed “sharp” pain rated 5-6/10 without any numbness or tingling. He was diagnosed with “bursitis” and provided tramadol and a non-steroidal anti-inflammatory drug. He used crutches for non-weight bearing which alleviated much of his pain. His lateral hip pain subsided, but he continued to have anterior hip and groin pain.

EXERCISE HISTORY: The patient averaged 80-90 miles per week, running in a light-weight, high-stability shoe on sidewalk surfaces.

PE:
Gait: Antalgic
Back: Full range of motion. Stork test was negative
Hip: Point tenderness over the right IT band and lateral groin. Pain with resisted hip flexion and at the extreme of external rotation. Flexion, abduction, external rotation negative for pain. Positive Ober’s test.

DIFFERENTIAL DIAGNOSES:
1. Hip flexor strain
2. Greater trochanteric pain syndrome
3. Femoral neck stress fracture
4. Snapping hip syndrome
5. Acetabulum labral tear
6. Iliotibial band friction syndrome

TESTS AND RESULTS:
LABS
25-hydroxyvitamin D 39.3, ionized calcium 1.22
INITIAL RIGHT HIP PLAIN FILMS
Normal at the emergency room
RIGHT HIP MRI WITHOUT CONTRAST
Periarticular bone marrow edema on the coronal T2 MR images and a fracture line noted on coronal T1 imaging were consistent with a nondisplaced, right, basivertical hip fracture.

FINAL WORKING DIAGNOSIS:
Right basivertical femoral stress fracture

TREATMENT:
Operative fixation of right basivertical hip femoral stress fracture
Vitamin D supplementation
POST-OPERATIVE X-RAYS
Normal bones in texture and density. A 2-hole, dynamic hip screw (DHS) plate with 2 bicortical screws was noted. Alignment of the right hip was anatomic.

OUTCOME:
1. 50% weight-bearing for one week after surgery
2. Preferred to do his own rehabilitation, doing exercises from a runner’s magazine
3. A walk-to-run program was completed
4. Competed in 50km of 2015
5. Completed six 30+-mile runs and is training for 100-mile run

HISTORY:
1. Pending laparoscopic surgery.
2. MRI L hip/pelvis: A 4cm well-circumscribed partially ossified mass in the left deep gluteal compartment with large surrounding edema
3. CT L hip/pelvis: 4cm partially ossified mass. No osseous extension into acetabulum or proximal femur. Appearance favors myositis ossificans. Cannot r/o osteosarcoma.
4. Pathology: Core needle biopsy of L buttck mass: Low grade fibrous lesion with myxoid change. Immunohistory chemistry results recommend FISH to r/o low grade fibromyxoid sarcoma
5. FISH Interphase: No evidence of FUS rearrangement
6. Pathology: Open biopsy of L buttck mass: Most consistent with benign fibro-osseous tumor (myositis ossificans)

Final Working Diagnosis: Myositis Ossificans

Treatment and Outcomes:
The case was reviewed by a multidisciplinary team including orthopedic surgery, oncology, and reading pathologist who concluded that this definitely represents a myositis ossificans with no current evidence of malignancy.
-Resume activity and soccer as tolerated
-PT to work on gluteus and abductor strengthening
-In 4 months plan to repeat XR and MRI of pelvis to ensure findings parallel the natural history of myositis ossificans

2475 June 3, 10:10 AM - 10:30 AM
Hip Injury-running
Farzad Pourarian, LECOM, Erie, PA. (Sponsor: Patrick Leary, FACSM)

(No relationships reported)

HISTORY:
1. Negative L hip and pelvis x-ray.

DIFFERENTIAL DIAGNOSIS:
1. Iliopsoas strain
2. Acetabular labral tear
3. Femoral Acetabular Impingement
4. Soft tissue neoplasm

TEST & RESULTS:
Anterior and cross-table lateral hip radiographs:
- Fracture of base of right femoral neck, undisplaced; left hip normal

FINAL WORKING DIAGNOSIS:
- Basivicalveal Femoral Neck Stress Fracture

TREATMENT AND OUTCOMES:
1. Percutaneous pinning of right femoral neck
2. Hip Labral Tear
3. Femoroacetabular Impingement
4. Trochanteric/Iliopsoas Bursitis
5. Iliotibial Band Tendinitis

Final Working Diagnosis: Myositis Ossificans

2477 June 3, 10:50 AM - 11:10 AM
Just Playing Kick Ball.
Cathia Vazquez, John J. Tierney, Mariisa Vasquez. Kaiser Permanente Los Angeles Medical Center, Los Angeles, CA.

(Sponsor: Aaron L. Rubin, FACSM)

(No relationships reported)

History: 32M recreational soccer player with history of testicular cancer status post left orchectomy, presents to the clinic with 2 yr history of right anterior hip pain, acutely worsened 2 wks prior to presentation. Pt reports playing kick ball 2 wks prior when he felt a sudden sharp pain at the anterior right hip. He was ambulatory post injury, but with significant pain, improved over the following wk. Pt noticed daily pain, when sitting for prolonged period of time (i.e. driving, squatting). He denied nighttime pain, swelling, ecchymosis, snapping sensation, numbness, tingling, or weakness of lower extremity. Patient recalls hearing and feeling a pop at the same site of injury 2 yrs prior, while kicking during soccer. He did not receive prior medical care.

Physical Exam:
Gen: NAD
MSK: Right hip
No scars, ecchymosis, deformities, swelling
No tip at groin, trochanter, pubic symphysis; no palpable masses
ROM: IR 25, ER 45, Ab 35, FF 115, Ext 0
FABER: 3 fists breaths, same on opposite leg
Detailed hip exam normal
Neurovascular intact

Differential Diagnosis:
1. Iliopsoas strain
2. Iliopsoas tear
3. Acetabular labral tear
4. Femoral Acetabular Impingement
5. Sports hernia

Test and Results:
XRay right hip: Rounded calcification at AIIS. Joint space preserved. Alpha angle (Lat) 60.
CT right hip: Large Type 3 Anterior Inferior Spine heterotopic ossification of prior rectus femoris injury.
MRA right hip: Extra-articular AIS heterotopic ossification consistent with prior avulsion of rectus femoris injury, labral tear at anterior superior labrum, deficiency of the anterior femoral neck-neck junction consistent with CAM type femoral acetabular impingement

Final and Working Diagnosis:
AISIIS/sub-pin impingement with mild femoral acetabular impingement and anterior superior labral tear.

Treatment:
Awaiting laparoscopic surgery for planned right hip arthroscopic evaluation, AISIIS decompression and labral tear repair.

Outcome:
1. Pending laparoscopic surgery.
E-22 Free Communication/Poster - Aerobic Capacity Testing
Friday, June 3, 2016, 7:30 AM - 12:30 PM
Room: Exhibit Hall A/B

2478 Board #1 June 3, 9:30 AM - 11:00 AM
Physical Fitness Predictor Test for the Soldier Move Under Fire Task
Sarah E. Sauers, Jan E. Redmond, Stephen A. Foulis, Bradley J. Warr, Peter N. Frykman, Marilyn A. Sharp, Edward J. Zambraski. US Army Research Institute of Environmental Medicine, Natick, MA.
Email: sarah.e.sauers2.mil@mail.mil
(No relationships reported)

Move under fire (MUF) is a common Soldier task that requires strength and agility to effectively move from one position to another. It is essential to determine if a Soldier can successfully perform this task. While the best method to assess the task would be to actually perform the task, it is not always practical. The use of physical fitness tests (PFT) to predict MUF performance may be more time efficient and mitigate injury risk. PURPOSE: To determine the effectiveness of physical fitness tests to assess a Soldier’s ability to perform the MUF task. METHOD: While wearing a fighting load weighing approximately 71 lbs. and carrying a weapon, 435 men and 188 women Soldiers moved through a simulated 100 meter course as quickly as possible. Soldiers cycled between 1 prone and 2 kneeling positions, each 6.7 meters apart. Soldiers also performed 14 PFT while wearing shorts, t-shirts and athletic shoes. The PFT included: dumbbell squat lift (SL), 9 kg powerball throw (PT), handgrip (HG), upright pull (UP), push-ups (PU), and sit-ups (SU). RESULTS: Average time to complete the MUF task was 2 minutes 34 seconds. A stepwise multiple regression was used to develop the following equation (SEE = .153 minutes): 2.848 - .184 (LJ-m) + .003 (PU) + 1.439 (IA-min) - .002 (SL-kg) - .002 (BT-shuttles) - .047(MP-m) + .037 (PT-m) - .001 (AE-RPM).

The six minute walk test (6MWT) is used to evaluate functional/aerobic capacity with the primary outcome measure being walk distance (6MWD). Other variables such as heart rate, perception of dyspnea and blood oxygen saturation are inconsistently measured during the 6MWT. Correlations between 6MWD and maximal oxygen consumption range from 0.51 to 0.90 in patients with cardiac and/or respiratory impairment. Patients with mitochondrial myopathies (MM) due to mtDNA mutations in skeletal muscle have reduced oxidative capacities and the severity of their condition is closely related to peak oxygen uptake. It is not known how closely the 6MWD correlates with oxidative capacity in MM patients, and whether the 6MWT is an appropriate test to assess functional capacity in MM patients.

Purpose: To determine if the 6MWT is a sensitive measure of functional capacity in six MM patients (5 males, 1 female; 38-71yrs). Methods: Peak oxygen consumption and heart rate were determined during cycle ergometer exercise testing. Later the same day, and on the next day the six MM patients performed 6MWTs during which 6MWD and pk HR were determined. Results: During a graded cycle ergometer exercise test: peak VO2 ranged from 10.4 to 21.9 ml/kg/min. During the 6MWT: 6MWD ranged from 583 to 647m and the relative exercise intensity ranged from 78 to 100% of max HR. 6MWD was not highly correlated with pk VO2 (r=0.267, r=0.541). Conclusion: The 6MWT is not a sensitive measure of functional capacity in this group of MM patients.

Diabetes mellitus (DM) is a common comorbidity seen in cardiac rehab patients. Previous studies have suggested that patients with DM experience an attenuated physiologic response to exercise. The association between DM status and response to exercise in cardiac rehab patients is less known.

Purpose: To determine whether performance on a cardiopulmonary exercise (CPX) test and a 12-minute walk test (12MWT) is attenuated in cardiac rehab patients with DM.

Methods: 783 patients undergoing therapy in a cardiac rehabilitation program performed a CPX test and a 12MWT. Paired t-tests were used to evaluate differences in peak VO2 and distance walked between the DM and non-DM patients.

Results: 253 (32%) of the cardiac rehabilitation patients were diabetic.

<table>
<thead>
<tr>
<th>Peak VO2 and distance walked</th>
<th>Variable</th>
<th>Diabetics</th>
<th>Non-Diabetics</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak VO2 (ml/kg/min.)</td>
<td>17.7 ± 4.3</td>
<td>21.2 ± 5.7</td>
<td>&lt; .0001</td>
<td></td>
</tr>
<tr>
<td>12MWT distance (m.)</td>
<td>3409.8 ± 711.5</td>
<td>3027.0 ± 615.2</td>
<td>&lt; .0001</td>
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</tr>
</tbody>
</table>

Conclusions: Performance on the CPX test and 12MWT was attenuated in the DM patients. Because of their reduced functional capacity DM patients may need additional assistance in meeting their cardiac rehab goals.
CONCLUSIONS: Test duration inversely influences the maximal velocity reached with no VO2max changes. The differences in VE_{max} keeping the same VO2max indicate a specificity issue that is time-length dependent for the IET protocols. Supported by agencies CAPES, CNPq and FAPERJ.

Patients who have had stroke often exhibit neurological and motor sequelae associated to functional impairments that compromise the activities of daily living. Walking difficulties associated with hemiparesis are major obstacles to a correct evaluation of aerobic capacity in stroke patients. Because of these limitations, standardized procedures for assessing the VO2_{max} of hemiparetic ambulatory post-stroke patients should be developed. PURPOSE: To compare the cardio-respiratory and perceptual responses elicited by two ramp cardiopulmonary exercise tests (CPET) specifically developed for chronic hemiparetic patients. METHODS: Eleven patients (52 ± 14 years, 10 men) performed the CPET protocol proposed by Ovando et al. (2011) and an adapted protocol proposed by the present study designed to increase its specificity for hemiparetic stroke population. The oxygen uptake (VO2), systolic blood pressure and heart rate (HR), maximum speed, time to exhaustion and rating of perceived exertion (RPE), as well as the speed, HR and the VO2 at the first ventilatory threshold (VT) were measured. To compare the relationship between VO2 vs. workload, HR vs. workload and VO2 vs. HR between both CPETs, individual linear regressions were calculated for each patient, and then, the slopes, intercepts and standard error of estimate were compared by Student t test.

RESULTS: In comparison with Ovando’s protocol, the current CPET protocol was able to induce higher VO2 peak (20.3 ± 6.1 vs. 16.1 ± 5.0 ml.kg.min⁻¹; P= 0.004), VO2 at VT (11.5 ± 2.9 vs. 9.8 ± 2.0 ml.kg.min⁻¹; P= 0.04) and time to exhaustion (10 ± 3 vs. 6 ± 2 min; P=0.05), the current protocol produced lower standard errors of estimate for HR vs. workload (2.95 ± 1.3 vs. 3.82 ± 1.6; P= 0.004) and HR vs. VO2 (6.0 ± 2.1 vs. 4.8 ± 2.4; P= 0.05) compared with Ovando’s protocol. CONCLUSION: The smoother rate of increment proposed by the current CPET protocol seems to be more appropriate than other available test, to assess the maximal aerobic capacity of hemiparetic post-stroke patients.

The 6-minute walk test (6MWT) has gained widespread acceptance in the clinical community as a simple, practical, and inexpensive option for measuring functional exercise capacity in disease-based populations known to experience exercise intolerance. Despite its widespread use as a clinical outcome measure in clinical trials to evaluate improvements in exercise capacity in disease-based populations known to experience exercise intolerance, the 6MWT in patients with FM.

CONCLUSIONS

High physical activity levels as well as inactive lifestyles are associated with an increase in oxidative stress that can generate negative effects on muscle hypertrophy mechanisms. Purpose: To investigate the oxidative stress, muscle damage, enzymatic antioxidant defense and body composition in senior adults who have performed different lifestyle physical activity practices. Methods: Twenty-three healthy senior men (60.1±1.8 years old) were divided into three groups according to their lifelong physical activity practice: (a) Sedentary (n=7), (b) Recreational (n=9) and (c) Amateur (n=7). Blinding was maintained throughout the study. Post-exercise red blood cell (RBC) damage, muscle damage and antioxidant enzymatic activity were measured using Teras-TBARS, -Assay, nuclear DNA-damage in peripheral lymphocytes using Comet-Assay, the plasma enzymatic activity of glutathione peroxidase by spectrophotometry and serum alpha-actin release as skeletal muscle damage marker through Western Blot. Body composition was evaluated using anthropometric assessments by the ISAK reach through skinfold thickness. One way ANOVA test was used to compare three groups. Post-hoc contrasts were performed by Bonferroni test at the significance level of p<0.016. Statistical procedures were carried out using SPSS/PC v22. Results: The lowest value of malondialdehyde was shown in the Amateur group. The nuclear DNA-damage was significantly lower in the Recreational group than in the Sedentary and Amateur groups (MD=5.5±1.1; P=0.013, MD=5.5±1.1; P=0.001, MD=5.5±1.1; P=0.001). Sedentary group presented a significant lower muscle mass (MD=3.6±1.10; p=0.011) and significantly higher fat mass (MD=4.19±0.98; p=0.001) than Amateur group. Conclusions: The results described above suggest that the lifelong amateur endurance practice seems to improve oxidative stress response and strengthens hypertrophy mechanisms that could preserve muscle mass in senior adults. Funding was supported by the Higher Council of Sports, Ministry of Education and Science of Spain (references 03/UPB31/10).

The free radical theory of aging posits that aging is a result of accumulated free radical damage to cells, tissues, and organ systems. Endogenous antioxidants such as superoxide dismutase (SOD) can protect cells from free radical damage. Thus, factors influencing the expression of these antioxidants could have important health-related implications. The potential associations among physical activity level (PA), cardiorespiratory fitness (CRF), and skeletal muscle expression of endogenous antioxidants have received limited attention in older adults. The PURPOSE of this study was to determine if PA and CRF were associated with skeletal muscle SOD and a marker of oxidative damage to DNA (8-hydroxy-2'-deoxyguanosine, 8-OHdG) in older adults. We hypothesized that PA and CRF would be positively correlated with skeletal muscle SOD expression, and inversely correlated with 8-OHdG levels in older adults. METHODS: In 26 subjects (MF=9/17, age=68±6y, BMI=26-3±3 kg m⁻²) self-reported moderate-to-vigorous PA (Community Healthy Activities Model for Seniors, CHAMPS) and CRF via estimated maximal oxygen consumption ( YMCA cycle ergometer test) were measured. SOD was measured in skeletal muscle biopsies (vastus lateralis) using western blot analyses. Serum levels of 8-OHdG were measured using a commercially available enzyme-linked immunosorbent assay (Amresco, Cambridge, MA). Pearson product-moment correlations were run between variables while controlling for age, sex, and BMI. Significance was set to p<0.05. RESULTS: The mean PA and estimated VO2max values were 1640±231 kcal week⁻¹ and 30±6 ml kg⁻¹ min⁻¹, respectively. The mean values for skeletal muscle SOD and serum 8-OHdG were 1.3±0.6 arbitrary units and 88±4.0 nM, respectively. There were significant
RESULTS: participants’ age of 70 ± 7.2 years, weight of 67.1 ± 11.3 kg; height of 152.8 ± 8.7 cm; BMI 26.5 ± 8.8 kg/m2. The mean RMS was 2.01 ± 1.22 V.

CONCLUSIONS: the preliminary RMS results unveil poor electromuscular functionality in our sample, according to values reported in other populations. It is suggested that exercise programs, suitable to be performed by the elderly close to or in home should be develop for public health authorities. In young adults it could help to prevent muscle function deterioration; meanwhile in elderly adults to maintain and recover muscle force.

Decrements in muscle function due to reduced muscle mass and quality (specific torque) occur in old age, and these changes may be sex-specific. It is not known whether high levels of activity are beneficial for the maintenance of muscle quality, or if its effect differs by sex. PURPOSE: To determine whether older adults runners (RUN) have greater knee extensor (KE) specific torque than their sedentary counterparts (SED), and to examine the influence of sex on muscle efficiency (specific torque normalized to muscle cross-sectional area).

METHODS: 8 RUN (4 F, 62.9±3.8 yrs, BMI 23.2±2.1) and 6 SED (4 F, 62.6±4.7 yrs, BMI 23.3±1.3) completed KE isometric and isokinetic concentric and eccentric contractions at 90, 180, and 270°/s. KE volume was assessed by serial MRI. Specific torque (Nm/cm³) was calculated as peak torque at each contraction velocity divided by KE volume. Repeated measures ANOVAs were used to compare specific torque between RUN and SED across contraction velocities with significance at p ≤ 0.1. Linear regression was used to examine the impacts of running and sex on muscle efficiency. 2 females (1 RUN, 1 SED) were removed from eccentric data due to testing difficulty. RESULTS: SED had greater isometric and concentric specific torque than RUN (Table 1). There were no associations between specific torque and KE volume or group in females, while there was a significant linear relationship in males (p = .06, r = -0.3). CONCLUSIONS: RUN had lower KE specific torque compared to SED despite having larger KE volumes. It appears that the decrease in specific torque with increasing muscle volume may be specific to males. These results suggest a complex mechanism behind changes in muscle quality with age and a possible sex-specific response to physical activity.

Specific torque across contraction velocities. Eccentric ANOVA separate due to different subject #.

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<th>Velocity (°/sec)</th>
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With adult aging, there is a loss of muscle mass and alterations to the structural components of the human neuromuscular system resulting in impaired contractile function. A potential source of impairment could be aged muscle operating at a restricted force-length relationship (i.e., smaller plateau region owing to shorter fascicle lengths and greater sarcomere length (SL) changes for a given excursion). PURPOSE: To investigate the force-fascicle length (F-Lf) relationship as related to SL changes for a given excursion. METHODS: 10). The MG was isolated surgically, attached in series to a torque (Nm/cm³) was calculated as peak torque at each contraction velocity divided by KE volume. Repeated measures ANOVAs were used to compare specific torque between RUN and SED across contraction velocities with significance at p ≤ 0.1. Linear regression was used to examine the impacts of running and sex on muscle efficiency. 2 females (1 RUN, 1 SED) were removed from eccentric data due to testing difficulty. RESULTS: SED had greater isometric and concentric specific torque than RUN (Table 1). There were no associations between specific torque and KE volume or group in females, while there was a significant linear relationship in males (p = .06, r = -0.3). CONCLUSIONS: RUN had lower KE specific torque compared to SED despite having larger KE volumes. It appears that the decrease in specific torque with increasing muscle volume may be specific to males. These results suggest a complex mechanism behind changes in muscle quality with age and a possible sex-specific response to physical activity.

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Age-related decline in grip strength (HGS) is associated with several unfavorable health conditions and an increased risk of all-cause mortality. In general, muscle strength declines at a higher rate than muscle mass. Thus, an age-related decline in muscle strength/mass ratio (i.e., muscle quality) would be expected, however, it is unknown whether muscle quality in the forearm associates with HGS in the aging process.

**PURPOSE:** To investigate the relationships between age-related declines in HGS and loss of forearm muscle size and/or muscle quality in men.

**METHODS:** Two hundred fifty men aged 20-89 had muscle thickness (MT) measured by ultrasound at the anterior forearm of the dominant hand. MT was measured as the perpendicular distance between the subcutaneous adipose tissue-muscle interface and muscle-bone interface of the ulna (MT-ulna). HGS was also measured for the dominant hand with a hand dynamometer. Muscle thickness (MT) was defined as a ratio of HGS to MT-ulna. Cross-sectional analyses determined differences among age groups for each variable and Pearson correlation coefficients were performed for all variables. Statistical significance was set at p < 0.05.

**RESULTS:** HGS was similar among younger groups (47.6 ± 5.5 kg in aged 20-29 (n=34), 48.8 ± 7.7 kg in aged 30-39 (n=23) and 47.5 ± 7.2 kg in aged 40-49 (n=25)) and it decreased (p < 0.001) gradually with age (43.8 ± 6.7 kg in aged 50-59 (n=47), 40.6 ± 6.7 kg in aged 60-69 (n=46), 36.7 ± 5.1 kg in aged 70-79 (n=47) and 33.3 ± 4.6 kg in aged 80-89 (n=28). MT-ulna was similar among young and middle-aged groups (3.92 ± 0.30 cm in aged 20-29, 3.85 ± 0.38 cm in aged 30-39, 3.83 ± 0.35 cm in aged 40-49, 3.82 ± 0.33 cm in aged 50-59 and 3.81 ± 0.29 cm in aged 60-69) and was lower (p < 0.01) in aged 70-79 (3.66 ± 0.26 cm) and aged 80-89 (3.58 ± 0.32 cm) compared to the aged 20-29. MQ was similar among younger groups (aged 20-29 to aged 40-49) and it decreased (p < 0.01) gradually with age. MQ was strongly correlated to HGS in each age group (r = 0.767-0.873), while MT-ulna was low to moderately correlated to MQ (r = 0.429-0.610).

**CONCLUSIONS:** Age-related decline in HGS is associated with MQ, but it appears to be accelerated after age 70 due to forearm muscle loss. Future research could investigate this further by looking at the association between loss of forearm muscle mass and mortality.
CONCLUSIONS: the results obtained indicate that muscle strength in Mexican elder people is reduced and lower than the values found in other international populations.

Sarcopenic obesity is a metabolic syndrome where excess adipose tissue and a decline of muscle due to age results in an increased risk of disability. This is a concern in the United States because older adults are the fastest growing obese population. The extracellular matrix (ECM) in skeletal muscle is essential because it assists in stability, force transmission, and muscle remodeling. Both sarcopenia and obesity are associated with increased fibrosis, however it is not known how these co-morbidities interact during sarcopenic obesity to affect the ECM. PURPOSE: To determine if skeletal muscle ECM-related gene expression is impaired in sarcopenic obese mice.

METHODS: Twelve young (3–4 months old) male C57BL/6J mice and twelve aged (22-24 months old) male mice were randomly assigned a normal chow or a high-fat diet (HFD, 60% fat) at 4 weeks of age. The gastrocnemius was excised for further analysis. ECM-related markers were determined by qPCR. Data were analyzed by two-way ANOVA and post hoc Fisher’s LSD.

RESULTS: There were significant interactions in collagen I, collagen III, fibronectin, and matrix metalloproteinase 2 (MMP-2) (p<0.05). There was a 2-fold increase in collagen I gene expression in young HFD mice compared to young lean mice (p<0.05). There was a 3-fold increase in collagen III in young HFD mice compared to young lean mice (p<0.05). However, there was no differences in collagen I in aged HFD and aged lean mice. There was a 3-fold increase in collagen III in young HFD mice compared to young lean mice (p<0.05). However, there was no difference in fibronectin in aged HFD and aged lean mice. There was a 2-fold increase in MMP-2 in young HFD mice compared to young lean mice (p<0.05). However, there was a 45% reduction in MMP-2 in aged HFD mice compared to aged lean mice (p<0.05). There was a main effect of diet to decrease MMP-9 and myoD in obese mice (p<0.05). There was a main effect of age to increase myoD in aged mice (p<0.05). There were no differences in TGF-β, myogenin, and TIMP-1.

CONCLUSIONS: Aging and obesity altered ECM-related gene expression that may be partially responsible for the reduction in muscle function observed in sarcopenic obese individuals. The study was funded by the Arkansas Bioscience Institute.

Older adults aged above 65 years comprise the fastest-growing segment of the world population. Similarly, the Mexican population is ageing. In the elderly, the musculoskeletal disorders represent a serious public health problem, one of the main causes of disability and one of the most common problems affecting mature people. The age-associated physical musculoskeletal alterations cause musculoskeletal discomfort, and a limiting factor for exercise practice. To our knowledge, there are no previous reports on musculoskeletal characteristics or on the prevalence has been studied in Mexican elders. PURPOSE: to determine the prevalence of musculoskeletal alterations (MSA) and the type of complaints (MSC) in elder Mexican people.

METHODS: one hundred and forty three responded an invitation to approximately 250 elder both men (17.48%) and women (82.52%), assisting regularly to a gerontology centre in León, Gto. The participants were evaluated by a thorough orthopedic and biomechanical examination. They also answered a modified version of the Standardised Nordic Questionnaire for Musculoskeletal Symptoms. Data were then analyzed using descriptive statistics.

RESULTS: general characteristics of the sample were: 69.5 ± 6.9 years of age; 153.3 ± 8.2 cm height, and 66.8 ± 11.8 kg of weight. 85% out of the total sample declared MSA. The knee was the most affected segment (64.9%), followed by the low back (52.2%) and the shoulder (47.8%). During the orthopedic exam, in 80% at least one musculoskeletal alteration was observed. The most prevalent was scoliosis (64.1%), followed by knee valgus (26.8), knee varus (24.5), and Hallux Valgus (25.8%).

CONCLUSIONS: both, MSA and MSC are highly prevalent among elder Mexican people. Based on our findings, this Mexican population group has to be considered prone to develop MSA and MSC, and should receive early education on musculoskeletal care, as well as continuous evaluation, vigilance and specialty care of the musculoskeletal system.

Hand-grip strength is a convenient and cost effective approach to assessment of total body muscle strength and functional depreciation with age.

Loss of muscle mass and function during aging leads to serious health problems for older adults. Protein aggregation increases with aging and disease progression in tissue affected by neurodegenerative diseases such as Alzheimer’s, Parkinson’s, and Huntington’s. However, protein aggregation has not been investigated for a role in sarcopenia. PURPOSE: 1) Determine if aging is associated with increased protein aggregation in human skeletal muscle. 2) Specifically identify aggregation prone human muscle proteins. 3) Test the mechanistic involvement of these proteins in protein aggregation and age-associated muscle loss using a nematode model.

METHODS: Protein aggregates were resolved (2D electrophoresis) from vastus lateralis muscle tissue collected from two young (23 and 26 yrs) and two older (65 and 68 yrs) subjects. Individual proteins were identified using liquid chromatography and mass spectrometry. Three proteins were chosen that are conserved as orthologs in Caenorhabditis elegans. The role of the orthologs in protein aggregation and age-associated muscle loss was assessed using RNA interference to block production of these proteins in a nematode model of Huntington’s disease. The model expresses polyglutamate tracts fused to green fluorescent protein which promotes and allows detection of protein aggregation. Muscle mass in the nematodes was quantified using fluorescent microscopy and a muscle specific stain (rhodamine-phalloidin).

RESULTS: Protein aggregation was higher for the older than the young adults. Three affected proteins were 60 to 90% higher and included 14-3-3 protein, Ankyrin-2, and Eukaryotic translation initiation factor 2, which are conserved in the nematode and encoded by the genes FTT-2, UNC-44, and EEF-2, respectively. RNA interference of FTT-2, UNC-44, and EEF-2 decreased protein aggregation by 30-66% (P<0.01) in aged nematodes and increased muscle mass by 2.0±0.0, 2.4±0.1 and 2.6±0.1 fold respectively (P<0.001 each).
CONCLUSIONS: These results demonstrate that specific proteins contribute to protein aggregation and age-associated muscle loss at least in a nematode model. These proteins are also present in protein aggregation that occurs with aging in human muscle. Thus, additional research is warranted to determine if protein aggregation plays a pathologic role in sarcopenia.

E-24 Free Communication/Poster - Cellular/ Molecular

Friday, June 3, 2016, 7:30 AM - 12:30 PM
Room: Exhibit Hall A/B

2497 Board #20 June 3, 9:30 AM - 11:00 AM
Maternal Exercise Activates Genes Associated With Mitochondrial Biogenesis In Fetal Myocardium Of Mice
Eunhee Chung1, Hayli Joiner1, Tracey Skelton1, Kalli D. Looten1, Maria Manczak2, P. Hernachand Reddy1, 1Texas Tech University, Lubbock, TX, 2Texas Tech University Health Sciences Center, Lubbock, TX. (Sponsor: Jacylan McComb, FACS)
Email: eunhee.chung@ttu.edu
(No relationships reported)

Maternal exercise during pregnancy has been shown to improve long-term metabolic health on offspring in later life. Mitochondria are the critical site of metabolism, and are inherited by maternal origin. However, the effects of maternal exercise during pregnancy on fetal mitochondrial biogenesis are not well understood. PURPOSE: To test whether maternal exercise can activate genes associate with mitochondrial biogenesis in the fetal heart. METHODS: Female C57BL/6 mice were divided into sedentary and exercise groups. The mice in the exercise group were exposed to voluntary cage-wheel from gestational day 1 through 17, at which time they were sacrificed. Litter size and individual fetal weights (3 days before birth) were taken when pregnant dams were sacrificed. All fetuses were sexed and two to three hearts from same sex within the group were pooled to study gene expression: all data were normalized to 18s rRNA. Genes associated with mitochondrial biogenesis, including Ppargc1a (peroxisome proliferator-activated receptor gamma, coactivator 1 alpha), Nr1f1 (nuclear respiratory factor-1), and Nr2f2 (nuclear respiratory factor-2) were significantly upregulated in fetuses from exercise dams. CONCLUSION: Although differences in litter size, sex distribution, and average fetal body weight per litter between sedentary and exercise dams. Genes associated with mitochondrial biogenesis, including Ppargc1a (peroxisome proliferator-activated receptor gamma, coactivator 1 alpha), Nr1f1 (nuclear respiratory factor-1), and Nr2f2 (nuclear respiratory factor-2) were significantly upregulated in fetuses from exercise dams. Genes associated with mitochondrial biogenesis, indicating that maternal exercise enhances mitochondrial biogenesis and mitochondrial function.

2498 Board #21 June 3, 9:30 AM - 11:00 AM
Cardioprotection Induced By Exercise Preconditioning Involves Downregulation Of Lc3ii/I And Katp Channel Subunits Sur2a
Jiao Lu, Shan S. Pan, Tang Q. Wang. Shanghai University of Sport, Shanghai, China.
Email: lj_sus@163.com
(No relationships reported)

Cardioprotection induced by exercise preconditioning involves downregulation of LC3II/I and KATP channel subunits SUR2A. Lu Jiao, Pan Shanshan, Wang Qiangtao. School of sports science, Shanghai university of sports, Shanghai, China. The cardioprotective effects of exercise preconditioning (EP) in late phase has been proved, while the intracellular mechanism still under investigation. Evidences showed activation of autophagy and sarcolemmal KATP channel took effect in myocardial protection.

PURPOSE: This research was aimed to probe the alteration of autophagy-related LC3 and KATP channel subunits SUR2A during the late cardioprotective effect of exercise preconditioning (EP) against exhaustive exercise-induced myocardial injury.

METHOD: Male 8-week-old Sprague-Dawley rats were exercised on a treadmill for four periods of 10 min each at 30 m/min with intervening periods of rest lasting 10 min. The exhaustive exercise (30 m/min) was performed 24 h after EP. LC3 and SUR2A protein were detected by immunofluorescence and western-blot. Autophagy levels was evaluated by the values of LC3II/I. RESULTS: Exhaustive exercise produced a significant increase in both LC3II/I and SUR2A levels (2.02 ±0.76 vs. 1.54 ±0.31, 0.22±0.05 vs 0.15±0.04, p<0.05). The high LC3II/I and SUR2A levels observed after exhaustive exercise were significantly mitigated by EP (1.63±0.34 vs. 2.02 ±0.76, 0.11±0.06 vs 0.22±0.05, p<0.05). CONCLUSION: Cardiac autophagy and KATP channels are involved in late cardioprotection against exercise exhaustive in rats through the downregulation of LC3II/I and SUR2A.

Supported by the National Natural Science Foundation of China (Grant No. 31471136)
The mitochondrial theory of aging implicates reactive oxygen species (ROS) produced during oxidative metabolism in damaging cardiac muscle cells and contributing to the physiological decline of aging. Mitochondrial DNA (mtDNA) is damaged by ROS and cannot be accurately transcribed or translated into proteins needed for oxidative metabolism leading to detrimental oxidative capacity of cardiac muscle with age. Obesity is also strongly associated with multiple cardiomyopathies and mitochondrial damage and may exacerbate the effects of aging. If mRNA translation of mitochondria-encoded gene products plays a role in the onset of cardiomyopathy is unclear.

**PURPOSE:** The purpose of this investigation was to describe mitochondrial content (COX-I, IV) biogenesis (PGC-1α, TFAM), mitochondrial mRNA translation machinery (12S and 16S rRNAs, mIF2/3, TUFM, TACO1), and the mitochondrially encoded protein (Cytb) during aging and obesity.

**METHODS:** Four groups of C57BL/6j mice were used: Young Lean (3-4 weeks old, normal diet, n=10, YL), Young diet-induced obese (n=16, YO), Aged Lean (20-24 months old, n=8, AL), and Aged Obese (n=6, AO). Hearts were removed, weighed, snap-frozen, and processed for protein and RNA for immunoblotting and real-time RT-PCR, respectively.

**RESULTS:** COX-IV protein was ~30% greater in aged mice compared to young (p<0.05). PGC-1α was ~100% higher in YO compared to YL (p<0.05) and ~75% higher in AL vs. YL (p<0.05). 12S was ~50% lower in aged compared to young (p<0.05) and ~30% lower in obese compared to lean (p<0.05). 16S content was ~30% lower in AL and AO vs. YL and ~70% lower in YO vs. YL (p<0.05). mIF2 protein was ~40% less in aged vs. young (p<0.05). Obese mice showed ~25% less TACO1 protein compared to Lean (p<0.05). Cytb protein was ~40% lower in aged vs. young (p<0.05).

**CONCLUSIONS:** This investigation has taken clear steps showing alterations in mitochondrial content and mRNA translation machinery in aged hearts, concomitant with decreases in the content of mitochondria-encoded protein. These impairments in mitochondrial mRNA translation are indicative of greater oxidative stress in cardiac tissue during aging, which may directly impact the development of cardiomyopathies such as ventricular hypertrophy and cardiac fibrosis.

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**E-25**

**Free Communication/Poster - Correlates and Behavioral Aspects of Physical Activity**

Friday, June 3, 2016, 7:30 AM - 12:30 PM

**Room: Exhibit Hall A/B**

**Board #25**

June 3, 11:00 AM - 12:30 PM

**Influence Of Social Support On Adherence And Compliance With Recommendations Of Healthy Practice**

Manuel F. De La Cruz1, Jorge Zamarripa1, Fissel A. Calva-Vite2. 1Universidad Estatal de Sonora, Hermosillo, Mexico. 2Universidad Autonoma de Nuevo Leon, San Nicolas de los Garza, Mexico.

Email: maunel.delacruz23@gmail.com

(No relationships reported)

**ABSTRACT**

Among the social and cultural factors, the significant support (family and friends) is an important model of social influence on the creation and adoption of healthy habits like the practice of healthy physical activity. From the perspective of the transtheoretical model, the behavior modification involves the progression of the individuals through five stages: pre-contemplation (PC = inactive without any intention to change), contemplation (C = inactive with intention to change), preparation (P = active but not fulfilling the recommendations of the American College of Sports Medicine [ACSM]), action (A = has complied with the recommendations of the ACSM) but for less than six months) and maintenance (M = has complied with the recommendations ACSM for more than six months). PURPOSE: To examine the influence of the family support (Fs) and friends support (Fs) on the stages of change for physical activity were used. Both instruments were translated into Spanish from Mexican. RESULTS: The internal consistency of the subscales of Fs(alpha = .81) and Fs(alpha = .83) were satisfactory. The results of One-Way ANOVA revealed significant differences in the Fs(F(4,524) = 5.935, p < .001) and Fs (F(4,508) = 10.755, p < .001) in different SC. The Tooke's test indicated that people in the PC (2.14 ± .84) received less Fs than those found in the PM (2.58 ± .974), A (2.60 ± .960) and M (2.61 ± .928). On the other hand, people in the PC (2.33 ± .884) showed lower scores of Fs than those in the stages of M (2.92 ± .943) and A (3.03 ± .744). CONCLUSION: The social support (family and friends) is a factor that positively influences adherence, compliance and maintenance of healthy practice recommendations issued by the ACSM. Supported by Programa de Apoyo a la Investigación Científica y Tecnológica de la Universidad Autónoma de Nuevo León (PAICYT, 2015).

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**Board #26**

June 3, 11:00 AM - 12:30 PM

**A High Intensity Structured Exercise Program Induces Compensation In Middle Age Women Increasing Time Spent In Sedentary Behavior.**

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**PURPOSE:** Sedentary behavior has recently emerged as an independent risk factor for hypokinetic diseases. Therefore, it is important to understand how exercise promotion interventions, not only affect physical activity and exercise, but sedentary behavior as well. The purpose of this study was to determine changes in sedentary behavior following a ten-week high intensity training exercise intervention with a follow up phase. METHODS: 20 women (M Age = 52.1 ± 7.4) participated in a ten-week exercise intervention consisting of a high intensity interval treadmill protocol and resistance training three times a week for a total of 30 sessions. Sedentary behavior was measured for seven days prior to the intervention, one week following the intervention, and 3 months after the intervention with an Actigraph accelerometer. Validated cut points were used to determine time spent in sedentary behavior and the percentage of spent in light, moderate and vigorous activity. RESULTS: Results showed that participants spent on average 76.5%, 87%, and 85.1% of the time in sedentary O2.

**CONCLUSION:** Our results suggest the implication of oxygen tension for shear-induced NO and eNOS bioactivity and the signal transduction under LSS. Fundings: NIH R01 HL126952; AHA SDG12070327; AHA PRE11960049.
behavior at the pre-test, after the intervention, and at the retention phases respectively. Sedentary time significantly (p<0.05) increased post intervention and retention phase on average by 10.5% and 8.6%, reducing time spent in light, moderate, and vigorous intensity p<0.05. Semi-structured interviews identified perception of exercise and active compensation as themes for increased sedentary behavior. CONCLUSIONS: Based on the results of this study, participants did compensate for additional exercise bouts and this behavior still remained after 3 months post intervention. Interventions incorporating high intensity activity for this population should consider the adverse effect on sedentary behavior.

2504 Board #27 June 3, 11:00 AM - 12:30 PM Review of Barriers Underlying Female Utilization Rates of Resistance Training Facilities
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Resistance training improves muscle strength and overall physical function in both men and women. Although resistance training has many recognized benefits, it can present unique challenges to some women. PURPOSE: To determine the barriers underlying female utilization rates of resistance training facilities. METHODS: A review of literature was performed to determine common barriers contributing to the lack of strength training participation in college age females. Fifty-five peer-reviewed articles dealing with strength training by women were analyzed in an effort to determine the top barriers to strength training for women. All barriers were identified and frequencies were calculated. RESULTS: Of the barriers mentioned, the five most prominent barriers found were time (50%), lack of education (e.g., lack of proper technique and/or believing in myths) (44%), social factors (e.g., friends are not supportive and women do not want to portray a feminine image), fatigue from resistance training alone (38%), male judgment (e.g., feelings of discomfort due to being watched, scrutinized, and/or negatively judged) (31%), and lack of self-confidence and self-competence (e.g., perceived incompetence) (31%). CONCLUSIONS: There is very little research on women in resistance training. Of the research that has been conducted, there is very little that looks into the barriers to women’s participation in resistance training. Secondly, there are many factors related to the lack of women’s participation in resistance training. This study indicates that the most prominent barriers are lack of time, lack of education, social factors, male judgment, and lack of self-confidence and self-competence. Many of these barriers are potentially based solely on perception and others are easily remedied. Further research is necessary to determine if the perceived barriers are real and to determine intervention strategies to address these barriers.

2505 Board #28 June 3, 11:00 AM - 12:30 PM Increased Sensitivity to Physical Activity in Healthy Older Adults Predicts Worse Pain and Functional Outcomes
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Prior research indicates older adults with knee osteoarthritis (OA) have increased sensitivity to physical activity (SPA) and respond to physical activities of stable intensity with increases in pain. SPA predicted self-reported pain and function in older adults with knee OA. It is unknown whether SPA is present in healthy older adults without chronic pain and predicts functional outcomes. PURPOSE: Determine if SPA in response to a standardized walking task (6-minute Walk Test) cross-sectionally predicts self-reported pain, physical function, and physical activity behaviors in healthy older adults. METHODS: Forty-two older adults (10 men, average age 67.5 +/- 5 years) completed the Pain subscale of the Quality of Life Being scale (QWB - measures the frequency and severity of pain during common daily activities), the Short Form Health Survey (SF-36 - measure of physical function), the 6-Minute Walk Test (6MWT), and wore an accelerometer on the hip for 7 days. Subjects rated overall satisfaction with walking performance and 8.6%, and severity (R2 change = 6%, Beta = 31) and frequency (R2 change = 17%, Beta = 44) of activity related pain on the QWB scale. SPA did not predict scores on the Physical Function scale of the SF-36 (p > .05).

CONCLUSION: These results revealed that increased SPA in healthy older adults was associated with fewer steps and MVPA per day, greater RPE on 6MWT, and greater self-reported activity-related pain on the QWB scale. This study was funded by the IUPUI School of PETM Faculty Research Opportunity Grant.

2506 Board #29 June 3, 11:00 AM - 12:30 PM Male Perceptions of Women Performing Strength Training Exercises
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Research on physical activity promotion interventions has focused primarily on cognitive beliefs, emphasizing that decisions are made by weighing the benefits and costs of performing the behavior. Yet, recent research suggests that feelings about physical activity (e.g., positive feelings about walking, worry about exercising) can also be critical to predicting physical activity. These findings suggest that using measures and cognitive measures may be unique and important predictors of who maintains exercising regimens. Purpose: The objective of the study was to assess the cognitive beliefs and feeling measures towards physical activity in breast cancer survivors. Methods: A convenience sample of postmenopausal breast cancer survivors (n=50) were recruited for the study. Participants completed a survey which included questions on demographics, current physical activity, survivorship, standard cognitive measures, and feeling measures. Chi-squares were used to compare positive and negative cognitive beliefs and affective beliefs. Logistic regression was used to determine predictors of physical activity frequency.

Results: Data collection is underway and will be completed December 2015. Over half of the data has been collected and statistical significance may be reached with additional data. Preliminary results suggest survivors cognitively believe exercise is more positive than negative, but this is not statistically significant (p<0.05). Similarly, survivors feel more positive about exercise (p<0.05), but is not statistically significant. Logistic regression will be completed upon completion of data collection, but preliminary results suggest that positive cognitive beliefs (p<0.09) and positive feelings (p<0.087) are the best predictors of weekly physical activity frequency. Conclusion: The current study suggests positive cognitive beliefs and positive feelings towards physical activity might be important predictors of physical activity. This research could be used to design interventions based on both increasing positive cognitive beliefs about physical activity (e.g. physical activity is beneficial), but also increasing positive feelings towards physical activity (e.g., physical activity makes me happy).
SUMMARY

Within the transtheoretical model, behavior modification involves the progression of individuals through five stages (SC): pre-contemplation (PC = inactive without any intention to change), contemplation (C = inactive with intention to change), preparation (P = active but not fulfilling the recommendations of the American College of Sports Medicine [ACSM], action (A = has complied with the recommendations of the ACSM but for less than six months) and maintenance (M = has complied with the recommendations ACSM for more than six months). Two critical aspects for progression through the stages are enjoyment (E) and self-efficacy (SE), the former being maybe the most important positive correlate for adherence and maintenance of a structured exercise program, whereas the latter refers to the confidence one has on his/her ability to perform a specific behavior in a specific situation. For instance, some people may have high level of self-efficacy towards 30 minutes vigorous walking during the day but low perception about maintaining such behavior at least five times a week for a long time.

PURPOSE: To examine the influence of perception of self-efficacy on the stages of change (EC) and healthy physical activity enjoyment.

METHOD: A total of 533 subjects (48% female and 51.8% male; 33.22 ±15.27; range = 11-76). Self-efficacy, enjoyment scales, and the stages of change for physical activity questionnaire were used. RESULTS: The internal consistency of the subscales of SE (alpha = .81) and E (alpha = .94) were satisfactory. The results of one-way ANOVA revealed significant differences in the SE (F[14, 2377.59] = 23.77, p< .001) and E (F[14, 2084.02] = 20.84, p< .001) in different EC. The Tukey’s test indicated that people in M and A perceived more SE than those in PC, and EC: people in A and P perceived higher SE than those in C and PC; and people in PC and C showed higher levels of SE than those in the PC. Meanwhile, people in M had higher E than those in PC, A, and C; and people in A and C showed higher SE than those in PC. The relation of EC vs SE was significant (F[15, 109.403] = 10.403, p< .001). CONCLUSION: Perceived self-efficacy is a factor that positively affects enjoyment in physical activity. This will be beneficial to continuing and extending the healthy practice recommendations issued by the ACSM. Supported by PMCTY, 2015 (UANL).

The practice of yoga has grown from a spiritual and meditation based discipline to a popular physical activity regimen.

PURPOSE: The purpose of this study was to observe the chronic effects of yoga practice on cognitive function through the use of EEG and computerized executive function tasks.

METHODS: A total of 21 healthy, right-handed adults (18-25 years old) were recruited for this study. Subjects were divided into novice practitioners (N=11) and advanced practitioners (N=10), with at least two years of experience. EEG and behavioral outcomes were recorded while subjects performed a modified flanker task, requiring them to respond to the direction of the central arrow in an array of five. The flanking arrows either pointed in the same direction (congruent, e.g. > > > > >), or in the opposite direction (incongruent, e.g. < < < < <). Accuracy and reaction time were evaluated, along with N1 and P3 event-related potentials (ERPs).

RESULTS: Apart from yoga experience, there were no demographic differences between groups. On the cognitive behavioral task, there was a main effect of congruency on accuracy (F(1,19) = 31.99, p< .001, n2= .63). All subjects, regardless of group, responded more accurately on congruent trials (98.6% ±5%) than on incongruent trials (87.5% ± 2.5%). There were also main effects of congruency (F(19,1) = 12.14, p< .001, n2= .86) and group (F(1,19) = 6.28, p= .021, n2= .26) on reaction time. Subjects reacted more quickly to congruent trials (404±11.12ms) than to incongruent trials (469±12.37ms). Yoga experts were able to respond more quickly (408±16.48ms) to all stimuli than novices (465±15.71ms). The results of ERP analysis were unclear, with some trials showing significant differences between groups.

CONCLUSIONS: This study provides evidence that regular and prolonged yoga practice improves motor performance on cognitive tasks, implying that yoga practice may provide cognitive benefits. Our EEG data must be studied further to identify the mechanisms behind these benefits. It is possible that the expert group in this experiment was more aerobically fit than the novice group, and that the better motor performance may be due to neuromuscular factors. Future research should focus on identifying the mechanisms of improvement, as well as comparing benefits associated with yoga to those achieved with more conventional physical activity.
Body image can be influenced by society’s promotion of the ideal body. The perceived inability to match these idealized physiques can result in several mental health complications such as low self-esteem, depression, eating disorders, and muscle dysmorphia. Previous research has shown that aerobic training (AT) can positively affect body image, but studies have predominately focused on women and those with a desire to be thin. As the promotion of the ideal body has started to shift away from being thin and moved toward being toned and muscular, interventions using resistance training (RT) may offer a unique advantage for those with poor body image.

**PURPOSE:** To conduct a systematic review of the effects of RT on body image.

**METHODS:** A search of electronic databases PubMed, Scopus, and Web of Science for relevant studies published in peer-reviewed journals before November 2015 was conducted. To be included, studies needed to be in written English, used some form of RT as the mode of exercise (i.e., resistance bands, body-weight, weights), and have a body image measure as a dependent variable that was assessed before and after a RT intervention. Combinations of the following key words were used for the search: body image, body satisfaction, resistance exercise, and strength training. Reference lists of included studies were also scanned. **RESULTS:** A total of 238 studies were identified, 19 of which were included in the final analysis. Reported effect sizes (ES) ranged from .29 to 1.35 (Cohen’s d) indicating a moderate to large effect of RT on body image. Effects were larger for men (ES=.83) than women (ES=.45); however, the factors moderating these effects were unclear. There were also conflicting results as to whether perceived changes (perceived fat loss, perceived muscle gain) were more impactful than objective changes (changes in strength, endurance). **CONCLUSION:** We found RT interventions to have a strong positive effect on body image for both men and women, with larger effects for men. Results suggest that RT may be a potential treatment for poor body image; however, further examination is needed. Future studies should target the mechanisms of action supporting the relationship between RT and body image.

**Purpose:** To determine whether exercise self-efficacy (ESE) was associated with physical activity minutes and weight loss during the weight loss phase of the Second Life Intervention for Weight Management (SLIM) Study.

**Methods:** One hundred eighty-seven overweight and obese, sedentary adults (M age = 44.5 years) were randomized to a 24-week remotely delivered weight management intervention. Guidelines for the behavioral weight loss intervention included decreased energy intake using pre-packaged meals and progressively increasing exercise to a recommended 300 minutes of moderate-intensity aerobic activity each week. Self-efficacy for physical activity was assessed before and after the weight loss intervention by the five-item ESE scale, for which participants rate their confidence level for action efficacy for physical activity was assessed before and after the weight loss intervention.

**Results:** One hundred thirty-three individuals completed the weight loss program, provided ESE survey responses and were included in the analysis. Both baseline ESE and change in ESE from zero to six months (ChESE) were significantly associated with total physical activity and percent weight loss. Hierarchical linear regression analyses were used to identify predictors of PA and weight change. Baseline ESE, independent of weight loss, was a significant predictor of percent of recommended PA (R²=.121, p<0.009) when controlling for age, gender, race, and baseline weight. Change in ESE from zero to six months was a significant predictor of weight loss (R²=.147, p<0.005), independent of total physical activity, where by those who saw improvements in ESE also lost more weight.

**Conclusion:** Baseline ESE and change in ESE during the intervention are small but statistically significant predictors of total PA during a weight loss intervention. Further, positive changes in ESE during the intervention was a predictor of total percent weight loss, independent of increases in PA. Research on strategies to increase ESE before beginning a weight loss intervention and exploring factors mediating changes in ESE during remotely delivered weight management interventions is warranted.

**Purpose:** The narratives people construct for themselves about their exercise participation can have a significant impact on future participation. Many program directors, however, fail to take these participant-generated stories into account when designing and assessing the impact of their program. The purpose of this research was to identify common themes within narratives about the development of the storyteller’s current exercise status.

**METHODS:** This research examined the exercise narratives of university students enrolled in a semester long wellness intervention class. The course features a 30 minute exercise session during each class meetings in an effort to build participation skill and habit. As a class assignment each student completed a four stage narrative building worksheet (previous status quo, disruption, action, and new status quo) detailing his or her narrative about how sport or exercise had come to occupy its place in his or her life. An inductive analysis was conducted on the exercise narratives to identify themes within the change stages of these narratives (disruption or action). **RESULTS:** Five themes emerged from the inductive analysis primarily based on what the event the narrative exercise status changed (disruption or action) and the nature of that status change (addition or removal of exercise). The themes are disruption event, disruption addition, disruption removal, action removal, and action addition. Disruptive elements included injury, environmental changes, and eligibility. Action elements included exercise trial as well as ceasing exercise. Further analysis showed that the narratives referencing the wellness course all fell within the action addition category. This group contained individuals that added exercise as a way to relieve the tension created earlier in their narrative.

**Conclusions:** Intervention programs seeking to increase exercise behavior or adherence are, from a narrative perspective, attempting to guide the longer narrative of the target individual. The results of this study indicate that changes in exercise participation can come as a response to another event or that exercise itself may be the disruption. Understanding these narratives arcs can assist in recruitment and retention in exercise programs.
Cardiorespiratory fitness and physical activity are low in adults with several senior class level. It was found that regular physical activity and modeling an active lifestyle in the highest at 5.000. The difference was between AT and PEEX with AT majors having the lowest mean effect size of 0.065 for the lone significant main effect on major, while the study was analyzed. Partial eta square analysis revealed a small effect of F(6, 119) = 0.914, p > .05. Partial eta square analysis revealed a small effect size of F(3, 119) = 0.335, p > .05, as well as a non significant interaction effect between major and class level, F(6, 119) = 0.914, p > .05. Partial eta square analysis revealed a small effect size of 0.065 for the lone significant major effect on major, while the study was found to be slightly under power at 0.72. A Scheffe post hoc test revealed that the difference was between AT and PEEX with AT majors having the lowest mean at the senior class level (3.889) as opposed to the PEEX senior major mean being higher at 5.000. CONCLUSION: Regardless of major or class level, the majority of the PED students were found to be regularly physically active and modeling an active lifestyle in these settings. However, the significant main effect emerging between AT and PEEX suggests that AT majors in their senior year are closer to being in the action level, whereas PEEX as well as PEEX majors are in the maintenance level. Possible reasons could be due to practical experience differences between majors or possible limitations to being able to continue to pursue being involved in athletics. AT majors in their senior class level.

Cardiorespiratory fitness and physical activity are low in adults with several psychiatric disorders but little is known about the relationship between adult attention deficit hyperactivity disorder (ADHD) and fitness or physical activity. Children with ADHD appear to have lower average cardiorespiratory fitness, whereas PEEX majors and high school students (67 ± 43). Correlations between ADHD symptoms and VO2peak and leisure time physical activity were -.39 (p=.034), and -.02 (p=.917), respectively. A linear relationship between ADHD symptoms and leisure time physical activity was -.39 (p=.034), and -.02 (p=.917), respectively. A linear relationship between ADHD symptoms and leisure time physical activity were -.39 (p=.034), and -.02 (p=.917), respectively.

RESULTS: A 3 X 4 between subjects ANOVA revealed a significant main effect for major, F(2, 119) = 4.157, p < .05, whereas no main effect was found for class level, F(3, 119) = 0.335, p > .05, as well as a non significant interaction effect between major and class level, F(6, 119) = 0.914, p > .05. Partial eta square analysis revealed a small effect size of 0.065 for the lone significant main effect on major, while the study was found to be slightly under power at 0.72. A Scheffe post hoc test revealed that the difference was between AT and PEEX with AT majors having the lowest mean at the senior class level (3.889) as opposed to the PEEX senior major mean being higher at 5.000. CONCLUSION: Regardless of major or class level, the majority of the PED students were found to be regularly physically active and modeling an active lifestyle in these settings. However, the significant main effect emerging between AT and PEEX suggests that AT majors in their senior year are closer to being in the action level, whereas PEEX as well as PEEX majors are in the maintenance level. Possible reasons could be due to practical experience differences between majors or possible limitations to being able to continue to pursue being involved in athletics for AT majors in their senior class level.

EXERCISE: A 3 X 4 between subjects ANOVA revealed a significant main effect for major, F(2, 119) = 4.157, p < .05, whereas no main effect was found for class level, F(3, 119) = 0.335, p > .05, as well as a non significant interaction effect between major and class level, F(6, 119) = 0.914, p > .05. Partial eta square analysis revealed a small effect size of 0.065 for the lone significant main effect on major, while the study was found to be slightly under power at 0.72. A Scheffe post hoc test revealed that the difference was between AT and PEEX with AT majors having the lowest mean at the senior class level (3.889) as opposed to the PEEX senior major mean being higher at 5.000. CONCLUSION: Regardless of major or class level, the majority of the PED students were found to be regularly physically active and modeling an active lifestyle in these settings. However, the significant main effect emerging between AT and PEEX suggests that AT majors in their senior year are closer to being in the action level, whereas PEEX as well as PEEX majors are in the maintenance level. Possible reasons could be due to practical experience differences between majors or possible limitations to being able to continue to pursue being involved in athletics for AT majors in their senior class level.
CONCLUSIONS: Children with MD have poorer object control skills proficiency and SCPA than children with TD. Compared to motor skills, self-concept on PA is a more important correlate that warrants particular attention when promoting PA in children with MD.

PURPOSE: Regular physical activity has been associated with many psychological and physiological health benefits. The reasons why people are regularly active vary amongst individuals. The purpose of this study was to examine the perceived benefits of regular activity in women.

METHODS: 250 women at least 18 years of age were surveyed. The survey asked them to describe how they felt after at least 6 months of regular physical activity. The study was approved by the university’s human subject review board and participants were recruited from courses at a western university. Participants were either in a physical activity class for one academic credit or attended a drop-in exercise class. Classes included Pilates, yoga, Zumba™, swimming, and CrossFit™. Data were analyzed for themes using NVivo 9.

RESULTS: The strongest theme was feeling strong (n = 286), followed by self-esteem related themes (n = 182), and finally feeling energized (n = 18). Examples of the self-esteem related themes were powerful, determined, balanced, content, inspired, and unstoppable. Themes related to weight control or weight loss (e.g., skinny, skinnier, leaner) were not strong (n = 18).

CONCLUSIONS: This study supports the concept that women are exercising for reasons other than weight loss or weight control and that women value the psychological and physiological benefits of regular physical activity. This may be a cultural shift in perception of the benefits of regular physical activity.

Exercise motives help explain initiation and adherence to exercise programs. As CrossFit (CF) has grown in popularity, the number of competitions has grown accordingly. CF aims to “forge a broad, general and inclusive fitness,” and some may do CF for fitness reasons rather than desiring competition.

PURPOSE: To determine if motives for current CF participants differed between those who chose to compete or not at multiple levels.

METHODS: Participants included 736 adults (age = 32.5 ± 8.1y, 52.7% male, BMI = 25.6 ± 3.9, 63.9% 1+ years CF experience) who completed an online survey. Over half (59.3%) of CF workouts 4+ days/week. Participants indicated if they competed in any local competitions, the CF Open, CF Regions, or CF Games. Participants completed the 51-stem Exercise Motivation Inventory (EMI-2) with responses from 0-not at all true for me to 5-very true for me. The EMI-2 contained 14 sub-scales. One-way ANOVAs were used to examine differences between non-competitors and competitors of 1+ levels with SPSS 20.

RESULTS: Non-competitors (G0) comprised 38.5% of the sample (n = 282); followed by those competing either in a local competition or the CF Open (G1; 26.1% n = 192), competing at two levels (G2; 26.6%, n = 196); competing at three levels (G3; 6.0%, n = 44); or competing at all four levels (G4; 2.8%, n = 21). Significant differences were found between groups for subscales Revitalization (p = .004), Enjoyment (p < .001), Challenges (p < .002), Social Recognition (p < .001), Affiliation (p < .001), Competition (p < .001), Weight management (p < .001), Appearance (p = .005), and Strength & Endurance (p = .016). Tukey post hoc tests indicated G0 had significantly lower scores for Revitalization (G2, G3), Enjoyment (G2, G3), Challenge (G2, G3), Social Recognition (G2, G3), Affiliation (G1-G3), and Competition (G1-G4). However, G0 had significantly higher scores for Weight Management (G2-G4) and Appearance (G4). No significant post hoc differences were found for Strength & Endurance.

CONCLUSIONS: Although non-competitors had similar BMI’s to the competitive groups (p = .66), they reported significantly greater motives for weight management and appearance. Understanding the different motives between groups can help CF trainers and coaches work with participants to initiate and sustain their CF exercise.
adherence to CrossFit, especially among women with elevated Neuroticism scores. CrossFit trainers may wish to counsel clients about this possible outcome until clients become more accustomed to CrossFit.

2525 Board #47 June 2, 11:00 AM - 12:30 PM
Physical Activity Partially Mediates The Relationship Between Depressive Symptoms And Cognitive In Older Adults
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Depressive symptoms are negatively associated with cognitive function in older adults. Engaging in physical activity (PA) in later life reduces risk of subsequent depressive symptom development and attenuates age-associated cognitive decline. PURPOSE: This study cross-sectionally examined PA as a mediator of the relation between depressive symptoms and cognitive function in older adults. METHODS: Sixty-nine community-dwelling older adults (67.9 ± 6.6 years, BMI 26.1 ± 4.0) participated in a cross-sectional study. PA was measured as total counts with an Actigraph accelerometer worn by the participant on the waist for 7 days. Cognitive function was operationally defined using the Trail Making Test as time to complete Trails B - time to complete Trails A. Greater time differences between trials is suggestive of lower executive function. Depressive symptoms were measured using the Center for Epidemiologic Studies Depressive Inventory (CES-D) with higher scores indicative of higher depressive symptomology. RESULTS: When separating participants into low and high CES-D score using cluster analysis, those with higher CES-D score had higher difference between Trails B and Trails A time (41.5 ± 4.6 vs 26.9 ± 2.5, p = 0.001) and lower total PA counts (190,791 ± 225,523 vs 270,118 ± 22,250 counts/day, p = 0.05) compared to participants with lower CES-D score. After co-varying for sex, higher CES-D was associated with lower total PA counts (unstandardized β = 433.7 ± 229.0, p = 0.05) and higher difference between Trails B and Trails A time (unstandardized β = 0.89 ± 0.27, p = 0.003). The significant association between CES-D and difference between Trails B and Trails A was partially attenuated when the indirect effect of total activity counts on Trails B and Trails A was unstandardized β = 0.001 ± 0.001, p = 0.03) was statistically removed using mediation analysis (unstandardized β = 0.72 ± 0.28, p = 0.01). CONCLUSIONS: PA may partially mediate the relationship between depressive symptoms and cognitive function in community dwelling older adults. Future studies should explore the relation of PA intensity (moderate-vigorous) to both depressive symptoms and cognitive function in older adults. Support for this study provided by: The Dairy Research Institute (Dairy Management Inc.) Grant1154 (KSH) and NIH NIA P30 AG034465 05 (KSH).

2525 Board #48 June 3, 11:00 AM - 12:30 PM
An Investigation of Attitudes Towards Strength Training Among College Women.
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Leah Wagner, David Q. Thomas, FACSM, Kristen M. Lagally, FACSM, Lisa Lagomarcino, Sydney Makela, Brianna Ackerman Illinois State University, Normal, IL. Strength training involves the use of resistance exercises to increase the muscles’ ability to generate maximal force. ACSM recommends that resistance training be an integral part of an adult fitness program and of a sufficient intensity to enhance strength, muscular endurance, and maintain fat-free mass. Despite its importance, women are participating in strength training at lower rates than men. Limited research has been conducted on women who regularly perform strength training. PURPOSE: To examine the attitudes toward strength training in female students on a university campus. METHODS: Thirty female students between the ages of 18-32, not on a university intercollegiate athletics team and not participating in any strength training program for the previous 6 weeks, were recruited to participate. Participants completed a 98 question survey pertaining to current strength training, exercise related attitudes, training behaviors, motivation, obstacles and preferences. Means, standard deviation, frequency and percentiles were calculated for all responses. RESULTS: Most stated that they had strength trained in the past (73.1%). Some of the students reported that they had not strength trained before (24.1%). Many indicated it would be more enjoyable if their friends strength trained (53.3%). Lack of social support was the primary obstacle for strength training. Half of the participants would prefer to strength train in areas restricted to women because it would be less intimidating (50.0%). Most of the students reported that they would be more likely to participate in strength training if they were offered an introductory class to learn how to strength train properly (76.7%). CONCLUSIONS: Findings from this study provide insights on attitudes college women have about strength training. Responses from the survey may serve to formulate interventions to promote women’s participation in strength training activities.

2526 Board #49 June 3, 11:00 AM - 12:30 PM
School Pe And Sport Experiences And Subsequent Physical Activity, Fitness, And Motivation Of College Students.
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(No relationships reported)

While previous studies have examined positive and negative experiences of students in school PE and Sport (PES), little research has focused on the effects of those experiences on subsequent physical activity (PA), physical fitness (FF) and exercise-related motivation (EXMOT). PURPOSE: To ascertain the extent to which feelings resulting from PES experiences predict the PA, PF, and EXMOT of college students. METHODS: Using data from an earlier qualitative study, a questionnaire with 54 items (using a 5-point Likert-type response scale) was written to reflect positive and negative PES feelings (PESFEEL). This scale, along with a PA questionnaire, and the Behavioral Regulation of Exercise Scale (BREQ-3 as measure of EXMOT) was completed by 175 students (age = 20.97 ± 4.11; 23% freshmen, 44% sophomores, 22% juniors, 11% seniors) in required general college classes (representing more than 60 different majors). PF was estimated using the method described by Junca et al., 2005. RESULTS: Four clear factors of PESFEEL were identified using principal components analysis. Using regression analysis, these factors: negative skills & social acceptance (NOSSAC), positive skills, social acceptance & motivation (POSSAM), teacher qualities (TEQUAL), and social/physical ridicule (SPRID) were entered as predictors of PA, PF, and EXMOT. The PESFEEL factors significantly (p < .05) and substantively predicted PA (R² adj = .18; males = .27, females = .10), PF (R² adj = .10; males = .38, females = .09), and EXMOT (R² adj = .26; males = .34, females = .13). Oneeway ANOVA indicated significant differences between means on the PESFEEL factors across the five categories of PA (NOSSAC, POSSAM, EXMOT > .001; TEQUAL, SPRID p < .05). CONCLUSIONS: The substantive predictive relationship between feelings related to their experience of PES and their subsequent PA, PF, and EXMOT in this sample of young adults (a minimum of 1-4 years after their PES experiences), suggests that school PE teachers and coaches have an important effect on PA, PF, and EXMOT that lasts for several years. Given the importance of PA and PF to public health, PE teachers and coaches should take care to foster mastery of physical skills and abilities, in an educational climate of social and physical acceptance.

2527 Board #50 June 3, 11:00 AM - 12:30 PM
Physical Activity Levels And Perceived Exercise Benefits And Barriers In HIV+ Women Living In Mississippi
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(No relationships reported)

PURPOSE: Engaging in regular physical activity (PA) is important in maintaining health and increasing the overall quality of life for people living with HIV (PLWH). The Deep South is known for its high rate of sedentary behavior although data on the activity levels and perceptions of the benefits and barriers to exercise in women living with HIV in the Deep South is lacking. Understanding how perceived benefits and barriers to exercise can guide the development of PA interventions. METHODS: We conducted a cross-sectional study to determine the PA levels and perceived exercise benefits and barriers in a group of 50 HIV+ women based on both age and depression level. Depression was assessed using the Center for Epidemiological Studies Depression Scale (CES-D) and exercise benefits/barriers were measured using the Exercise Benefits and Barriers Scale (EBBS). PA was measured using the International Physical Activity Questionnaire (IPAQ) and a Fitbit physical activity monitor. RESULTS: Our sample was predominantly African American (96%) with a mean BMI of 36.6 (11.5). Eighty four percent (n=42) of our participants reported no vigorous intensity exercise and 48% (n=24) reported no moderate intensity exercise in the previous seven days. The Fitbit data revealed that 16% (n=8) of the participants took >10,000 steps per day at least 50% of the days they were monitored. Physical performance was the ranked as the greatest benefit of exercise (3.3 (0.1)) and this was significantly higher than both life enhancement (3.1 (0.1), p = 0.001) and social interaction (2.8 (0.1), p < .0001). The greatest perceived barrier to exercise was physical exertion (2.4 (0.2)) and this was ranked significantly higher than exercise milieu (1.9 (0.1), p = 0.004). Higher overall perceived benefits were reported by women >/= 43 years (3.2 (0.2) vs 3.1 (0.2), p = 0.006) and women reporting higher levels of depression.
Observational research has consistently reported an inverse relationship between exercise and posttraumatic stress disorder (PTSD). However, the majority of these studies have compared individuals with and without PTSD, and very few have measured the symptoms of PTSD or its severity. In fact, no study has examined the relationship between exercise and PTSD symptoms in a sample of individuals diagnosed with PTSD. As such, further investigation is needed.

**PURPOSE:** To elucidate the cross-sectional relationship between self-reported exercise and PTSD symptoms and symptom severity in a sample of individuals diagnosed with PTSD.

**METHODS:** Baseline data collected from a longitudinal study of PTSD and lifestyle behaviors were used for this study. Participants were 18 males, 61 females, and 2 transgender males ages 19-59 (34.6±11.6). To be eligible, participants had to have a prior diagnosis of PTSD. Exercise was assessed using the Godin Leisure-Time Exercise Questionnaire, and participants were divided into two groups using recommended cut-offs: <14 Insufficiently Active (n=38, 46.9%) and ≥14 Active/Moderately Active (n=43, 53.1%). PTSD symptoms and severity were measured with the PTSD Checklist (PCL)-Civilian, Pittsburgh Sleep Quality Index (PSQI), and Kessler Psychological Distress Scale (K10). Group differences were analyzed using independent samples t-tests.

**RESULTS:** PTSD symptom and related symptoms were significantly worse in the Insufficiently Active group. Specifically, when compared to the Active/Moderately Active group, PTSD symptomatology was significantly higher for the PCL (66.7±12.2 vs. 59.8±12.2; t=2.45, p=.01), PSQI (14.0±3.6 vs. 10.4±3.9; t=2.49, p<.01) and K10 (34.4±8.2 vs. 29.8±8.8; t=2.40, p=.02).

**CONCLUSIONS:** The results of this study suggest that there is an inverse relationship between exercise level and PTSD symptoms and PTSD symptom severity among individuals diagnosed with PTSD. While inferences about the direction of causality cannot be made from these data, this is the first study to reveal such a relationship in this population. Future studies will be needed to further investigate how varying levels of exercise impact PTSD and its related symptoms.
CONCLUSIONS: While exercise motivations changed and %BF increased with age, overall males had different exercise motivations, lower SPA, lower %BF, higher exercise confidence, and were more likely to maintain them regardless of age.

Purpose: Undergraduates face many challenges and transitions. With only 40% of University students meeting the minimum standard recommended for physical activity, understanding the life goals of University students can provide insight into a connection between aspirations and choices around behaviors such as exercise. This study examined life goals and exercise motivations of low, moderate and vigorously active college students within the context of Self-Determination Theory (SDT) (Deci & Ryan, 1985; Kasser, 2002). It was hypothesized that students who reported more intrinsic life aspirations would report greater levels of intrinsic motivation for exercise and would be more voluntarily active.

Methods: Undergraduates (N = 680) were administered three questionnaires relating to Physical Activity Level, Exercise Motivations and Life Goals following the approval of the institutional review board. Physical Activity Levels were calculated utilizing the methods outlined in the International Physical Activity Questionnaire with categorical values of Low, Moderate and Vigorous Activity. Intrinsic and Extrinsic Motivation was determined based on the results of the Exercise Motivations Scale (Pelletier et al., 1995) and the Aspirations Index (Kasser & Ryan, 1996). Independent group t-tests were utilized to analyze significant differences among aspirations, exercise motivations and physical activity levels.

Results: Undergraduates who reported being vigorously active (VA) (n = 423) were found to be more intrinsically and extrinsically motivated for both life goals and exercise than their low-active (LA) (n = 81) and moderately-active (MA) (n = 176) counterparts. Male VA students (n = 206) reported significantly higher intrinsic motivation for exercise as well as being motivated by "financial success" than female VA students (n = 217). Conclusion: Extrinsic motivation, as defined by SDT, is not simply the motivation to act for an external goal but is placed on a continuum of external characteristics that influence behavior such as an internal pressure to act because one "should." Examining the results of this study on a deeper level may provide greater insight into the development of programs to support choices for healthy behaviors for Undergraduates.

Self-reported parental practices have been shown to be positively associated with child physical activity (PA). However, there is little research examining parental practices on children’s PA in a controlled laboratory setting. PURPOSE: The purpose was to examine observed parental practices and children’s objective PA in a controlled laboratory setting (racquetball court).

METHODS: Participants included parent and child dyads (n=40) with children aged 8-13 years (male = 58%; white = 68%; low SES = 43%; normal weight = 73%). Parent and child dyads participated in activities for 30 minutes in a controlled laboratory setting. Active activities included: soccer, basketball, floor hockey, jump rope, stationary bike, elliptical, and step aerobics video. Sedentary activities included: TV, puzzles, magazines, crayons and coloring books, and Legos. Observations were made every 30 seconds; recording 10 seconds using a modified Stanford observation form (60 observations per parent-child dyad). Observations assessed parental practices, including encouragement and discouragement of PA and sedentary activity (SA). Physical activity was assessed by the SenseWear Pro Armband. Paired t-tests were used to analyze the data (SPSS v 21).

RESULTS: Overall, children engaged in PA for 24 min (SD = 4.8) and parents 16 min (SD 9.6). After dividing children into two groups based on activity level, parents of higher active children were more encouraging than parents of lower active children (54.3 vs 40.9 times; p = 0.002). Similarly, the lower active children had parents encourage SA more (18.8 vs 3.9 times; p < 0.001). Overweight children had parents discourage SA more compared to normal weight children (0.73 vs 0.10 times; p < 0.001). Parents of overweight children also verbally discouraged (SA) more relative to parents of normal weight children (0.64 vs 10.10 times; p < 0.001).

CONCLUSIONS: Our findings illustrate that observed parental practices relate to children’s PA and weight status in a controlled laboratory setting. Future research might investigate whether these laboratory-based findings translate into increased PA in free-living children.

Purpose: The purpose of this study was to examine the relationship between parent conversations with their child about PA or weight and child PA. Parent participation in children's PA has been shown to be positively related to increases in PA. However, the relationship between parent conversations and child PA has not been well described.

METHODS: Two hundred and thirty-four parent-child dyads (n=234) with children aged 8-13 years (male = 58%; white = 68%; low SES = 43%; normal weight = 73%) were recruited from local parks and community centers in the southeastern United States. Parents completed questionnaires at home and returned them to the researchers. They were also observed in a laboratory setting for 30 minutes of PA and sedentary activity. Parent conversations with their child about PA or weight were coded using the Social Cognitive Feedback Observation System (SCFOS). SCFOS is a coding system designed to measure the content and frequency of parent-child conversations about PA or weight.

RESULTS: Parents of higher active children were more likely to engage in conversations with their child about PA or weight. Parents of higher active children were also more likely to engage in conversations with their child about weight. Parents of higher active children were more likely to engage in conversations with their child about weight. Parents of higher active children were also more likely to engage in conversations with their child about weight.

CONCLUSIONS: There is a need for future research to examine the relationship between parent conversations and child PA. Future research should examine factors that influence the relationship between parent conversations and child PA.
Pregnancy physical activity (PA) is likely influenced by a pregnant woman’s perception of health benefits (outcome expectancy). Qualitative research suggests some women may perceive maternal PA health benefits to be greater than fetal benefits, but this has not been quantitatively examined. Furthermore, their individual and joint influence on pregnancy PA is unclear.

PURPOSE: We investigated whether pregnant women’s PA outcome expectancy for maternal health is greater than for fetal health. Additionally, we examined main and interactive effects of PA outcome expectancies (for mother and baby) on PA participation in various modalities.

METHODS: Pregnant women (N = 498) completed an online survey about outcome expectancies for and participation in various PA modalities, including: brisk walking, light and intense jogging, cycling, and swimming, prenatal yoga, aerobic dance, and resistance training exercise. For each PA outcome expectancy was assessed on 11-point Likert scales for maternal and fetal health. Participation in each modality was defined as PA > 0 min/wk. Paired-Sample Wilcoxon Signed Ranked Tests were performed to examine differences between outcome expectancy for mother and for baby. Hierarchical logistic regression was used to examine main and interactive effects of outcome expectancies (for mother and baby) on PA participation.

RESULTS: Outcome expectancy for maternal health was significantly greater than for fetal health for all PA modalities (p < 0.05). After controlling for preconception PA and self-efficacy beliefs, PA outcome expectancy for maternal health did not affect PA participation. In contrast, PA outcome expectancy for fetal health did positively affect participation in light jogging (β = 1.15, CI = 1.09-1.21), intense jogging (β = 1.26, CI = 1.07-1.49), aerobic dance (β = 1.18, CI = 1.04-1.33), resistance band exercises (β = 1.14, CI = 1.00-1.31), and CrossFit-type exercises (β = 1.57, CI = 1.19-2.06). No interactive effects were found for maternal and fetal PA outcome expectancies on PA participation.

CONCLUSIONS: Pregnant women perceive many types of PA to be more beneficial for their own health than for the health of the baby. However, it appears that perceived health benefits for the baby meaningfully influence some types of pregnancy PA.
preferred the parent condition and only one child preferred the alone condition ($\chi^2 = 9.1, p < 0.01$). CONCLUSION: Playing with a friend or parent significantly increased children’s physical activity and reduced sedentary behavior versus playing alone. Children also preferred playing with their friends versus all other conditions. Therefore, the presence of either a friend or a parent enhances physical activity behavior and enjoyment while simultaneously reducing sedentary behavior.

2540 Board #63 June 3, 11:00 AM - 12:30 PM
Using the Reasoned Action Approach to Identify Correlates of Active Play in Children
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(No relationships reported)

Studies addressing the correlates of physical activity in children often fail to properly apply a behavioral theory and correctly define the behavior in terms of action, context, target and time, leading to weak relationships between the theory constructs and the behavior. PURPOSE: To correctly apply the Reasoned Action Approach (RAA) to the behavior of “actively playing for 30 minutes after school, every day this week.”

METHODS: A 17-item RAA survey was administered to 210 5th and 6th grade students from Central Indiana. The survey measured three items for intention (IN), the main determinant of behavior, and four to six items for each of the three global constructs underlying intention (i.e., attitude toward the act (AA), perceived norm (PN) and perceived behavioral control (PBC)) on a 5-point Likert scale. The survey was administered on Monday. Self-reported behavior (BH) was assessed by two questions on Friday during a face-to-face, semi-structured interview. Construct scores were created by calculating the mean across the items. Cronbach’s alpha measured internal consistency of the construct scores. Pearson correlations assessed the bivariate relationships. Multiple regression determined how well the three global constructs predicted IN.

RESULTS: Internal consistency for construct scores questions ranged from 0.67 - 0.87. AA ($r = 0.75$), PN ($r = 0.59$) and PBC ($r = 0.76$) were highly correlated to IN at $p \leq 0.01$. The three constructs significantly predicted IN ($F = 160.77, p < 0.001$), accounting for 70% of the variance. The strongest predictors were PBC ($\beta = 0.548$ (0.068), $R^2 = 0.513$, $p < 0.001$) and AA ($\beta = 0.457$ (0.066), $R^2 = 0.493$, $p < 0.001$). IN was a significant predictor, but not as strong as PBC and AA ($\beta = 0.193$ (0.059), $R^2 = 0.328$, $p < 0.001$). IN was strongly associated with BH ($r = 0.598$, $p < 0.001$).

CONCLUSIONS: The size of the multiple $R$ predicting IN and of the correlation between IN and BH demonstrate that the RAA can be used to understand the specific physical activity behavior of active play after school. The values were higher than what has been shown in the literature; perhaps due to properly applying the RAA and correctly defining the behavior. The higher weights for AA and PBC suggest that programs to increase active play should address the children’s rating of how good/bad is active play and how much active play is under their control.

2541 Board #64 June 3, 11:00 AM - 12:30 PM
Psycho-Physiological Effects of Television Viewing During Exercise
Brian C. Rider1, David R. Bassett, FACSM2, Kelley Strohacker2, Brittany Overstreet1, Eugene C. Fitzthugh2, Hollie A. Raynor1.
1Hope College, Holland, MI. 2The University of Tennessee, Knoxville, TN. (Sponsor: David R Bassett, FACSM)
(No relationships reported)

PURPOSE: To examine the effects of television (TV) viewing on psychological and physiological variables during a moderate-intensity exercise bout. METHODS: Twenty-eight insufficiently active adults participated in this study. Participants performed three separate 30-min walking bouts on a motorized treadmill. The bouts were light-to-moderate intensity (50% of Heart Rate Reserve), separated by 48 hr, and the majority of participants completed all bouts within three wks. During each bout, participants watched a program they selected (self-selected TV condition), a British Broadcasting Corporation (BBC) nature program the investigators selected (standardized TV condition), or no TV (no TV condition). Variables measured during exercise were: heart rate (HR), perceived exertion (RPE), affect (FAS), and arousal (FAS). The physical activity enjoyment scale (PAES), subjective exercise experience scale (SEES), and visual analogue scales (VAS) to determine attentional focus, were administered at the end of each bout. Repeated measures ANOVAs were performed on all variables and additional analyses were conducted to assess the potential mediators of exercise enjoyment (e.g., exercise motivation types). RESULTS: Participants rated enjoyment of exercise higher during both TV conditions (97.1 ± 15.2 and 92.7 ± 15.2) compared to the No TV condition (77.5 ± 13.4, $p < 0.001$). Participants reported more positive affect during the self-selected TV condition compared to the no TV control condition (3.49 ± 0.17 vs. 2.7 ± 0.3, $p = 0.025$). They reported liking the self-selected program more ($84.3 ± 2.1$ vs. $67.2 ± 4.3$, $p = 0.001$) than the standardized program. Nonetheless, the two types of TV programs resulted in similar levels of attentional focus on TV viewing (self: $81.2 ± 19.7$ and standardized: $79.1 ± 14.2$, $p = 0.05$) and dissociation from walking, (no TV: $72.6 ± 5.6$ vs. self: $38.1 ± 6.7$ and standardized: $33.2 ± 3.9$, $p = 0.002$) compared to the no TV condition.

CONCLUSIONS: The findings indicate that TV viewing, regardless of whether the programming is self-selected or standardized, resulted in greater enjoyment of exercise relative to a no TV condition. This may have occurred because TV viewing caused the participants to focus their attention more on the TV program, and less on the physiological demands of the exercise itself.

2542 Board #65 June 3, 11:00 AM - 12:30 PM
Psychosocial and Friend Influences On Screen Time and Objective Sedentary Behavior: A Mixed Methods Analysis
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(No relationships reported)

PURPOSE: To examine psychosocial and friend influences on sedentary behavior (SB) and screen time (ST) in a sample of adolescents using a cross-sectional, mixed-methods design. METHODS: Participants were 108 middle school (MS) and high school (HS) students (mean age: 14.6 years, 58% female, 49% high school, 81% Caucasian). Objective SB (minutes) was measured with an Actigraph GT3X+ accelerometer. Screen time (hrs/wk), psychosocial variables and demographic data were assessed via self-report. Participants also nominated up to 5 friends who self-reported ST and physical activity (PA). Focus group discussions centered around psychosocial and social influences of SB and ST behavior. Multiple regression analyses were conducted to examine the associations between demographic variables, psychosocial factors, and nominated friends’ ST and PA with adolescents’ ST and SB. Nviio 10.0 was used to analyze qualitative data, with themes stratified by sex and school level to compare similarities and differences in factors associated with ST and SB. RESULTS: MS females reported significantly less ST (M=7.2±5.4, p<0.01) than MS males (M=13.17±7.5) or HS males (M=11.23±5.3), but there were no significant between-group differences in SB. Males’ ST was associated with greater levels of ST enjoyment, lower ST self-efficacy, and greater levels of friends’ ST ($r=-0.21$, p<0.001). Only school level (high school) predicted increases in participants’ SB, but the overall model was not significant ($r^{2}=0.06$, p=0.4). Focus groups revealed that the most common SB among MS and HS females was using mobile phones, which females used for multiple purposes (e.g. watching movies). MS males preferred playing video games and HS males most commonly reported watching videos and watching television. Conversely, the presence of friends decreased SB and ST for females and HS males through co-participation in sports and PA. Only MS males reported friends increasing ST levels by co-participating in video game playing. CONCLUSIONS: With the exception of MS males, friends appeared to influence adolescents to engage in less SB and ST behaviors. Interventions should place an emphasis on encouraging less ST, particularly for MS males, and providing opportunities for adolescents and their friends to engage in activities that promote PA rather than ST behaviors.

2543 Board #66 June 3, 11:00 AM - 12:30 PM
Development and Psychometric Evaluation of the Acute Exercise Readiness Questionnaire
Kelley Strohacker, Rebecca A. Zakrjasek, Kayla Smitherman, Daniel Fazzino. University of Tennessee, Knoxville, TN.
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(No relationships reported)

The flexible non-linear periodization method of exercise organization suggests that daily workloads should be matched to participants’ readiness to exercise in order to optimize training. PURPOSE: The current paper addresses the development and preliminary validation of the Acute Exercise Readiness Questionnaire (AEROQ), which was designed to provide a composite readiness score by assessing four relevant dimensions (vitality, physical fatigue, discomfort, and health). METHODS: Following initial survey design, anonymous survey data were collected in a sample primarily consisting of undergraduate students (N=572, mean age = 22, 44% women) to assess various types of validity and internal consistency. RESULTS: Multiple model-fit metrics were assessed using confirmatory factor analysis ($\chi^2/df = 2.06$, Goodness of Fit Index = .973, Comparative Fit Index = .981, and Root Mean Square Error Approximation = .043). Cronbach’s alpha coefficients for each factor ranged between 0.73 and 0.91 (average = 0.81) across two independent samples. Composite readiness scores were positively correlated ($r = .54$, p < 0.001) with visual analog scores regarding degree of readiness to exercise.

CONCLUSIONS: The multidimensional structure of the AEROQ provided acceptable model fit according to confirmatory factor analysis, with evidence for preliminary
Triathlon cycling utilizes alternate bicycle geometry and rider position compared with traditional road cycling in order to improve performance. Cycling with shorter crank lengths (CL) may benefit triathletes by allowing for improved mechanical advantage at the hip and knee, slower muscle contractions and prevent the thigh from interfering with breathing. To date, no CL research has been performed in a triathlon/time trial body position or by matching relative VO2 between CL. METHODS: To examine the effect of utilizing shorter than traditional CLs on triathlon cycling performance metrics and ventilation. METHODS: A total of nine trained amateur triathletes completed the study. The subjects were fitted to the cycle ergometer utilizing a 78° seat tube angle. The participants completed randomized cycling bouts with CLs of 145, 155, 165 and 175 mm. For all CL trials, the subjects’ seat height and aerobar location were adjusted to maintain a 30° knee angle at bottom dead center, 30° degree torso angle and 90° of shoulder flexion. The intensity (power output) of the four cycling bouts was adjusted to maintain a relative VO2 (ml/kg/min) equivalent to 95% of the participants’ previously measured ventilatory threshold. An ANOVA followed by a Bonferroni post hoc analysis were used to determine differences in power output, cycling economy, cadence, breathing frequency, tidal volume, ventilatory equivalent for oxygen, ventilatory equivalent for carbon dioxide, respiratory exchange ratio and RPE between CL conditions. RESULTS: Participants were able to generate significantly greater power output in the 145 mm trial versus the 175 mm trial (189.4 vs 178.3 W respectively; p = .008) when relative VO2 and the triathlon cycling position were maintained. Due to greater power output but maintained VO2, cycling economy was significantly greater in the 145 mm trial vs the 175 mm trial (67.4 & 63.4 W/liter/min-1 respectively; p = .008). Cadence and all ventilatory parameters were not significantly different between CL trials (p > .05). CONCLUSIONS: The shorter than traditional 145 mm crank length may change mechanical advantage at the hip and knee allowing the muscle to contract slower through the pedal stroke thereby improving cycling power and triathlon performance at a long course race intensity.

**E-26** Free Communication/Poster - Cycling
Friday, June 3, 2016, 7:30 AM - 12:30 PM
Room: Exhibit Hall A/B

2544 Board #67 June 3, 9:30 AM - 11:00 AM
**Triathlon Cycling with Shorter Crank Lengths at Same VO2 Leads to Increased Power Output**
Brian Moscicki1, Boe Burrus2, Tracey Matthews3, Vincent Paolone, FACSM4. 1Gonzaga University, Spokane, WA. 2Springfield College, Springfield, MA. (Sponsor: Vincent Paolone, FACSM)
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(No relationships reported)

Caffeine Does Not Affect Performance But Increases PO Signal Complexity (p< 0.001: control 1.25 ± 0.41; placebo 1.23 ± 0.38; caffeine 1.31 ± 0.46), a measure used to indicate motor output responses. CONCLUSION: The results of present study suggest that caffeine increased the motor output complexity during TT4, despite no alteration in performance.

2545 Board #68 June 3, 9:30 AM - 11:00 AM
**Caffeine Does Not Affect Performance But Increases Entropy In Motor Output During Cycling Time Trial**
Bruno Ferreira Viana1, Flávio Oliveira Pires2. 1PEB-COPPE, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil. 2EACH, University of São Paulo, São Paulo, Brazil.
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(No relationships reported)

**PURPOSE:** Caffeine improves cycling time trial performance due to improvements in motor output and muscle recruitment. However, it is unknown if caffeine further increases the complexity in power output responses. The purpose of this study was to investigate the effects of caffeine on performance and motor output complexity.

**METHODS:** Nine cyclists (26.4 ± 4.8 yrs, 77.6 ± 12.1 kg, 172.7 ± 6.9 cm, VO2MAX of 52.5 ± 6.2 ml/kg/min and WPEAK of 368.4 ± 19.3 W) performed three 4-km cycling time trials (TT4) (control, placebo and caffeine) in a counterbalanced order. After preliminary session to characterize the cyclists, experimental TT4 were performed on cycling time trials (TT4) (control, placebo, caffeine) in a counterbalanced order. After 15 minutes of race finish, a saliva sample was collected for measurement of cortisol. The cyclists’ mean age was 42.1 years (SD = 9.0 years). Means (SD) for pre- and post-competition cortisol levels were 9.4 nmol/L (4.1) and 20.8 nmol/L (14.5), respectively. A one-way repeated measures ANOVA indicated cortisol levels increased significantly from pre- to post-competition, F(1, 29) = 11.1, p = .003. There were no significant correlations between pre-race nervousness and either pre- (ρ = -.11, p = .47) nor post-competition cortisol (ρ = 0.13, p = .42).

**CONCLUSION:** The physiological demand of a competitive cycling event leads to a stress hormone response. The magnitude of this response was not related to psychological nervousness.

2547 Board #70 June 3, 9:30 AM - 11:00 AM
**Field Test for Estimation of Lactate Threshold Heart Rate: The 30-minute Cycling Time Trial**
Staci M. Partridge, Aaron J. Seipel, Jason T. Penny. Oregon State University, Corvallis, OR.

(No relationships reported)

Lactate threshold (LT) is frequently used to prescribe exercise intensities specific to endurance training. While incremental laboratory tests are useful to determine LT, access to laboratory-based testing is not always available or feasible and often expensive. Field tests are used to estimate LT in such cases. Among recreational cyclists, the 30-minute cycling time trial field test (30CTT) is recommended to identify heart rate (HR) at LT or ventilatory threshold (VT).

**PURPOSE:** To examine the validity and reliability of the 30CTT in estimating HR at LT across fitness levels.

**METHODS:** Recreationally trained cyclists (n = 22) and triathletes (n = 28) volunteered for this study (n = 31 males, n = 19 females). Participants performed 3 tests in random order: (1) a graded exercise test (GXT) to determine LT (using an increase of 0.5% grade and 1.5mmol increase methods), and (2) two 30CTTs on a bicycle ergometer. The average HR and power over the last 20 minutes of the 30CTT was used to estimate LT HR and power. A participant subset had respiratory gases measured during the GXT to determine VT and VO2max (n = 31). A one-way repeated measures analysis of variance (ANOVA) was used to compare HR and power during the 30CTTs to LT. For the subset of participants with ventilatory data, a second ANOVA was used to compare the lactate variables to LT. Bland-Altman plots were used to assess agreement between HR at threshold during the 30CTTs, with HR differences between 30CTTs plotted on the Y-axis and mean HR values plotted on the X-axis. To assess 30CTT across fitness levels, the difference between the 30CTT HR and LT HR was plotted against (1) years of experience, (2) minutes of training each week, and (3) LT power in watts per kilogram.

**RESULTS:** HR and power during the 30CTTs were not different. The 30CTT overestimated LT HR (1.5mmol mean difference = 6.8 bpm, p = .0001; DXmax mean difference = 6.0 bpm, p = .001). Power during the last 20-minutes of the 30CTT did not systematically differ from LT power.
not differ from LT power. In the participant subset in which respiratory gases were collected, VT HR and power were not significantly different than LT HR or power. Level of training did show a systematic bias in the 30CTTs ability to estimate LT HR.

CONCLUSIONS: These findings suggest the 30CTT is reliable across fitness levels, but overestimates LT HR by 6 or more BPM, and should not be used for estimating LT HR when precision is needed.

2548 Board #71 June 3, 9:30 AM - 11:00 AM
Comparison Of Upper And Lower-body Strength Development While Concurrently Training For Aerobic Endurance Utilizing Recumbent Cycle Ergometry
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(Please note: this abstract was a poster presentation and was not prepared for publication.)

PURPOSE: This investigation was conducted to clarify and further explain the mechanisms associated with concurrent training by measuring upper and lower-body strength development utilizing only lower-body endurance exercise. METHODS: Two groups of young male subjects (19 - 23) performed an identical total body progressive resistance training program consisting of Leg Press, Bench Press, and Lat Pull exercises using three sets of between 8 - 12 reps twice per week for nine weeks. One group performed a resistance-only training (RO; N = 5) while the comparison group (RC; N = 5) added a progressive recumbent cycling component at 65% of their age predicted maximal heart rate to the regimen. Pre and Post 1 RM measures were recorded for comparison.

RESULTS: Data analysis revealed percent strength improvements for both groups in all three exercises. However, the RO group was significantly stronger Post (6.6 %) than RC (3.3%) in the Leg Press exercise (p<0.05), while Bench Press and Lat Pull were not significantly different but with some reduction in RC that may be due to caloric and/or metabolic factors.

CONCLUSIONS: These results suggest that the attenuation in strength development by adding endurance training to a resistance training regimen with equal volume and intensity is not caused by overtraining syndrome, but rather the local skeletal muscle’s ability to optimally adapt to the imposed dual training stimuli in that muscle group. However, greater volume and intensity of both resistance and endurance training may lead to overtraining syndrome in similar subjects.

2549 Board #72 June 3, 9:30 AM - 11:00 AM
External Work Efficiency On Immersed Ergocycle Vs. Dryland Ergocycle: A Potential Novel Training Modality
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(Please note: this abstract was a poster presentation and was not prepared for publication.)

Purpose: We determined if abdominal power and endurance were related to anaerobic and aerobic cycling performance. Methods: Twenty-three college aged subjects, whose X̄ ± SD for age, height, and weight were 19.17 ± 1.0 y, 170.4 ± 7.5 cm, and 74.5 ± 14.1 kg, completed the front abdominal power output and ACSM Crunch test so we could evaluate their abdominal power and endurance, respectively; the tests were completed twice across 48 h to attenuate any learning effects. Twelve of the subjects completed the Wingate Anaerobic Test (WAnT) on a Monark 834E ergometer set at 7.5% of body mass. The remaining 11 subjects completed a 3.2 km cycling time trial (TT) on an Expresso S3U virtual reality bike; mean TT power and time were recorded as indicators of aerobic cycling performance. Subjects completed familiarization, baseline, and performance cycling trials, while correlational analyses were used to evaluate the relationships between abdominal and cycling measures; α was set at 0.05. Results: Abdominal muscle fatigue significantly decreased mean anaerobic power by 16% (p<0.001) and increased the rate of fatigue by 19.8% (p = 0.004). Peak power decreased by 5.6%; the change approached significance (p = 0.088). Abdominal muscle fatigue didn’t affect TT performance; however, after fatigue, abdominal power was significantly correlated with TT mean power and time (r = 0.708 and 0.704, respectively). No other significant correlations were found between abdominal and cycling measures before or after fatigue. Conclusion: The data show that abdominal fatigue affects anaerobic cycling performance in our subject population; consequently, individuals may wish to avoid fatiguing abdominal exercise prior to aerobic power tests or competitions that include anaerobic power elements.

2550 Board #73 June 3, 9:30 AM - 11:00 AM
Impact of Standing up During Sprint Cycling on Power Output in Female Athletes
Alexis N. Awdziejczyk, Ross A. Sherman, Jeffrey A. Potteger, FACSM, Sango Otiemo, Grand Valley State University, Allendale, MI.

(Please note: this abstract was a poster presentation and was not prepared for publication.)

Traditionally, the Wingate anaerobic power cycling test (WAPT) has been administered while the test subject remains seated. However, it is plausible that allowing the subject to perform the test in the standing position may increase power output.

Purpose: The purpose of this study was to determine whether female athletes are able to generate more power when standing up during testing, rather than remaining seated for the entire test. METHODS: Fifteen female athletes (mean SD; age 20 ± 1 years; height 167 ± 5 cm; body mass 60 ± 4 kg), whom were inexperienced cyclists, performed two 30 s WAPTs with resistance set at 7.5% body weight; one seated for the entire test (SEAT), and the other seated for the first 15 s, then standing for the final 15 s (SEAT-STAND). Testing conditions were randomized and separated by at least 3 d. Using a mixed linear model, we examined differences in power output between conditions for the first 3 s of the transition (16-18 s) and the last 3 s (28-30 s) of the test, adjusted for any difference between conditions for the first 15 s. RESULTS: Power output was lower in the SEAT-STAND vs. SEAT condition for the first 3 s after the transition to standing (28 W, 95% CI, 0 to 56 W). In the final 3 s of the test, the mean power output was higher in SEAT-STAND vs. SEAT (18 W, -10 to 46 W). Peak 1 s power, obtained during the first 5 s of testing, was similar in both conditions (SEAT 10.1 ± 2.0 W kg-1; SEAT-STAND 10.2 ± 1.6 W kg-1; p=0.78). Conclusion: The transition to standing causes a negative, transient effect on sprint cycling power output, be it either biomechanical and/or physiological in nature, which ultimately appears to provide no long term performance decrement on WAPT. Further work is needed to identify whether these responses are also seen with experienced cyclists.

2551 Board #74 June 3, 9:30 AM - 11:00 AM
The Abdominal Musculature and Cycling Performance

(Please note: this abstract was a poster presentation and was not prepared for publication.)

Purpose: We determined if abdominal and endurance were related to anaerobic and aerobic cycling performance and if abdominal fatigue influences cycling parameters. Methods: Twenty-three college aged subjects, whose X̄ ± SD for age, height, and weight were 19.17 ± 1.0 y, 170.4 ± 7.5 cm, and 74.5 ± 14.1 kg, completed the front abdominal power output and ACSM Crunch test so we could evaluate their abdominal power and endurance, respectively; the tests were completed twice across 48 h to attenuate any learning effects. Twelve of the subjects completed the Wingate Anaerobic Test (WAnT) on a Monark 834E ergometer set at 7.5% of body mass. The remaining 11 subjects completed a 3.2 km cycling time trial (TT) on an Expresso S3U virtual reality bike; mean TT power and time were recorded as indicators of aerobic cycling performance. Subjects completed familiarization, baseline, and performance cycling trials, while correlational analyses were used to evaluate the relationships between abdominal and cycling measures; α was set at 0.05. Results: Abdominal muscle fatigue significantly decreased mean anaerobic power by 16% (p<0.001) and increased the rate of fatigue by 19.8% (p = 0.004). Peak power decreased by 5.6%; the change approached significance (p = 0.088). Abdominal muscle fatigue didn’t affect TT performance; however, after fatigue, abdominal power was significantly correlated with TT mean power and time (r = 0.708 and 0.704, respectively). No other significant correlations were found between abdominal and cycling measures before or after fatigue. Conclusion: The data show that abdominal fatigue affects anaerobic cycling performance in our subject population; consequently, individuals may wish to avoid fatiguing abdominal exercise prior to aerobic power tests or competitions that include anaerobic power elements.
### Board #75
**June 3, 9:30 AM - 11:00 AM**

**The Nocebo Effects Of Moderate Hypoxia On Cycling Performance And Locomotor Muscle Fatigue**

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*(No relationships reported)*

**PURPOSE:** Reduced exercise capacity with hypoxia may be linked to the accelerated attainment of a critical level of peripheral locomotor muscle fatigue. Therefore it is possible that hypoxia may influence pacing of exercise such that the development of locomotor muscle fatigue is regulated. Consequently the aim of this study was to explore how moderate hypoxia influences pacing of simulated cycling time trials.

**METHODS:** Following thorough familiarisation, ten well trained cyclists (VO2max = 58.1 ± 11.5 ml·kg⁻¹·min⁻¹) completed three 20km time trials in an environmental chamber; a normoxic trial (CON) in which fraction of inspired oxygen (FiO2) was 0.21 ± 0.02, followed by two trials in hypoxia (FiO2 = 0.18 ± 0.03) in a randomised, counterbalanced order. In one trial (TRUE) participants were correctly informed of the hypoxia while during the other trial (FALSE) participants were misled by being told that they were exercising in normoxia. Quadriceps twitch force, in response to supramaximal electrical stimulation of the femoral nerve was assessed pre- and at 2 min post-exercise.

**RESULTS:** Cycling duration was 2% greater (P < 0.05) in TRUE (1905.2 ± 107.3s) than CON (1876.5 ± 100.3s) and FALSE (1869.8 ± 83.8s). Cycling duration was not different between CON and FALSE. Mean power output was higher (P < 0.05) in CON (271.7 ± 41.3W) and FALSE (269.4 ± 35.45W) compared to TRUE (257.6 ± 40.9W). SaO2 was significantly lower (P < 0.001) in TRUE (90.3%) and FALSE (90.1%) compared to CON (93.9%) but did not change over the course of the 20kmIT in any trial (P > 0.217). There were no differences in RPE between trials (P > 0.05). Pre- to post-exercise twitch force was reduced to a greater extent in FALSE (37.0%) and CON (34.1%) compared to TRUE (26.0%; P < 0.05). There was no difference in pre-to-post exercise twitch force between FALSE and CON.

**CONCLUSIONS:** In contrast to our hypothesis the extent of locomotor muscle fatigue was not similar in the three experimental trials. Our findings suggests that pacing and therefore time trial performance was influenced by the cyclists’ anticipation of air oxygen content.

### Board #76
**June 3, 9:30 AM - 11:00 AM**

**Exercise Intensity and Performance Aspects of Fat Biking on Dirt vs Snow**

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*(No relationships reported)*

Recently, a fat bike (FTB), equipped with tires twice as wide as a traditional mountain bike (MTB), has become a popular alternative to MTB. Notably, the FTB is ridden at an inflation pressure as low as 27579 Pascal (4 PSI), especially relevant on snow. **PURPOSE:** To quantify the performance aspects of riding an FTB on a natural earthen trail (ET) vs. the snow trail (ST). **METHODS:** Eleven recreational MTB riders (M = 9, F = 2) with greater than two years of riding experience, participated in this two part (i.e., fall and winter), repeated measures study over a 3 km course. Both the same FTBs were used throughout testing. Tire pressure and air temperature, respectively, were 55158 Pascal (8 PSI) and 8.4 ± 2.9 C° on ET and 27579 Pascal (4 PSI) and -3.6 ± 1.2 C° on ST. Continuous heart rate (HR) was recorded and saved via a global positioning system (GPS) transmitter and watch to later assess average heart rate (HRavg) and peak heart rate (HRpeak). GPS was also used to assess average speed (speedavg) and max speed (speedmax) TT outcomes. Prior to the first sprint and immediately post-sprints 5 and 10. Heart rate and rate of perceived exertion (RPE) were also recorded. **RESULTS:** From sprint 2-10, heart rate recovery was greater during 180s compared to 30s (p < 0.001). There was a statistically significant difference in the post-sprint 10 HR peak power during the sprints and elbow flexor MVC force. Interestingly, there was a peak power decrease from sprint 1 to 10 by 35.8% (p < 0.001) and 11.5% (p = 0.010) when the sprints were interspersed with 30s and 180s rest, respectively. With the exception of sprint 1, participants produced a higher peak power from sprints 2-10 when the sprints were interspersed with 180s rest compared to 30s rest (p < 0.001). When the sprints were interspersed with 30s and 180s rest, MVC force was decreased by 6.1% (p = 0.008) and 11.1% (p = 0.005) from pre-sprint 1 to post-sprint 5. 11,2% (p = 0.001) and 17.5% (p = 0.001) from pre-sprint 1 to post-sprint 10, and 5.1% (p = 0.039) and 6.4% (p = 0.014) from pre-sprint 5 to post-sprint 10, respectively. When the sprints were interspersed with 30s compared to 180s rest MVC force was 5.1% (p = 0.024) and 6.4% (p = 0.004) higher at post-sprints 5 and 10, respectively. From sprint 2-10, heart rate recovery was greater during 180s compared to 30s (p < 0.001). RPE increased throughout the sprints (p < 0.01) when sprints were interspersed with 30s and 180s rest, but no between-group differences occurred.

**CONCLUSIONS:** Differences in fatigue during maximal arm-cycling sprints interspersed with 30s and 180s of Rest.
Critical Power (CP) demarcates the boundary between sustainable and unsustainable exercise, and it is widely used as a measure of exercise tolerance/performance. Evaluation typically consists of a time-consuming and physically demanding protocol of 3-5 time-to-exhaustion trials (TTE) ranging from 1 to 20 min. However, the power output (PO) associated with the calculated CP does not generally reflect a sustainable intensity of exercise, and lactate concentration ([La]) cannot be stabilized (i.e. lactate steady-state is not reached). PURPOSE: To test cyclists’ ability to predict their CP based on their own perception of effort, and to compare this PO with those derived from 5 TTE trials and maximal lactate steady-state (MLSS) measurements. METHODS: Seven experienced cyclists (28±3 yrs; 68.4±7.3 kg; 175±9 cm) participated in the study. A ramp incremental test to exhaustion was performed on a cycle ergometer (Velotron Dynafit Pro, Racer Mate, Seattle, WA, USA) for determination of VO_{2max} (Quark CPET, Cosmed, Rome, Italy) and peak PO. PO of CP from 5 TTE trials was derived from a 2-parameter hyperbolic model (PO=HYP/(1+HYP)); Participants also performed two 30-min rides at a self-selected PO (PO_{SEL}) that they considered the highest intensity of exercise they could sustain for a prolonged time. Additionally, participants performed 30-min rides at the estimated PO_{HYP} for determination of PO at MLSS (PO_{MLSS}). [La] was measured at 5-min intervals and PO_{MLSS} was considered as the highest PO at which variation of [La] ≤ ± 2 mmol/L between 2 consecutive 5-min samples; PO_{HYP} and PO_{self} were 4.30±0.67 L·min⁻¹ and 383±53 W, respectively. PO_{PO/HYP}, PO_{PO/SEL}, and PO_{PO/MLSS} were similar (267±39 W; 246±37 W and 246±37 W, respectively; p > 0.05). Bland–Altman plots were used to determine limits of agreement (LOA) between PO_{HYP} and PO_{MLSS} (HYP vs 22 W, bias = 0; p > 0.05), PO_{HYP} and PO_{self} (-8 to 51 W, bias = 21; p < 0.05) and PO_{HYP} and PO_{SEL} (439 to -4 W, bias = -21 W; p < 0.05). Although PO_{HYP} and PO_{SEL} had similar magnitudes of range when compared to PO_{MLSS}, PO_{HYP} consistently over predicted PO_{MLSS} and PO_{SEL}. CONCLUSION: Experienced cyclists can predict their maximal sustainable PO for a prolonged time-trial with more precision than the current CP testing. This finding challenges the practical application of this test in experienced cyclists.
Research has shown a significant positive contribution of the anaerobic system on endurance performance in 5 and 10 km running race. However, this has not yet been verified in cycling with longer periods of exercise on different types of course.

METHODS: Participants were healthy adults (M age = 46.90, SD = 7.40, n = 19) who self-reported participating in at least 30 minutes of vigorous exercise, 3 times per week. Subjects exercise 6 days per week, using the complete aerobic routines developed by Ploutz-Snyder that consisted of (a) 30 min. of continuous aerobic exercise on a stationary cycle at above 75% of maximum heart rate, (b) long, 4 x 4 min. intervals at or above 90% maximum heart rate with 3 minutes active rest, (c) medium 6 x 2 min. intervals at or above 75% of maximum heart rate, and finally 2 simulated isoenergetic time-trials on a flat course of 28 km and the other composed of 5 isoenergetic laps (4 km vs. 5.6 km) performed on a Computrainer.

RESULTS: W' and PP were inversely correlated with the relative average power (PM-20 km) (W' = 1.03, r = .95, p<.01; PP = .12, r = .80, p<.05 for fatigue vs. time). Kinetics of PM-20 km and of PM-28 km showed a parabolic performance pattern on both courses (F (1, 9) = 22.08, p<.01; F (1, 9) = 42.03, p<.01). CONCLUSION: Anaerobic metabolism contributed to a higher proportion in the cycling ascending time trial.

BACKGROUND: The benefits of interval training on muscular strength and fitness in healthy adults have been well-documented. Little is known about the influence of aerobic interval training programs with aerobic workloads at or above 90% maximum heart rate and anaerobic workloads at or above 75% maximum heart rate on muscular strength.

METHODS: Ten (10) cyclists completed a peak aerobic power test, a 3-min all-out test to measure critical power (CP), peak power (PP), anaerobic capacity (W'), and finally 2 simulated isoenergetic time-trials on a flat course of 28 km and the other an uphill 20 km (442.1 m vertical gain). The route for both courses were similarly composed of 5 isoenergetic laps (4 km vs. 5.6 km) performed on a Computrainer. RESULTS: W' and PP were inversely correlated with the relative average power (PM-20 km) (W' = 1.03, r = .95, p<.01; PP = .12, r = .80, p<.05 for fatigue vs. time), but anaerobic work (Wana) during the uphill 20 km was higher than in the flat 28 km (18.5±3.10 vs. 7.9±1.45 kJ, p<.0001). However, the aerobic work (Wae) in the 20 km was lower than during the 28 km (632.37±57.42 vs. 690.22±57.40 kJ, p<.05). Kinetics of PM-20 km and of PM-28 km showed a parabolic performance pattern on both courses (F (1, 9) = 22.08, p<.01; F (1, 9) = 42.03, p<.01). CONCLUSION: Anaerobic metabolism contributed to a higher proportion in the cycling ascending time trial. The course characteristics may influence the recruitment energy systems with a same energy expenditure.

Little is known about the how an intensive aerobic interval training program would influence muscular strength in healthy adults aged 30-62. PURPOSE: To determine if participation in an intensive interval exercise program targeted towards increasing aerobic fitness could lead to gains in muscular strength. METHODS: Participants completed a 6-day per week exercise program on a cycle ergometer for a 6-month time period. Participants were healthy adults (M age = 49.60, SD = 7.40, n = 19) who self-reported participating in at least 30 minutes of vigorous exercise, 3 times per week. Subjects exercise 6 days per week, using the complete aerobic routines developed by Ploutz-Snyder that consisted of (a) 30 min. of continuous aerobic exercise on a stationary cycle at above 75% of maximum heart rate, (b) long, 4 x 4 min. intervals at or above 90% maximum heart rate with 3 minutes active rest, (c) medium 6 x 2 min. intervals at or above 75% of maximum heart rate, and finally 2 simulated isoenergetic time-trials on a flat course of 28 km and the other composed of 5 isoenergetic laps (4 km vs. 5.6 km) performed on a Computrainer. RESULTS: W' and PP were inversely correlated with the relative average power (PM-20 km) (W' = 1.03, r = .95, p<.01; PP = .12, r = .80, p<.05 for fatigue vs. time), but anaerobic work (Wana) during the uphill 20 km was higher than in the flat 28 km (18.5±3.10 vs. 7.9±1.45 kJ, p<.0001). However, the aerobic work (Wae) in the 20 km was lower than during the 28 km (632.37±57.42 vs. 690.22±57.40 kJ, p<.05). Kinetics of PM-20 km and of PM-28 km showed a parabolic performance pattern on both courses (F (1, 9) = 22.08, p<.01; F (1, 9) = 42.03, p<.01). CONCLUSION: Anaerobic metabolism contributed to a higher proportion in the cycling ascending time trial. The course characteristics may influence the recruitment energy systems with a same energy expenditure.

PREDICTION OF OXYGEN UPTAKE DURING WALKING IN PERSONS WITH DOWN SYNDROME

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Little is known about the how an intensive aerobic interval training program would influence muscular strength in healthy adults aged 30-62. PURPOSE: To determine if participation in an intensive interval exercise program targeted towards increasing aerobic fitness could lead to gains in muscular strength. METHODS: Participants completed a 6-day per week exercise program on a cycle ergometer for a 6-month time period. Participants were healthy adults (M age = 49.60, SD = 7.40, n = 19) who self-reported participating in at least 30 minutes of vigorous exercise, 3 times per week. Subjects exercise 6 days per week, using the complete aerobic routines developed by Ploutz-Snyder that consisted of (a) 30 min. of continuous aerobic exercise on a stationary cycle at above 75% of maximum heart rate, (b) long, 4 x 4 min. intervals at or above 90% maximum heart rate with 3 minutes active rest, (c) medium 6 x 2 min. intervals at or above 75% of maximum heart rate, and finally 2 simulated isoenergetic time-trials on a flat course of 28 km and the other composed of 5 isoenergetic laps (4 km vs. 5.6 km) performed on a Computrainer. RESULTS: W' and PP were inversely correlated with the relative average power (PM-20 km) (W' = 1.03, r = .95, p<.01; PP = .12, r = .80, p<.05 for fatigue vs. time), but anaerobic work (Wana) during the uphill 20 km was higher than in the flat 28 km (18.5±3.10 vs. 7.9±1.45 kJ, p<.0001). However, the aerobic work (Wae) in the 20 km was lower than during the 28 km (632.37±57.42 vs. 690.22±57.40 kJ, p<.05). Kinetics of PM-20 km and of PM-28 km showed a parabolic performance pattern on both courses (F (1, 9) = 22.08, p<.01; F (1, 9) = 42.03, p<.01). CONCLUSION: Anaerobic metabolism contributed to a higher proportion in the cycling ascending time trial. The course characteristics may influence the recruitment energy systems with a same energy expenditure.

E-27 Free Communication/Poster - Disease - Disability - Exercise

Friday, June 3, 2016, 7:30 AM - 12:30 PM
Room: Exhibit Hall A/B

PREDICTION OF OXYGEN UPTAKE DURING WALKING IN PERSONS WITH DOWN SYNDROME

Stamatis Agiovlasitis, FACSM1, Goncalo V. Mendonca2, Bo Fernhall, FACSM1, Mississippi State University, Mississippi State, MS. 'University of Lisbon, Lisbon, Portugal. 'University of Illinois at Chicago, Chicago, IL. Email: sagiovlasitis@colled.msstate.edu

Prediction of Oxygen Uptake during Walking in Persons with Down Syndrome

Stamatis Agiovlasitis, FACSM1, Goncalo V. Mendonca2, Bo Fernhall, FACSM1, Mississippi State University, Mississippi State, MS. 'University of Lisbon, Lisbon, Portugal. 'University of Illinois at Chicago, Chicago, IL. Email: sagiovlasitis@colled.msstate.edu

Persons with Down syndrome (DS) have increased rate of oxygen uptake (VO2) during walking likely due to balance problems and reduced fitness. For exercise prescription, a formula for predicting VO2 from speed is needed. The formula must be derived from a large enough sample to account for wide variability in responses among persons with DS. PURPOSE: To develop a formula for predicting VO2 from walking speed for persons with DS and examine its accuracy. METHODS: We compiled data from three previous studies. A total of 470 VO2 observations at different speeds were available from 54 persons with DS (29 ± 8 yrs; 23 women) and 61 persons without DS (30 ± 8 yrs; 26 women). VO2 was measured with open-circuit spirometry during either over-ground or treadmill level walking at speeds ranging from slow to fast. The relationship between VO2 and speed was analyzed with multi-level regression. Predicted accuracy was assessed with the mean absolute percent error and Bland-Altman plots. RESULTS: The relationship between VO2 and speed differed between persons with and without DS.
Significant predictors of VO2 were speed, speed squared, group, and group by speed interaction (p < 0.001; R² = 0.82). Walking mode (treadmill vs. over-ground) was not a significant model for each group showed that speed and its square significantly predicted VO2 (p < 0.001). For persons with DS, the prediction equation was VO2 = 7.113 + 3.477×speed + 7.911×speed2 (R² = 0.83). For persons without DS, the equation was VO2 = 6.951 + 0.736×speed + 3.560×speed2 (R² = 0.77). Mean absolute percent error across speeds did not differ between groups (DS: 13.0 ± 9.3%; non-DS: 11.9 ± 8.2%; p = 0.16). Bland-Altman plots showed that the difference between actual and predicted VO2 was on average nearly zero for each group, but had greater variability for persons with DS. CONCLUSION: Persons with DS have different VO2 response to walking speed from persons without DS. VO2 is predicted from speed with acceptable accuracy for persons with and without DS. Exercise professionals may use the present formulas for exercise programs involving level walking.

**INTRODUCTION:** Persons with multiple sclerosis (MS) often experience elevated fatigue that may be associated with poor sleep quality and therefore decreased quality of life. The association between fatigue and sleep quality might additionally be related to physical activity (PA) level, which can be objectively assessed using vector magnitude (VM) data from tri-axial accelerometer. PURPOSE: To investigate if there is an association between sleep quality and fatigue level in MS, and to study if associations exist between fatigue level and PA in persons with MS who have good or poor sleep quality. METHODS: Forty-seven persons with MS (48 ± 2 years, length of diagnosis 10 ± 1 year, 9 males) completed the Fatigue Severity Scale (FSS) and Pittsburgh Sleep Quality Index (PSQI) as markers of quality of life, and one week of PA assessment via free living accelerometry (analyzable data was obtained from a subset of 40 subjects). Subjects were classified as Bad Sleepers (BAD) or Good Sleepers (GOOD) based on PSQI scores (>5 and ≤5, respectively), and High Fatigue (HIGH) or Low Fatigue (LOW) based on the FSS (≥4 and <4, respectively). A chi-square analysis was performed between sleep quality and fatigue level. Subsequently, correlations between fatigue level and PA using average VM for GOOD and BAD subjects were calculated for the subset of 40 subjects (N=18 and N=22 for GOOD and BAD, respectively). Statistical significance for all analyses was set at p<0.05. RESULTS: Subjects who reported poor sleeping habits were significantly more likely to have high fatigue than those with good sleeping habits: BAD-HIGH=22, BAD-LOW=4, GOOD-HIGH=12, GOOD-LOW=9 (p=0.036). PA as determined by average VM was not significantly correlated with fatigue level in either the GOOD or BAD group (p=0.564 and p=0.269, respectively). DISCUSSION: These data suggest that poor sleep quality in MS significantly increases the likelihood of elevated fatigue compared to those with good sleeping habits. Additionally, analysis of PA using VM does not appear to demonstrate an association with fatigue level regardless of sleeping status. Further investigation of this potential relationship using alternative objectively-obtained PA variables is warranted.

### Board #88

**June 3, 9:30 AM - 11:00 AM**

**Low-intensity Resistance Training With Blood Flow Restriction Increases Muscle Function And Mass In Rheumatoid Arthritis**

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(No relationships reported)

Rheumatoid arthritis (RA) is a chronic inflammatory disease characterized by synovia involvement and gradual degradation of peripheral joints. Strengthening exercises are widely recommended for improving muscle function and mass in RA. High-intensity resistance training (<75% 1RM) has been shown effective for both muscle mass and strength gains; however, patients with RA are often unable to exercise at such intensities. Alternatively, low-intensity resistance training (<30% 1RM) combined with partial blood flow restriction (LIO) has been alleged to induce similar gains in muscle function which could be beneficial for RA, as lower loads represent less stress to the affected joints.

**PURPOSE:** To investigate the effects of a LIO training program on muscle strength, mass and functionality in patients with RA.

**METHODS:** Twenty-three female patients with RA were divided into three groups: LIO (30% 1RM associated with partial blood-flow restriction), high-intensity training (HI: 90% 1RM), and control. LIO and HI underwent a 12-week, twice-a-week supervised training program and all patients were assessed for lower-limb 1RM (leg press and knee extension), functionality (timed-stands [TST] and timed-up-and-go test [TUG]), and quadriceps cross sectional area (CSA) at baseline and after the intervention. Absolute changes were tested by ANOVA.

**RESULTS:** HI and LIO resulted in similar increases in leg-presses (39.9 and 32.1%, respectively) and knee-extension 1RM (26.8 and 19.8%, respectively), which were significantly greater than control (all p<0.05). Functionality was significantly (all p<0.05) improved in both HI (TST: 10.7%; TUG: -12.3%) and LIO (TST: 9.6%; TUG: -7.3%) when compared with control (TST: -9.0%; TUG: 0.8%). In addition, quadriceps CSA was also significantly (all p<0.05) improved in both trained groups (HI: 12.8%; LIO: 7.7%) when compared with control (220%).

**CONCLUSIONS:** LIO was as effective as conventional HI in improving lower-body strength and muscle mass as well as functionality in RA patients. Importantly, LIO may be more advantageous than HI as lower training loads may be both safer and more enjoyable to these patients while maintaining training effectiveness. We conclude that LIO constitutes a promising alternative adjunctive therapy for RA management.

### Board #89

**June 3, 9:30 AM - 11:00 AM**

**Sedentary Behavior Is Independently Associated With Quality Of Life In People With Inflammatory Bowel Disease**

Katrina Taylor, Philip W. Scruggs, Chantal A. Vella, FACSM. University of Idaho, Moscow, ID. Email: katrinat@uidaho.edu

(No relationships reported)

Inflammatory Bowel Disease (IBD), a severe gastrointestinal disease, affects 700,000 people in the US. IBD is thought to reduce quality of life (QOL) and currently there is no medical cure. PURPOSE: To investigate whether sedentary behavior was associated with QOL independent of moderate-vigorous physical activity (MVPA) in people with IBD, and whether resilience mediated this relationship. METHODS: 185 participants with IBD (81.6% female; 54.7% in remission; mean±SD: age 37.2±12.7 y; physical QOL 42.7±9.3; mental QOL 38.4±11.7; resilience 65.7±13.7) completed an online-survey consisting of the Short Form-36 (SF-36), International Physical Activity Questionnaire (IPAQ), and the Connor-Davidson Resilience Scale (CD-RISC) to assess QOL, MVPA, and resilience, respectively. Multiple regression analyses examined the associations between sedentary behavior and physical and mental QOL, with MVPA, disease state, age, sex, and resilience as covariates. RESULTS: On average, participants spent 436.3 min/week sitting and 98.4 min/week in MVPA. Sedentary behavior was independently associated with physical QOL after adjusting for MVPA, disease state, age, and sex (R²=28, β=-.22, p=.01). This association was slightly attenuated but remained significant when resilience was entered into the model (R²=29, β=-.21, p=.03). Sedentary behavior was independently associated with mental QOL after adjusting for MVPA, disease state, age, and sex (R²=21, β=-.23, p=.01). This association was no longer significant with the addition of resilience, suggesting it is a mediating variable (R²=35, β=0.09, p=.29). CONCLUSIONS: We are the first to show that sedentary behavior is associated with both physical and mental QOL independent of MVPA in people with IBD. However, resilience mediates the relationship between MVPA and mental QOL in these patients. Thus, decreasing sedentary behavior and increasing resilience may be advantageous for improving QOL in people with IBD.

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Abstracts were prepared by the authors and printed as submitted.
from ventilation and may offer an effort-independent measure of cardiorespiratory fitness (CRF) in patients with ESLD.

**PURPOSE:** To determine whether OUES is influenced by beta-blocker therapy using the V-slope method. OUES [VO\(_{2}\)peak] was determined as the highest 30-second average values during the test. VT was measured was calculated at 50% (OUES\(_{50}\)), 75% (OUES\(_{75}\)) and 100% (OUES\(_{100}\)) of the test. Independent t-tests and Mann-Whitney U tests compared the mean difference in CPX variables between participants on and off beta-blockade.

**RESULTS:** Sixty-three participants (age 55.9 (interquartile range 51.4-59.5); model of end-stage liver disease score 15.5±4.7; male 85.7%) were included. Twenty-six participants (41%) were receiving beta-blockade at the time of CPX. Compared to those off beta-blockers, patients taking the medication demonstrated significantly (p<0.05) reduced VO\(_{2}\)peak (3.9±3.7 vs. 16.1±2.6 ml/kg/min\(^{-1}\)) and VT (10.7±2.6 vs. 12.6±2.1 ml/kg/min\(^{-1}\)). However, there were no significant differences (p>0.05) at OUES\(_{50}\) (1.59±0.48 vs. 1.76±0.51), OUES\(_{75}\), (1.61±0.43 vs. 1.72±0.52) and OUES\(_{100}\) (1.24±0.52 vs. 1.54±0.66) between beta-blocked and non-beta-blocked cohorts.

**CONCLUSION:** Unlike traditional CRF measures, the OUES does not appear to be influenced by beta-blocker in patients with ESLD. The OUES may therefore have utility as an effort-independent measure of CRF in this patient cohort.

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**Cardiorespiratory fitness (VO\(_{2}\)max) represents the peak rate of metabolic activity in exercised muscle. Previous studies demonstrated a relationship between VO\(_{2}\)max and brain atrophy at different stages of Alzheimer’s disease (AD). Furthermore, in patients with mild cognitive impairment VO\(_{2}\)max is correlated with the decrease of white/ gray matter ratio of cortex. Consequently, AD seems to be associated with alteration of metabolic state. Cognitive function, assessed by means of Mini Mental State Examination (MMSE) seems also correlated with the VO\(_{2}\)max, however it is not clear if exercise-induced ameliorations in the metabolism are associated with changes in the progression of cognitive impairment.

**PURPOSE:** To compare the effect of an exercise treatment (ET) with respect to a cognitive treatment (CT) on metabolism and progression of cognitive impairment in AD patients.

**METHODS:** Twenty patients with AD (77±7 years) were randomly assigned to ET group (n=10) or CT group (n=10). All the subjects performed 72 treatment sessions, 3 times a week. ET included: moderate intensity aerobic and strength training. ET included: moderate-intensity aerobic and strength training. CT included moderate-intensity aerobic and strength training.

**RESULTS:** The subjects completed all the 72 treatments. MMSE did not change significantly in ET (T0=21.6±3.7 Vs T1=21.1±4.1, p=0.534), while at contrary decreased significantly in CT group (T0=19.4±5.2 Vs T1=16.1±5.8, p=0.003). VO\(_{2}\)max increased significantly in ET (29.1±9.6 ml/kg/min Vs T1=41.7±8.4 ml/kg/ min, p= 0.011), meanwhile was stable in CT group (T0=22.8±7.7 ml/kg/min Vs T1=25.1±5.1 ml/kg/min, p= 0.255).

**CONCLUSION:** Data from the current study suggested that an ET program can temper the progressive reduction of cognitive function usually exhibited in patients with AD. A possible explanation of this result could be related to exercise-induced ameliorations of mitochondrial function. Indeed, patients with AD are characterized by mitochondrial abnormalities co-occurring at peripheral and central level, causing metabolic disturbances and brain’s degenerative process. Therefore, exercise-based intervention could be a useful non-pharmacological intervention that ameliorates both metabolic and the progression cognitive deterioration of AD patients.

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**Disability Level**

<table>
<thead>
<tr>
<th>Mild (n=25)</th>
<th>Moderate (n=47)</th>
<th>Severe (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent Body Fat</td>
<td>38.07 ± 9.97</td>
<td>35.77 ± 7.93</td>
</tr>
<tr>
<td>Total Body Lean (kg)</td>
<td>42.25 ± 7.73</td>
<td>42.51 ± 7.77</td>
</tr>
<tr>
<td>Visceral Mass (kg)</td>
<td>.730 ± .600</td>
<td>.757 ± .613</td>
</tr>
</tbody>
</table>

**CONCLUSION:** Total body lean mass, percent body fat, and visceral adiposity did not differ across levels of disability status. Further work may be needed to explore how body composition variable may interact with other health and physiologic parameters in this important population.

---

**Multiple sclerosis (MS) is a debilitating neurological disorder that invariably leads to difficulties with walking. Gait analyses indicate that persons with MS exhibit slower walking speeds, spend more time in the double-support phase, and walk with wider strides. The adaptations in gait exhibited by individuals with MS are associated with declines in performance on both short- (25 ft) and long-distance (6 min) walk tests.**

**PURPOSE:** To identify the neuromuscular determinants of walking performance for individuals with MS. We hypothesized that motor unit (MU) characteristics and force steadiness (coefficient of variation for force) during submaximal, isometric contractions could explain most of the variance in walking performance.

**METHODS:** Eleven persons with MS (55.2 ± 6 yrs) participated in the study. Participants completed 1 to 3 data collection sessions, each separated by 4-6 wks. 23 experiments yielded a total of 2,010 discriminated MUs. Walking speed was measured with a timed 25-ft walk test and walking endurance was determined as the distance walked in 6 min. MUs were identified through decomposition of high-density EMGs recorded from tibialis anterior, gastrocnemius, and soleus muscles. The recordings were then used to perform steady, submaximal isometric contractions with either the plantarflexor or dorsiflexor muscles. Based on Pearson correlation results, multiple-regression analyses were used to construct models that could explain the variance in the two measures of walking performance of study participants.

**RESULTS:** Regression model 1 indicated that 74% of the variance (R=0.89) in walking speed was predicted by two variables: coefficient of variation for interspike interval of soleus MUs at 20% MVC (partial r = 0.66) and dorsiflexor force steadiness at 20% MVC.
(partial r = 0.69). Regression model 2 indicated that 61% of the variance (P<0.01) in walking endurance was predicted by two variables: dorsiflexor force steadiness at 20% MVC (partial r = 0.72) and the number of identified gastrocnemius MU’s at 20% MVC plantarflexors (partial r = -0.51).

CONCLUSION: Much of the variance in walking speed and endurance for individuals with MS was explained for dorsiflexor force steadiness and MU activity in calf muscles during submaximal isometric contractions.

**2571 Board #94**

June 3, 9:30 AM - 11:00 AM

Functional Predictors Of Physical Activity Levels In Patients With Multiple Sclerosis


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(No relationships reported)

Multiple Sclerosis (MS) is the leading cause of non-traumatic neurological disability in young adults and affects up to two million people worldwide. Patients with MS (PwMS) often have reduced physical activity (PA) levels compared to their healthy counterparts.

PURPOSE: The purpose of this study was to identify the strongest predictors of PA levels in PwMS.

METHODS: Twenty-five women and 9 men (age: 54 ± 12.6 years; Patient Determined Disease Steps: 0-6) with a confirmed diagnosis of MS participated in the study. A total of 17 tests were completed to assess behavioral and functional outcomes of MS. Eight variables that had significant Pearson correlations with moderate-vigorous physical activity (MVPA) / day or with at least 14 other behavioral and functional outcomes were entered into a stepwise multiple regression analysis to predict MVPA / day. The 8 independent variables were: Falls Efficacy Scale-International and Fatigue Severity Scale questionnaire scores, average handgrip strength of the left and right sides, body weight normalized total leg strength (knee extensor + flexor force) on the more- and less-affected sides, body fat %, walking speed, and Timed-Up-And-Go performance.

More- and less-affected sides were determined from a combination of leg strength and weight normalized total leg strength (knee extensor + flexor force) on the more- and less-affected sides.

RESULTS: The patients averaged 33 min of MVPA / day (range: 4-107 min). The more- and less-affected sides were entered into a stepwise multiple regression analysis to predict MVPA / day. The stepwise procedure converged on a model (R2 = 0.34, P = 0.002) that included total leg strength, handgrip strength of the more-affected side (partial r = 0.416, P = 0.016) and average handgrip strength (partial r = 0.365, P = 0.037). The other variables did not contribute to the model (P > 0.404).

CONCLUSION: These results suggest that PwMS with greater average handgrip strength and leg strength on the more-affected side engage in more MVPA / day. The strength of the more-affected leg is a predictor of PA levels because it may represent lower functional ability on one side of the body. Since handgrip strength is a general indicator of whole-body muscular strength, this characteristic also contributes to PA levels. To improve PA levels in PwMS, rehabilitation should target muscle strength with an emphasis on the more-affected side.

**2572 Board #95**

June 3, 9:30 AM - 11:00 AM

Effects Of Concurrent Training In People Living With HIV/AIDS: A Randomized Clinical Trial

Sidney B. Peres1, Debora A. Guariglia2, Rafael E. Pedro2, Nadia Candido1, Bruno P. Melo1, Solange M. Franzoi de Moraes1, 1State University of Maringa, Maringa, Brazil. 2Estacio de Sa College Ourinhos, Ourinhos, Brazil.

Email: sbperes@uem.br

(No relationships reported)

PURPOSE: To evaluate the effects of 16 weeks of concurrent training on body composition, immunological and respiratory variables in people living with HIV/AIDS undergoing highly active antiretroviral therapy (HAART).

METHODS: The procedures followed the rules for Randomized Clinical Trials described by CONSORT statement for non-pharmacological treatments. The sample consisted of 58 HIV-positive volunteers undergoing HAART, which were randomized and assigned into two experimental groups: 1. Control (C) and 2. Concurrent Training (T). The T group performed 16 weeks of aerobic and strength exercise training (concurrent training), 3 times a week. The C group performed stretching and recreational activities. Body composition was measured by Dual-Energy X-Ray Absorptiometry, 12-h fasting serum interleukins (IL-4, 5, 6, 8, 10, IFN, GM-CSF, e TNF) determined by Multiplex Assay (Lumines), maximum O2 uptake (VO2max) consumption determined by gas analysis (Metalyzer 3B), and peak running speed (Vpeak) assessed during incremental treadmill tests.

RESULTS: T group showed the following modifications on body composition: reduction of 6% on fat mass, 8% on trunk fat mass, 10% of android fat, and 9% on total fat mass (p<0.05). From all cytokines analyzed only IL-8 levels were lower in T group (p<0.05) when compared to C group. Finally, V02max and Vpeak increased 21.5% and 17.5% in T group in comparison to C group, respectively (p<0.05).

CONCLUSION: Concurrent training provided benefits in body composition, immunological and respiratory parameters in people living with HIV/AIDS undergoing HAART.

**2573 Board #96**

June 3, 9:30 AM - 11:00 AM

Neuromuscular Electrical Stimulation Can Improve Walking Endurance In Individuals With Multiple Sclerosis

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Email: leah.davis@colorado.edu

(No relationships reported)

Multiple sclerosis (MS) is a neurodegenerative disease that invariably leads to difficulties with walking. Neuromuscular electrical stimulation (NMES) can be an effective intervention for a range of conditions that reduce motor function. Wide pulses (0.5-1 ms) activate a greater proportion of sensory axons and thereby augment the central contribution to evoked contractions, whereas narrower pulses (0.2-0.4 ms) preferentially activate motor axons. The differential activation of motor and sensory axons is attributable to the longer strength-duration time constant and lower rheobase of sensory axons.

PURPOSE: To compare the influence of pulse width on the changes in motor function elicited by a 6-wk NMES intervention in individuals diagnosed with MS.

METHODS: Eleven persons (51 ± 6.7 yrs, 5 women) with clinically diagnosed MS participated in a 6-wk NMES intervention. The average score on the first page of the Patient Determined Disease Steps questionnaire was 3.4 ± 1.5. Intervention sessions entailed 10 min of stimulation of the calf muscle and 10 minutes of stimulation of the tibialis anterior muscle. Performance evaluation included a 6-min walk test, a 25-foot walking test, and strength tests of the dorsiflexor and plantarflexor muscles for both limbs. The 6-min walk test provides a measure of walking endurance, whereas the 25-ft walking test indicates fast walking speed. Evaluation sessions were performed at week 0, week 6 (after the 6 wks of treatment), and week 10 (4 wks after intervention).

RESULTS: While not yet sufficiently powered to compare the narrow- and wide-pulse groups, the data were collapsed across groups and pairwise comparisons suggested that walking endurance was significantly improved (437 ± 137 m to 464 ± 162 m, P = 0.027) after the intervention (week 6). In contrast, there was no statistically significant change in fast gait speed (5 ± 11 m/s to 4 ± 8 m/s, P = 0.6). Improvements in walking endurance lasted through the retention session (week 0: 453 ± 133 m; week 10: 490 ± 140 m, P=0.01).

CONCLUSION: A 6-wk treatment with NMES can improve walking endurance, but not fast walking speed, in persons with MS who self-report walking limitations. Supported by NIH under award number R01HD097958.

**2574 Board #97**

June 3, 9:30 AM - 11:00 AM

The Impact of Obstructive Sleep Apnea on Cardiovascular Hemodynamics During Steady-state Exercise

Gabrielle E. Giersch, Ryan A. Martin, Jacob D. Ridings, Courtney L. Strosnider, Christopher X. Womack, FACSMM, Trent A. Hargens, FACSMM, James Madison University, Harrisonburg, VA.

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(No relationships reported)

Obstructive Sleep Apnea (OSA) is a disorder characterized by repetitive partial and/or complete airway collapse of the upper airway. This disorder significantly increases the risk for Cardiovascular Disease (CVD) and heart failure. The repetitive respiratory effort against a closed airway has been shown to result altered hemodynamic variables, suggesting cardiovascular remodeling. To date, these findings have only been shown at rest. Whether these alterations have been examined during exercise has not been examined.

Purpose: To determine the effect that OSA has on hemodynamic variables during steady-state exercise compared to non-OSA controls.

Abstracts were prepared by the authors and printed as submitted.
Related to cardiorespiratory fitness, mechanisms of limitations in exercise capacity and additional prognostic information from CPX in these patients are under investigation.

**PURPOSE:** The aim of this cohort study was to test the hypothesis that key CPX variables, in addition to peak oxygen uptake, are abnormal in CKD patients compared to matched healthy individuals (HC).

**METHODS:** CPX was carried out in 25 Stage 3 - 5 CKD patients (60 ± 13 yrs; eGFR 43 ± 14) and 19 matched healthy individuals (56 ± 5 yrs; eGFR > 60) on a cycle ergometer with workload increased by 15W every minute until volitional fatigue. Breath by breath expired respiratory gas analysis was carried out with an automated gas analyzer and averaged over 10 second intervals. **RESULTS:** Peak oxygen uptake was reduced in CKD compared to HC (18 ± 6 vs. 26 ± 8 ml/kg/min; *p* < 0.01), as was oxygen uptake at the ventilatory threshold (9 ± 4 vs. 13 ± 6 ml/kg/min; *p* < 0.05). A steeper V̇E/V̇CO₂ slope (32 ± 3 vs. 27 ± 4; *p* < 0.05) in CKD deactivates ventilation perfusion mismatching in these patients. A lower PETCO₂ (p < 0.05) with a normal PECO₂, PETCO₂ ratio (p > 0.05) during exercise suggest that this may be due to pulmonary blood flow as opposed to ventilatory defects. The ventilatory cost of oxygen uptake was higher in CKD (36 ± 5 vs. 33 ± 5; *p* > 0.05). Maximum heart rate (135 ± 22 vs. 155 ± 18 bpm) and heart rate recovery after one minute (21.5 ± 10 vs. 31 ± 11 bpm) were both reduced in CKD (p < 0.05). **CONCLUSION:** In CKD patients a number of CPX variables were markedly abnormal in comparison to age matched healthy individuals. These findings provide a strong case for the expanded clinical use of CPX in patients with CKD. Future studies should assess the prognostic value of these abnormalities in CKD.

Supported by NIH Grant R01 HL113514

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**Table 1. Differences in Physical Activity and Sitting by Gender and Visual Impairment.**

<table>
<thead>
<tr>
<th>Walking</th>
<th>MPA</th>
<th>MVPA</th>
<th>VPA</th>
<th>ST</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>F1(107)=0.568, p&lt;0.003</td>
<td>F1(107)=0.559, p&lt;0.003*</td>
<td>F1(107)=0.239, p=0.014*</td>
<td>F1(107)=0.624, p&lt;0.008</td>
</tr>
<tr>
<td>VI</td>
<td>F1(107)=0.322, p=0.025*</td>
<td>F1(107)=0.624, p&lt;0.001*</td>
<td>F1(107)=0.583, p&lt;0.001*</td>
<td>F1(107)=0.826, p&lt;0.001</td>
</tr>
<tr>
<td>F3(107)=0.195, p&lt;0.001*</td>
<td>F3(107)=0.438, p&lt;0.001*</td>
<td>F3(107)=0.1096, p&lt;0.001*</td>
<td>F3(107)=0.354, p&lt;0.001*</td>
<td></td>
</tr>
</tbody>
</table>

Note: G=gender, VI=Visual Impairment, MPA=moderate physical activity, MVPA=moderate and vigorous physical activity, VPA= vigorous physical activity, ST=sitting time. *= significance at p<0.05

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**Table 2. Differences in Cardiopulmonary Exercise Testing Reveals Abnormalities in Chronic Kidney Disease.**

<table>
<thead>
<tr>
<th>Cardiopulmonary Exercise Testing Reveals Abnormalities in Chronic Kidney Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danielle L. Kirkman, Bryce J. Muth, David G. Edwards, University of Delaware, Newark, DE.</td>
</tr>
</tbody>
</table>

Cardiopulmonary exercise testing (CPX) provides a wide range of information related to cardiopulmonary fitness, mechanisms of limitations in exercise capacity and prognosis. Cardiopulmonary fitness is reduced in patients with chronic kidney disease (CKD) however the mechanisms of reduced fitness and additional prognostic information from CPX in these patients are under investigation.

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

**Board #98 June 3, 9:30 AM - 11:00 AM**

**Self-Reported Physical Activity and Sitting in Adults with Visual Impairments**

Elizabeth K. Lenz, Brooke E. Starkoff, Lauren J. Lieberman, John Foley², Danny Too, FACSM.¹ The College at Brockport-SUNY, Brockport, NY; SUNY-Cortland, Cortland, NY. (Sponsor: Danny Too, FACSM)

Email: egrimm@brockport.edu

(No relationships reported)

**Purpose:** Very few have investigated the physical activity (PA) habits among adults with disabilities, and, more specifically, visual impairments (VI). **Methods:** One hundred and fifteen individuals (age = 36.1 ± 13.9yrs, body mass index = 28±6.9 kg/m²) with varying degrees of VI (B1, n=30; B2, n=25; B3, n=34; B4, n=62) completed the study. Participants completed the International Physical Activity Questionnaire Short Form (IPAQ-S), which assesses self-reported participation in walking, moderate PA (MPA), vigorous PA (VPA), and sitting time (ST). 2x4 Factor ANOVAs were conducted to examine differences in participant characteristics and the impact of gender and VI on PA and ST. **Results:** Participants spent 7.1% walking, 49% in MPA, 49% in VPA, 9.8% in combined moderate and vigorous PA (MVPA), and 44.6% of their awake time sitting. ANOVA results are in Table 1. For MPA there was a significant main effect for gender, with greater participation in men (71.1±46.8mins/d) when compared to women (42.7±30.9mins/d). For MVPA greater participation was found with men (120.4±75.3mins/d) when compared to women (84.2±55.7mins/d). There was a significant interaction between gender and VI in walking with a significant main effect for VI. Take out post hoc analysis was conducted, B2 walked 46.8±39.9mins/d more than B1 (p<0.005). **Conclusion:** Gender impacts time spent in various PA, with men participating in more MPA and MVPA, whereas VI impacts time spent in walking.

Due to the numerous symptoms associated with Parkinson’s disease (PD), many different types of therapies are employed to combat this chronic condition, often placing a great time burden on patients and their families. Targeted exercise is important in order to maintain functional ability and improve muscular strength and endurance. **PURPOSE:** The purpose of this study was compare pre-to-post testing outcomes on measures of fitness and balance as the result of a combined and sequential physical fitness and speech therapy treatment programs for individuals with PD. **METHODS:** Twenty-two individuals with PD (aged 37-83 years old) volunteered for this study. Participants’ initial functional fitness was measured by performance on the Senior Fitness Test (SFT). Initial balance was measured using the MINI-BEST Test (MBT). The study took place over two summers, during the first summer 8 participants participated in a 60-minute session of combined physical and vocal exercises three times a week for four weeks. The second summer, 14 different participants participated in separate physical and vocal training, both types of training were 60 minutes classes. Physical training included a warm up, strength and endurance exercises, static and dynamic balance training, and flexibility/cold down. Modifications were included for individuals to maintain their own pace while partaking in group activities. Upon program completion, the SF and MBT were again assessed to monitor progress. **RESULTS:** The results of the repeated measures ANOVAs revealed no significant group effects. However, there were significant pre-to-post improvements in all of the physical measures of interest including: chair stands (p = .003), arm curl (p = .000), 8 foot-up and-go (p = .000), sit-and-reach (p = .000), 6 minute walk test (p = .010), and total balance score (p = .000). **CONCLUSION:** Subjects improved on measures of fitness and balance regardless of the class format, combined or sequential delivery of physical and vocal exercises. Achieving similar improvements in the combined training class is momentous because only one hour was spent in combined training compared to two hours of separate. These results support continued research on combining physical and vocal exercises for those with Parkinson’s disease or other conditions that impact both domains.

**Board #100 June 3, 9:30 AM - 11:00 AM**

**Combined and Sequential Physical and Vocal Training for Parkinson’s Disease**

Jacylin M. Olson, Linda Scaley Holtz. University of Central Oklahoma, Edmond, OK.

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(No relationships reported)
to be safe and effective in promoting strength and functional capacity in older patients with other chronic disabilities. PURPOSE: This study was to assess the effects of Tai Chi on muscle strength and physical function in patients with PN. METHODS: Thirty-seven participants (men=21, women=16) were randomly assigned to either Tai Chi exercise (Ex, n=20, age: 71 ± 8.29 years) or control group (Con, n=17, age: 75 ± 9.02 years). Exercise training consisted of 12-week progressive Tai Chi (i.e., Yang Style), offered three times per week, 60 minutes each time. Before and after training, muscle strength (One repetition maximum [IRM] for leg extension and leg curl) and physical function [8-foot up-and-go] were evaluated. RESULTS: Muscle strength increased significantly in the Ex group [leg extension: pre = 26.76 ±16.05; post = 46.99±26.84 kg; leg curl: pre = 28.69±13.51; post = 43.55±14.82 kg; (p<0.05)]. In addition, the 8-foot up-and-go decreased significantly in the Ex group [pre = 12.34±5.73; post = 7.45±2.95 sec, (p<0.05)]. No significant changes were observed in the Con group. CONCLUSIONS: Clearly, these findings demonstrate that Tai Chi is capable of increasing lower extremity muscle strength and physical function among patients with PD. Interestingly, the exercise training program was able to reduce the risk for loss of functional mobility (i.e., decreased 8-foot up-and-go time) among the participants.

Individuals with Down syndrome have low peak heart rates coupled with low peak aerobic capacity. In general, DS comprises about 15% of the intellectual disability (ID) population. While low physical activity has been reported among individuals with ID, it has not been systematically determined if persons with ID without DS also have reduced fitness levels and peak heart rates. PURPOSE: To investigate if individuals with ID (without DS) also exhibit lower peak heart rate and peak oxygen uptake than individuals without ID, taking age, sex and body mass index into account. METHODS: A retrospective analysis of a large dataset of individuals with ID (n=100), with DS (n=48) and without ID (n=224) was performed, using multiple linear regression analyses with peak heart rate and peak oxygen uptake as dependent variables, and age, sex, BMI, ID and DS as independent variables. RESULTS: Clearly, these findings demonstrate that Tai Chi is capable of increasing lower extremity muscle strength and physical function among patients with PD. Interestingly, the exercise training program was able to reduce the risk for loss of functional mobility (i.e., decreased 8-foot up-and-go time) among the participants.

Conclusions

### Lower Peak Heart Rate and Oxygen Uptake in Individuals with Intellectual Disabilities

**Purpose**

Study aim: To examine the difference in lower body peak torque for individuals with PD while ON and OFF anti-PD medications.

**Methods**

Seventeen individuals with PD (Hoehn and Yahr stages 2-3), six females and eleven males (mean ± SD: age, 63.6 ± 6.9 years; height, 173.5 ± 11.4 cm; weight, 82.6 ± 16.3 kg) volunteered for this study. Participants were asked to stop taking their anti-PD medications 12 hours prior to testing. The testing session consisted of a pre-test (OFF), immediate anti-PD medication ingestion, one hour seated rest, and a post-test (ON). Using a Biodex System 4, participants performed two five-second isometric maximum voluntary contractions (MVC) on the right leg, for both the quadriceps and hamstrings muscles. A one minute rest period was given between each contraction, with the knee set at a 60° angle. The highest measure was used to calculate peak torque (PT) for each muscle group. The following dependent variables were calculated from the MVCs: Quad PT and Ham PT, relative PT [PT/ mass (BWT)] for both muscle groups (Quad PT/BWT and Ham PT/BWT), and a hamstring to quadriceps ratio [Ham PT ÷ Quad PT (H:Q ratio)]. Five separate independent t-tests were used to analyze the differences between groups. An alpha level of p < 0.05 was set for statistical significance.

**Results**

There were statistically significant differences found between ON and OFF for the following variables (mean ± SD): Quad PT [OFF: 72.2 ± 37.3; ON: 81.1 ± 47.9 (p < 0.01)], Quad PT/BWT [OFF: 37.0 ± 16.9; ON: 41.3 ± 19.2 (p = 0.006)], Ham PT/BWT [OFF: 30.0 ± 13.7; ON: 31.3 ± 13.8 (p = 0.240)], and H:Q ratio [OFF: 0.812 ± 0.189; ON: 0.775 ± 0.178 (p = 0.331)].

**Conclusions**

Our results suggest that individuals with PD exhibited greater muscle performance in the quadriceps while ON anti-PD medications, but not in the hamstring muscles. Future studies should examine other strength measurements, the relationship anti-PD medications have with specific muscle groups, and the time course of pharmacological ingestion.

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**Board #102**

**June 3, 9:30 AM - 11:00 AM**

**Lower Peak Heart Rate and Oxygen Uptake in Individuals with Intellectual Disabilities**

**Tracy Baynard, FACSM1, Thessa IM Hilgenkamp2.**

1University of Illinois at Chicago, Chicago, IL. 2Erasmus University Medical Center, Rotterdam, Netherlands.

Email: tbaynard@uic.edu

(No relationships reported)

### Board #103

**June 3, 9:30 AM - 11:00 AM**

**Lower Body Peak Torque Differences In People With Parkinson Disease On And Off Medications**

**Elaina M. Voss1, Stephanie Combs-Miller2, Eric Dugan2, Lee Everett1.**

1University of Indianapolis, Indianapolis, IN. 2Seattle University, Seattle, WA.

(No relationships reported)

Numerous studies have examined muscle strength in individuals with Parkinson Disease (PD), however there is little evidence examining muscle strength and medication use. PURPOSE: The purpose of this study was to examine the difference in lower body peak torque for individuals with PD while ON and OFF anti-PD medications.

METHODS: Seventeen individuals with PD (Hoehn and Yahr stages 2-3), six females and eleven males (mean ± SD: age, 63.6 ± 6.9 years; height, 173.5 ± 11.4 cm; weight, 82.6 ± 16.3 kg) volunteered for this study. Participants were asked to stop taking their anti-PD medications 12 hours prior to testing. The testing session consisted of a pre-test (OFF), immediate anti-PD medication ingestion, one hour seated rest, and a post-test (ON). Using a Biodex System 4, participants performed two five-second isometric maximum voluntary contractions (MVC) on the right leg, for both the quadriceps and hamstrings muscles. A one minute rest period was given between each contraction, with the knee set at a 60° angle. The highest measure was used to calculate peak torque (PT) for each muscle group. The following dependent variables were calculated from the MVCs: Quad PT and Ham PT, relative PT [PT/ mass (BWT)] for both muscle groups (Quad PT/BWT and Ham PT/BWT), and a hamstring to quadriceps ratio [Ham PT ÷ Quad PT (H:Q ratio)]. Five separate independent t-tests were used to analyze the differences between groups. An alpha level of p < 0.05 was set for statistical significance.

**Results**

There were statistically significant differences found between ON and OFF for the following variables (mean ± SD): Quad PT [OFF: 72.2 ± 37.3; ON: 81.1 ± 47.9 (p < 0.01)], Quad PT/BWT [OFF: 37.0 ± 16.9; ON: 41.3 ± 19.2 (p = 0.006)], Ham PT/BWT [OFF: 30.0 ± 13.7; ON: 31.3 ± 13.8 (p = 0.240)], and H:Q ratio [OFF: 0.812 ± 0.189; ON: 0.775 ± 0.178 (p = 0.331)].

**Conclusions**

Our results suggest that individuals with PD exhibited greater muscle performance in the quadriceps while ON anti-PD medications, but not in the hamstring muscles. Future studies should examine other strength measurements, the relationship anti-PD medications have with specific muscle groups, and the time course of pharmacological ingestion.
Lower extremity function may be affected by pain symptoms in older adults, particularly those with chronic multisite pain. However, it is unknown whether lower extremity strength is associated with pain severity in these individuals. PURPOSE: To investigate the relationship between global pain severity and lower extremity strength in older adults with multisite pain who are at risk of falling. METHODS: Thirty-six older adults (77±8 years, 29 females and 7 males) with multisite pain (≥2 pain sites) who reported falling in the past year or currently used an assistive device were recruited from the Boston area. Global pain severity was measured using the Brief Pain Inventory by the pain severity subscale (0-10). Lower extremity strength was measured by the repeated chair stands test, during which the time required to complete 5 repeated chair stands was recorded. Pearson correlation and linear regression were used to assess the association between pain severity and lower extremity strength. RESULTS: The average pain severity was 4.89±1.70. For the repeated chair stands test, 7 participants were not able to complete the 5 chair stands, and for the rest of the cohort, the range of times to complete the chair stands was from 10.46 s to 36.64 s. Quantiles of time to complete the repeated chair stands were used in the linear regression. Repeated chair stands time was positively associated with pain severity (r=0.36, p=0.03). This association was diminished after multivariable adjustment using linear regression. CONCLUSION: Global pain severity may be associated with decreased lower extremity strength in older adults with multisite pain who are at risk of falling. This finding will need to be confirmed by future larger studies. (Supported by NIH Grant R21 AG043883)
These results suggest when determining peak torque from isokinetic shoulder IR and ER data at 80° and 180°/s, the data be windowed at 90% of the target velocity. Future research will consider the effects of windowing on total work and average power.

### Results

#### Impact of Hybrid Delivery on Learning Outcomes in Exercise Physiology

**Michele M. Fisher, Nathalie Pfeifer. Montclair State University, Montclair, NJ.**

(No relationships reported)

**PURPOSE:** The purpose of this study was compare the effectiveness of a traditional face to face class format and hybrid class format (partially online instruction) on learning outcomes in exercise physiology. METHOD(S): Fifty five undergraduate students who were enrolled in one of two sections of Exercise Physiology at a University in the northeastern United States participated in the study. Participants were upper level students majoring in athletic training, exercise science, or physical education. The traditional section (n = 27) met twice a week for a total of 150 min of lecture and 50 min of laboratory activities. The hybrid section (n = 28) met once per week for a 75-min lecture and 50-min laboratory. For the hybrid section, the remaining 75-min lecture was replaced with a link to an online lesson that incorporated class notes, illustrations, physiology animations, and interactive activities. Students accumulated points throughout the course to serve as a record that they completed the assigned content. Measures of student learning included scores on three written exams and the overall semester average. Additionally, a questionnaire with a series of Likert-scale items was administered at the end of the semester to evaluate student perceptions of delivery mode. Procedures for obtaining informed consent at the beginning of the semester and collecting data were approved by the University Institutional Review Board. The comparison of exam and semester grades was accomplished through an independent t test. Perceptions of course delivery were evaluated with a 2x2 Chi Board. The analysis of data was performed through SPSS 21.0.

**RESULTS:** The mean scores for both the PL and SC subscales decreased from pre to post (PL: 3.6±0.6 vs. 3.1±0.6, t(167) = -2.802, p <.001, d = .5, the flipped classroom was not detrimental to student learning outcomes but was not superior. Writing clarity and APA format need emphasis. Educators may wish to consider the time involvement developing flipped classroom podcasts and classroom activities whether implementation may be beneficial to their course. The podcasts may aid facilitation towards hybrid or online delivery.

**CONCLUSIONS:** These data indicated no differences in final paper rubric overall scores and final exam scores between traditional lecture and flipped classroom. The flipped classroom was not detrimental to student learning outcomes but was not superior. Writing clarity and APA format need emphasis. Educators may wish to consider the time involvement developing flipped classroom podcasts and classroom activities whether implementation may be beneficial to their course. The podcasts may aid facilitation towards hybrid or online delivery.

**Supported by a Research Council Curriculum Enhancement Grant from Winthrop University (CE13008).**

### Changes in College Students’ Perceptions of Required Blogging in an Exercise and Nutritional Sciences Course

**Madlyn I. Frisard, Tanya M. Halliday. Virginia Tech, Blacksburg, VA.**

(No sponsors)

**PURPOSE:** To assess students’ perceptions of blogging on perceived learning (PL) and sense of community (SC) at the beginning (pre) and end of the semester (post), and compare perceptions of undergraduate (UG) and graduate (GRAD) students. METHOD(S): UG (pre: n=78, post: n=50) and GRAD (pre: n=20, post: n=17) students from a human nutrition, foods, and exercise department were enrolled in semester long seminar courses which required blogging. An anonymous 5-point Likert-scale (1=strongly disagree to 5=strongly agree) survey was administered to assess students’ perceptions of blogging on PL (7 items) and SC (6 items) pre and post. Scores for each subscale were averaged and t-tests were used to determine differences in perception pre to post and between UG and GRAD students. Data are presented as mean±SD.

**RESULTS:** Mean scores for both the PL and SC subscales decreased from pre to post (PL: 3.6±0.6 vs. 3.4±0.7, p=0.02; SC: 3.1±0.7 vs. 2.8±0.8, p<0.01). The decrease in agreement was driven by UG students (PL: 3.7±0.6 vs. 3.4±0.6; p=0.03; SC: 3.2±0.7 vs. 2.9±0.8, p<0.004), as no difference was detected in GRAD students’ perceptions (p>0.05 for PL and SC) pre to post. At baseline, UG students were more likely to agree that blogging could enhance PL and SC than GRAD students (PL: 3.7±0.6 vs. 3.4±0.5, p<0.04; SC: 3.2±0.7 vs. 2.6±0.5, p<0.01). Perceptions did not differ between UG and GRAD at the conclusion of the semester (p>0.05 for PL and SC).
CONCLUSIONS: UG students were less likely to agree that blogging could enhance learning or promote a sense of community at the end of the semester compared to the beginning. GRAD student’s perceptions were unchanged. Future research evaluating course characteristics and structure of blogging requirements that may enhance student’ perceptions, as well as research assessing objective learning outcomes are warranted.

E-29 Free Communication/Poster - Foot and Ankle Mechanics
Friday, June 3, 2016, 7:30 AM - 12:30 PM
Room: Exhibit Hall A/B

2590 Board #113 June 3, 11:00 AM - 12:30 PM
Altered Frontal Ankle Neuromechanics in Subjects with AI Compared to Copers and Healthy Controls
Matthew Gregory1, S. Jun Son1, Hyunsoo Kim2, Matthew K. Seeley1, J. Ty Hopkins, FACSM1, Brigham Young University, Provo, UT; 2West Chester University, West Chester, PA.
Email: mg.matt.soccer@gmail.com
(No relationships reported)

Lateral ankle sprains often result in ankle instability (AI). However, some individuals (copers) who have a history of a sprain(s), do not exhibit residual symptoms. Defining neuromechanics of copers can help us clarify successful movement strategies to avoid AI.

PURPOSE: To examine frontal-plane ankle angles, moments, and peroneus longus (PL) activation during a jump task.

METHODS: 66 subjects (M=42, F=24; 22.2±2 yrs, 173.8±8 cm, 71.4±11 kg) consisted of 22 AI (77.1±15.3% FAAM ADL, 62.5±20.4% FAAM Sports, 2.0±1.1 sprains), 22 Copers (FAAM ADL & Sports = 100%, sprains = 2.0 ± 1.1), and 22 healthy controls. Subjects performed 5 jumps, consisting of a max vertical jump, landing on a force plate, and transitioning immediately to a side jump, while the dependent variables were collected during stance. Functional linear models (α=.05) were used to detect mean difference between groups. If functions and corresponding effects sizes (95% confidence intervals) did not cross the zero, then significant differences existed (p<.05).

RESULTS: Figure 1 shows that while copers demonstrated similar frontal ankle angles to normals, AI subjects exhibited up to 2.5° less dorsiflexion during 30-75% of stance, relative to normals (p<.05). While copers exhibited similar neuromechanics to normals in sagittal ankle moments, TA and MG activation, AI demonstrated up to 0.5 Nm/kg less plantarflexion moment, 2.5% less TA and 47% less MG activation (p<.05).

CONCLUSION: Copers show neuromechanics similar to normals at times, and similar to AI at others. Reduced plantarflexion moments and MG activation suggest that AI may rely more on static stabilizers than dynamic stabilizers, which could increase impact loads on tibialcartilage surface.

2592 Board #115 June 3, 11:00 AM - 12:30 PM
High Arch Foot Provide Positive Compensation to Maintain Balance in Those with Chronic Ankle Instability
Hyung-pil Jun1, Taeyoung Kang2, Kyeong Tak Song1, Sae Yong Lee1, 1University of Idaho, Moscow, ID; 2Yonsei University, Seoul, Korea, Republic of; 1University of North Carolina, Chapel Hill, NC.
(No relationships reported)

The function of the intrinsic muscle as a core of foot is emphasized in postural control. The positive compensation mechanism of the intrinsic muscle that maintains balance in patients with chronic ankle instability (CAI) has not been examined.

PURPOSE: To investigate the role of arch types to maintain balance in those with CAI.

METHODS: A total of 50 subjects [25 (12 low-arch, 13 high-arch) non CAI (age: 24.2±2.79 years; height: 173.46±8.60 cm; weight: 69.41±13.66 kg) and 25 (12 low-arch, 13 high-arch) CAI (age: 25.88±2.92 years; height: 171.86±7.28 cm),
Ankle sprains often lead to ankle instability (AI), however, some individuals (copers) who have sprained their ankles but do not go on to develop AI. Using copers as a comparison group will help us understand movement neuromechanics that underlie AI.

**PURPOSE:** To examine sagittal-plane hip angles, moments, gluteus maximus (GX) and medial hamstring (MH) activation during a max jump task.

**METHODS:** 66 subjects (M=42, F=24; 22.2±2 yrs, 173.8±8 cm, 71.4±11 kg) consisted of 22 AI (77.1±15.3% FAAM ADL, 62.5±20.4% FAAM Sports, 4.1±2.8 sprains), 22 Copers (100% FAAM ADL & Sports, 2.0±1.1 sprains), and 22 healthy controls. Subjects performed 5 jumps, consisting of a max vertical jump, landing on a force plate, and transitioning immediately to a side jump, while the dependent variables were collected during stance (initial foot-contact to toe-off). Functional linear models (p<.05) were used to detect mean difference between groups. If functions and corresponding effect sizes (95% confidence intervals) did not cross the zero, then significant differences existed (p<.05).

**RESULTS:** Figure 1 shows that while copers demonstrated similar sagittal-plane hip angles, moments, and GX activation, AI subjects demonstrated up to 5° greater hip flexion, 0.5 Nm/kg hip extension moment, and 15% less GX activation compared to normals (p<.05).

**CONCLUSIONS:** Increased hip flexion angles and extension moments suggest that AI subjects adopt altered hip neuromechanics, compared to copers and normals. Reduced GX activation as opposed to greater hip flexion angles and extension moments suggest that sagittal-plane trunk motion may play a role in these altered hip neuromechanics in AI subjects.

**REFERENCES:**

(No relationships reported)
 Lower leg muscles following acute ankle sprain (AAS) are consistently found to be dysfunctional, resulting in disability and poorer health-related quality of life in patients with AAS. Maximum amplitude of Hoffmann reflex (H) in ankle muscles has been associated with self-reported ankle dysfunction following AAS, however it is unknown whether H-reflex latency correlates with ankle function in patients with AAS. PURPOSE: To examine the relationship between self-reported ankle function and H-reflex latency in patients with AAS. METHODS: Eleven subjects with AAS within 72 hours of the injury onset (8 males, 3 females; age=23±6.0 years; height=177.3±9.4 cm; mass=78.9±9.7 kg) participated. The Foot and Ankle Ability Measure (FAAM) was administered to quantify self-reported ankle function during activities of daily living (ADL) and sports activities. Hoffmann reflex tests of the soleus, fibularis longus, and tibialis anterior were performed on injured limbs. The recruitment curve of the H-reflex was mapped for each muscle. Main outcomes were the FAAM-ADL and Sport scores, with a higher score representing a higher level of ankle function. For the other outcome, latency of the maximum H-reflex amplitude was measured by recording the time it takes for the H-reflex to appear relative to the introduction of the stimulus. Pearson correlation coefficients were calculated between the FAAM and H-reflex latency measures. The alpha level was set at <0.05. RESULTS: A significant inverse correlation was found between FAAM-Sport and the soleus latency measures (r=-0.611, p=0.046), indicating that as the FAAM-Sport scores decrease, the H-reflex latency of the soleus increases. Other correlation analyses were not found to be significant (p<0.05). CONCLUSION: Thus, patients with AAS who perceive lower levels of ankle function during sport activities may have slower score decreases, the H-reflex latency of the soleus increases. Other correlation analyses the soleus latency measures (r=-0.611, p=0.046), indicating that as the FAAM-Sport: A significant inverse correlation was found between FAAM-Sport and H-reflex latency of the soleus.

Comorbid conditions that utilize plantar cutaneous sensations to maintain good postural control among those with chronic ankle instability (CAI) have not yet been reported. PURPOSE: To determine if individuals with CAI demonstrate altered postural control after a diminished plantar cutaneous sensibility than non CAI on postural control. METHODS: Forty five CAI (age: 24.82±2.77 years; height: 170.84±7.50 cm; weight: 66.77±11.70 kg) and non CAI (age: 24.49±2.55 years; height: 173.53±8.29 cm; weight: 69.62±13.07 kg) were recruited. Independent variables of this study were the groups (CAI or non CAI) and time (pre or post ice immersion). Subjects immersed both feet in an ice water for 10 minutes and performed three trials of a single-leg stance balance test with their eyes closed while standing on a forceplate for 10 seconds. The traditional center of pressure (CoP) measures and time to boundary (TTB) measures were analyzed. A two-way by 2 mixed model of repeated measures of ANOVA was used to analyze differences.

RESULTS: There were significant interactions in SD of mediolateral CoP (SDx: F3,176=13.96; P<0.00), mediolateral CoP range (RangeX: F3,176=15.44; P<0.00), and mean anteroposterior TTB (meanTTBy: F3,176=5.93; P<0.01). In SDx, CAI with pre ice immersion (Pre-CAI: 0.84±0.14) showed small variability in postural control than CAI group with pre ice immersion (Pre-nonCAI: 1.02±0.16), non CAI with post ice immersion (Post-nonCAI:1.04±0.18), and non CAI with pre ice immersion (Pre-nonCAI: 1.02±0.16). For the RangeX, Pre-CAI (3.43±0.54) was more stable in postural control than Pre-nonCAI (4.09±0.53) and Post-nonCAI (4.15±0.58); CAI with post ice immersion (Post-CAI: 3.73±0.61) was more stable in postural control than Pre-nonCAI (4.09±0.53) and Post-nonCAI (4.15±0.58). In meanTTBy, Pre-CAI (0.79±0.19) showed more postural control than Pre-nonCAI (0.64±0.20) and Post-nonCAI (0.66±0.18).

CONCLUSIONS: Since CAI group show better postural control than non CAI, slope of postural control in CAI was steeper than non CAI which indicates CAI utilized more plantar surface feedback information. In this sense, the better postural control ability of CAI group may be a result of compensatory mechanism of plantar surface sensation.
Lateral ankle sprains often develop into ankle instability (AI), but some individuals (copers) who have sprained their ankles demonstrate no residual symptoms. Identifying neuromechanical patterns between AI and copers may help identify risks that underlie AI.

**METHODS:izado** subjects underwent 10 trials of a single leg land on a force plate, and transitioning immediately to a side jump, while the dependent variables were collected during stance (initial foot-contact to toe-off). Functional linear models (α=0.05) were used to detect mean difference between groups. If functions and corresponding effects sizes (95% confidence intervals) did not cross the zero, then significant differences existed (p<0.05).

**RESULTS:** Figure 1 shows that AI and normal subjects exhibited up to 5° less hip abduction than copers, which was associated with 15% and 39% less GM and AL activation, respectively (p<0.05).

**CONCLUSIONS:** Each of three groups demonstrate unique neuromechanics during a max jump task. Less hip abduction in AI subjects than copers might result in a more vertical position during landing. This strategy may allow AI subjects to maintain their center of mass closer to the center of pressure during stance. However, less GM activation in AI subjects may reduce hip joint stability, potentially increasing a risk of lateral sprains.

One of the major issues following an acute lateral ankle sprain is the development of chronic ankle instability (CAI). The existing research has determined that clinician-delivered plantar massage improves postural control in those with CAI. However, the effectiveness of self-administered treatments and the underlying cause of these improvements remain unclear. **PURPOSE:** To determine the effectiveness of a self-administered plantar massage treatment in those with CAI as well as to determine if the postural control improvements were due to the stimulation of the plantar cutaneous receptors.

**METHODS:** 20 participants with self-reported CAI (21.5±1.8yrs, 166.5±5.7cm, 68.5±14.2kg) completed three test sessions. Three 5-minute treatments were given in a counter balanced order including: a clinician-delivered manual plantar massage (MANUAL), a patient-delivered ball massage (BALL), and a clinician-delivered sensory brush massage (BRUSH). Postural control was assessed using single leg balance with eyes open and closed. A repeated measures multivariate ANOVA with a significance level of p<0.05 was conducted and hedge’s g effect sizes (ES) and 95% confidence intervals were calculated to provide clinical meaningfulness to the results.

**RESULTS:** Both static postural control outcomes: center-of-pressure (COP) velocity (MANUAL: -0.37±0.60, ES: 0.79 (0.14 to 1.43), p<0.013; BALL: -0.61±0.68, ES: 0.99 (0.33 to 1.66), p<0.013; BRUSH: -0.32±0.67, ES: 0.92 (0.27 to 1.55); 95% COP ellipse (MANUAL: -1.64±0.27, ES: 0.69 (0.05 to 1.33), p<0.014; BALL: -1.64±0.28, ES: 0.68 (0.04 to 1.32), p<0.013; BRUSH: -1.03±1.51, ES: 0.78 (0.14 to 1.43), p<0.007) improved following each of the interventions. However, the magnitude of improvements did not differ between the interventions as all between group confidence intervals crossed zero. **CONCLUSION:** The results demonstrate that a single 5-minute massage treatment improves static postural control in CAI patients and that these improvements can be obtained through self-treatment. The results also provide empirical evidence that the postural control improvements are due to the stimulation of the plantar cutaneous receptors.

One male Long Evans rats were surgically instrumented with fine wire electromyographical (EMG) electrodes that were implanted in the tibialis anterior (TA), gastrocnemius (MG), vastus lateralis (VFL), and biceps femoris (BF) muscles. Baseline EMG were recorded while rats walked on a motor driven treadmill (16mpm) and then a closed lateral ankle sprain was induced by overextension of the lateral ankle ligaments. After ankle sprain, the rats were placed back on the treadmill every 24 hours for 7 days of post-sprain EMG data. Altered muscle activity was quantified via changes in muscle onset time, phase duration, and sample entropy that were compared to baseline EMG calculated for sample entropy to quantify the change in muscle activity outside of measurement error that reflected true change. **RESULTS:** Compared to baseline, BF and TA muscles was found to exhibit delayed onset time (ms; BF:baseline=+16.7±5.4; day0.5:23.6±6.4; TA: baseline=367.0±6.4; day3:362.5±5.9; day6:357.3±3.9; p<0.05) and longer phase durations were observed for the VL and TA (ms; VL:baseline=321.9±9.2; day3:301.3±10.1; day4:401.4±9.3; day6:364.6±10.5, TA:baseline=105.3±14.5; day4:154.9±9.7; day6:141.9±16.2, P<0.05). After sprain, greater sample entropy was found for the VL and TA (VL:baseline=0.69±0.3; day0.5:0.93±0.4; day7:0.85±0.3; TA:baseline=0.62±0.4; day0.5:0.90±0.5, P<0.05).

**CONCLUSION:** Manually inducing an ankle sprain in a rat via overextension of the lateral ankle ligaments alters the coordination of VL and TA muscles that exceeded the MDC of the baseline data.

Mechanisms(s) that contribute to the development of chronic ankle instability are not understood. Previous investigators have developed a hypothetical model, where neuromuscular alterations that stem from damaged ankle ligaments are thought to underlie AI. **CONCLUSIONS:** Altered muscle activity of two periarticular muscles and two proximal muscles of the rat hindlimb following an ankle sprain. METHODS: Five (16 weeks-of-age, 400±13.5g)
PURPOSE: To evaluate if delayed access to a running wheel, as a model of prolonged rest, improves postural control outcomes in mice with a severe ankle sprain.

METHODS: Eighteen male mice (CBA/J), at seven weeks of age, underwent an ankle sprain surgery where the right anterior talofibular ligament and calcaneofibular ligament were transected. Mice were then randomized to one of three groups representing when access to a running wheel post-surgery was gained: a 3-days, 1-week, and 2-weeks. All mice underwent balance testing before surgery (Baseline) and consistently post-surgery up to 54-weeks post injury. Balance was defined as the number of right hindfoot slips that occurred while crossing a 9cm round beam 1m in length. A liberal alpha level of .05 was used to assess Group × Time differences in this preliminary investigation.

RESULTS: Foot slips significantly increased at 4-weeks post injury (p<0.05) and remained increased at 54-weeks post injury (4.4±1.3 compared to baseline 1.8±0.4). A Group × Time interaction (p<0.05) was also observed for foot slips as the 3-day group had significantly more slips at 54-weeks (5.3±0.75) than the 1-week (3.6±1.75) and 2-week (4.2±0.79) groups.

CONCLUSIONS: Shorter recovery periods appear to improve long-term postural control outcomes following a surgically induced severe ankle sprain in male mice. Supported by the Faculty Research Grant Program at UNC Charlotte.

2603 Board #126 June 3, 11:00 AM - 12:30 PM
Lower Extremity EMG Alterations in Subjects with Ankle Instability Clustered by Motion
J. Ty Hopkins, FACSM1, Hyunsoo Kim2, S. Jun Son1, Shane Reese3, Matthew K. Seeley1. 1Brigham Young University, Provo, UT. 2Texas State University, San Marcos, TX. 3University of Miami, Coral Gables, FL. Email: tyhopkins@byu.edu (No relationships reported)

The neuromechanics associated with movement in an ankle instability (AI) population have shown large variability, making it difficult to identify specific deficits that perpetuate the chronic nature of the problem. PURPOSE: To describe EMG patterns in 5 distinct kinematic clusters during a jump task in subjects with ankle instability (AI).

METHODS: 100 subjects (22.3±2.2 yrs) with a history of ankle sprains (4.4±2.7) and EMG electrodes for measurement during a jump task (5 trials) consisting of a max vertical jump and transitioning immediately to a side jump. Lower extremity kinematics were reduced to a single curve using principle component analysis, and the resultant curves were clustered with a Dirichelet process. Five distinct clusters were identified, and normalized EMG data from each cluster were compared to EMG data from a matched healthy control (n=100, 22.2±3.0 yrs) using functional linear models and a Group × Time interaction (p<0.05).

RESULTS: Multiple, distinct EMG patterns were identified in clusters of AI subjects. Generally, distal (ankle) muscles demonstrated decreased muscle activation, while proximal muscles showed increases. AI subjects should be defined according to their movement strategy in order to better identify neuromechanical alterations that may perpetuate AI.

2604 Board #127 June 3, 11:00 AM - 12:30 PM
Analysis of Postural Stability During Bipedal Stance Following Acute Lateral Ankle Sprain
Hyung Rock Lee1, Jooung Kim2, Kyung-Min Kim3. 1University of Central Arkansas, Conway, AR. 2Texas State University, San Marcos, TX. 3University of Miami, Coral Gables, FL. Email: rlee@uca.edu (No relationships reported)

Lateral ankle sprain is one of the most common lower extremity injuries experienced in sport. Multiple systematic reviews suggest that acute lateral ankle sprain (ALAS) alters motor and postural control in unipedal stance. However, research on the bipedal standing control following ALAS remains inconclusive. PURPOSE: To determine effects of ALAS on postural control in bipedal stance. METHODS: Eighteen subjects with ALAS within 3 days of the injury onset (8 males and 10 females: 17 Grade I and 1 Grand II ALAS; age=21.4 ± 2.7 years; height=68.7 ± 3.7 in; mass=164.7±29.6 lb) and 18 health controls without any history of lower extremity injury onset (age=21.9 ± 2.2 years; height=66.3 ± 3.3 in; mass=144.6±23.7 lb) completed the NeuroCom Sensory Organization Test (SOT) consisting of 6 different postural tasks. Postural stability was determined with an equilibrium score (ES) and the individual sensory system scores: Somatosensory (SOM), Visual (VIS), Vestibular (VEST), and Vision Preference (VREF) scores. RESULTS: An independent sample t-test was performed to determine any differences between the two groups on equilibrium scores and individual sensory system scores. The results revealed no statistically significant differences between bipedal stance with ALAS and healthy control: condition 1 ES (t(34)= 0.280); condition 2 ES (t(34)= -1.485, p=.541); condition 3 ES (t(34)= -1.239, p=.224); composite equilibrium score (t(34)= -1.594, p=.120). Condition 4 ES (t(34)= -0.646, p=.520), condition 5 ES (t(34)= -0.685, p=.498), and condition 6 ES (t(34)= -1.239, p=.22); composite equilibrium score (t(34)= -1.098, p=.280; SOM (t(34)= -0.048, p=.962), VIS (t(34)= -0.468, p=.643), VEST (t(34)= -0.618, p=.541), and VREF (t(34)= -1.485, p=.147). The alpha level was set at <.05. CONCLUSION: Based on the results, there were no statistically significant differences of the SOT in the bipedal standing following ALAS. Since limited research has been conducted to examine postural stability deficits after ALAS, further research is warranted to determine significant postural stability changes in bipedal standing following ALAS.
Chronic ankle instability (CAI) is a condition that often results from lateral ankle sprains and is characterized by pain, range of motion alterations, neuromuscular changes, decreased postural control, subjective disability, high recurrence rate, and post-traumatic osteoarthritis. Differences have been reported in kinematics, kinetics, and surface electromyography (EMG) during many functional tasks including gait and jumping landings. These measures are often collected independently and there is limited research on these measures simultaneously during a movement task.

Purpose: To assess the kinematics and kinetics of the lower extremity and EMG of the shank musculature above resting activity were collected while performing 10 drop jumps off a 30cm box onto an instrumented force plate of 50% of the participant’s height away. Means and 90% confidence intervals were calculated for all measures from 200ms prior to forefoot contact to 100% post contact with the forceplate. Results: CAI patients had greater inversion (107ms to 200ms post contact; MD=4.61±2.55”) and dorsiflexion excursions (11ms to 77ms post contact; MD=5.33±2.07”), increased sagittal ankle, kinetics (15.9±4.5 ms to 77ms post contact; MD=0.17±0.09, 107ms to 200ms post contact; MD=0.23±0.03) and decreased knee sagittal kinetics (95ms to 200ms post contact; MD=8.23±0.97/Nm/kg) compared to controls after landing. CAI patients also had greater peroneal activity following forefoot contact (17ms to 128ms post, MD=10.56±4.52). Conclusion: CAI patients presented with differences in their landing strategy and may be related to continued instability in this population. Greater muscle repositioning and peroneal longus activation were found following contact with the forceplate which may indicate a neuromuscular dysfunction within the peroneals to prevent an inverted foot position in CAI patients. The DVJ task should be considered in the rehabilitation of CAI patients.

CONCLUSIONS: Rest interval time was not an appropriate fatigue factor for performance of the SEBT in individuals with CAI. However, muscle activation and multijoint motion of the lower extremity were able to discriminate between individuals with and without CAI.

No relationships reported.

Shorter rest intervals between trials during functional tests negatively affect performance. While a 10 or 20 second rest interval is typically used during the Star Excursion Balance Test (SEBT), it is not known whether this is adequate for recovery between trials. If this results in acute fatigue, muscle activation and kinematics may be impacted. It is unknown whether there are differences in response between healthy individuals and those with chronic ankle instability (CAI). PURPOSE: To determine whether different rest intervals during the SEBT and the presence of CAI affect muscle activation and kinematics of the lower extremity during the SEBT.

Methods: 24 healthy (age: 22.7±1.6 yrs) and 24 CAI subjects (age: 21.9±2.3 yrs) participated. Subjects performed 3 trials in each of 3 directions (anteromedial; AM, anterolateral; AL, posterior; P) in random order. A total of 3 visits were needed to complete the 3 rest intervals (10, 20, 40 seconds). Normalized maximum reach distance, electromyographic activation of tibialis anterior (TA), peroneus longus (PL), and medial gastrocnemius (MG) muscles, and dorsiflexion (DF) and tibial internal rotation (TIR) excursions were calculated and compared between groups in each direction for each rest interval.

Results: Normalized maximum reach distance in CAI subjects was significantly greater than healthy subjects in all directions (AM: 89.9±5.9 vs. 74.9±2.0, AL: 88.6±5.7 vs. 83.3±4.8, P: 102.1±6.8 vs. 92.3±9.2). Healthy subjects demonstrated significantly greater mean amplitude (MA) of TA in all direction (AM: 38.3±22.3 vs. 21.5±11, M: 37.7±13.5 vs. 24.2±9.4, P: 50.6±24.3 vs. 27.8±12.3, M: 47.1±32.4 vs. 28.8±19.7, P: 40±33.2 vs. 26.3±17.3). CAI subjects demonstrated significantly greater DF excursion in all direction (AM: 15.9±5.4 vs. 20±5.3, M: 14.6±6.1 vs. 19.7±4.3, P: 12±8.5 vs. 17.5±4.5) and TIR excursion in only anterior direction than healthy subjects (AM: 6.7±2.7 vs. 8.7±2.9).

CONCLUSIONS: Rest interval time was not an appropriate fatigue factor for performance of the SEBT in individuals with CAI. However, muscle activation and multijoint motion of the lower extremity were able to discriminate between individuals with and without CAI.

No relationships reported.

The importance of foot strength to proper arch mechanics has been recently recognized. Foot strengthening has been shown to increase the static height of the arch. However, it is not known whether these effects carry over into dynamic activities.

PURPOSE: To determine if an 8-wk foot strengthening program reduces the vertical deformation of the arch during the mid-stance in running.

Methods: 35 healthy, recreational runners (18 males, age 24±3.8 yrs) have completed this ongoing study. To date, 22 subjects are in the control group (CON: 8 wks of their normal running) and 13 are in the treatment group (TX: 8 wks of foot strengthening, along with their normal running). Static arch height and dynamic arch drop were measured at baseline and following the strengthening program using a motion analysis system. Markers were placed on the proximal and distal ends of the 1st and 5th metatarsals. These 4 markers were recorded during static stance (for AH) and during single leg mid-stance (for arch drop) during treadmill running at a self-selected pace. 10-second trials were averaged. The Arch Height (AH) was calculated as the perpendicular distance from the marker at the proximal 1st metatarsal to the plane formed by the other 3 markers. Arch drop was measured as the AH during mid-support relative to the static AH.

Results: No differences were noted in arch drop between the groups as a whole (Table 1). However, there was a significant increase in arch drop from baseline to
The medial longitudinal arch has been classified as the central core of the foot. Its structure and integrity during running largely depend on the strength and function of intrinsic and extrinsic foot muscles. Purpose: To observe strength and size changes in intrinsic foot muscles (IFM) between a foot strengthening exercise group (FS), a group walking in minimalist shoes (MSW) and a control group (C). Methods: 22 healthy college subjects (age 22.6±2.5 years, height 174.2±10.8 cm, weight 69.3±12.6 kg) were recruited and randomly assigned to either the FS, MSW, or C and monitored over 8 weeks. The FS followed a series of progressive exercises designed to target IFM while the MSW began walking 2,500 steps daily reaching 7,000 steps daily by the end of the study. All groups maintained consistent running mileage. Strength testing was completed at week 0 and 8 using a customized dynamometer for doming, great toe flexion and lateral toe flexion. Ultrasound images were recorded at week 0 and 8 of the abductor hallucis (ABDH), quadratus plantae (QP), flexor digitorum brevis (FDB) and flexor hallucis brevis (FHB). Measurements included the cross-sectional areas (CSA) of the ABDH, QP, FDB and thickness of the FHB. Data were analyzed using an ANCOVA with a post-hoc test to determine differences in size and strength within the groups.

Results: See table below for specific results.

Discussion: The preliminary data suggest that increasing IFM size and strength can be done by following an exercise protocol. IFM strength can also occur while walking in minimalist shoes. Increases in doming strength among all groups may be due to a potential learning curve.

Table 1. Size and strength changes from week 0 to week 8

<table>
<thead>
<tr>
<th>Group</th>
<th>ABDH (cm²)</th>
<th>QP (cm²)</th>
<th>FDB (cm²)</th>
<th>FHB (cm³)</th>
<th>Great Toe (kg)</th>
<th>Lateral Toes (kg)</th>
<th>Doming (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.06 ± 0.15</td>
<td>-0.02 ± 0.16*</td>
<td>0.03 ± 0.15</td>
<td>0.02 ± 0.07</td>
<td>0.43 ± 2.38</td>
<td>0.02 ± 2.38</td>
<td>3.51 ± 4.25*</td>
</tr>
<tr>
<td>MSW</td>
<td>0.05 ± 0.25</td>
<td>0.04 ± 0.03*</td>
<td>0.03 ± 0.06*</td>
<td>0.01 ± 2.19*</td>
<td>1.66 ± 2.78*</td>
<td>5.20 ± 3.12*</td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>0.16 ± 0.15*</td>
<td>0.17 ± 0.32*</td>
<td>0.18 ± 0.17*</td>
<td>1.89 ± 2.13*</td>
<td>1.91 ± 2.02*</td>
<td>4.11 ± 3.56*</td>
<td></td>
</tr>
</tbody>
</table>

*significant mean differences between weeks 0 and 8 (p<0.05)

An important characteristic of bone is its ability to adapt to applied loads (Wolff’s Law). The magnitude of load and number of loading cycles influence whole body and site-specific bone mineral density (BMD). Acute and overuse metatarsal fracture risk may relate to site specific BMD. However, limited research has examined the relationship between loading and metatarsal BMD. PURPOSE: To examine the relationship between BMD and loading of the second metatarsal during gait.

METHODS: Twenty male subjects volunteered to participate in this study (height 186.1cm, mass 81.0kg, age 18.3yrs). A recently developed dual x-ray absorptiometry (DXA) method was used to scan the second metatarsal. BMD was calculated from the total area of the metatarsal. Three trials of barefoot gait at self-selected speed were also collected with a pressure distribution platform. DXA images were overlaid onto the pressure distribution trials and a customized mask was created to calculate regional pressure distribution directly under the 2nd metatarsal. The maximum force, peak pressure, force-time integral, and the relative-load were calculated within the metatarsal region for each trial. Bivariate correlations were used to determine relationships among variables (p<0.05).

RESULTS: A statistically significant correlation was found between second metatarsal BMD and second metatarsal bone loading (maximum force r=0.72 p=0.001, peak pressure r=0.42 p=0.07, force time integral r=0.69 p=0.001, relative load r=0.65 p=0.002).

CONCLUSIONS: A strong correlation was found between the BMD and the loading under the second metatarsal during gait in healthy males. Future work should determine if loading asymmetries predict differences in BMD across all metatarsals.
The arch of the foot is comprised of 4 layers of muscles, which help to control its downward motion with every step. Strengthening these muscles of the arch may increase overall arch control.

**Purpose:** To compare the effect of foot strengthening and minimal shoe walking on Arch Height Index (AHI) and Arch Excursion in runners.

**Methods:** 35 healthy runners (18 males, age: 22.62 years) were randomly assigned to one of 3 groups: control (CON), foot strengthening (FS), or minimalist shoe walking (MSW). The CON group continued with their normal activities. The FS group performed exercises to strengthen the arch muscles. The MSW group walked a prescribed number of steps in minimalist shoes each day, progressing from 2,500 to 7,000 steps. Photos of the foot were taken during sitting and standing. The dorsum height (at 50% of foot length) and truncated foot length were measured in order to calculate the Arch Height Index. This was done at baseline and post training.

**Results:** Differences were not found in static AHI between between baseline and post-training across all 3 groups in both sitting and standing (mean AHI-sit=.37.03, p=.27; mean AHI-stand=.35.03, p=.71). However, a significant time by group interaction was found across all 3 groups in both sitting and standing (mean AHI-sit=.37.03, p=.27; mean AHI-stand=.35.03, p=.71). However, a significant time by group interaction was found across all 3 groups in both sitting and standing (mean AHI-sit=.37.03, p=.27; mean AHI-stand=.35.03, p=.71).

**Conclusion:** Walking in minimalist shoes, as well as foot strengthening both reduce the amount the arch deflects when going from sitting to standing, indicating strengthening has occurred.

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Foot structure has been implicated in lower extremity injury. Research has shown that athletes with aberrant foot structure exhibit unique biomechanics during running and landing tasks. While foot function has been suggested to underlie distinct injury patterns in high-(HA) compared to low-arched (LA) athletes, no previous research has addressed the contribution of individual joints to load attenuation in a landing task.

**Purpose:** The purpose of this study was to quantify differences in individual joint contributions to total negative work during a landing task in high- compared to low-arched athletes.

**Methods:** Ten HA and 10 LA female athletes performed five landing trials from a height of 0.3 meters while three-dimensional kinematics and ground reaction forces were collected using an 8-camera motion capture system (240 Hz, Vicon) and a force platform (960 Hz, AMTI), respectively. Lower extremity joint work values were calculated using Visual 3D (C-Motion, Inc.). Relative contributions of each joint to negative joint work was calculated as a percentage of the individual joint work relative to total joint work. Independent samples t-tests were used to compare relative joint work values for the lower extremity.

**Results:** HA athletes exhibited significantly smaller total negative joint work compared to LA athletes (p<0.016; HA: 1.79±0.43; LA: 2.16±0.26). HA athletes had significantly smaller knee (p=0.046; HA: 0.98±0.36; LA: 1.22±0.23) and hip joint work values (p=0.019; HA: 0.22±0.18; LA: 0.39±0.16). HA and LA athletes had similar ankle joint work values (p=0.252; HA: 0.99±0.16; LA: 0.55±0.12). When comparing relative joint work, HA athletes exhibited greater ankle contributions to total negative work than LA athletes (p = 0.032; HA: 35.1±25.7%; LA: 25.7±6.6%). No differences existed between HA and LA athletes at the knee (p=0.255; HA: 53.5±11.2%; LA: 56.3±6.3%). HA athletes had a smaller hip contribution to total negative work than the LA athletes during landing (p = 0.049; 11.4±8.8%; LA: 18.0±7.6%).

**Conclusion:** These findings indicate that HA and LA athletes use unique biomechanical strategies to attenuate load during a landing task and may provide insight into the distinct injury patterns experienced by these two groups.
soreness (DOMS) than non-smokers (NS); and 2) altered muscle activity of key pro-inflammatory regulator canonical nuclear factor kappa-beta (p65 NFκB; NS: -7.1±1.3 fold change from baseline; SM: -1.1±1.0 fold). Coinciding with a shift from pro-inflammatory signaling and peak DOMS, these data suggest delayed inflammatory resolution in SM. Nerve growth factor (NGF) plays a role in pain development and is stimulated by p65 NFκB. We hypothesized that NGF expression and co-localization with both high- (tyrosine receptor kinase A, TrkA) and low- (p75NTR) affinity receptors would be greater in SM than NS following ECC, and may explain greater DOMS in SM.

METHODS: Young adult male SM (N=6) and NS (N=5) performed 100 maximal ECC using the non-dominant knee extensors. Bilateral vastus lateralis biopsies were obtained at 48h post-exercise for NGF mRNA quantification via qPCR. Immunohistochemistry was performed on a subcohort (n=3/group) to quantify and localize NGF, TrkA, and p75NTR protein.

RESULTS: ECC did not alter NGF mRNA (NS: 1.9±0.3 fold; SM: 2.8±0.7 fold; p=0.09) or protein levels, which were similarly induced in SM compared to NS (1.1 fold). NGF co-localization with TrkA was unrelated to exercise or smoking status (~23±22%). However, SM expressed 2.1 fold higher p75NTR levels than NS (p<0.05). Further, there was a significant interaction (p=0.05) whereby NGF/p75NTR co-localization after ECC decreased in NS (control: 39.6±8.1%; exercise: 31.3±11.4%) but increased in SM (control: 59.2±8.4%; exercise: 72.4±13.7%).

CONCLUSIONS: Greater p75NTR expression and p75NTR/NGF co-localization may enhance nerve sensitivity in SM and further augment DOMS. Along with our previous DOMS and qPCR findings, NGF in SM could delay inflammatory resolution, enhancing risk for chronic pain/disability. This work provides insights into mechanisms that may place SM at greater risk for musculoskeletal injury and impaired healing. Supported, in part, by a grant from the Department of Defense.

### 2618 Board #141 June 3, 9:30 AM - 11:00 AM Association Between Candidate Performance-related Gene Polymorphisms And Strength In Iranian Elite Athletes

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No relationships reported.

One of the most important elements gives us the potential to individualize as an elite endurance runner or world champion weight lifter is DNA sequence variation. Investigations has discussed that about 66 percent of the variability in the athletic position is under the influence of genetics. There are many sport-related traits which can be explained by common. One of the traits whose heritability may depend on SNPs is maximal muscle strength. Unlike the vast number of studies in genetic profile of endurance performance, the genetic influence on elite strength performance has received less attention. PURPOSE: The purpose of this study was to investigate the relation between the polymorphisms of candidate genes (ACTN3, PGC-1α, ACE, CKMM, and PPARγ) with strength trait in Iranian elite athletes. METHODS: The subjects of this study included 100 Iranian elite athletes from different disciplines, as well as 100 sedentary healthy controls. Body mass index (BMI), waist-to-hip ratio (WHR), body fat percentage (%BF) have been measured for physical characteristic of subjects. Grip strength test has been conducted to measure maximal strength. Genomic DNA was extracted from saliva. Genetic polymorphism evaluation performed by RFLP and double check with sequencing methods. One-way ANOVA was used to assess differences between genotype groups for investigated phenotypes. RESULTS: Measuring Mean differences showed that %BF (athlete: 12.78±4.48, non-athlete: 17.9±5.84), WHR (athlete: 0.83±0.5, non-athlete: 0.80±0.06) and grip strength (athlete: 49.54±0.5, non-athlete: 40.16±0.8) were significantly different in two groups (P≤0.05). We have shown that ACTN3 (P=0.001), and CKMM (P=0.041) polymorphisms were significantly associated with strength phenotype in elite athletes. While the ACTN3 (P=0.040) polymorphism was the only one that had a significant association in unsorted control population. CONCLUSIONS: Considering Iranian population as Caucasians, these results may lead us to clarify the polygenic profiles of athletes in this ethnicity, although we have to out spread this study to different disciplines of athletic populations. Further investigations are warranted to study the mechanisms by which these polymorphisms may affect skeletal muscle to produce force.

### 2619 Board #142 June 3, 9:30 AM - 11:00 AM Identification Of Candidate Genes Contributing To Exercise Performance Phenotype Using Bioinformatics Analysis

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No relationships reported.

PURPOSE: The aim of this study was to closely examine putative candidate genes to identify those most likely involved in exercise performance phenotype due to their involvement in the same molecular pathways as genes with multiple known associations. METHODS: A set of 140 genes linked to performance and health-related fitness phenotypes in published studies was used to conduct Gene Ontology (GO) and pathway analysis. We hypothesized that in a manner similar to multifactorial disease phenotypes the same canonical pathway(s) will be enriched in genes implicated in exercise performance phenotype, and that of those, the most likely candidates will be enriched with minor single nucleotide polymorphisms (SNPs).

### 2617 June 3, 9:30 AM - 11:00 AM Deficiency Of α-actinin-3 Is Associated With Increased Incidence Of On Indirect Muscle Disorders/Injuries In Elite Football Players.

Myosotis Massidda1, Claudia Culigioni1, Francesco Piras1, Paolo Cugia1, Marco Scorcu2, Carla M. Calò1.

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No relationships reported.

Besides performing many important cellular functions, mitochondria are the main source of energy production. The influence of mitochondrial DNA (mtDNA) variability, which is known as mitochondrial haplogroups, on many complex traits including status of elite athlete, have been evidenced. Lineage J of mtDNA haplogroups, was shown to be related to the uncoupling of oxidative phosphorylation that result in reducing ATP production in favor of heat production. PURPOSE: To determine the difference in the frequency of haplogroup J in Iranian male elite athlete population. METHODS: DNA samples from the saliva of 60 Iranian healthy men and 65 male elite sprint power Iranian athletes were obtained using the Saliva DNA collection, preservation and isolation kit (RU35700, NorgenBiotek Corp; Ontario, Canada). The haplogroups were determined by sequencing the Hyper Variable Region (HVR) I and II of mtDNA using appropriate primers and comparing the sequence with the Revised Cambridge Reference Sequence (rCRS) (GenBank NC_012920). Haplogroup frequencies were compared through test of difference between proportions. RESULTS: The frequency of haplogroup J in elite Iranian male athlete was 14.5% in compared to 5.7% in control population. The difference in frequency for haplogroup J was significant (p<0.05). CONCLUSION: Haplogroup J over-represented in Iranian male elite athlete. Harboring haplogroup J related phenotypic expression could be considered beneficial for sprint power performance.
RESULTS: Genes were ranked by the number of published studies related to athletic performance, and top 15 genes were used as a benchmark to identify shared GO annotations for Biocarta and KEGG pathways [including ACE, APOE, LPL]. Pathways were then examined to identify other candidate genes that belong to the same pathways. The top 15 genes were annotated with a significantly larger number of pathways than the bottom 125 genes (median values of 3 versus 1, and 4.5 versus 2, with P values of 0.015 and 0.025 for Biocarta and KEGG, respectively; Kruskal-Wallis test). When individual annotations were considered, 10 genes shared both Biocarta and KEGG pathways, and hence, appear to be the most promising candidates for future studies linking genetic polymorphisms and exercise performance phenotypes [including AGTR1, HIF1A, PLCG1 and PPARA]. Analysis of single nucleotide polymorphisms (SNPs) distributions (per Ensembl Variation 82, GRCh38.p3) revealed that while the average number of SNPs per gene was significantly lower in the top candidate genes, these 15 genes were enriched with SNPs with minor allele frequencies of at least 0.1 compared to the bottom 125 genes (36.6% versus 14.6%, respectively, P = 0.0001, chi-square with Yates correction test). Likewise, identified additional 10 candidates were also enriched with SNPs (23.1% versus 14.6%, respectively, P = 0.0001).

CONCLUSIONS: In this study we identified several promising genetic candidates that may be contributing to exercise performance phenotype, which can be used in future genetic studies, including whole-genome or whole-exome genotyping studies.

2620 Board #143 June 3, 9:30 AM - 11:00 AM
The AGTR2 rs11091046 Polymorphism Is Associated with Elite Japanese and Jamaican Sprint/Power Athlete Status

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(No relationships reported)

The angiotensin II type 2 receptor (AGTR2) is a component of the renin-angiotensin system that mediates the effects of angiotensin II on cellular differentiation and growth, and plays several metabolic roles, i.e. muscular insulin regulation, cardiovascular and renal systems signalization. In the AGTR2 gene, the rs11091046 (A>C) polymorphism has been shown to be associated with muscle fibre type composition, athletic status and athletic performance in Caucasian population: the A allele being associated with a higher percentage of fast-twitch fibres and power-oriented athlete status.

PURPOSE: To study whether the A allele of the AGTR2 rs11091046 (A>C) polymorphism is associated with sprint/power athletic performance in Japanese and Jamaican track and field athletes.

METHODS: The AGTR2 rs11091046 polymorphism has been genotyped by TaqMan Genotyping Assay in 214 Japanese sprint/power athletes (42 international level, 172 national level, 56 women) and 815 Japanese healthy control subjects (601 women) and in 113 Jamaican sprint/power athletes (103 international level, 100 national level, 56 women) and 303 Jamaican healthy control subjects (152 women). All athletes answered a questionnaire about their competition results in order to assess athlete status.

RESULTS: In the Japanese cohort, the C allele frequency was significantly higher in sprint/power athletes (68.0%) than in control subjects (56.5%) (OR: 1.20, 95% CI: 1.02 - 1.40; P = 0.03), in men. In the Jamaican cohort, the C allele frequency in men sprint/power athletes (43.1%) tended to be higher than in control subjects (34.4%), without significance (OR: 1.25, 95% CI: 0.87 - 1.81; P = 0.25). There were no significant differences in women for both Japanese and Jamaican populations. As shown by the low heterogeneity index (I2=0%), meta-analysis indicated that the frequency of the C allele was significantly higher in pooled (Japanese and Jamaican) men elite sprint/power athletes than in control subjects (OR: 1.21, 95% CI: 1.04 - 1.40; P = 0.01). CONCLUSION: In contrast to the result obtained in Caucasian population, the C allele of the AGTR2 rs11091046 polymorphism is associated with sprint/power athlete status in Japanese and Jamaican men. Further replication and functional studies are necessary to confirm these findings.

2621 Board #144 June 3, 9:30 AM - 11:00 AM
Effects of High Intensity Interval and Continuous Exercise on DNA Damage

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(No relationships reported)

High-intensity interval exercise (HIIE) appears to be more time efficient and achieves similar, or even superior, molecular, cardiovascular, and muscle oxidative capacity adaptations when compared to continuous exercise (CE). It remains unknown if there are any differences between HIIE and CE in response to DNA damage.

PURPOSE: To investigate the differences in DNA damage after intensity and duration matched HIIE and CE.

METHODS: Five male subjects (29.4 ± 3.6 yrs; 1.8 ± 0.1 m; 84.4 ± 9.9 kg; VO2max: 40.2 ± 5.5 ml.kg⁻¹.min⁻¹) performed a cycle ergometer exercise test to determine exercise intensities. First, CE was performed with the intention of completing 90 min at the target workload 5% below lactate turn point 2. Second, a HIIE with matched intensity and duration as in CE was conducted. Venous blood samples were taken pre- and post-exercises, as well as 24 h and 4 days after each exercise.

DNA damage was assessed by measuring γ-H2AX foci within lymphocytes. Heart rate (HR), and respiratory parameters were measured continuously during both exercise modes. Lactate was measured before and every 10 minutes during each exercise.

The difference in γ-H2AX foci from baseline was calculated for each measurement; afterwards the exercise modes were compared by paired sample t-tests.

RESULTS: Significant difference was found with γ-H2AX foci (within 10 lymphocytes), in comparison of modes immediately post exercise (A1-L 1.5 ± 8.9; p = 0.04). Even so, there was no significant difference at 24 h (p = 0.09) or 4 days after (p = 0.7). Exercise matching was successful given that no significant difference was found in average time, HR, VO2 or power output. Although, there were significant differences found in average RER (p = 0.005) and lactate (p = 0.02).

CONCLUSIONS: To the best of our knowledge, this is the first study showing the differences in comparison of HIIE and CE in DNA damage. Since we found no clinically (RER & lactate) or statistically different physiological or cardiopulmonary parameters, this allowed us to compare the DNA damage in these different exercise modes. In conclusion, we observe an overall systematic trend of increased γ-H2AX foci after CE in comparison to HIIE. Further research should use the same methods as in the present study with larger sample sizes, and additionally use other DNA damage detection methods.

2622 Board #145 June 3, 9:30 AM - 11:00 AM
Actn3 R577X Polymorphism Is Associated With Trunk Flexibility In Two Different Cohorts

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(No relationships reported)

α-Actinin-3 (ACTN3) R577X polymorphism is associated with aspects of physical fitness, such as muscular strength and power. However, the relationship between ACTN3 R577X polymorphism and flexibility as another component of physical fitness remains unclear.

PURPOSE: To investigate the association between ACTN3 R577X polymorphisms and flexibility as two factors from the general Japanese population.

METHODS: Cohort 1 consisting of 208 men and 568 women (23 - 88 years of age) and Cohort 2 consisting of 529 men and 728 women (23 - 87 years of age) were included in the analysis. All subjects answered a questionnaire about exercise habits, and were subjected to a battery of tests to assess their fitness status (including grip strength, sit-and-reach flexibility test). Genotyping results were analyzed using the TaqMan approach for the ACTN3 (rs1815739) polymorphism.

RESULTS: As results, in the Cohort 1, there were no differences in age, height, weight, BMI, grip strength, or sit-and-reach flexibility among genotypes in men. In contrast, the sit-and-reach flexibility in the RR genotype (38.9 ± 0.4 cm) even after adjusting for age and exercise habitat as covariates (P = 0.01). In Cohort 2, the sit-and-reach flexibility in the RR genotype (39.3 ± 0.7 cm) tended to be lower than those in the RX and XX genotypes (40.4 ± 0.4 cm), but there was no significance after adjusting for age and exercise habitat as covariates (P = 0.221). Analysis of sit-and-reach flexibility in pooled male subjects indicated a tendency to lower flexibility in the RR genotype compared to the RX and XX genotypes, but the differences were not significant (P = 0.36). In contrast, the RR genotype was associated with significantly lower flexibility than the RX and XX genotypes in pooled female subjects (P = 0.004).

CONCLUSIONS: In conclusion, our data indicated that ACTN3 R577X genotype is associated with flexibility, with the RR genotype showing lower flexibility in the sit-and-reach test than the RX and XX genotypes in general Asian populations, especially in women.
Elevated global DNA methylation (GDM) has been linked to increased risk of cardiovascular disease. We recently reported an association between the epigenomic measure of GDM and maximal aerobic capacity as well as body composition in females. Throughout the course of this testing one question that arose was whether GDM is stable from week to week and month to month, and whether it is affected by acute exercise. PURPOSE: The aim of this study was to determine the variation of GDM over time, and following acute aerobic and anaerobic exercise.

METHODS: Seventeen participants (age = 29.5 ± 9 years, h = 162 ± 26 cm; wt = 73 ± 14 kg) provided resting capillary blood samples during the morning each week for four weeks (wk 1, wk 2, wk 3, wk 4) and at two months (mo 2) and three months (mo 3). Additionally, these same participants completed a maximal aerobic test to exhaustion (VO2max) as well as a series of three repeated Wingate anaerobic cycle tests, providing blood samples before (pre) and after (post) the bouts. DNA from leukocytes was isolated, and methylation was analyzed using a commercially available kit. Variation over time was analyzed using a one-way ANOVA, while differences attributable to acute exercise was analyzed using a 2(time) x 2(exercise type) repeated measures ANOVA. Significance was accepted at p<0.05.

RESULTS: Global DNA methylation did not vary over time (p = 0.105); wk1 = 1.3±1.1%, wk2 = 1.0±1.7%, wk3 = 1.3±0.8%, wk4 = 2.2±1.3%, mo 2 = 1.4±0.8%, mo 3 = 2.0±1.9%. Acutely, exercise to maximal exertion did not alter GDM (p = 0.71; pre 1.9±1.0%, post 1.5±1.0%), and neither did acute anaerobic exercise (p = 0.97; pre 1.9±1.0%, post 2.1±1.1%).

CONCLUSIONS: These findings provide evidence that the epigenomic marker of global DNA methylation is a relatively stable measure that does not vary over the course of several months. Additionally, this marker is unaffected by acute exercise perturbations whether aerobic or anaerobic in nature. As GDM is associated with aerobic fitness and body composition, it would be of interest to determine whether chronic adaptations to exercise training results in beneficial changes in this epigenomic marker.

Purpose: The accumulation of visceral adipose tissue (VAT) drives chronic inflammation and the development of cardiometabolic disease. Obesity and its related comorbidities modify DNA, but specific obesity-driven epigenetic changes related comorbidities modify DNA, but specific obesity-driven epigenetic changes associated with sport performance. The literature regarding associations with habitual physical activity is limited and inconsistent. Here, we hypothesize that the associations of the ACE DIP polymorphism and physical activity among European-American adults.

METHODS: 203 men and 258 women with a body mass index (BMI) of 24.3±4.8 kg/m² completed the Paffenbarger Physical Activity Questionnaire to determine weekly walking distance. ACE II (n=119), ID (n=213), and DD (n=129) genotypes were determined using TaqMan allele discrimination assays. Multivariate analysis of covariance (MANCOVA) determined logtransformed differences among ACE DIP genotypes and weekly walking distance with gender as a fixed factor and age and BMI as covariates. Because a significant ACE DIP x BMI interaction was found (p=0.03), we categorized the sample into normal weight (NW: BMI<24.9 kg·m⁻²) and overweight (OW: BMI>24.9 kg·m⁻²). We repeated the MANCOVA with gender and BMI groups as fixed factors and age as a covariate. Bonferroni corrections were used to control for multiple comparison testing with alpha levels at p<0.05.

RESULTS: For NW (BMI=21.7±1.8 kg·m²), participants with the ACE II reported walking 14.1±1.0 mi/wk, ID 12.0±0.9 mi/wk, and DD 11.6±1.2 mi/wk, with ID walking less than II (p=0.05). For OW (BMI=29.6±4.4 kg·m²), participants with the ACE II reported walking 15.1±1.1 mi/wk, ID 12.3±0.1 mi/wk, and DD 0.6±0.8 mi/wk, with DD walking less than II (p=0.02). For NW vs OW, weekly walking distance was 1.0±2.2 mi/wk less among OW with the ACE DD genotype than NW with this genotype (p=0.02); there were no other genotype-physical activity differences within or between NW and OW (p>0.05).

CONCLUSIONS: BMI interacted with ACE DD to modulate habitual physical activity levels such that weekly walking distance was ~1.0 mi/wk greater among NW than OW with ACE DD. Our findings may provide insight into the discrepancies of this literature, and have public health significance equating to a body weight differential of ~1.4 lb/yr.
RESULTS: Higher baseline levels of miRNAs (miR-126, miR-130b, miR-221, and miR-222) were found in obese subjects than normal-weight subjects (P<0.001). Obese subjects elicited a greater expression of miR-21 (P<0.001), miR-126 (P=0.001), miR-130b (P=0.006), and miR-221 (P=0.020). Furthermore, all miRNA area-under-the-curve “with respect to increase” (AUC) were higher in obese subjects (P<0.020) and also positively correlated (P<0.001), even after controlling for cardioregulatory fitness (VO2max).

CONCLUSIONS: Identifying circulating miRNAs could be reliable biomarkers predicting outcome of exercise treatments to prevent or delay obesity-associated inflammatory disease development.

2627 Board #150
June 3, 9:30 AM - 11:00 AM
Exercise Impacts The Global Profile Of MiRNA In Plasma And Skeletal Muscle In Hypertensive Rats
Clarissa PC Gomes1, Bernardo A. Petriz2, Jeeser A. Almeida3, Octávio L. Franco4, Taek-Kyun Kim2, David J. Galas2, Kai Wang2, Rinaldo W. Pererita5. 1Centro Universitário do Distrito Federal, Brasilia, Brazil. 2Universidade Federal de Mato Grosso do Sul, Campo Grande, Brazil. 3Universidade Católica Dom Bosco, Campo Grande, Brazil. 4Institute for Systems Biology, Seattle, WA. 5Pacific Northwest Diabetes Research Institute, Seattle, WA. (No relationships reported)

MiRNAs play a role in several physiological processes and in the development of pathologies, such as hypertension. These molecules have also been implicated in the adaptation to exercise, but information is still scarce. Since regular exercise practice is indicated to prevent and help treat hypertension, understanding the molecular mechanisms involved in the adaptation to exercise is crucial.

PURPOSE: Our aim was to determine the global profile of miRNA in plasma and skeletal muscle of hypertensive rats by next generation sequencing (NGS).

METHODS: Two spontaneously hypertensive rats were kept sedentary or subjected to low or high intensity treadmill running (60 and 80% of Vmax). Rats trained for 20 min 5 days a week for 8 weeks. Aerobic capacity was measured before, during and after training and their arterial blood pressure was measured weekly. MiRNAs were obtained from plasma and gastrocnemius, then sequenced by NGS on Illumina platform. Sequence reads were mapped and counted against miRBase by bowtie and normalized with TMM normalization approach. Differential analysis was performed by edgeR method. RESULTS: While blood pressure increased in sedentary rats, it decreased in exercised animals, particularly in the high intensity group. Eighteen miRNAs were differentially expressed (DEmiRNAs) in plasma and 16 in skeletal muscle, with only 3 in common (miR-192-5p, 27b-3p and -150-5p). While most were increased in plasma, most were decreased in muscle. Among the DEmiRNAs were those enriched in muscle, kidneys, endothelium and adipocytes. MiR-192 has been associated with kidney function, particularly blood pressure regulation, and miR-27b has been linked with hypertension in rats. Here miR-192 was increased in plasma and miR-27b was decreased in muscle and increased in plasma, suggesting they could be involved in the reduction of blood pressure due to exercise. Few of the DEmiRNAs have been reported in association to exercise, but those that have included miR-133a, -133b, -29a, -26a, -378a and -486.

CONCLUSION: This is the first study to obtain a global profile of circulating and muscle miRNAs by NGS in response to exercise in hypertension, thus contributing to a broader view of the possible miRNAs involved in the adaptation to chronic exercise in hypertensive animals. Supported by CNPq, CAPES, UCB

2628 Board #151
June 3, 9:30 AM - 11:00 AM
Running Speed Is More Genetically Influenced Than Duration Or Distance Run With Aging Male Mice
Michael J. Turner, FACSM1, Erik A. Wikstrom, FACSM2, Tricia H. Turner, FACSM3. 1UNC Charlotte, Charlotte, NC. 2UNC Chapel Hill, Chapel Hill, NC. 3UNC Chapel Hill, Chapel Hill, NC. Email: mmiller@ucmo.edu (No relationships reported)

Many factors are believed to influence the decline in physical activity with aging. Recent evidence from our laboratory suggests genetic background participates in the declining physical activity level. PURPOSE: To determine the impact of genetic background on daily physical activity throughout the lifespan of male mice in four inbred strains.

METHODS: Twenty-six, seven-week old male mice from four inbred strains (C57Bl/6J, CBA/J, DBA/J, and SWR/J) were individually housed with a running wheel. Standard chow and water were provided ad libitum. Daily physical activity, as assessed by voluntary running wheel activity, was measured with a sensor and digital odometer every day from eight to eighty weeks of age and calculated for monthly averages. RESULTS: Daily duration (p<0.0001), running speed (p=0.0004), and distance (p=0.042) were different between strains across lifespan (3 to 18 months). Duration

(p=0.001) and distance (p=0.0008) decreased from 3 to 18 months of age, but average running speed (p=0.15) did not change. SWR/J mice averaged greater daily durations and distances than the remaining strains of mice (p<0.0001). Average running speed was faster for the C57Bl/6J mice compared to the other strains (p<0.0001). Broad-sense heritability estimates increased from 3 to 6 months for duration, 3 to 5 months for average speed, and 3 to 8 months for distance (p<0.001). Broad-sense heritability estimates decreased for duration and distance throughout the second half of the lifespan (p<0.0001). The highest monthly averages for broad-sense heritability were 47.7±1.1% for duration, 61.8±6.8% for average speed, and 35.1±14.5% for distance.

CONCLUSIONS: For males, genetic influence on physical activity variables increased throughout the first third of the lifespan and declined throughout the remainder of the lifespan for only duration and distance. A consistent genetic influence was found with running speed throughout most of the lifespan for male mice. Additionally, running speed exhibited the highest broad-sense heritability estimates, indicative of more highly influenced by genetic background, compared to duration and distance in aging mice. Supported by National Institutes of Health Grant AG-022417 (M.J. Turner) and UNC Charlotte Faculty Grant Program (Turner, Hubbard-Turner, Wikstrom).

E-31 Free Communication/Poster - Hop, Skip, Jump
Friday, June 3, 2016, 7:30 AM - 12:30 PM
Room: Exhibit Hall A/B

2629 Board #152
June 3, 11:00 AM - 12:30 PM
Assessment Of Electromyographic Activity During a TRX And Traditional Split-squat
William M. Miller1, Jason D. Waggener2, Jeremy T. Barnes2, Seidu S. Sofo2, Michael P. Godard, FACSM1. 1University of Central Missouri, Warrensburg, MO. 2Southeast Missouri State University, Cape Girardeau, MO. (Sponsor: Michael P. Godard, FACSM)

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To date, traditional resistance training (TRT) programs incorporate a minute amount of instability training (IT). Over several decades TRT has transformed and taken on new and unusual concepts, such as Total Body Resistance Exercise (TRX). However, very little research has been completed investigating the effects of the TRX. PURPOSE: Therefore, the purpose of the study was to measure electrical muscle activity via electromyography (EMG) while performing a bodyweight split-squat in a stable environment compared to an unstable environment (i.e. TRX). METHODS: Twenty non-athlete (10 male; 10 female) experienced resistance and/or aerobically trained individuals participated in the investigation. The study consisted of three sessions including two variations of bodyweight split-squats and a training session to acclimate the participants. The TRX split-squat was performed by placing the rear foot within the foot cradle of the TRX strap, while the traditional split-squat required the participant to place the rear foot on a stable bench, both 16 inches in height. Each session was separated by one minute of rest and each split-squat required the participant to perform three correct, consecutive, repetitions. EMG analysis was performed to assess the muscle activity of the gluteus maximus (GMa) and rectus femoris (RF). Final EMG data for the GMa and RF was analyzed via paired samples t-tests using IBM SPSS v. 23, between gender and environment. RESULTS: Paired samples t-tests were performed to compare the relative amount of EMG activity of the RF and GMa, between the TRX and traditional split squat. Significantly (p<0.001) higher EMG activity was displayed for the GMa during the TRX split-squat (569.91 ± 138.47 mV), compared to the traditional split-squat (499.78 ± 119.34 mV). No other significant differences in EMG activity of the GMa or RF were observed. CONCLUSIONS: The results were significant for the EMG activity of the GMa during the TRX split-squat, which most likely was due to stabilizing any medial or lateral rotation of the trail leg knee. Little research has utilized the TRX and this investigation provides insight for future studies. Future implications include, perhaps involving an external resistance or performing another movement with the TRX, such as a two-leg squat or reverse lunge, may elicit greater results.
Increased external knee valgus moment is a major factor in noncontact anterior cruciate ligament injury. Gluteal muscle activity is important for preventing excessive hip adduction motion and external knee valgus moment. To increase gluteal muscle activity during single-leg support, we devised a resistive single-leg squat (SLS) exercise using a novel isokinetic exercise machine (ERIK). SLS is a closed kinetic chain exercise where the support leg performs a single-leg squat while sliding the opposite leg laterally against a resistive force.

PURPOSE: To reveal the biomechanical and electromyographic (EMG) characteristics of the support leg during SLS compared with those of a common single-leg squat (SLS). METHODS: Twenty-four isokinetic female college students participated in this study. Participants performed SLS and SLS. In SLS, the movement speed of ERIK was 0.25 m/s and the reaching length was 80% of the SMD (spina malleolar distance). A motion capture system and force plate were used for motion analysis, and the support leg joint moments were calculated. Surface electrodes recorded EMG of support leg muscles. Average EMG amplitude during descent phase in both tasks was normalized by that during maximum voluntary contraction. The Wilcoxon signed-rank test was used for statistical analysis. RESULTS: In SLS, hip adduction angle was significantly smaller (3.2 ± 2.3° vs. 12.2 ± 3.7°, p < 0.05) and hip abduction angle was significantly larger (11.9 ± 2.0° vs. 1.3 ± 4.1°, p < 0.05) than those in SLS. Motion patterns of the hip joint differed between motions. Hip adduction angle increased in SLS, while hip abduction angle increased in SLS. External valgus moment occurred in 5 participants during SLS (0.2 ± 0.2 Nm/kg but in only 1 participant during SLS. EMG activity of the gluteus medius was significantly higher in SLS than in SLS (85 ± 17% vs. 60 ± 17%, p < 0.05), as was that of the adductor longus muscle (355 ± 18% vs. 23 ± 13%, p < 0.05). CONCLUSION: SLS against isokinetic force with ERIK increased the load on the gluteus medius, and the alternate hip joint motion pattern seemed effective for preventing external knee valgus moment on the supported leg. Supported by JSPS KAKENHI Grant No. 25282192.

The force-time curve of a countermovement vertical jump (CMJ) has recently gained popularity among trainers and scientists as a means to specifically address performance enhancement and injury reduction programs. Many components of the curve such as rate of force development, impulse and peak concentric force yield a better understanding of the specific technique being utilized during this maximal effort stretch-shortening activity. A recent study sampling 273 athletes found a relationship between vertical jump performance and lower limb asymmetry during return to play decisions and injury risk screening protocols. However, most athletes participate in sports that require significant multi-directional demands outside of the sagittal plane. Assessing lower extremity performance and asymmetry in multiple planes may provide complementary information to the standard FTH.

PURPOSE: To examine the differences in performances between different triple hop direction and the relationship of performances and side-to-side asymmetry between the FTH, medial (MTH) and lateral (LTH) triple hop tests.

METHODS: Twenty healthy (age: 19.2 ± 0.93 years; height: 167.2 ± 5.7 cm; weight: 65.9 ± 6.6 kg) Division-I women’s soccer players performed three trials each of a FTH, MTH, and LTH for distance test on both limbs in randomized order. Performance was measured as the average total distance travelled over the three trials, while limb symmetry indices (LSI) were calculated as the distance performed on the right divided by the left limb. A repeated measures ANOVA identified performance differences and Spearman’s rank correlations identified the extent of the relationship of performance and LSI between the FTH, MTH, and LTH (p = 0.05).

RESULTS: FTH distances (distance= -0.90 ± 0.44 m) were significantly larger than those in SLS (distance=4.03 ± 0.40 m, p<0.001) and LTH (distance=3.70 ± 0.41 m, p<0.001) and MTH were larger than LTH distances (p<0.001). Spearman’s rank correlations indicated strong relationships between FTH and MTH (p=0.78-0.80, p=0.001) and the FTH and LTH (p<0.62-0.61, p<0.05) performances, and FTH LSI and LTH LSI (p<0.74, p<0.001). There was no significant relationship identified between LSI observed during the FTH and MTH (p=0.32, p=0.17).

CONCLUSIONS: Performance in the triple hop are different dependent on the direction of movement, but high performers in one direction appear to also be high performers in other directions. LSI elicited by FTH and MTH tests are unrelated. Thus, the MTH may provide complementary information to the FTH regarding side-to-side asymmetries during injury risk screening procedures or return to play decisions.
RESULTS: JH (49.8±15.7 cm) was significantly (p < .05) correlated to CONC-F (1783±489 N)(r=0.589) and ECC-V (-1.00± .22 m/s)(r=-0.515) but not significantly correlated to ECC-C (1.89 kN/s)(r=0.193).

CONCLUSIONS: Some practitioners believe augmenting a certain aspect of the force-time curve will yield better and more personalized gains to their clientele. This study supports the notion that greater peak concentric force and a faster loading velocity in the eccentric phase are associated with greater jump height in college age participants. However, the rate at which force is developed during the terminal stages of the eccentric phase is not associated with greater jump height.

2634 Board #157 June 3, 11:00 AM - 12:30 PM Kinematic Comparison between Drop Jump and Vertical Jump: Implications for ACL Risk of Injury Assessment

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(No relationships reported)

Vertical jump (VJ) is frequently conducted for the assessment of athletic performance while drop jump (DJ) is more commonly employed in clinical settings to screen for anterior cruciate ligament (ACL) injury risk. The extent to which VJ can be used as screening tool for ACL injury risk has not been assessed. PURPOSE: To determine whether VJ provides similar lower extremity kinematic pattern compared with DJ. METHODS: Thirty one female collegiate athletes performed 3 DJs and 3 VJs as low extremity three-dimensional kinematics were recorded. The Pearson correlation (r) described relationships between VJ and DJ average peak joint angles (hip, knee, and ankle).

RESULTS: Sagittal plane hip and knee angles correlated strongly between DJ and VJ (r=0.74 and 0.70, respectively; p<0.0001) while no significant correlation was observed for the ankle joint (p=0.11). In the frontal plane, DJ and VJ angles correlated moderately at the hip (r=0.53; p=0.002), strongly at the knee (r=0.92; p<0.0001), but not significantly at the ankle (p=0.07). In the transverse plane, DJ and VJ angles correlated moderately at the hip (r=0.65; p=0.001), strongly at the knee (r=0.93; p<0.0001), and moderately at the ankle (r=0.62; p=0.0001).

CONCLUSIONS: Although ankle angles did not exhibit strong correlations between DJ and VJ, knee angles correlated strongly and hip angles correlated moderately to strongly in all 3 planes of motion. These results imply that VJ and DJ exhibit similar kinematic patterns at the knee and hip joints. More data are needed to assess whether VJ provides similar lower extremity kinematic pattern compared with DJ.

2635 Board #158 June 3, 11:00 AM - 12:30 PM Biomechanical Deficits During Drop Jump in Young Athletes With Recent Anterior Cruciate Ligament Reconstruction

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(No relationships reported)

PURPOSE: This study assessed biomechanics during a vertical drop jump (VDJ) in young athletes following recent anterior cruciate ligament reconstruction (ACLR). METHODS: 29 limbs with unilateral ACLR (69% female, mean age 15.8 ± 1.6 years, 5 to 12 months post-surgery), 29 contralateral non-operative limbs, and 19 control limbs (53% female, mean age 15.5 ± 1.8 years) were evaluated. Lower extremity 3D kinematic and kinetic data were compared using analysis of variance with Bonferroni post-hoc tests.

RESULTS: Operative limbs had lower peak ground reaction forces (GRF) than control and contralateral limbs (ACLR: 1.7 body weights (BW); Control: 2.1 BW, Control: 2.1 BW; p<0.01) along with lower average external knee flexion moments (ACLR: 0.7 Nm/kg, Control: 0.9 Nm/kg, Control: 1.1 Nm/kg; p<0.05) and reduced power absorption at the knee (ACLR: 0.9Nm/kg, Control: 1.3Nm/kg, Control: 1.2Nm/kg; p=0.01). Operative limbs had lower peak knee flexion (ACLR: 96.8°, Control: 100.7°; p=0.001) and knee flexion excursion (ACLR: 75.9°, Control: 82.6°; p=0.003) than contralateral limbs but did not differ from controls in these measures. Operative and non-operative limbs had greater peak hip flexion (ACLR: 99.9°, Control: 98.8°; p=0.005) and reduced hip flexion excursion (ACLR: 60.8°, Control: 65.6°, Control: 49.6°; p=0.02), and power absorption at the hip (ACLR: 1.0Nm/kg, Control: 1.2Nm/kg, Control: 0.7Nm/kg; p=0.03) compared to controls. In the coronal plane, operative and non-operative limbs showed higher peak knee valgus moments than controls (ACLR: 0.5Nm/kg, Control: 0.4Nm/kg; p=0.02) and utilized less hip abduction range (ACLR: 1.7°, Control: 1.9°, Control: 6.1°; p=0.003) though no differences were seen in knee valgus angles or excursion (p>0.52).

CONCLUSIONS: Lower GFR and less energy absorbed at the knee suggest a landing strategy that shifts loading from the post-surgical knee to the hip and contralateral limb. Frontal plane knee deficits in both operative and non-operative limbs may place the limb at an elevated risk for future injury/re-injury. Avoidance of loading the reconstructed knee and residual deficits in frontal plane hip/knee control may indicate lack of readiness to return to activity after recent ACLR.

2636 Board #159 June 3, 11:00 AM - 12:30 PM Vertical Force Measures to Predict Unilateral and Bilateral Jump Height

Sophia M. Ulman, Abigail C. Schmitt, Robert J. Butler. Duke University, Durham, NC. (Sponsor: Dr. William Garrett, Jr., FACSM)

(No relationships reported)

Vertical jumps are regularly implemented in assessments of leg strength and power given the clear relationship between power and jump height. While many investigations have had various successes predicting jump height using complex methodologies, a simplistic method for identifying variables that predict jump height would prove useful to develop training programs. PURPOSE: To analyze the vertical ground reaction force (vGRF) of the left leg during single leg vertical jumps (SLVJ) and bilateral vertical jumps (BVJ) with the aim of predicting jump height. METHODS: 17 physically active adults (9M, 8F; age = 24 ± 5.7 years; mass = 71.8 ± 12.5kg; height = 1.74 ± 0.10m) performed unilateral and bilateral jumps with each foot on an independent force plate. Two sagittal markers were tracked with an skeleton motion capture system to determine jump height. Peak vertical ground reaction forces (vGRFs), minimum vGRFs, rate of force development, rate of force reduction, loading rate, and impulse were calculated and extracted from the propulsion and landing phases of each jump trial. All variables were entered into a stepwise regression to identify which variables predicted vertical jump height. Variables were retained if the model was statistically significant at the p<0.05 and variables were extracted if the model increased R^2 by p<.10

RESULTS: A model consisting of rate of force reduction during landing, minimum vGRF during landing, peak vGRF during propulsion and the rate of force development during propulsion explained single leg jump height on the right leg (r-squared = 0.74 ± 0.02). Rate of force reduction was the only significant predictor of single leg jump height on the left leg (r-squared = 0.76 ± 0.03). Finally, bilateral jump height was explained using a combined model of peak vGRF during propulsion, minimum force during landing and the propulsive impulse (r-squared = 0.89 ± 0.03). CONCLUSIONS: This study provides evidence that jump height of SLVJ and BVJ can be accurately predicted by calculating loading rates, impulse, and extracting peak and minimum values from vertical ground reaction forces. Differences between right SLVJ and left SLVJ may result from different neural control strategies used to complete each jump. Lastly, these variables may identify aspects of jump height that could be implemented during training to improve jump performance.
Vertical jump involves a complex motor pattern that requires advanced coordination between inferior and superior limbs. It is the simplest indirect assessment of the stretch and shortening cycle (SSC) used in the field to assess training effects and performance. The Myostest® accelerometer is a small portable device that measures change in velocity during a vertical jump and provides estimates of height displacement and power, a useful information for coaches and trainers. However, the device has not been tested among experienced Hispanic collegiate athletes. PURPOSE: To evaluate the intrasession reliability of the height displacement estimate obtained with the Myostest® through a vertical jump in experienced Hispanic collegiate athletes (basketball, volleyball, track and field). METHODS: A group of 30 Hispanic collegiate athletes (15 males, 15 females) completed 3 Squat Jumps (SQJ) and 3 Countermovement Jumps (CMJ) wearing the Myostest® attached to a belt around the waist. Each participant was encouraged to perform the highest jump possible in each attempt followed by 3 minutes of rest. The reliability of the Myostest® was evaluated using intraclass correlation coefficients (ICC), standard error of measurement (SEM), and coefficients of variation (CV). Also, a repeated measure ANOVA with Bonferroni post hoc test was used to detect differences between jumps. RESULTS: Mean age of male and female athletes (20.6 ± 1.5 and 20.6 ± 1.6 years, respectively) was not different (P > 0.05). The Myostest® showed good reliability for the SQJ (ICC = 0.84, SEM = 2.9 cm, CV = 8.6%) and CMJ (ICC = 0.93, SEM = 2.0 cm, CV = 5.2%). The estimated height displacement was not different between jumps in SQJ (33.2 ± 7.7, 33.4 ± 6.8, and 34.2 ± 6.3 cm, P > 0.05) however, PO differences were between the first and second jump and between the first and third CMJ (37.8 ± 9.2, 39.3 ± 9.2, and 39.6 ± 0.9 cm, P < 0.05). CONCLUSION: These results suggest that the Myostest® offers reliable information of height displacement in a maximal vertical jump; therefore, providing useful information that can be measured in the field. To obtain the maximal height displacement with the CMJ, athletes need to perform a minimum of three jumps.

Implicit (IF) and explicit (EF) feedback are two motor learning strategies that have been demonstrated to alter biomechanical movement patterns. While both strategies have been utilized for injury prevention, it remains unclear which strategy may be more effective.

PURPOSE: To examine the effects of reduced relative IF and EF video feedback on lower extremity landing mechanics.

METHODS: Seventeen participants (23.5 ± 0.9 years, 1.72 ± 0.1 m, 67.7 ± 11.5 kg) were randomly assigned to three groups: IF (n = 6), EF (n = 5), and Control (CG) (n = 6). 12 box-drop jumps were performed three times a week for six weeks. IF and EF groups received video feedback, while CG received no feedback. IF was used to cue their attention in overall jump, while EF was used to focus on landing, video, knee and shallow knee flexion. Participants viewed 2 video recordings for each plane (sagittal and frontal), in normal speed and slow motion. Video feedback was provided along a reduced feedback continuum that was partitioned into 100% (viewed the video recordings after every jump), 50% (3 minutes of rest). The reliability of the Myotest® was evaluated using intraclass correlation coefficients (ICC), standard error of measurement (SEM), and coefficients of variation (CV). Also, a repeated measure ANOVA with Bonferroni post hoc test was used to detect differences among jumps. RESULTS: Mean age of male and female athletes (20.6 ± 1.5 and 20.6 ± 1.6 years, respectively) was not different (P > 0.05). The Myostest® showed good reliability for the SQJ (ICC = 0.84, SEM = 2.9 cm, CV = 8.6%) and the CMJ (ICC = 0.93, SEM = 2.0 cm, CV = 5.2%). The estimated height displacement was not different between jumps in SQJ (33.2 ± 7.7, 33.4 ± 6.8, and 34.2 ± 6.3 cm, P > 0.05) however, PO differences were between the first and second jump and between the first and third CMJ (37.8 ± 9.2, 39.3 ± 9.2, and 39.6 ± 0.9 cm, P < 0.05). CONCLUSION: These results suggest that the Myostest® offers reliable information of height displacement in a maximal vertical jump; therefore, providing useful information that can be measured in the field. To obtain the maximal height displacement with the CMJ, athletes need to perform a minimum of three jumps.
increased KF. Our preliminary results partially suggest that implicit and explicit feedback alters lower body mechanics while jumping.

2642 Board #165 June 3, 11:00 AM - 12:30 PM Landing Stiffness Measures Between Individuals With And Without A History Of Low Back Pain
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No relationships reported

Biomechanical differences in individuals with a history of low back pain (HxLBP) during jogging gait and between males and females with recurrent low back pain during landing have previously been reported. Females have also been shown to have lower vertical stiffness compared to males. However, little is known about the impact of HxLBP status on landing measures compared to healthy individuals and if gender influences these values.

Purpose: To compare vertical, ankle, knee, hip and lumbar spine stiffness during a unilateral landing task between healthy and HxLBP individuals.

Methods: Unilateral landing trials were recorded on both limbs using an electromagnetic three-dimensional motion capture system from a thirty-centimeter box in 45 participants (24 healthy and 21 HxLBP; age: 24 (8) years; body mass index: 24.2 (3.1) kg/m2) for a total of 90 limbs. Vertical stiffness was calculated graphically as the slope of the regression line of the normalized vertical ground reaction force and vertical center of mass displacement. Joint stiffness was calculated as the change in moment to the change in angle from the minimum to maximum joint moments after initial contact. All stiffness measures were normalized to body weight and height. Effect sizes (ES) were calculated as the ratio of the Z score divided by the square root of the sample size.

RESULTS: HxLBP individuals had lower vertical stiffness measures than healthy individuals (HxLBP: median=19.90 (range: 12.57-47.97); Healthy: median=24.52 (range: 9.81-61.62); P<0.04, ES=0.21) When stratified by gender, HxLBP males landed less stiff than healthy males (HxLBP: median=20.50 (range: 14.34-46.97); Healthy: median=29.65 (range: 15.98-61.62), P=0.01, ES=0.27). There were no differences in vertical stiffness between HxLBP and healthy females (HxLBP: median=19.90 (range: 12.57-39.33); Healthy: median=22.41 (range: 9.82-39.99), P=0.45). No differences were observed between all, male or female HxLBP and healthy participants for any joint stiffness measures (P>0.05).

CONCLUSION: Previous HxLBP influences vertical stiffness measures compared to individuals without a HxLBP. However, these changes seem to be dependent on gender. According to these findings, male HxLBP participants have vertical stiffness measures similar to females during unilateral landing tasks.

2643 Board #166 June 3, 11:00 AM - 12:30 PM High-Arched Athletes Exhibit Significantly Greater Vertical Stiffness Values Than Low-Arched Athletes During A Landing Task
Brett A. Windsor1, J. Lee Easley1, Rachel N. Plummer1, Michael A. Mize1, Robin M. Queen, FACSM4, D.S. Blaise Williams2, Douglas W. Powell. 1Campbell University, Buies Creek, NC; 2Virginia Tech University, Blacksburg, VA; 3Virginia Commonwealth University, Richmond, VA. (Sponsor: b.windsor0614@campbell.edu)

No relationships reported

High-arched athletes (HA) have been shown to have greater ankle and knee joint stiffness as well as leg stiffness during a running task. However, only a single study has examined the role of foot function in load attenuation during a landing task. Though this study demonstrated that HA compared to LA athletes exhibit unique frontal plane kinetics, the role of sagittal plane stiffness during a landing task remains unclear.

PURPOSE: Therefore the purpose of this study was to quantify vertical stiffness in HA compared to LA athletes during a landing task.

METHODS: Ten HA and 10 LA female athletes performed five landing trials from a height of 0.3 meters while three-dimensional kinematics and ground reaction forces were collected using an 8-camera motion capture system (240 Hz, ViconPEAK) and a force platform (960 Hz, AMTI), respectively. Vertical stiffness was calculated as the quotient of the peak vertical ground reaction force divided by the vertical displacement of the center of mass (tracked by L5-S1 marker) between initial contact and peak knee flexion. Independent samples t-tests were used to compare peak vertical ground reaction forces and vertical stiffness values for the HA and LA athletes.

RESULTS: No differences were observed in peak vertical ground reaction forces (p = 0.780; HA: 2.20 ± 0.12 BW; LA: 2.29 ± 0.07 BW). HA athletes had significantly greater vertical stiffness values than LA athletes during the landing task (0.06; HA: 18.3 ± 8.3; LA: 11.0 ± 3.5).

CONCLUSIONS: These findings show that HA athletes. These data suggest that the increased vertical stiffness is likely due to smaller vertical oscillations of the center of mass during the landing phase as no significant differences were observed in peak vertical ground reaction forces. The findings of this study suggest that forces applied to the musculoskeletal system, potentially underlying injury, may be altered through movement retraining.

2644 Board #167 June 3, 11:00 AM - 12:30 PM Trunk-Mounted Accelerometry Predicts Temporal Variability in Landing Phases During a Jump-Landing Task
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No relationships reported

Evaluation of stance time, time-to-peak loading, and flight time are commonly used to objectivley evaluate an athlete’s performance and neuromuscular control. Today’s micro-sensor technology may offer more accessible and mobile approaches to quantify task phases in a real-world environment compared traditional resource-intensive biomechanical analyses using ground reaction force data.

PURPOSE: To determine if a commercially available trunk-mounted accelerometer (TMA) can be used as a valid tool to identify the temporal phases (stance, flight, and time-to-peak loading) of a jump-landing task.

METHODS: A tri-axial TMA was secured and centered proximal to the xiphoid process. Two piezoelectric force plates (1,000 Hz) and a TMA (200 Hz; up, down, sampled vertical ground reaction forces (vGRF) and vertical trunk accelerations during a jump-landing task, respectively. 58 jump-landing trials from 7 participants (age: 22.8 ± 1.1 yr; height: 1.66 ± 0.09 m; weight: 58.3 ± 6.8 kg) were included for analysis. Per TMA manufacturer guidelines, 1g = 2000 arbitrary units (AU). Pearson Product-Moment coefficients were calculated between TMA-derived and vGRF-derived stance time, flight time, and time-to-peak loading temporal variables. Differences between TMA and vGRF were expressed as raw error (msec).

RESULTS: There was a significant positive correlation between TMA-derived and vGRF-derived stance time (TMA: 51.91±14.43; vGRF: 49.79±14.59; r=0.86, p<0.05) and flight time (TMA: 521.61±40.09; vGRF: 500.30±42.42; r=0.79, p<0.05, error=21.30±26.70). There was no association between TMA-derived and vGRF-derived time-to-peak loading (TMA: 11.13±7.73, vGRF: 35.47±11.37, r=0.280, p=0.840, error=79.69±78.62).

CONCLUSION: There is a strong positive association between TMA- and vGRF-derived stance and flight time variables during a jump-landing task. A TMA can be used to estimate the total stance and flight time of a jump-landing task with acceptable relative phase-time error (stance=5.4±1.11, flight=5.7±3.8%) to the established laboratory-based measure. Commercially available TMA’s provide valid estimates of temporal markers of an athlete’s neuromuscular control and performance during a jump-landing task.

2645 Board #168 June 3, 11:00 AM - 12:30 PM Association between Knee Strength and Landing Biomechanics in Marine Corps Forces Special Operations Command Operators
Joshua D. Winters1, John Abt, FACSM1, Takashi Nagai2, Brad Lambert1, CAPT Necia Williams2, Nicholas Heebner1, Scott Royer1, Scott Lephart, FACSM1. 1University of Kentucky, Lexington, KY; 2University of Pittsburgh, Pittsburgh, PA. Marine Corps Forces Special Operations Command, Camp Lejeune, NC. (Sponsor: John Abt, FACSM)

No relationships reported

Marine Corps Forces Special Operations Command (MARSOC) Operators are required to perform a multitude of complex tactical movements. Understanding the strategies used to attenuate shock during different dynamic tasks may provide insight into mechanisms associated with an increased risk of injury. PURPOSE: To examine the association between knee strength and landing mechanics and the association between knee strength and specific landing strategies.

METHODS: Knee strength and sagittal plane knee kinematics were collected on 41 Operators (Age: 28.4 ± 6.1 years; Height: 178.8 ± 6.7 cm; Mass: 85.4 ± 7.9 kg). Knee extension strength (KES) was collected using an isokinetic dynamometer. Knee angle at initial contact (KIC), peak knee flexion (PKF), and peak vertical ground reaction forces (VGRF) were collected during a Forward Jump Single-Leg Landing task (FJSL) and a Double-Leg Drop Landing (DLDL) using a 3-D motion capture system. Pearson correlation coefficients examined the relationships between strength and landing mechanics. Paired samples t-tests examined asymmetries in strength and landing mechanics. Significance was set at p<0.05. RESULTS: Increased KIC and PKF correlated to decreased VGRF during the FJSL (r=0.327, p=0.037 and r=0.643, p=0.001 for the right and r=0.375, p=0.016 and r=0.638, p<0.001 for the left), but these correlations were not significant during FJSL. KES did not correlate to any knee kinematic measures for their respective sides. Operators demonstrated asymmetrical KES (p=0.023) but not asymmetrical KIC, PKF, or VGRF during either the FJSL (p=0.825, p=0.097, p=0.998 respectively) or DLDDL (p=0.703, p=0.246, p=0.380 respectively).

CONCLUSION: During DLDDL, minimizing
VGRF involved the knee, but these strategies were not associated with KES, indicating factors other than KES play a role. During FJSL, which is a complex movement that incorporates balance, the relationship between knee kinematics and VGRF diminished, indicating that different landing strategies were required. Tactical movements are often complex, incorporating a combination of factors such as shock absorption and balance. Understanding how landing strategies change with increased complexity will provide insight into specific mechanisms associated with injury, allowing for the design of effective injury prevention training strategies.

2646 Board #169 June 3, 11:00 AM - 12:30 PM
Differences In First And Second Landing Biomechanics During The Vertical Drop Jump Task In Female Athletes
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(No relationships reported)

PURPOSE: The Landing Error Scoring System (LESS) is a combined score of 17 biomechanical features of the 1st landing of the Drop Jump Task: Athletes drop down, then jump up immediately and land. We believe that athletes are more focused on their 1st landing than the 2nd, resulting in the 2nd landing being a better representation of the athlete’s neuromuscular control during competition when focus is on the game not the landing activity. The purpose of this study was to compare the LESS measure of the 1st and 2nd landings among a group of female athletes.

METHODS: 28 females (N=11 gymnasts, mean age=16, SD= 2.4 yrs; N=17 softball players, mean age= 17, SD= 2.6 yrs) provided written informed consent to participate in our institutional approved study. Subjects performed 3 vertical drops from a 30cm box, followed by an immediate vertical jump. Using front and side view videos (120 Hz), one reviewer used the LESS scoring system to evaluate both 1st and 2nd landings. A low total LESS value is desired. A Wilcoxin signed-rank test used the mean score of the 3 trials to compare the 1st and 2nd landing LESS scores.

RESULTS: Across all 28 subjects the average LESS score for the 1st landing was lower than for the 2nd landing, Z = -4.186, p = .0001, (Figure 1). There was a significant difference in LESS scores between landings among softball players (Z = 3.621, p = .0001), but not for gymnasts (Z = 1.785, p= .074).

CONCLUSIONS: The 2nd landing scores revealed reduced controlled biomechanics compared to the 1st landing. This difference was larger in softball players than in gymnasts. Further research is needed to determine if the 2nd landing might be a better representation of an athlete’s neuromuscular control than the 1st landing.

2648 Board #171 June 3, 11:00 AM - 12:30 PM
Effect of Limb Dominance on Landing Biomechanics Prior to a Cutting Movement.
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Non-contact anterior cruciate ligament (ACL) injuries are common in females, and a majority of these injuries occur during the landing phase after being airborne. Several epidemiological studies have been reported that limb dominance is a possible etiological factor for noncontact ACL injuries. However, the findings of these investigations are conflicting. Asymmetry of lower extremity landing mechanics between limbs before cutting may provide a better understanding of the relationship between limb dominance and non-contact ACL injury risk.

PURPOSE: To determine if limb dominance affects lower extremity landing biomechanics in females before cuttings.

METHODS: Recreational female athletes (n = 17; 21.2±1.5 yr, 63.3±4.8 kg, 169.1±4.0 cm) participated in this study. Participants performed double leg drop landings (ht = .5m) with each foot landing onto a separate force platform (1200 Hz). After landing, participants performed a 45° diagonal cut. Participants performed 3 trials for each cut direction. The participant's trials were classified by the limb that was used to push off the ground to make the cut: dominant (DC) and non-dominant (NDC). Reflective marker coordinates were reconstructed from locations captured from 7 motion-capture cameras (240 Hz). Lower extremity angular joint kinematics and ground reaction forces (GRF) were compared between the cutting conditions using paired t-tests (p<.05).

RESULTS: DC compared to NDC resulted in decreased knee flexion (49.9±6.4° and 50.4±5.5°), increased ankle inversion (10.6±4.0° and 6.0±5.2°), and significant difference hip abduction-adduction (0.7±1.3° and -3.2±3.4°) displacements; and greater maximum ankle inversion (13.6±5.6° and 6.3±7.9°) angle. No GRF differences were detected.

CONCLUSION: During a landing prior to cutting movement, DC’s lower knee flexion displacement occur to help maintain a more upright posture, increasing stability, but could potentially increase ACL loading, and may lead to less knee extension during push-off, and require increased ankle inversion displacements in compensation. Furthermore, hip adduction displacement and increased ankle inversion displacements possibly lead malalignment for the frontal plane joint kinematics which surmised to be involved in ACL landing injuries.

2647 Board #170 June 3, 11:00 AM - 12:30 PM
Changes In Lower-extremity Joint Kinematics Due To Joint Cooling During A Single Leg Drop Landing Jump
DaeHo Kim1, Kyeongtak Song2, HwiGeum Jeong1, Youngmin Chun1, Sae Yong Lee1, Jihong Park1. 1Kyung Hee University, Seoul, Republic of; 2University of North Carolina at Chapel Hill, Chapel Hill, NC. Email: yom@ohio.edu
(No relationships reported)

Sex differences in joint kinematics during landing tasks are well established. However, combinations of other factors such as joint cooling and limited visual information with sex differences are unknown. PURPOSE: To observe combined effects of joint cooling and limited visual input (without seeing the landing spot) in healthy people during a single leg drop landing.

METHODS: Lower-extremity joint kinematics were recorded from twenty healthy young adults (10 males and 10 females) during single leg drop landings from a 30 cm height box. Subjects completed three data collection sessions on three separate days that were separated by at least 2 days. Joint kinematic data (right leg only) using 3D motion analysis system (sampling rate: 200 Hz) were recorded at baseline, 0, 15, and 30-min post treatment (ankle joint cooling, knee joint cooling, or control). Joint cooling was applied to the right leg for 20 min. In each time interval, subjects performed three successful landings with and without seeing the landing spot: dropping down on the right leg onto the force platform followed by an immediate vertical jump. Joint kinematic data were smoothed, time-normalised, and then averaged across the three trials. Peak values of each joint angle in the sagittal and frontal plane were analysed. Four-way (treatment × time × vision × sex) mixed model ANOVAs and Tukey-Kramer post hoc tests were performed (p<.05).

RESULTS: The main observations were as follows. Regardless of the vision and time, females under the treatment of knee joint cooling landed with (1) 2° more dorsiflexed (p=0.02) and 3° more knee flexed (p=0.01) position, compared to the other treatments; (2) 3° and 4° increased their hip flexion (respectively), compared to the control (p=0.001); (3) with less knee valgus position, compared to the ankle joint cooling (3°, p<0.001) and knee joint cooling (2°, p=0.003). Regardless of the vision, time, and treatment, females landed with 3° hip adduction while males landed with slight (1°) hip abduction (p<0.01).

CONCLUSIONS: Limited visual information (not seeing the landing spot) during landings does not appear to change lower-extremity joint kinematics. Knee joint cooling may change general landing patterns in females compared to males. Supported by the National Research Foundation of Korea Grant (2014S1A5A8019804).

2647 Board #170 June 3, 11:00 AM - 12:30 PM
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Drop jump landings are commonly used as a screening tool to analyze the biomechanical form and neuromuscular control of athletes. Handheld tablets offer an alternative to standard stationary cameras to capture this video, possibly more feasible for use with a sports team or in a clinic setting. However, limited literature discusses the validity of using a tablet to capture a drop jump landing.

**Purposes:** The purpose of this study is to examine the validity of handheld tablets for analyzing a drop and jump landing task. **Methods:** N=30 subjects performed three drop jump landings each from a box 31 cm high. 80 drop landings were analyzed. A normal speed video camera with shutter set to 1/500 was set on a tripod 2.7 meters in front of the subject which recorded the drop vertical jump in the frontal plane. Two different reviewers held two different tablets chest height to capture the landing tasks. Six different reviewers analyzed the frontal plane projection angle (FPPA) from the videos on a free motion analysis application on the tablet. FPPA for each trial was averaged across reviewers. FPPA using the video from the stationary camera was analyzed using MaxTrac software on a desktop computer. A paired t-test and a Pearson Product Moment Correlation were used compare tablet and video data. α = 0.05.

**Results:** The effect size was small (r=0.37) and the significance of the difference was due to a high correlation (r=0.71) between angle measures from the stationary camera and the tablets. The average FPPA from the table was 165.5 ± 12.5°, and the average FPPA from the stationary camera was 165.8 ± 11.6°. The difference of approximately three degrees was statistically significant (r=0.33, p=0.001). **Conclusion:** Three degrees is not a clinically meaningful amount, despite the statistical significance. This, along with the small effect size and strong correlations, help demonstrate that tablets should be considered as an alternative to traditional video analysis for drop vertical jumps.

**Introduction:** Females are four to six times more likely to experience a non-contact ACL injury than their male counterparts. In particular, altered knee biomechanics have been implicated, particularly during pubertal development, when girls demonstrate greater differences in the external knee abduction moment (KAbM) during pubertal and post-pubertal stages compared to pre-puberty. In addition, during double leg landing girls exhibit greater moments in their dominant (D) compared to non-dominant (ND) limb, indicating greater leg asymmetry, which has been linked with higher ACL rupture rates. However, non-contact ACL injury is primarily a single leg landing injury. To date, no research has investigated whether between-limb differences in KAbM exist across pubertal development during a single leg landing task. **Purposes:** This cross-sectional study aimed to investigate differences in D and ND KAbM across pubertal development during a single leg drop lateral jump (DLJ). **Methods:** Knee biomechanics of 29 females (10 pre-pubertal, mean age 9.3 ± 0.8, Tanner stage 1 and 19 post-pubertal, mean age 22.2 ± 2.7, Tanner stage 5) were assessed during a single leg DLJ (on both D and ND legs) in bare feet. Box height was scaled to 30% of leg length, while a 12-camera Vicon motion analysis system and two AMTI force plates were used for motion capture. KAbM was determined by means of inverse dynamics and statistical comparisons were made using a series of dependent and independent t-tests, while effect sizes were calculated via Cohen’s d. **Results:** There were no significant differences between pubertal groups for the D limb. In contrast, the ND limb demonstrated a 27% higher KAbM (46.16 Nm/kg, d=0.07, p<0.05) in the pre-pubertal group compared to the post-pubertal (33.55 Nm/kg). Furthermore, within the post-pubertal group alone, a significant increase of 18% in KAbM was observed in the ND limb (46.16 Nm/kg, d=0.44, p<0.05) compared to the D (37.98 Nm/kg). **Conclusion:** These results indicate that pubertal development increases KAbM in the ND limb during single leg landing. This may be important when designing injury prevention programs and screening tests for ACL injury, as previous studies suggest greater asymmetry is linked to higher ACL injury.
Lateral foot (LF) loading has been purported to relate to increased risk of fifth metatarsal fractures in an athletic population. In a basketball population, Jones fractures are a debilitating injury sustained to the LF. Increasing the shoe stiffness or adding custom orthoses have been previously used to help control loading and as an intervention to decrease risk of stress fractures on the fifth metatarsal. Conflicting results on LF loading have been found when increasing stiffness during athletic performance.

**CONCLUSIONS:** To examine the effects of midsole stiffness on lateral plantar loading during a drop vertical jump (DVJ).

**RESULTS:** The control (less stiff) shoe had greater relative loading in the central forefoot (control: 15.2 ± 4.2%, stiff: 13.9 ± 4%, p<0.04) and lesser toes (control: 12.6 ± 4.1%, stiff: 10.8 ± 3.5%, p=0.01) regions during the landing phase. However, the stiff footwear had greater relative load in the lateral midfoot compared to the control shoe (control: 10.3 ± 5.7%, stiff: 11.7 ± 6.6%, p<0.01).

**CONCLUSIONS:** The results indicate that greater shoe stiffness increases plantar loading on the lateral midfoot which coincides with the proximal head of the fifth metatarsal. Increasing shoe stiffness should be done cautiously as increased loading on the LF may exist. Whether this increased loading is present during other basketball tasks should be determined. The authors would like to acknowledge funding support from adidas International, Inc.

**Differential Midsole Stiffness Influences Plantar Loading During Double Leg Landings In Basketball Players**

Hailey A. Parry, Anh-Dung Nguyen, Jeffrey B. Taylor, Kevin R. Ford, FACSM, *High Point University, High Point, NC.* (Sponsor: Kevin R. Ford, FACSM) (No relationships reported)

**PURPOSE:** To identify relationships between different methods of determining limb dominance in adolescent female basketball players.

**METHODS:** Twenty high school and collegiate basketball players volunteered to participate in the current study (height 185.9 ± 6.2 cm, mass 80.6 ± 9.2 kg, age 18.0 ± 1.84yr). Each subject was fitted for the appropriately sized basketball shoe. One pair of shoes was modified with a fiberglass plate placed under the insole to increase midsole stiffness. The shoe conditions were blinded and randomly assigned to each subject. During the DVJ, subjects stood on a 30 cm box and dropped off with both feet leaving the box at the same time. Upon immediate landing, they completed a maximum vertical jump. A flexible in-shoe pressure distribution measuring insole was used in the right side and sampled at 200Hz. Separate repeated measures analysis of variance (ANOVA) determined the relative loading differences in shoe stiffness during the DVJ in 9 foot regions (p<0.05).

**RESULTS:** The control (less stiff) thigh had greater relative loading in the central forefoot (control: 15.2 ± 4.2%, stiff: 13.9 ± 4%, p<0.04) and lesser toes (control: 12.6 ± 4.1%, stiff: 10.8 ± 3.5%, p=0.01) regions during the landing phase. Upon immediate landing, they completed a maximum vertical jump. A flexible in-shoe pressure distribution measuring insole was used in the right side and sampled at 200Hz. Separate repeated measures analysis of variance (ANOVA) determined the relative loading differences in shoe stiffness during the DVJ in 9 foot regions (p<0.05).

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Obesity is associated with chronic inflammation. Intermediate monocytes (iMn) are a pro-inflammatory leukocyte subpopulation implicated with cardiovascular (CV) disease. While exercise improves CV health via modulation of inflammatory processes, its effects on circulating iMn of obese patients are unknown. Understanding the changes in iMn for children may optimize the effectiveness of exercise interventions.

PURPOSE: To evaluate the changes in circulating iMn in obese (Ob), overweight (Ow), and normal weight (Nw) children (10-17 yr) following a high-intensity interval exercise (10 x 2-min @ 80% peak VO2).

METHODS: 11 Ob (BMI ≥ 95%), 6 Ow (BMI 85-94%), and 5 Nw (BMI < 85%) underwent a high-intensity, cycle ergometer interval exercise (10 x 2-min @ 80% peak VO2). Baseline, end-exercise, and 1 hour post exercise blood samples were used to determine ratios of classical (cMn, CD14++CD16-) vs. iMn (CD14++CD16+) subtypes by flow cytometry.

RESULTS: At baseline, relative abundance of iMn correlated positively with BMI% (r=0.48, p=0.02). In all groups, exercise induced a significant (p<0.001) but similar changes in iMn for children may optimize the effectiveness of exercise interventions.

CONCLUSIONS: These results suggest that voluntary exercise in TLR5 deficient mice might be occurred in prevention of obesity-associated inflammation along with alteration of gut microbiota.

The purpose of the study was to examine changes of total antioxidant status and 8-oxo deoxyguanosine (8-OXO) from blood samples before and after exercise at different intensities in smokers and non-smokers. Methods: Total eighteen physically inactive subjects (eight smokers:SM and ten non-smokers:NS) aged 20 to 27 (SM: 23±1.0 vs NS: 22.7±1.8, Mean±SD) were recruited. Smokers were accepted if level of exhaled carbon monoxide (eCO) was greater than 16ppm. Each subject completed three treadmill runs at different intensities in a random order (53%, 65%, and 75% of VO2max). Running distance for all three runs was equivalent to 35-min run at 65% VO2max. Smokers had 2 hour smoking cessation before each run. Blood samples were collected before (Pre), after (Post), and an hour following each run (1h Post). Results: levels of total antioxidant status and 8-OXO in SM was quite different to those previously presented (Experimental Biology, Boston, 2015) where smokers ceased smoking only for 30 minutes before each exercise. SM showed levels of 8-OXO (P<0.01) and lower level of antioxidant (P<0.001) as compared to non-smokers (NS) (group effect). 8-OXO elevated at Post following 65% (SM:2439±172pg/ml→2951±224, P<0.012; NS:2132±192→2581±215, P=0.021) and 75% (SM:2352±191→3369±259, P=0.001; NS:2104±253→2872±392, P=0.005) VO2max runs. 8-OXO elevated up to 1h Post following 75% run (2744±239, P=0.028) in SM only. Total antioxidant decreased immediately after 65% run (Pre:4.8±4.3mM→Post:4.2±5.5, Mean±SD, P=0.028) and up to 1h post following 75% run (Pre:4.9±4.4→Post:3.7±6.6, P=0.011→1h Post:3.9±4.4, P<0.019) in SM; however it was significantly lower than Pre immediately after 75% run (Pre:5.9±5.9→Post:4.6±8.8, P=0.013) only in NS. Conclusion: Both total antioxidant status and 8-OXO changed in dose-dependent manner to exercise intensity and showed a mirror image, indicating that DNA damage in blood immune cells may be associated with levels of total antioxidant status. The patterns of changes corresponded with previous presentation (EB, 2015) with 30 minute smoking cessation; however, the differences between SM and NS were much smaller in this study suggesting that smokers may need to avoid cigarette smoking before exercise to minimize immune disturbance caused by combined stress from exercise and chronic smoking.
Exercise-mediated Pentraxin 3 Expression From In Vitro Stimulation Of Human PBMCs With LPS In Obese Individuals
Aaron L. Slusher, Yoshimi Shibata, Michael Whitehurst, FACSM, Arun Maharaj, Justin Quiles, Chun-Jung Huang, FACSM. 1Virginia Commonwealth University, Richmond, VA. 2Florida Atlantic University, Boca Raton, FL. (Sponsor: Dr. Chun-Jung Huang, FACSM)

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(NO relationships reported)

PURPOSE: Pentraxin 3 (PTX3), a cardioprotective protein and a mediator of inflammation, is decreased in obese individuals. Therefore, to further understand the capacity of PTX3 production, we investigated whether or not lipopolysaccharide (LPS)-stimulated PTX3 production by peripheral blood mononuclear cells (PBMC) ex vivo is reduced in obesity and increased following acute exercise. The relationship of PTX3 with the inflammatory cytokines interleukin-6 (IL-6), IL-10 and tumor necrosis factor-alpha were also monitored.

METHODS: Eleven healthy obese and 11 normal-weight individuals performed an acute bout of aerobic exercise at 75% VO2max on a treadmill. PBMCs were collected and cultured with LPS prior to, immediately post-exercise, and at 1 and 2 hours into recovery following exercise.

RESULTS: Acute exercise decreased LPS-stimulated PTX3 release in both. However, obese subjects exhibited significantly attenuated percent changes in IL-6 and IL-10 compared to normal-weight subjects groups. Furthermore, the acute exercise-elicited PTX3 response was positively correlated with IL-6 and IL-10 immediately following exercise in normal-weight, but not obese subjects.

CONCLUSIONS: These findings indicate that acute aerobic exercise downregulates PTX3 production as well as IL-6 and IL-10. Interestingly, the magnitude of these inflammatory responses to acute exercise was less in obese than in normal individuals.

Acute Aerobic Exercise on Soluble Cell Adhesion Molecules
Ashley P. Lamar1, Kandace Parks1, Kyung-Shin Park2, Yunsuk Liu1, Yu Qin Wei1, Yang Wang1, Ling Zhu1, Ru Wang1, Guo Yuan Huang2, Zhan Bin Niu1, Xiang Yun Liu1, Yunsheng Bai1, Guo Yuan Huang2, Zhan Bin Niu1, Xiang Yun Liu1, Yunsheng Bai1 (No relationships reported)

Exercise Modes on Blood Lipid in Older Adults
Ashley L. Lamar1, Kandace Parks1, Kyung-Shin Park2, Yunsuk Liu1, Yunsheng Bai1, Guo Yuan Huang2, Zhan Bin Niu1, Xiang Yun Liu1, Yunsheng Bai1 (No relationships reported)

Effect of AVP V1a Gene Polymorphisms and Different Exercise Modes on Blood Lipid in Older Adults
Ru Wang1, Guo Yuan Huang2, Zhan Bin Niu1, Xiang Yun Liu1, Yu Qin Wei1, Yang Wang1, Ling Zhu1, Ru Wang1 (No relationships reported)
Acute exercise preferentially mobilizes antigen-specific CD8+ T-cells into the bloodstream where they can be readily accessed for immunotherapeutic purposes. Although exercise is a simple and economical adornant to boost circulatory T-cell numbers, arduous exercise bouts might not be possible in some patient and healthy donor populations. Identifying the mechanisms underpinning the preferential redeployment of antigen-specific CD8+ T-cells with exercise might allow for the use of pharmacological interventions in lieu of exercise for “at risk” patients.

**CONCLUSIONS**

To determine if antigen-specific CD8+ T-cells are redeployed by exercise via β2-adrenergic receptor signaling pathways independently of shear stress.

**METHODS:**

Five healthy male subjects (mean ± SD, age 32 ± 6 yrs; height 174.2 ± 3.9 cm; weight 74.4 ± 4.7 kg) performed 30 min of steady state cycling exercise at +10% of blood lactate threshold cycling power under 3 different conditions separated by 7-days: (1) placebo, (2) non-preferential β1+ β2 antagonist (80 mg nadolol), and (3) β2-preferential antagonist (10 mg bisoprolol) administered 3 hr prior to exercise in a randomized double-blind design. Blood samples were taken at baseline, at rest 3 hr after drug administration, immediately post-exercise, and 1 hr post-exercise.

**RESULTS:**

Compared to placebo, nadolol and bisoprolol had similar effects on lowering exercising heart rate (-24.4%) and blood pressure (-11.3%), indicating that vascular adrenergic receptor signaling pathways independently of shear stress.

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**CONCLUSIONS:**

The mobilization of antigen-specific CD8+ T-cells with exercise is largely driven by β2-adrenergic receptor signaling pathways. In patients for whom exercise is not possible or desirable, clinicians may consider using preferential β2-agonists to mobilize antigen specific CD8+ T-cells from the tissues to the bloodstream where they can be easily accessed for immunotherapy.

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Glycemic responses are commonly measured in both research and clinical practice. Factors such as prior food intake and physical exertion are often controlled for, yet water intake and hydration status are typically uncontrolled and may impact results.

**PURPOSE:**

To investigate the effects of hydration status on glycemic control and to inform future study design. METHODS: In a randomized-crossover design, five healthy individuals (80% male) aged 28 ± 4 y, were dehydrated in a sauna (55–85°C) for 45 minutes between 1700–1900 hours, before either remaining dehydrated (consuming maximum 200 mL) or rehydrating with 150% of individual weight losses throughout the evening. Participants then arrived at the laboratory the next morning in a fasted state at 0800 hours and provided a urine sample to verify hydration status.

**RESULTS:**

Body mass was reduced by 1.2 ± 0.8 kg. The following week, participants maintained this weight loss or remained in the sauna for 45 minutes (whichever came first). Urine osmolality was significantly higher when dehydrated (1069 ± 67 and 606 ± 292 mOsm). The iAUC for blood glucose was lower in the rehydrated group, although the differences in the time-course of the initial response but then an attenuated concentration in the hydrated trial from 45 minutes onwards. Blood lactate concentrations were also lower in the hydrated trial, yet no differences in the time-course of the initial response were apparent from 75 minutes.

**CONCLUSIONS:** Glycemic control may be an important factor to consider when measuring glycemic response. The trend in the lactate data suggest the effect

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Vitamin D deficiency has been associated with poor cardiometabolic fitness in adolescents and adults, but this association is unclear in preschool-aged children.

**PURPOSE:**

To determine the association between serum 25(OH)D concentration and cardiometabolic fitness in preschool-aged children, and whether these are any gender differences in this association.

**METHODS:**

The participants were 137 preschool children (45% were girls) aged 4 and 5 years (mean height: 112.1±4.9 cm; weight: 20.5±3.4 kg). Participated in this study. Cardiorespiratory fitness (maximal oxygen uptake, VO2max) was measured with the 20-meter shuttle run test. Fasting blood samples were collected for the determination of plasma 25(OH)D and iPTH concentrations using commercially available ELISA kits. Multiple linear regressions were used to assess whether serum 25(OH)D concentration was associated with VO2max adjusted for potential confounding variables (BMI, sex, and physical activity).

**RESULTS:**

The mean 25(OH)D concentration was 58.1±14.3 mmol/L, 29.9% of children were 25(OH)D deficient (<50 mmol/L), and 56.2% of children had insufficient 25(OH)D (50-75 mmol/L). Multiple linear regression analysis revealed that Serum 25(OH)D concentration was positively associated with VO2max independently of BMI, sex, and objectively measured physical activity in boys (Beta = 0.22, P = 0.046), but not in girls (Beta = 0.02, P = 0.904).

**CONCLUSIONS:** These findings suggest that serum 25(OH)D concentration is independently and positively related to cardiometabolic fitness in preschool-aged boys, but not in girls. These findings indicate that the prevention and treatment of vitamin D deficiency may help to maintain and improve cardiometabolic fitness in preschool-aged boys.
Maintenance of fluid homeostasis is essential for health, athletic performance and thermoregulation. Although there are a lot of studies evaluating hydration status in many sports, there are few data concerning hydraulic status. PURPOSE: To assess hydration status of elite young sailing athletes during the World Championship Laser 4.7. METHODS: 12 young elite male athletes participated in the study (age: 15.8±1.1 y, height: 1.74±0.1 m, weight: 65±1.5 kg, body fat: 12.5±3.1%, training age: 7.0±1.2 y). Hydration status was assessed via pre- and post-race urine osmolality (S_osm) and urine color. RESULTS: Although all sailors were hydrated after the end of the 1st semifinal race (day 1) (USG=1.017±0.001), a significant body weight loss was observed (1-4% despite ad libitum drinking during the race). Hydration indices were significantly elevated during the remaining days, with post-race USG (2nd semifinal race/day 2: 1.024±0.001, 1st final/day 3: 1.026±0.001, 2nd final/day 4: 1.027±0.001, p<0.05), post-race urine color (5, 6, and 7) and change in body weight (2.5, 2.8, and -3%). All measured parameters indicated progressively increasing levels of dehydration for the athletes. CONCLUSION: The data suggested that progressive dehydration was developed throughout the consecutive days of racing and especially during the race. It is of vital importance even for elite athletes to be educated about the importance of euhydration.

E-34 Free Communication/Poster - Muscle Mitochondria and Metabolism

Friedrich’s Ataxia (FA) and Mitochondrial Disease (MITO) are associated with biochemical impairments that result in inadequate mitochondrial energy production. Current FA and MITO treatments target enhancement of mitochondrial functioning. PURPOSE: The aim of our study was to measure muscle-specific endurance and muscle mitochondrial capacity in people with FA and MITO. METHODS: Participants with FA (n=11), MITO (n=11), and controls (n=5) were tested. Muscle twitch accelerationometry was used as an assessment of muscle-specific endurance after electrical stimulation for 3 minutes each at 2, 4, and 6Hz. Near-infrared spectroscopy was used to measure the rate of recovery of oxygen consumption after a short bout of electrical stimulation in the forearm flexors as a measure of muscle mitochondrial capacity. RESULTS: Muscle endurance indexes were 91%, 51%, 33% and 97%, 76%, 47% for the FA and MITO participants, respectively. The controls had endurance indexes of 98 ± 1%, 92 ± 8%, and 75 ± 12%. The rate constant reflecting mitochondrial capacity was reduced for the FA participant (1.0/min) but not for the MITO participant (1.4/min), relative to historical controls (n=9, 1.5 ± 0.3/min). CONCLUSIONS: Both FA and MITO patients had reduced endurance indexes indicating reduced muscle function. FA athletes were hydrated with reduced mitochondrial capacity, while MITO was similar to previous MITO patients with normal mitochondrial capacity. Future studies of patients with mitochondrial-related diseases should evaluate both muscle endurance and metabolism.
Skeletal muscle mitochondria are important for health and performance; however, the optimal exercise stimulus to increase mitochondrial content and function is equivocal. Countercycled single-leg (SL) cycling permits the comparison of training adaptations to two different protocols within the same subject, but in a manner that simulates the feeling of normal two-legged cycling. This approach provides greater statistical power to elucidate possible differences in the adaptive response to distinct training strategies.

**PURPOSE:** To compare changes in skeletal muscle mitochondrial content and function in response to short-term high-intensity interval training (HIIT) and moderate-intensity continuous training (MICT), matched for total work.

**METHODS:** Ten active but untrained men (age = 23±4 y, VO_{2peak} = 46±5 mL·kg^-1·min^-1) performed unilateral graded-exercise tests to measure SL VO_{2peak} and SL peak power (W_{peak}). Each leg was randomly assigned to complete either six sessions of MICT (30 min at 50% W_{peak}) or HIIT (4 x [5 min at 65% W_{peak} and 2.5 min at 20% W_{peak}]) over 2 weeks. Citrate synthase (CS) maximal activity and mitochondrial OXPHOS capacity (6.4±2.9 to 5.3±1.4 pmol·s^-1·CS-1; n = 8; p = 0.30) and SL VO_{2peak} (34±3.2 to 34±4.1 mL·kg^-1·min^-1; n = 8; p = 0.75) were unchanged in both groups.

**CONCLUSION:** Over a 2-week training period, HIIT elicited greater increases in skeletal muscle mitochondrial content and function compared to MICT. We conclude that the intensity and/or pattern of contraction is an important determinant of exercise-induced skeletal muscle remodeling in humans.

Supported by NSERC of Canada

**REFERENCE:**

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(No relationships reported)
There is strong evidence supporting a crucial role for inflammatory cytokines in mediating metabolic adaptations to exercise. Many reports have indicated that skeletal muscle is the source of systemic elevations in cytokine levels observed during and post exercise. However, the exact mechanism modulating these inflammatory cascades has yet to be elucidated. Toll-like receptor-4 (TLR-4) is an immune receptor that is widely expressed in skeletal muscle and other metabolic tissues. Pathogen-mediated activation of TLR4 stimulates the production of pro-inflammatory cytokines. However, in the context of exercise and muscle contraction it is not clear if TLR4 elicits the exercise-induced cytokine response. Purpose: To investigate the role of skeletal muscle TLR4 signaling in modulating cytokine response and mitochondrial adaptation to acute and chronic exercise, respectively. Methods: We used a muscle-specific TLR4 knockout mouse (mTLR4-/-) and wild type littermates (WT), which underwent a 4-week treadmill running program. Serum samples were collected from the saphenous vein, and flow cytometry technology was utilized to assess cytokines prior to and immediately post acute exercise. Quadriceps and gastrocnemius muscles were collected for mitochondrial maximal enzyme activity 36 hours after the completion of the last bout of exercise. Results: Flow cytometry revealed a 114% increase in serum interleukin 6 (IL6) of WT mice following exercise, whereas this response was blunted in mTLR4-/- mice (-55%), P<0.05. Furthermore, treadmill training increased serum interleukin 6 (IL6) of WT mice following exercise, whereas this response was blunted in mTLR4-/- mice (-55%), P<0.05. Furthermore, treadmill training increased serum interleukin 6 (IL6) of WT mice following exercise, whereas this response was blunted in mTLR4-/- mice (-55%), P<0.05.

EXERCISE TRAINING

Skeletal Muscle-TLR4 Deficient Mice Lack Exercise-induced Cytokine Up-regulation and Mitochondrial Adaptation to Exercise Training

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(No relationships reported)

Purpose: Obesity promotes several metabolic disorders, including insulin resistance (IR). It is known that physical exercise is an important non-pharmacological agent in the prevention and treatment of IR and consequently reducing the incidence of T2DM. Rho-kinase (Rock) has been postulated as an important protein that acts directly on the phosphorylation of IRS-1, collaborating up to 50% of glucose uptake in skeletal muscle tissue. Therefore, the aim of this study was to evaluate if physical exercise modulates Rock activity and whether the increase of glucose uptake by muscle tissue of obese and insulin resistant mice after physical exercise also occurs due to Rock metabolism. METHODS: Twenty four Swiss mice (4 weeks old) were divided into 3 groups (8 animals / group): Sedentary Control (C) sedentary animals fed with control diet, Sedentary Obese (SO) sedentary animals fed with HFD and Trained Obese (TO) animals fed with HFD and submitted to the training protocol. Protocol training was carried out for 1h / day, 5 days / week during 8 weeks and it was performed at the intensity of 60% of maximum power, which was determined at the beginning of the experiment. During the last experimental week the insulin tolerance test (ITT) and glucose tolerance test (GTT) were performed. Twenty four hours after the last exercise session the animals were euthanized and the muscle was harvested for subsequent analysis.

Results: It was seen that in obesity condition there was a decrease of Rock activity in muscle tissue. This finding was, in part, due to the increase of RhoA, molecule that inhibits Rock activity and decrease of Rock, molecule that increases Rock phosphorylation, which culminated in a lower activity of Rock and consequently lower phosphorylation of IRS-1/Akt pathway and thus lower glucose uptake, which collaborated with insulin resistance in obese. However, after physical exercise, obese mice showed their state of Rock metabolism reversed. It was found increase of RhoA and Rock levels and reduced level of RhoE. Conclusion: Physical exercise can contribute to glucose homeostasis through Rock metabolism for obese mice. Thus, these results reveal a new mechanism by which physical exercise collaborates on glucose uptake in skeletal muscle of obese and insulin resistant animals without the use of insulin.

FAPSISP: 2013/00554-6 and 2013/21491-2

A high-fat (HF) diet induces metabolic disease while initially increasing muscle mitochondrial content: a putative compensatory response to increased reactive oxygen species (ROS). Maternal obesity exacerbates the metabolic syndrome phenotype in offspring weaned to a HF diet, but little is known about the effects of maternal obesity on muscle mitochondrial function. Purpose: To determine whether maternal obesity influences muscle mitochondrial function in offspring weaned to a HF diet. METHODS: Female mice were fed a control (CON, 10% kcal) or HF (45% kcal) diet to induce maternal obesity prior to mating. Diets were maintained throughout pregnancy and lactation. Male offspring (n=30) were weaned to HF or CON diet creating 4 groups (CON/CON, CON/HF, HF/CON, HF/HF). At 12 months body composition (DEXA) and mitochondrial function in permeabilized gastrocnemius biopsies (high-resolution respirometry) was determined.

Results: Newborns and adult offspring of obese dams were heavier than CON. Percent lean body mass was lower in offspring of obese mice, and those weaned to a HF diet (71±2.5, 52±1.2, 60±2.5, 50±1 %) in the 4 groups respectively; effect of maternal obesity and HF diet p<0.05, two-way ANOVA). Maximal muscle fatty-acid (palmitoyl-carnitine, PC) and carbohydrate (glutamate) driven respiration was lower with saturating ADP, oxidative phosphorylation (OXPHOS) and electron transport system capacity (ESTS) were each greater in HF diet (p<0.05). Flux control ratio for ADP+PC was also greater in HF diet (0.15±0.05, 0.25±0.06, 0.16±0.04, 0.23±0.05 p<0.05).
CONCLUSIONS: Greater LEAK in offspring of obese dams indicates pathological dyscoupled respiration, perhaps consequent to increased ROS. Despite this, muscle oxidative capacity tended to be lower in the muscles of offspring of obese dams. Maternal obesity may contribute to HF diet-associated metabolic disease by ameliorating the compensatory increase in muscle mitochondrial content and function. Support: March of Dimes 030344; Pulmonary Education and Research Foundation.

PURPOSE: Aging is associated with reduced mitochondrial abundance and oxidative capacity in skeletal muscle. There are also intrinsic mitochondrial abnormalities with aging such as lower energetic efficiency and increased emission of reactive oxygen species (ROS). This so-called "mitochondrial dysfunction" is one of several factors that contribute to impaired physical function with aging. We previously reported that dietary omega-3 fatty acids (n-3-PUFAs) increase the expression of genes that regulate mitochondrial biogenesis and enhance mitochondrial capacity in muscle of old mice. We conducted a human intervention study to determine if the beneficial effects of n-3-PUFAs on mitochondrial function were evident in aging humans.

METHODS: 12 older (67-83 yrs) adults were studied at baseline and after 4 months of n3-PUSA supplementation (4gday). 12 young adults (19-34 yrs) were studied as a comparison group at baseline. Vastus lateralis muscle biopsies were collected in the postabsorptive state. High-resolution respirometry was used to evaluate the oxidative capacity and coupling of isolated mitochondria. Hydrogen peroxide emission was monitored using spectrophotometry. Muscle gene expression profiles were evaluated by RNA sequencing. RESULTS: Older adults exhibited significantly lower oxidative capacity using substrates specific to carbohydrate oxidation (young: 6.60±0.70 pmol/s/µg, old: 4.67±0.47 pmol/s/µg, p=0.032) and lipid oxidation (young: 1.42±0.14 pmol/s/µg, old: 0.94±0.12 pmol/s/µg, p=0.016). Oxidative capacity was unchanged following n3-PUSA supplementation for carbohydrate substrates (3.99±0.38 pmol/s/µg) or lipid substrates (0.89±0.11 pmol/s/µg). However, mitochondrial ROS emission was significantly reduced following n3-PUSA supplementation in older adults (baseline: 671±78 pmol/s, follow-up: 530±62 pmol/s, p=0.001). None of the 764 mitochondrial-related genes measured by RNA sequencing were induced by n3-PUFAs in older adults. Moreover, oxidative capacity in skeletal muscle of older humans does not exhibit any evidence of mitochondrial biogenesis or improvements to mitochondrial oxidative capacity in skeletal muscle in response to dietary n3-PUFAs. However, n3-PUFAs may hold promise for reducing skeletal muscle oxidative stress by reducing mitochondrial ROS production.

PURPOSE: To explore the necessity of M-Cr for in vivo ADP transport at rest and during exercise.

METHODS: MI-Cr wild-type (WT) and knockout (KO) mice (n=6-8/group) were randomized to a sedentary (SED) or exercise (EX) group (acute bout; 1 hour, 15m). Mi-CK wild-type (WT) and knockout (KO) mice (n=6-8/group) were randomized to a sedentary (SED) or exercise (EX) group (acute bout; 1 hour, 15m/EX). Mi-CK wild-type (WT) and knockout (KO) mice (n=6-8/group) were randomized to a sedentary (SED) or exercise (EX) group (acute bout; 1 hour, 15m/EX). Mi-CK wild-type (WT) and knockout (KO) mice (n=6-8/group) were randomized to a sedentary (SED) or exercise (EX) group (acute bout; 1 hour, 15m/EX). Mi-CK wild-type (WT) and knockout (KO) mice (n=6-8/group) were randomized to a sedentary (SED) or exercise (EX) group (acute bout; 1 hour, 15m/EX).

RESULTS: The Mi-CK enzyme was not present in the mitochondria of KO mice, and while PMFs displayed an attenuated response to exogenous Cr, this response was not completely absent in KO mice. These data suggest solely analyzing ADP sensitivity in PMFs with Cr is confounded by the cytosolic CK enzyme, and therefore we relied on

CONCLUSION: In contrast to previous estimates in the heart, the present data provides in vivo evidence that Mi-CK is not required for mitochondrial ADP respiratory sensitivity in resting muscle or during exercise. However, in situ experiments reveal that ADP sensitivity is increased in KO mice to optimize ADP transport and energy provision during exercise, suggesting either ANT or ATP synthase proteins are externally regulated.

Recent research has reported an effect of environmental temperature on the exercise stimulated response of several genes related to skeletal muscle mitochondrial biogenesis in humans. However, the previous research has not addressed the impact of environmental temperature, independent of exercise. Purpose: To determine the effects of acute hot and cold exposure on skeletal muscle gene expression related to mitochondrial biogenesis in humans. Methods: Recreationally trained male subjects (n=11, age 27±5, height 183±5 cm, weight 84.1±13.0 kg) had skeletal muscle biopsies taken from the vastus lateralis after 3 hours of sitting in an environmentally controlled chamber in either cold (C), room temperature (RT), or hot (H) conditions (7°C, 20°C, 35°C, respectively). Results: Core temperature was significantly higher in C and C compared to RT (37.2±0.1°C, p=0.001; 37.1±0.1°C, p=0.013; 36.9±0.1°C, respectively). Whole body oxygen consumption was significantly higher in H and C compared to RT (0.38 ± 0.1 L·min⁻¹, p < 0.001; 0.52 ± 0.3 L·min⁻¹, p < 0.001; 0.35 ± 0.1 L·min⁻¹, respectively). There was no difference in the gene expression of ERRα (p = 0.665), GABPA (p = 0.080), MEF2A (p = 0.630), NRF1 (p = 0.651), PGC1α (p = 0.612), SIRT1 (p = 0.080), TAF1 (p = 0.890), VDAC1 (p = 0.800) between H, C, and RT. Conclusions: Temperature exposure alone does not elicit significant changes in gene expression related to mitochondrial biogenesis. When considered in conjunction with previous research, exercise appears to be a necessary component to observe gene expression alterations between different environmental temperatures in humans.

Funded by National Institute of General Medical Sciences of the National Institutes of Health, Centers of Biomedical Research Excellence (P20GM109090).

It is widely accepted that mitochondrial creatine kinase (Mi-CK) contributes to ~80% of ADP transport into mitochondria. However, this notion is based on calculated algorithms, and direct in vivo evidence to support the assumption that Mi-CK is a major regulator of mitochondrial ADP transport does not exist.

METHODS: To elucidate the necessity of Mi-Cr for in vivo ADP transport at rest and during exercise.

RESULTS: The Mi-CK enzyme was not present in the mitochondria of KO mice, and while PMFs displayed an attenuated response to exogenous Cr, this response was not completely absent in KO mice. These data suggest solely analyzing ADP sensitivity in PMFs with Cr is confounded by the cytosolic CK enzyme, and therefore we relied on

CONCLUSION: In contrast to previous estimates in the heart, the present data provides in vivo evidence that Mi-CK is not required for mitochondrial ADP respiratory sensitivity in resting muscle or during exercise. However, in situ experiments reveal that ADP sensitivity is increased in KO mice to optimize ADP transport and energy provision during exercise, suggesting either ANT or ATP synthase proteins are externally regulated.
We have previously shown an increase in mitochondrial density using an exercise mimetic electrical pulse stimulation (EPS) (30V, single bipolar pulses of 2ms and 1Hz continuously) applied to an in vitro human primary cell culture model. PURPOSE: To determine if continuous EPS of 11.5V, 2ms single bipolar pulses at 1Hz is a valid in vitro exercise mimetic to effectively increase mitochondrial density and insulin action of human primary myotubes. METHODS: Primary cultures were established from myoblast extracted from 5 healthy lean Caucasian male donors (23 ± 1.9 y; BMI 24.2 ± 0.6 kg/m²). Myoblasts were pooled, grown and differentiated into myotubes. EPS was applied to fully differentiated myotubes at either 11.5V or 30V, using single bipolar pulses of 2ms and 1Hz continuously for 24 hours. Control groups were maintained without stimulation. Protein was extracted from EPS stimulated and unstimulated (control) myotubes for western immunobloting of mitochondrial density and insulin action of human primary myotubes.

RESULTS: 24 hours of EPS at 30V resulted in ~1.7 fold greater OXPHOS complex content compared to the unstimulated control, while 11.5V resulted in 0.82 fold lesser OXPHOS content compared to control. After 24 hours of EPS, there was a 0.9 fold and 0.5 fold difference in the Akt phosphorylation using 30V and 11.5V respectively, compared to corresponding unstimulated control cells.

CONCLUSION: 30V of EPS resulted in a greater mitochondrial density, an evident adaptation to regular physical activity, and greater Akt phosphorylation compared to CONCLUSION: Relationship between IMCL content and physical activity level differs between young and elderly adults. This finding congruents our previous studies, which found relationship between IMCL content and muscle strength in young but not in elderly adults. This study was supported by KAKENHI grant #23650432 and the Descente and Ishimoto Memorial Foundation for the Promotion of Sports Science.

Sedentary time (ST) is associated with increased risk for insulin resistance, metabolic syndrome, and type 2 diabetes. The impact of ST on insulin sensitivity and muscle mitochondrial oxidative capacity, key mediators of the aforementioned metabolic diseases, is not fully understood. PURPOSE: We sought to determine the impact of ST on insulin sensitivity and muscle mitochondrial oxidative capacity in inactive, middle-aged, obese adults. This study was supported by KAKENHI grant #23650432 and the Descente and Ishimoto Memorial Foundation for the Promotion of Sports Science.

Sedentary behavior inversely relates to insulin sensitivity and mitochondrial oxidative capacity in inactive obese adults. Brian A. Irving1, Matthew L. Johnson2, Ian R. Lanza2, Matthew R. Robinson2, Adam R. Konopka3, Katherine A. Klaus2, K. Sreekumaran Nair2, 1Louisiana State University, Baton Rouge, LA, 2Mayo Clinic, Rochester, MN, 3Colorado State University, Fort Collins, CO. (Sponsors: Glenn A. Gaesser, FACSM) Email: briana@miners.utep.edu

Relative Validation of a Semiquantitative Food Frequency Questionnaire for Portuguese Adolescents. Ana L. Silva, Francilia Neto, Cristina Monteiro, Júlia Teles, Isabel Fragoso, Faculdade de Matricidale Huma, Universidade de Lisboa, Cruz Quebrada, Dafundo, Portugal. Email: analuciasilva79@gmail.com

A food frequency questionnaire (FFQ) that efficiently measures food intake in a comprehensive manner is priority for epidemiology studies as this information is crucial for the investigation of associations between dietary factors and disease or disease-related markers. PURPOSE: To validate a semiquantitative FFQ for Portuguese adolescents. METHODS: A cross-sectional analysis was conducted in an adolescent sample. A semiquantitative Portuguese food frequency questionnaire (SQ-PortFood-FQ) was developed and validated with a three-day multiple-pass 24-hour recall as reference method. Eighty-three adolescents (aged 10 to 16 years) filled the SQ-PortFood-FQ and answered to the multiple-pass 24-hour recall, in order to collected energy intake (EI), raw macronutrients intake (MI) and energy-adjusted MI obtained from SQ-PortFood-FQ and multiple-pass 24-hour recall. Spearman correlation coefficients were used to quantify the association between EI, raw MI and after EI adjustments obtained from both tools. Intra-class correlations were performed in order to compare data and assess the reliability. Levels of agreement were obtained by weighed kappa statistics and by the percentage of participants correctly classified into the same quintiles, same or adjacent quintile and grossly misclassified. The Bland-Altman method was used to assess the degree of agreement when using the log-transformed data, considering the mean (difference of the methods) ±1.96 standard deviations (difference) for limits of agreement (LOA). The significant level was considered at P value of 0.05.

RESULTS: EI showed acceptable reliability by Spearman’s correlation coefficient (r=0.53) and by the ICC (ICC=0.42). A good level of agreement was obtained for EI with a level of concordance of 0.41, and with 40% of the participants classifying at the same quintile, more than 70% at the same or adjacent quintile, and 1% grossly misclassified. The Bland-Altman showed accuracy for EI, albeit the overestimation of 15% in the SQ-PortFood-FQ comparing to the multiple-pass 24-hour recall. CONCLUSIONS: The results demonstrated that the SQ-PortFood-FQ is reliable and accurate for EI, mostly by ranking the intake into categories of consumption. As far as we know this is the first FFQ to be validated for Portuguese adolescents.
groups using a randomized, counterbalanced design. Breakfast meals consisted of 320 calories by design (PROT [P 30g/F 6g/C 27g/Fib 3g] / BIB [P 11g/F 5g/C 59g/Fib 8g] / SUG [P 8g/F 5g/C 59g/Fib 1g]). Data collection occurred at the same time of day on three separate occasions 1 week apart. After familiarization to the survey pre-trial, each participant completed a satiety survey preceding and following the breakfast treatment and at intervals throughout the morning and after ad libitum lunch. Participants completed tests to measure academic performance, memory, and focus immediately prior to the lunch meal.

RESULTS: Breakfasts were designed and pretested as described but during trials the actual average nutrient intake were as follows: PROT [P 19g/F 4g/C 24g/Fib 1g/224 Cal] / BIB [P 8g/F 3g/C 42g/Fib 5g/230 Cal] / SUG [P 6g/F 5g/C 51g/Fib .75g/275 Cal]. There were no significant main effects on academic tests or satiety surveys. Participants consumed PROT616±42 / 876±248, BIB163±53 / 888±273, and SUG541±48 / 943±263 calories at lunch and total.

CONCLUSIONS: There was no effect of breakfast type on measured outcomes. However, some participants did not consume the treatment as designed resulting in high variability in individual macronutrient intake. The amount of familiarity to satiety scales was variable among individuals & may require additional time stabilizing in children.

2686  Board #209 June 3, 9:30 AM - 11:00 AM Assessing the Prevalence of Dietary Supplement Use Among Collegiate Athletes
Jennifer Ratnapatram1, Mark Mustert, Aaron Rafterty2, Martin Caniza2, Terri Lisagor3, Michelle T. Barrack1. 1California State University, Northridge, Northridge, CA. 2California State University, Long Beach, Long Beach, CA. 3California State University, Northridge, Northridge, CA.

BACKGROUND: While dietary supplement use among the general population has increased, literature outlining supplement use among collegiate athletes is limited.

PURPOSE: To describe current trends in supplement use by athletes and identify potential factors.

METHODS: A survey was distributed to collegiate athletes, between ages 18-26, competing in ten NCAA Division I sports. The survey inquired about athletes’ supplement use and consisted of 8 multiple choice and 5 open-ended questions. Data was recorded on Microsoft Excel using a coding system and analyzed using SPSS software.

RESULTS: Of the sample of 596 athletes (53% males, 47% females, BMI 23.7 ± 0.14 kg/m2), 55% reported taking supplements on ≥2 days/week in the past year (46.6% reported taking 1-3 supplements, 8.6% reported intake of >3 supplements). Dietary supplements consumed by athletes included amino acid/protein (33.3%), vitamin/mineral (23.3%), fatty acid/fish oil (10.6%), other (5.2%), carbohydrate/hydration (4.5%), and herb/botanical (2.0%) supplements. Females were more likely to consume vitamin/mineral supplements than males, (X2= 5.5, 27.8% vs. 19.4%, p = 0.019), more males reported use of amino acid/protein supplements (X2= 36.6, 44.5% vs. 20.5%, p = 0.001). More athletes in sports using the phosphocreatine energy system (Pcr) compared to the phosphophosphate system and anaerobic glycolysis (PCr/A) or all three energy systems (PCr/Ag/Op) reported using amino acid/protein (X2= 12.1, 40.5%, 33.9%, 18.6%, p = 0.002) and fatty acid/fish oil, (X2= 6.9, 15.2%, 9.9%, 4.7% p = 0.03) supplements. Athletes in the PCr/Ag/Op compared to the PCr/A and PCr groups were more likely to report use of carbohydrate/hydration supplements, (X2 = 15.7, 11.6%, 4.5%, 0.6%, p < 0.001).

CONCLUSIONS: This study provides evidence of regular supplement use in over half of collegiate athletes. Knowledge regarding supplement use by gender and sport may assist in optimizing health and targeting education efforts. Supported by the NIGMS grant # 8TL4GM118980-02

2687  Board #210 June 3, 9:30 AM - 11:00 AM Rural Community Member Adaptations to a Recent Food Desert
Wayne C. Miller, FACSM, Brian Griffith, Denver Rogalla, Dustin Spencer, Nida Zia, Haylee Heinsberg, West Virginia School of Osteopathic Medicine, Lewisburg, WV.

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Food deserts are urban neighborhoods or rural towns without ready access to fresh, healthy, and affordable food. Large food corporations are causing food deserts in rural towns by underpricing local grocery stores, causing them to close. PURPOSE: Discover how rural community members adapted to a recent food desert caused by the closing of their only grocery store. METHODS: Alderson, WV (population 1,184) lost its only grocery store December 31, 2014, causing a food desert. 155 households (30%) were surveyed as to how they adapted to the new food desert. Behaviors were compared before and after the grocery store closing. Statistical analyses included t-tests for mean group comparisons, and Pearson correlations. RESULTS: 44% of households used the food pantry, and 23% used SNAP (Supplemental Nutrition Assistance Program). 43% of families reported their food pantry use increased. No difference (p=0.17) in frequency of driving more than 10 miles to buy food. No difference (p=0.85) in local restaurant use. 21% increase for the number of family gardens. Correlation coefficients were low between local food use and distant food use (range, r=0.88 to r=0.26). The new food desert caused families to ask restaurants to sell them fresh produce and dairy. CONCLUSION: Although a new food desert caused hardships for a rural community, it did not affect their eating at local restaurants or traveling long distances to purchase food.

2688  Board #241 June 3, 9:30 AM - 11:00 AM ACSM Certified Non-Degreed and Degreed Fitness Professional’s Attitudes and Actions Towards Healthy Eating Information
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Purpose: Exercise professionals often work with individuals seeking information and advice regarding healthy eating, yet scope of practice limits the extent of information that can be disseminated. The purpose of this study was to compare the perceptions and practices of delivering healthy eating information between fitness professionals with degree-required ACSM credentials (DR) and those with non-degree required ACSM credentials (NDR). Methods: An e-survey was distributed to all ACSM Certified Professionals in June 2015 (n=25,947). Completed surveys were grouped as DR (CEP, CCEP, RCEP, CETT, CRPDD, CHFD; n=1035) and NDR (GEI, CPT, CET, IFT, PPHS, GEL; n=722; Total completed surveys=1759). The perception and practice differences between groups were calculated using chi square tests (SPSS v.20, alpha > .05). Results: Almost 80% of all completed surveys were from licensed Personal Trainer (CPT, 39.6%) and the Certified Exercise Physiologist (CEP, 38.4%). Of the NDR, 47.9% had at least a bachelor’s degree in exercise science. For healthy eating topics, NDR were less likely to refer to an RDN-based facility or program (63.3% vs. 69.2%, p=0.006), 2) to provide guidance on locating credible healthy eating information (77.8% vs. 82.4%, p<0.009), and 3) to provide guidance based on the Dietary Guidelines for Americans (71.4% vs. 80.2%, p<0.001). A significantly higher proportion of NDR believed it was acceptable for ACSM practitioners to sell dietary supplements (13.8% vs. 10.2%, p=0.024). NDR were more likely to be aware of the Registered Dietitian’s (RDN) scope of practice document, but not to have read it (63.1% vs. 56.8%, p=0.006). NDR were less likely to have read the CEP, CCEP, or RCEP scope of practice (p<0.005 for all). NDR were less likely to agree that RDNs could provide guidance on physical activity based on the Physical Activity Guidelines for Americans or for the client’s weight goals (59.5% vs. 66.9%, p=0.001 and 19.9% vs. 27.0%, p=0.014, respectively). Conclusion: Based on these results, NDR ACSM-credentialed professionals do not utilize resources and referrals regarding healthy eating as well as the DR professionals. Additionally, NDR are more likely to endorse the idea of selling dietary supplements, while not understanding an RDN’s scope of practice regarding PA guidelines or weight loss.

2689  Board #212 June 3, 9:30 AM - 11:00 AM Nutritional Supplement Use By Endurance Athletes: Trends And Determinants Of Consumption.

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(No relationships reported)

Nutritional supplement use by athletes rose from 57% in 1999 [1] to 88% in 2009 [2]. Supplement consumption can modify some of the physiological determinants of performance and help to meet athletes’ increased dietary requirements. It is unclear what influences the use of supplements by athletes and if supplement use has increased further in the last 6 years.

PURPOSE: To describe current trends in supplement use by athletes and identify potential factors influencing consumption.

METHODS: Athletes (n=212) from a variety of sports, ranging in level from ‘casual’ to Olympians/World Internationals (n=63) completed an online survey to record their demographic and use of supplements.

RESULTS: Male athletes reported a higher % of supplement use (89%) than female athletes (75%). Report use was highest in elite (88%) and serious amateur athletes (88%) and was higher during competition (n products ~374) compared to training (n products ~297). In competition, total uses of ‘energy’ supplements were higher than in training (n products=169 vs 108); this was also seen with ‘ergogenic’ supplements (n products=71
Pre-mixed products were used more frequently during competition vs training (n products = 67 vs 22); conversely powdered products were more popular in training vs competition (n products = 110 vs 80). The physiological determinants of performance that athletes ranked as of ‘very high’ and ‘high’ importance were similar in training and competition: power, lactate handling and recovery. The difference that athletes perceived between scores/times for ‘average’ and ‘best’ competitive performances was 5.1% for serious amateurs and 2.4% for elite athletes.

CONCLUSIONS:
Supplement use remains high in athletes of all levels and there are clear differences in supplement use between training and competition phases. Athletes target specific physiological determinants of performance and performance improvements when choosing a supplement; it may be possible to predict the popularity of a supplement based on its mechanism of action or the degree of improvement that it claims to offer.

REFERENCES:

The prevalence of nutritional supplements use was 50.8% (urban 54.9 %, suburban 43.2%, and exurban 39.9%). The most commonly-used nutritional supplements were Health food (68.2%) and vitamin/mineral (19.0%). The decision to use nutritional supplements was mostly driven by their friends (18.7%). Two major reasons for using nutritional supplements were to eliminate the fatigue (19.1%) and enhance immune function (15.5%). Overall, supplement users have significantly higher scores of nutrition knowledge test than non-users (72.4 ± 19.9 vs. 65.2 ± 26.5, p < 0.001). There were no significant differences between three areas in total physical work capacity test score (urban 91.1 ± 8.25, suburban 89.3 ± 9.05, and exurban 90.2 ± 8.04, p = 0.39). However, the urban and suburban field firefighters have significantly higher heavy load and run, push-up, sit-up and weight lifting scores than exurban field firefighters.

CONCLUSIONS: These results can provide information for their senior officers and can be a reference of nutrition education for dietitians and health educators.
Little is known about factors contributing to physical activity (PA) in American Indian (AI) populations, particularly correlates of PA in AI caregiver/child dyads. PURPOSE: To determine factors contributing to PA in families from 5 diverse AI communities nationwide using baseline data from a large randomized healthy lifestyles intervention trial. METHODS: Demographic and anthropometric data (body mass index [BMI] kg/m2) were collected in adult caregivers and their children age 2 - 5 years (n = 450 dyads). Self-report surveys collected data on PA (adults, Godin-Shephard Leisure-Time PA Questionnaire; children, Netherlands PA Questionnaire), stress (adults only), and sleep and screen time (adults and children). For analysis, PA was categorized by those who did or did not engage in PA. Covariates included BMI (BMI percentile in children), screen time (min; TV watching, computer, and videogame use), site, age (years), weekday and weekend sleep (hours), stress (total units; adult age (children only). Univariate logistic regression models were fit to determine inclusion of independent variables into the multivariate model (p < 0.20). Multivariate logistic regression models were done separately for adults and children using adjusted odds ratios (aOR). RESULTS: For adults, 44.9% were active, 16% moderately active, and 38.9% sedentary. For children, 76.7% were active, 22% moderately active, and 1.3% sedentary. For adults, the odds of engaging in PA were lower in those ≥36 years of age (aOR = 0.46; 95% CI = 0.27, 0.80; p < 0.01), those that watched TV for >2 hours daily (aOR = 0.62; 95% CI = 0.39, 0.99; p = 0.046), and used the computer for >30 minutes daily (aOR = 0.48; 95% CI = 0.31, 0.73; p < 0.001). For children, the odds of engaging in PA were higher when adults engaged in MVPA (aOR = 1.71; 95% CI = 1.08, 2.72, p = 0.02). CONCLUSION: In total, 44.9% of adults and 76.7% of children in this study engaged in daily PA. Screen time and older age contribute to lower odds of engaging in MVPA for adults, while adult MVPA contributed to higher odds of PA for children. Adult perceived stress and sleep variables did not predict PA. Understanding factors that contribute to PA will aid in evaluating and designing effective interventions in AI communities.

PURPOSE Primary health care providers (PHCP) are excellent resources to address the prevalent problem of inactivity in the population. Some studies provided information on physical activity counselling (PAC) in Canadian primary care contexts, but none used medical chart audits to collect data. They focused primarily on primary care physicians (PCPs), without including other PHCP. Thus, the purpose of this study was to: i) quantify the assessment of PA level, PAC provided and referral to kinesiologists performed by PHCP of patients treated in Quebec Family Medicine Groups (FMGs); ii) identify the determinants of the assessment of PA level performed and PAC provided by PHCP. METHODS An 18 months retrospective medical chart review was performed by trained research personnel using a standardized grid to obtain information about PHCP’s practice, the number of kinesiologist referrals and patients’ comorbidities. Sociodemographic data were self-declared in a questionnaire. Patients’ leisure PA was determined using the Canadian Community Health questionnaire and quality of life with the Short Form-36. RESULTS Forty one PCPs (48±10 years, 63% of female), 24 nurses (56±12 years, 92% of female) and 439 patients (58±14 years, 66% of female, BMI 29±6 kg/m2, 56% of inactive) from 10 Quebec FMGs were recruited between 2009 and 2012. According to chart audits, PCPs referred 0.2% of patients to a kinesiologist. Almost, 52% of patients had their PA level assessed during the last 18 months, but only 22% received PAC by one of the PHCP. More exactly, PCPs performed PAC with 15% of their patients and nurses with 18%. In multivariate analysis, 34% of the PAC’s performed by at least one PHCP variance was explained by: [OR (95%CI)] PA level assessment [4.32 (2.37-7.85)], overweight/obese status [3.21 (1.46-7.10)], type 2 Diabetes/Pre-Diabetes status [2.84 (1.51-5.37)], PHCP experience [0.97 (0.94-0.99)], patient’s annual family income ≤50 000 $ [0.56 (0.32-0.97)], number of nurses’ encounters [1.22 (1.10-1.35)] and patient’s physical component of the quality of life [1.06 (1.03-1.10)]. CONCLUSION Although the majority of patients were inactive, the assessment of PA and PAC is low in the Quebec FMGs. Initiatives to help PHCP and more resources to assess PA and provide PAC should be favor in FMGs.

Individuals with schizophrenia are less physically active than the general population. In order to accurately assess the relationship between health and physical activity (PA), identify PA determinants, and develop interventions, valid and reliable methods of assessing PA must be identified. Previous research has reported that the Short-Form International Physical Activity Questionnaire (IPAQ) demonstrates similar measurement properties in this population as it does in the general population. Cognitive deficits are common among individuals with schizophrenia, and 7-day recall may be challenging. PURPOSE The purpose of this study was to replicate and expand on the initial validation study by examining reliability over a 4-week period, and to test whether a 24-hour recall protocol improved criterion validity correlation coefficients in comparison to 7-day recall. METHODS One hundred and eight participants completed the IPAQ at baseline and 4 weeks later. Participants wore an Actigraph GT3X+ accelerometer on their waist for 7 days in the week prior to the final IPAQ administration. A 24-hour recall modification of the IPAQ was administered after the final IPAQ assessment. Spearman’s correlation coefficients were calculated based on the minutes of moderate to vigorous PA (MVPA) determined by each method of measurement. RESULTS Test-retest reliability for the self-administered IPAQ was p=.47, p<.001 for total minutes of moderate to vigorous PA. Correlation between the final IPAQ assessment and objectively measured PA was r=.31, p=.002. IPAQ reported in the 24-hour recall correlated significantly with MVPA on the previous day r=.24, p=.041. CONCLUSIONS Compared to a previous validation study, IPAQ criterion validity was similar but less reliable over a four-week period. Notably, 24-hour recall was not associated with improved criterion validity correlation coefficients. Findings provide further support that the IPAQ may be suitable as a surveillance tool to assess levels of physical activity among individuals with schizophrenia. Overall, the IPAQ demonstrated similar measurement properties as that reported among the general population. Use of the IPAQ will help increase epidemiological research and may be a suitable assessment tool for health care providers. Supported by a CIHR Operating Grant.
METHODS: We studied 605 participants from the Masked Hypertension Study, a worksite-based study of employed adults (mean age 45.4 ± 10.6 years; 57.4% male). 24-hour accelerometry was conducted on a work day using a hip-mounted Actical accelerometer. Concurrently, participants completed electronic diary entries regarding their location (home, work, vehicle, other) and task (working, working, chores, mealtime, commuting, relaxing, other) every 30 min. Sedentary bouts were defined as consecutive minutes wherein the accelerometer registered <100 counts/min.

RESULTS: For the needs assessment survey, 29% of respondents (84% female) reported having anxiety while 15% reported having depression. As such, many believed a worksite wellness program should have a component focusing on mental health. The top three reasons for wanting to increase physical activity were 1) health, 2) weight management, and 3) appearance; while the top three barriers to physical activity were 1) time, 2) cost, and 3) other life priorities. Twenty percent of respondents believed it was “extremely important” to include their family in a worksite wellness program. Utilizing Kruger’s focus group methodology, 3 focus groups (n=19; 95% female; 89% White) were conducted to examine employees’ perception of worksite wellness. Findings indicated that health and wellness are valued by the employee with top and middle management supporting work-life balance and the employees’ health. Employees wanted programs that focused on nutrition, fitness, health coaching, and stress management. Furthermore, employees wanted employer based incentives to encourage program participation and completion. Many employees reported a sense of constantly being “plugged in” to their work smartphones and emails. This perception had a negative impact on their work-life balance. Employees believed administration should do more to encourage employees to “unplug.”

CONCLUSIONS: Conducting a mixed-methods needs assessment is critical to identifying employees’ wellness perceptions and programmatic needs. Practitioners should conduct needs assessments prior to developing interventions to ensure programs meet participant desires.

2697 Board #220 June 3, 11:00 AM - 12:30 PM

An Assessment of Participation and Initiatives in an Established Corporate Wellness Program
Elizabeth Ballien, Jessica Kiss, Jeremy Knous. Saginaw Valley State University, University Center, MI. (No relationships reported)

Corporate wellness programs are popular and effective mechanisms in providing support and opportunities for employees to adopt and maintain healthy behaviors that decrease health risks, enhance quality of life, and boost personal efficacy. To maintain an effective corporate wellness program it is essential to continually assess employee participation and barriers.

PURPOSE: To assess employee participation in a currently established wellness program, reasons for nonparticipation, and interest in wellness program initiatives.

METHODS: An anonymous electronic survey was distributed to 831 eligible employees. Participants were asked about their current participation, reasons for nonparticipation, and interest in proposed initiatives. Data were analyzed using a mixed methods approach based on the option to elaborate on specific questions. Participation data were dichotomized and interest was measured using a modified Likert scale.

RESULTS: 141 (17%) of the benefit eligible employees responded to the survey. 108 (77%) respondents reported current participation while 33 (23%) reported being nonparticipants in the wellness program. The three most commonly reported reasons for nonparticipation were other (56%), with the elaborated general theme related to lack of time and program convenience, perception of the wellness program not having value (17%), and specific program offerings not being of interest (17%). Among all respondents, the specific programs currently offered that were most favored included the wellness fair (21%), lunch & learns (13%), and the pedometer challenge (11%). Of the proposed initiatives, wellness program participants and nonparticipants alike were most interested in a wellness newsletter (66%), hands-on instructional seminars (57%), and nutrition counseling (50%).

CONCLUSIONS: Considering that the most popular barriers to participation in the wellness program are attributed to a perceived lack of time, program convenience, and program value, it is speculated that initiatives requiring less commitment or that can be completed at the participants’ leisure is most appealing. Based on the survey data and initiative interest, program initiatives should focus on educational resources such as a wellness newsletter, hands-on seminars, and nutrition counseling.

2698 Board #221 June 3, 11:00 AM - 12:30 PM

Conducting a Needs Assessment for a Worksite Wellness Program in Eastern North Carolina
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PURPOSE: A significant amount of literature links the social and physical workplace environment to employees’ health and productivity. This study was a needs assessment for a worksite wellness program, focusing on office workers in Eastern North Carolina.

METHODS: Employees who provide mental health resources to community members participated in the mixed-methods study. Employees were eligible to participate if they worked ≥ 20 hours/week and were at least 18 years of age. Assessments included a Qualtrics survey (quantitative) and focus groups (qualitative).

RESULTS: The needs assessment survey, 29% of respondents (84% female) reported having anxiety while 15% reported having depression. As such, many believed a worksite wellness program should have a component focusing on mental health. The top three reasons for wanting to increase physical activity were 1) health, 2) weight management, and 3) appearance; while the top three barriers to physical activity were 1) time, 2) cost, and 3) other life priorities. Twenty percent of respondents believed it was “extremely important” to include their family in a worksite wellness program. Utilizing Kruger’s focus group methodology, 3 focus groups (n=19; 95% female; 89% White) were conducted to examine employees’ perception of worksite wellness. Findings indicated that health and wellness are valued by the employee with top and middle management supporting work-life balance and the employees’ health. Employees wanted programs that focused on nutrition, fitness, health coaching, and stress management. Furthermore, employees wanted employer based incentives to encourage program participation and completion. Many employees reported a sense of constantly being “plugged in” to their work smartphones and emails. This perception had a negative impact on their work-life balance. Employees believed administration should do more to encourage employees to “unplug.”

CONCLUSIONS: Conducting a mixed-methods needs assessment is critical to identifying employees’ wellness perceptions and programmatic needs. Practitioners should conduct needs assessments prior to developing interventions to ensure programs meet participant desires.
Most studies investigating trends in physical activity (PA) and sedentary time have based their results on self-reported measures, which have several known limitations. PURPOSE: The aim of this study was to assess secular and longitudinal trends in accelerometer-measured physical activity and sedentary time in a population-based sample of adults (20–90 years) in Norway. METHODS: For the secular trend analysis, the cohort consisted of 3485 participants (47% men) in 2008–09 (Kan1) and 3173 participants (45% men) in 2014–15 (Kan2). In 2014–15, we localised 1317 (91%) of the original 2008–09 participants whom were invited to participate in the follow-up examination. 1964 participants agreed to participate (62%) of which 1759 (46% men) provided valid data on both occasions. We measured PA and sedentary time using Actigraph accelerometers. Outcome variables were overall PA level (expressed as mean counts per minute, cpm), time (min/day) spent sedentary (<100 cpm) and in moderate-to-vigorous physical activity (MVPA; ≥2020 cpm). RESULTS: We found that participants in Kan2 had a significantly higher overall PA level compared with the participants in Kan1 (mean difference: 10 cpm, 95% CI: 2.6, 16.5; P<0.007). There was no difference in time spent sedentary over the six-year period. However, participants in the 2014–15 survey accumulated on average 36 minutes (min/day) more per day in MVPA compared with the participants in the 2008-09 survey. For the longitudinal analysis, we observed no significant changes in overall PA level, time spent sedentary or in MVPA over the six-year period. However, in sub-group analyses, older participants (>65 years) at baseline decreased their overall PA level by 58 cpm (95% CI: -77, -39, P<0.001) more per day in MVPA compared with the participants in the 2008-09 survey. For the longitudinal analysis, we observed no significant changes in overall PA level, time spent sedentary or in MVPA over the six-year period. However, in sub-group analyses, older participants (>65 years) at baseline decreased their overall PA level by 58 cpm (95% CI: -77, -39, P<0.001). Further, women (<23 min/d), men and women aged 35–49 years (<15 min/day) and those >65 years (<23 min/day) significantly increased their time spent sedentary. Moreover, participants aged >65 years at baseline significantly decreased time spent in MVPA (5 min/day) over the six-year period. CONCLUSIONS: The results indicate that the overall PA level in the population is somewhat higher in 2014-15 than in 2008-09. The longitudinal increase in sedentary time among women and the elderly are of concern and not entirely explained by an ageing effect.

Preliminary PA results from 2016 indicated that 85% of Norwegian adults met the recommended daily PA level. However, these results may be limited by regression dilution. Although objectively assessed MVPA may make such comparisons more valid, they should still be treated with caution.

**Purpose:** To evaluate physical activity (PA) interdependence and patterns among under-resourced, urban dwelling 24-35 month-old children and their parents. METHODS: Hip worn accelerometers were used to collect PA data from N=60 dyads for 7 days at 30Hz. Child and parent data were analyzed in 5s and 60s epochs using Costa (2014) and Freedson (1998) cut points, respectively, with a custom algorithm. Descriptive statistics, correlations, tests for temporal and dyadic interdependence, two-phase linear regression, unbalanced panel data analysis, and a cross-lagged path analysis model were run. Significance level was set a priori at p<0.05. RESULTS: PA data for 44 dyads (girls: n=24; women: n=43) achieved sufficient wear time reliability of r=0.7 to 0.8. Most children (89%) were insufficiently active, while most parents (82%) met recommended volumes of PA. Vector magnitude (VM) patterns, reflecting PA intensity, were time dependent for children, but were independent from their parent’s VM patterns. Girls and boys participated in activities of similar VM. Child and parent time spent in PA were interdependent for light (LPA) [r(44) = 0.56] and moderate-vigorous (MVPA) [r(44) = 0.40], but not for sedentary (SED) behavior. There were no differences in SED nor LPA time between girls and boys. On average, girls spent fewer minutes per day in MVPA [35.4(19.3)] than did boys [44.4(23.8)], and parents of boys spent fewer minutes in MVPA per day [51.8(28.4)] than did parents of girls [66.5(32.2)] (both, t(8) = -11.797; t = 2.73). Children also spent fewer minutes in MVPA [39.5(21.7)] than their parents [59.6(31.1)] (β = -19.3, t = -4.47). Total time spent in PA (TPA) during a given hour had a significant effect on TPA time in the following hour for children [γ = 0.49(0.02), Z = 21.7] and for parents [γ = 0.73(0.02), Z = 37.6]. After adjusting for responsive time spent in TPA during the prior hour, parents showed a stronger effect on children’s minutes in TPA [γ = 0.13(0.01), Z = 10.3] than children did on the amount of time their parents spent in TPA [γ = 0.12(0.03), Z = 3.4]. Conclusion: Time spent in PA is temporarily interdependent for very young children and their parents. However, the intensity of PA was independent within dyads. These data suggest that the temporal patterns of children’s PA should be considered when designing PA interventions.

**Purpose:** The association of physical activity with BMI and health outcomes are often compared with inferences made about their relative importance to health status. However, such analyses assume that measures of these exposure variables are equally valid, they should still be treated with caution.
PURPOSE: The combined use of accelerometers and global positioning system (GPS) devices may provide insights into how trails can support physical activity (PA) and an alternative approach for objectively measuring specific activities on trails, such as cycling. The aims of this study were to examine associations between trail use and PA and sedentary behavior (SB) and to quantify on-trail PA with accelerometer activity counts only and then with a combination of accelerometer and GPS data.

METHODS: Participants (N=141, 53% female, 19-78 y), who were recruited on five trails in Massachusetts, wore an Actigraph 7164 accelerometer and a GeoStats GPS data logger concurrently for 1-4 days. Total PA (daily mean counts min^-1), and daily minutes of light PA (LPA=100-759 counts), moderate PA (MPA=760-5724), and vigorous PA (VPA=5725), and SB (0-99) were derived from activity counts. A trail use day was defined as a day on which a participant engaged in a minimum of 2 consecutive minutes of activity on a trail as defined by GPS coordinates. Mixed linear regression models were used to examine whether trail use was associated with PA outcomes and SB, controlling for demographics, trail site, weekday/weekend trail use, SB for PA outcomes, and PA (all intensities) for SB outcome.Intensity of PA on trails was quantified using counts only and a combination of counts and GPS speed. Ainsworth's compendium was used to classify intensity based on the metabolic equivalent levels for different cycling speeds.

RESULTS: Trail use had positive associations with LPA (β=7.7 min∙d^-1, p<.004), MPA (β=28.3 min∙d^-1, p<.0001), and total PA (β=522 counts∙min^-1, p<.0001). Trail use was not associated with VPA or SB. Minutes of activity on trails classified as VPA increased by 0.1 min when on trails and GPS speed was defined to use intensity defined, compared to using activity counts only. On-trail LPA, MPA, and SB decreased by 15%, 91%, and 85%, respectively.

CONCLUSION: Adults accumulated more LPA, MPA, and total PA on days when they used trails, indicating the importance of these resources for supporting regular PA. The combination of GPS and accelerometer data may be useful for classifying PA intensity on trails where individuals are likely to be cycling. Supported by funding from the Active Living Research Program, the Robert Wood Johnson Foundation.

Regular exercise and physical activity (PA) reduce the risk of chronic disease and premature mortality. Emerging evidence links sedentary behaviors, independent of exercise and PA, with increased risk of disease and premature mortality. Sedentary behaviors include sitting or lying during waking hours. Many adults spend the majority of this time in sedentary occupations. PURPOSE: To determine, in sedentary office workers: 1) time spent in PA and sedentary behaviors and 2) whether the workers who were most active also spent the least time sitting during a typical 5 day work week.

METHODS: Participants (n = 44) were women who had a sedentary, office-based job. The activePAL3 activity monitor was placed on the thigh and participants were asked to maintain normal daily activities while wearing it continuously for seven days. Objective measures of PA and sedentary behavior during a 5-7 h day were obtained. Participants were divided into tertiles based on average daily step count. A comparison of PA and sedentary time during work hours was made between participants in the lowest (n=15) and highest (n=15) tertiles. RESULTS: Participants were predominantly Caucasian (95%), middle-aged (48 ± 9y), with a BMI of (30.5 ± 8.2). During the workday, participants spent 5.7 ± 1.1 hrs sitting, 2.0 ± 1.1 hrs standing, and 0.7 ± 0.2 stepping. Participants in the lowest step tertile spent 5.6 ± 1.6 hrs sitting, 2.4 ± 1.6 hrs standing, and 0.5 ± 0.2 stepping. Those in the highest step tertile spent 6.1 ± 0.7 hrs sitting, 1.5 ± 0.7 hrs standing, and 0.9 ± 0.3 stepping. A significant difference was observed in time spent stepping between those in the lowest and highest step tertiles (p=0.001). No significant difference in time spent sitting (p=0.3) or standing (p=0.07) was found between those in the lowest and highest step count tertiles. CONCLUSION: Employees with the most time stepping did not sit less than employees with the least time stepping. This may suggest that employees classified as active by step count may also be sedentary for long periods. Therefore, to have the greatest value, interventions intended to improve employee health must target both physical activity and time spent sitting. Supported by a Slippery Rock University- College of Health and Environmental Sciences grant.

Although access to transit may affect transport-related physical activity (PA), built environments that may have the greatest value, interventions intended to improve employee health must target both physical activity and time spent sitting. Supported by a Slippery Rock University- College of Health and Environmental Sciences grant.
RESULTS: Population statistics were composed for each location. Health Behavior Index was determined by summing Z-scores. Using state statistics, Hawaii State had a HIHI of 2.13. Maui ranked the healthiest with HIHI of 3.14, compared to Oahu (2.26), Kauai (0.45), and Kona (-4.30). CONCLUSION: Data from the available Hawaiian Islands indicates Maui has the healthiest behaviors, while Kona ranks last. Although these results assume compatible comparison between islands and equally weighted health variables, it shows clear discrepancies in health behaviors among the different Hawaiian Islands. Future research may identify other variables related to health (e.g., environmental factors) and focus on island specific strategies to improve health behaviors.

Nurses comprise the largest professional group within the health care workforce. A large proportion of Canadian nurses self-report as being overweight/obese, hypertensive, dyslipidemic, diabetic and having heart disease and cancer. While regular physical activity (PA) is known to prevent many of these diseases, it remains unknown as to whether Canadian nurses are meeting current PA guidelines (≥150 minutes/week) of moderate-to-vigorous intensity physical activity (MVPA); 10,000 steps/day). PURPOSE: To objectively describe the PA profiles (sedentary time; low, moderate and vigorous intensity PA levels) of Canadian registered nurses from a mix of rural and urban hospitals (N=13) in the Champlain region of Ontario. METHODS: Nurses were an Actigraph GT3X+ accelerometer (Actigraphy, Pensacola, FL) for ≥10 hours/day for a 5-day recording period. Height, body weight, waist circumference and vascular health (Mobil-O-Graph) were assessed in triplicate. Descriptive statistics were used to report the measures and their variations. RESULTS: Three-hundred nurses (286 females; mean ± SD: age = 44 ± 12 years; height: 164 ± 6 cm; BMI: 27.1 ± 5.4 kg/m²; waist circumference: 81 ± 12 cm; resting blood pressure: 113 ± 13/73 ± 8 mm Hg) participated in this study. The most commonly reported medical conditions included: anxiety (8.6%), depression (8.3%), chronic back pain (8.3%), asthma (7.0%), hypertension (7.0%), hypothyroidism (5.7%), arthritis (3.7%) and dyslipidemia (3.7%). Nurses spent an average of 448.6 ± 114.3 minutes/day sedentary, and 408.2 ± 81.0 minutes/day in light intensity, 122.1 ± 18.3 minutes/day in moderate intensity and 118.6 ± 39.0 mins/day in MVPA. WSc was significantly and positively associated with steps/day (β=0.05 per 1000 steps, p<0.05), but was not associated with mins/day of LPA (p=0.16) or MVPA (p=0.33). Three subcategories of the WSc were significantly associated with steps/day; errands (β=0.06, p=0.009), shopping (β=0.05, p=0.03), and dining/drinking (β=0.05, p=0.02). Subcategory scores for schools, parks, grocery stores, and culture were not associated with steps/day. CONCLUSIONS: WSc was associated with daily steps but not mins/day in specific intensities (LPA or MVPA). Women with higher steps/day had higher amenity scores for shopping, errands and dining/drinking.

There is an increasing percentage of international players within Major League Baseball (MLB), specifically from the Dominican Republic (DR). Players from different countries of origin have different training norms, which can affect their resiliency and performance. A proposed influence of athlete durability and performance is fundamental movement patterns. Currently, there is a paucity of studies comparing fundamental movement competency of athletes born in different geographic locations. PURPOSE: To examine differences in fundamental movement patterns in United States (US) versus DR born professional baseball players. METHODS: All players included in the study were recently selected by an MLB team to join their organization. Upon arrival to the facility, each player underwent an initial evaluation, which included the Functional Movement Screen (FMS). Over the course of two years, a total of 142 athletes were included in the study (76 DR and 66 US born). Subjects completed the FMS using the standardized 7 movement tests and the 3 isolated clearing tests. The primary variables studied were composite score, left and right asymmetry, and individual movement standard scores. Two-way Chi square analysis was utilized for the statistical analysis with statistical significance being identified at p<0.05. Results: The primary findings were that players from the DR had a larger number of 1’s (7.8% vs. 3.0%) and 3’s (10.5% vs. 1.5%) on the right-sided hurdle step and they also had a greater percentage of 3’s (82.8% vs. 60.6%) on right-sided shoulder mobility. On the other hand, players from the US had a larger percentage of 3’s (33.3% vs. 13.4%) and a lower percentage of 1’s (2.2% vs. 15.1%) on the active straight leg raise, and a greater percentage of passable scores (≥2; 99.5% vs. 65.8%) on the trunk stability push up. Conclusions: This study suggests that fundamental movement competency differs between US and DR born professional baseball players. Specifically, DR players displayed greater upper extremity mobility in comparison to US players who exhibited greater core stabilization and lower extremity mobility. Based on these movement competency differences, a player’s country of origin may be taken into account in order to create an effective training program.
People with disabilities are living longer as they typically have better health care and support than in earlier years. However, many studies showed that people with disabilities are less likely to engage in regular moderate physical activity than people without disabilities, yet they have similar needs to promote their health and prevent unnecessary disease. Purpose: The objective of the study was to develop behavior change strategies for engaging in regular physical activity among elderly with disability using the Transtheoretical Model (TTM) and International Classification of Functioning, Disability and Health (ICF). Methods: A systematic literature review was conducted and an interdisciplinary coalition of kinesiologists, social workers, physical therapists, health care professionals, and experienced field experts teamed together to reframe items of ICF which focused on old adults with physical disability. Based on this information, physical activity behavior strategies were developed for physically disabled elderly who were in the stage of precontemplation, contemplation, and preparation. Finally, the developed physical activity promotion strategies were validated by 22 interdisciplinary team members. Results: The study found that overall promotion strategies for each exercise behavior change stage in elderly with physically disabled required policy support in addition to administrative assistance. Also, the cooperation of different expert groups, family and relatives of elderly with disability could change exercise behaviors of disabled older adults. It is also necessary to check, continuously educate, and promote exercise behaviors to seniors with disability. Also, healthy seniors assisting disabled senior was recommended. If we employed these strategies effectively, elderly with physical disability would continuously participate in physical activity programs. Conclusions: Physical activity promotion strategies could be used for future policy decisions and institutional development for seniors with physical disabilities.

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Self-efficacy is the belief in one’s self to complete a task and often influences behavior. There is some evidence suggesting that individuals with higher self-efficacy engage in more physical activity (PA). PURPOSE: To examine the relationship between self-efficacy and PA in a sample of older adults. METHODS: Older, healthy adults (age 50+), currently not meeting ACSM PA recommendations, were enrolled in a PA or control group and completed a survey assessing demographics (gender, age, race, education level and marital status). Self-efficacy for engaging in PA was also assessed. Height and weight were measured to calculate body mass index (BMI). Participants wore an Actigraph accelerometer for seven days, during all waking hours. Time spent in sedentary, light, and moderate to vigorous PA was expressed as the percentage of each day spent in each intensity level. Pearson correlation coefficients were computed to examine the relationship between self-efficacy and PA behaviors. Multiple linear regression models examined the relationship between self-efficacy and sedentary, light, and moderate to vigorous PA, controlling for age, gender, and education. RESULTS: On average, participants (n=71) were 64±9 years of age and had a mean BMI of 33±7 kg/m2. A majority were women (75%), Caucasian (80%), married (61%), and completed at least some college (82%). Participants spent an average of 62% of their day sedentary, 37% in light PA, and 1% in moderate to vigorous PA. Results from the Pearson correlations showed a significant relationship between self-efficacy and sedentary time (r=-.27, p<.05), light PA (r=-.26, p<.05), but not moderate to vigorous PA (r=.14, p=.26). Results from the regression models showed borderline significant relationships for sedentary time for PA (p<.05) and light PA (p<.06) but not moderate to vigorous PA (p>.35). CONCLUSIONS: Findings indicate that self-efficacy was associated with sedentary time and light PA, but not moderate to vigorous PA. Results may be due, in part, to the low level of moderate to vigorous PA and self-efficacy of participants. Future research is needed to fully understand the influence of self-efficacy on PA among older adults. Including more diverse samples of older adults (with respect to PA and self-efficacy) would assist in increasing the generalizability of results.

Aging causes declines in motor function, which may be attenuated by interventions such as neuromuscular electrical stimulation (NMES). NMES pulse width influences the relative activation of motor and sensory axons. Wide pulses (0.5-1 ms) activate relatively more sensory axons than narrow pulses (0.2-0.4 ms) due to the longer strength-duration time constant and lower rheobase of sensory axons. Wide-pulse stimulation, therefore, can augment the central contribution to evoked contractions.

PURPOSE: To compare the influence of pulse width on the changes in motor function elicited in old adults by a 6-week NMES intervention. We hypothesized that the improvement in walking endurance would be greater for participants who received wide-pulse NMES.

METHODS: 13 healthy old adults (75.6 ± 6.5 yrs) free of neurological disease were recruited to participate in a 6-wk intervention comprising 3 weekly sessions of NMES provided over the proximal gastrocnemius and distal soleus muscles. Participants were randomized to receive either narrow- or wide-pulse stimulation. The stimulation applied in each session comprised a cycle of 4-s on, 12-s off for 20 minutes per leg at the maximal intensity tolerable. Evaluation sessions were performed at weeks 0, 4, 7, and 10 to measure walking endurance (400-m walk test), walking speed, maximum voluntary contractions with leg muscles, time to complete a chair-rise test, and balance (maximal length and rapid step tests).

RESULTS: While not yet sufficiently powered to compare the narrow- and wide-pulse groups, pairwise comparisons performed on data collapsed across groups demonstrated that the time to walk 400 m was significantly reduced (250 ± 61 s to 234 ± 54 s, P < 0.02). Preferred walking speed did not change, but maximal walking speed increased between weeks 0 and 4 (0.55 ± 0.08 ms to 0.51 ± 0.08 ms, P < 0.02). Plantarflexor strength increased between weeks 0 and 7 (P < 0.001), but no significant changes were observed for the dorsiflexors, hip flexors, knee extenders, and knee flexors. Chair rise test time was reduced between weeks 0 and 4 (P < 0.05), weeks 0 and 7 (P < 0.005), and weeks 0 and 10 (P > 0.002). No significant differences were detected in the balance tests.

CONCLUSION: NMES can improve walking endurance, maximal walking speed, strength of the muscles stimulated, and chair rise performance in old adults.
PURPOSE: Objectively assessing children’s energy expenditure (EE), physical activity (PA) and sedentary behaviors (SB) will facilitate the implementation of effective interventions at schools. The purpose of this study was to investigate the effects of a school-based exergaming intervention on children’s EE, PA and SB during in-school, after-school and weekend segments in comparison with physical education (PE).

METHODS: Participants were 260 second and third grade children (134 girls; M = 8.13 years, SD = 0.71) who took part in the Learning through Exercise study. Demographic data were collected by parent report. A two-level Mixed Models analysis was performed to compare blinded measures across periods (8:00am-10:00pm) for each day. Two-level Mixed Models were used to account for school-level clustering.

RESULTS: Of those participants with valid accelerometer wear time of ≥3 days and 7-day accelerometry (Actigraph GT3X+) was used to measure sMVPA. Measured EE was calculated using the Schofield equation. Results show that children in the intervention group had significantly increased in-school and weekend MVPA while 2 main effects emerged for SB (increase). But only 2 main effects emerged for MVPA (decrease). With regard to PA level, only 1 main effect was found for PA (decrease).

CONCLUSION: Intervention children had significantly increased MVPA while control children significantly decreased MVPA in-school over time. Both groups had increased SB in-school over time yet control children showed decreased EE in Time 4. Additionally, children’s overall EE and MVPA decreased but SB increased during after-school and weekend segments. Effective PA interventions should be implemented for after-school and weekend segments.

PURPOSE: The purpose of this study was to compare time spent in sedentary behaviors (SB), moderate-to-vigorous physical activity (MVPA), and meeting the PA recommendation of children living in Puerto Rico to children living in the continental U.S.

METHODS: Sixty-seven children (mean±SD, age 9.91±1.3 yrs; BMI 33.1±10.4 kg/m²), living in Puerto Rico, wore an Actigraph GT3X+ accelerometer on their right hip for two weeks. Time spent in SB (<100 cpm), MVPA (Freedson child equation), and meeting the PA recommendation (60 min of MVPA per day) were estimated following the procedures used in NHANES. Values for the Puerto Rican children were compared to U.S. population data obtained from NHANES.

RESULTS: On average, the Puerto Rican children wore the accelerometer for 950.2 min/study (10:6/5.9 days). In general, Puerto Rican children spent 82.9% of their time in SB and 8.9% of their time in MVPA. In contrast, their U.S. peers spent less time in SB (40.8% of their day) and more time in MVPA (15.4% of their day). Specifically, Puerto Rican boys and girls spent 63.9±32.5 min/day and 983.6±374.7 min/day, respectively, and 77.7±23.7 min/day and 64.5±29.4 min/day in MVPA, respectively. Compared only to Mexican-American children from the U.S. NHANES sample the trend was similar with the Mexican-American males and females spending less time in SB (43.7% and 43.3% of their day, respectively) and more time in MVPA (11.8% and 8.6% of their day, respectively) than children living in Puerto Rico. Thirty-nine (58%) Puerto Rican children met the public health recommendation of ≥ 60 min of MVPA per day, compared to 42% of the U.S. NHANES sample.

CONCLUSIONS: Overall, Puerto Rican children living on the Island, spent more time in SB and less time in MVPA per day compared to U.S. children. This trend was also similar when compared to Mexican-American children from the U.S. sample. However, a majority of Puerto Rican children are meeting the PA recommendation. Future work needs to examine ways to increase MVPA time among children living in Puerto Rico.

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PURPOSE: Few children meet school-based physical activity (PA) recommendations. Addressing the interpersonal environment may provide opportunities to shape children’s PA behaviors in school. The goal of this research was to assess the relationship between two domains of school-based social support for PA including peer/friend social support (PSS) and teacher social support (TSS) for school-based moderate-vigorous physical activity (MVPA).

METHODS: Schoolchildren (n=174, grades 3-4) were recruited from 6 schools in low-income Massachusetts communities during January 2015 to participate in the Fueling Learning through Exercise study. Demographic data were collected by parent report. 7-day accelerometer (Actigraph GT3X+) was used to measure MVPA. Measured height and weight were used to calculate BMI z-score and weight status category. Social support for PA was self-reported on a 10-item questionnaire. Subscales for PSS (4 items, grouped into low, moderate, high) and TSS (2 items, grouped into support present and support absent) were constructed. The associations between PSS, TSS, and MVPA were examined using mixed effect models adjusting for sex and controlling for school-level clustering.

RESULTS: Of those participants with valid accelerometer wear time of ≥3 days and ≥10 hr/day (n=122, 49% male, 8.81±0.8 years), 88% did not meet the 30-min school-time MVPA recommendation (16:6/9.8 min/school day). Both PSS and TSS scores did not differ by BMI or sex. Children in the high-PSS group (20.5%, n=25) were more likely to engage in MVPA compared to children in the low-PSS group (β=4.0 mins/school day; 95% CI: 1.6, 6.5; p=0.001), and there were no differences between the moderate-PSS group and low-PSS group (p=0.05). Children who reported receiving TSS (40.2%, n=49) were also more likely to be physically active in school (β=3.3 mins/school day, 95% CI: 0.2, 5.9, p<0.05) compared to students who indicated no TSS.

CONCLUSION: Self-reported high PSS and having TSS were positively associated with amount of MVPA in schoolchildren from low-income communities. When addressing the PA interpersonal environment in schools, strategies should target both teacher and peer encouragement of and involvement in PA.
PURPOSE: Few studies have examined the dynamic relationships among elementary school childrens psychosocial beliefs, PA and screen time. This study was designed to examine the longitudinal relationships among childrens psychosocial beliefs, outside school PA, and screen time across two school years, as well as the gender differences on the outcomes over time.

METHODS: A total of 113 third and fourth grade children (57 boys, 56 girls; Mage = 9.47 year, SD= 80; 68.4% Non-Hispanic White) from a public school took part in the study. In children this school had 125-minute structured PA at school. To assess psychosocial beliefs, childrens self-efficacy, outcome expectancy and social support were measured through a battery of established questionnaires. Childrens outside PA and screen time were also measured through established questionnaires. The assessments were conducted in spring 2014 and then again in spring 2015.

RESULTS: One-way (2 genders) ANOVA with repeated measures were conducted to examine if there were any differences in PA and screen time over time. Multiple regressions were performed to examine the association between childrens psychosocial variables, PA, and screen time at two time points. Results indicated that there was no significant difference in PA, F(1,65) = 10, p>.05 and screen time, F(1,66)= 2.18, p>.14 over time. However, there were significant gender differences in both PA, F (1, 65) = 4.95, p<.03 and screen time, F (1, 66) = 4.7, p<.03. Specifically, girls reported less PA and screen time than boys. Regression results indicated PA self-efficacy significantly predicted PA at Time 1, R2 = .15, F (3, 84) = 4.95, p<.03. However, outcome expectancy was found to be the only significant predictor of PA at Time 2, R2 = .13, F (3,76) = .376, p>.01. No significant relationships between the beliefs and screen time were seen at both time points.

CONCLUSIONS: Findings indicate that childrens outside school PA and screen time did not change across time, and girls spent less time in both PA and screen time than boys did. Our findings also support that PA self-efficacy and outcome expectancy are important correlates of PA but not necessarily screen time. Self-efficacy was more important at the onset of PA program, whereas outcome expectancy contributed more in predicting PA as the program extended for a longer period.

PURPOSE: To evaluate the association of Balanced Energy Physical Activity (BEPA) Toolkit use by elementary teachers to childrens physical activity (PA) at school.

METHODS: Between January and February of 2014, six elementary schools in rural Oregon received BEPA-Toolkits. Three schools received one Toolkit per classroom and teacher trainings to support implementation, and three schools received one Toolkit per grade and no trainings. In October and November of 2014 (approximately 9 months following BEPA-Toolkit distribution), we surveyed teachers use of the BEPA-Toolkit and objectively measured child PA levels. PA data were connected to teacher response and PA data. RESULTS: Practice time averaged (±SD) 61 ± 8.6 min and participants spent 34 ± 2.3 more minutes per day at school compared to FIT (31.8 ± 4.4%). Youth sport (YS) contributes substantially to daily moderate-to-vigorous physical activity (MVPA), but the majority of practice time is spent in a lower intensity. Depending on how coaches structure practice, MVPA is likely to vary greatly. However, only rudimentary empirical evidence exists examining the influence of YS practice structure on MVPA.

PURPOSE: To determine the influence of practice time segments on MVPA during YS practice.

METHODS: Twenty-eight practices from 14 recreation flag football teams (2 practices/team) were video recorded. For the duration of each practice, participants (boys, N=111, 5-11 yr, mean 7.9 ± 1.2 yr) wore an ActiGraph GT1M accelerometer. Using event logging software (Observer XT), 2 independent raters observed and divided YS practice videos into naturally occurring time segments (N=214) according to the task context. Each time segment was then categorized by context and participant demand. Mutual exclusivity categorizations for task context included: warm-up (WU), fitness (FIT), free play (FP), game play (GP), scrimmage (SCR), skill drill (SKD), or strategy (STR). Each segment was coded as demand participation (e.g., all participants involved) or fostering elimination (e.g., use of elimination game, standing in line). Percent agreement between raters was 94%. Accelerometer data were analyzed using Evesons cut-points and paired with observation data. RESULTS: Practice time averaged (±SD) 61 ± 8.6 min and participants spent 34 ± 2.4 percent of time (%time) in MVPA overall. Mixed random effect models indicated significantly greater (P <0.05) %time was spent in MVPA during FP (54.2 ± 4.7%), GP (53.5 ± 3.7%), and WU (53.1 ± 3.2%) compared to FIT (31.8 ± 4.4%). Significantly greater (P <0.001) %time was spent in MVPA during FP compared to SCR (28.5 ± 4.3%), STR (30.3 ± 2.6%), and SKD (31.4 ± 2.5%). Compared to STR and SKD, a greater was spent in MVPA during GP (P <0.001). Significantly greater (P <0.001) %time was spent in MVPA during segments with participant demand (55.5 ± 2.2%) compared to elimination (28.9 ± 7.5%).

CONCLUSION: The percent of time children were engaged in MVPA during practice differed depending on the task context and participant demand. Restructuring YS practice routine tasks and participant demand could increase percent of time spent in MVPA.

OUTDOOR PHYSICAL ACTIVITY (PA) has been suggested to be a promising strategy for increasing overall PA levels in children. Parents have considerable influence on overall PA behaviors of their children, but their impact on childrens outdoor PA has been less examined.

PURPOSE: To investigate the relationship between parental influences and outdoor PA in Chinese children. METHODS: Baseline data collected from 1,546 grades 1-3 Chinese children (54% boys, mean age = 7.6 ± 1.0 years) who participated in the Understanding Childrens Activity and Nutrition (UCAN) cohort study between 2009 and 2011 were used in this study. Childrens average outdoor PA time on weekdays and weekend days was reported by parents. Four types of parental influences, i.e. family support, parental encouragement, parental belief, and parental control, were measured using parent-reported questionnaires. Linear regression models were performed to examine the associations between parental influences and childrens outdoor PA adjusting for childrens age, body mass index (BMI), and parental education level. All models were stratified by sex. RESULTS: Children spent 90 ± 110 min/day and 133 ± 116 min/day doing PA outdoors on weekdays and weekend days, respectively. No differences were found in outdoor PA time between boys and girls. For boys, after adjusting for age, BMI and parental education level, parental belief (β=0.12, P<0.05) is positively associated with outdoor PA on weekdays, whereas family support (β=0.12, P<0.05), parental encouragement (β=0.14, P<0.05), and parental belief (β=0.12, P<0.05) are positively related to outdoor PA on weekend days. For girls, family support, parental encouragement, and parental belief are positively associated with outdoor PA on both weekdays (β=0.13, 0.17, 0.10, respectively; all P<0.05) and weekend days (β=0.21, 0.18, 0.17, respectively; all P<0.05). CONCLUSION: Strategies for promoting outdoor PA in Chinese children should consider improving levels of family support, parental encouragement, and parental belief.

PURPOSE: To examine the associations between parental influences and childrens outdoor PA behaviors of their children, but their impact on childrens outdoor PA has been less examined.

METHODS: Baseline data collected from 1,546 grades 1-3 Chinese children (54% boys, mean age = 7.6 ± 1.0 years) who participated in the Understanding Childrens Activity and Nutrition (UCAN) cohort study between 2009 and 2011 were used in this study. Childrens average outdoor PA time on weekdays and weekend days was reported by parents. Four types of parental influences, i.e. family support, parental encouragement, parental belief, and parental control, were measured using parent-reported questionnaires. Linear regression models were performed to examine the associations between parental influences and childrens outdoor PA adjusting for childrens age, body mass index (BMI), and parental education level. All models were stratified by sex. RESULTS: Children spent 90 ± 110 min/day and 133 ± 116 min/day doing PA outdoors on weekdays and weekend days, respectively. No differences were found in outdoor PA time between boys and girls. For boys, after adjusting for age, BMI and parental education level, parental belief (β=0.12, P<0.05) is positively associated with outdoor PA on weekdays, whereas family support (β=0.12, P<0.05), parental encouragement (β=0.14, P<0.05), and parental belief (β=0.12, P<0.05) are positively related to outdoor PA on weekend days. For girls, family support, parental encouragement, and parental belief are positively associated with outdoor PA on both weekdays (β=0.13, 0.17, 0.10, respectively; all P<0.05) and weekend days (β=0.21, 0.18, 0.17, respectively; all P<0.05). CONCLUSION: Strategies for promoting outdoor PA in Chinese children should consider improving levels of family support, parental encouragement, and parental belief.

CONCLUSIONS: Consistent with the literature around PA behaviors and childrens physical activity (MVPA), but the majority of practice time is spent in a lower intensity. Depending on how coaches structure practice, MVPA is likely to vary greatly. However, only rudimentary empirical evidence exists examining the influence of YS practice structure on MVPA.

PURPOSE: To determine the influence of practice time segments on MVPA during YS practice.

METHODS: Twenty-eight practices from 14 recreation flag football teams (2 practices/team) were video recorded. For the duration of each practice, participants (boys, N=111, 5-11 yr, mean 7.9 ± 1.2 yr) wore an ActiGraph GT1M accelerometer. Using event logging software (Observer XT), 2 independent raters observed and divided YS practice videos into naturally occurring time segments (N=214) according to the task context. Each time segment was then categorized by context and participant demand. Mutual exclusivity categorizations for task context included: warm-up (WU), fitness (FIT), free play (FP), game play (GP), scrimmage (SCR), skill drill (SKD), or strategy (STR). Each segment was coded as demand participation (e.g., all participants involved) or fostering elimination (e.g., use of elimination game, standing in line). Percent agreement between raters was 94%. Accelerometer data were analyzed using Evesons cut-points and paired with observation data. RESULTS: Practice time averaged (±SD) 61 ± 8.6 min and participants spent 34 ± 2.4 percent of time (%time) in MVPA overall. Mixed random effect models indicated significantly greater (P <0.05) %time was spent in MVPA during FP (54.2 ± 4.7%), GP (53.5 ± 3.7%), and WU (53.1 ± 3.2%) compared to FIT (31.8 ± 4.4%). Significantly greater (P <0.001) %time was spent in MVPA during FP compared to SCR (28.5 ± 4.3%), STR (30.3 ± 2.6%), and SKD (31.4 ± 2.5%). Compared to STR and SKD, a greater was spent in MVPA during GP (P <0.001). Significantly greater (P <0.001) %time was spent in MVPA during segments with participant demand (55.5 ± 2.2%) compared to elimination (28.9 ± 7.5%).

CONCLUSION: The percent of time children were engaged in MVPA during practice differed depending on the task context and participant demand. Restructuring YS practice routine tasks and participant demand could increase percent of time spent in MVPA.
INTRODUCTION: Most youth in the U.S. do not meet national recommendations for fruit (F) and vegetable (V) consumption and over-consume “empty” calories. Limited research has shown that athletic youth engage in better nutrition practices than non-athletes. However, most research has examined elite athlete nutrition practices, the female athlete triad, or sports that emphasize leanness. Furthermore, little or no research has compared nutrition behaviors in low-income children based on their level of sports participation. PURPOSE: To examine the differences among nutrition intakes and attitudes of youth and non-athlete, low-income 3rd-5th grade students.

METHODS: A sample of 211 students (mean age 9.7±0.9 years; 43.1% males) completed a two-part survey, including modules measuring daily frequency of intakes from food groups, frequency of meals, breakfast, snacks, and fast food consumption, and attitudes toward F and V consumption. Students were grouped into “non-athletes” (NA), “one sport” (OS), “multiple sports” (MS), and “no sports” (NS).

Wallis H tests were used to determine differences in consumption and attitudes between groups. Significance was set at p<0.05.

RESULTS: Approximately 70% of youth participated in at least one sport, with the distribution for sport groups being 38.0% (NS), 29.4% (OS), and 39.8% (MS). Significant group differences were found for whole grain breads (WGB; χ² = 23.860, p = 0.018), total F (χ² = 23.937, p = 0.013), and total V (χ² = 23.937, p = 0.013) for strength and MS>NS youth and had stronger beliefs about potential health benefits of F/V consumption. These trends are similar to national data related to athlete nutrition behaviors. Funded by Blue Cross Blue Shield of Michigan.
CONCLUSIONS: Individuals who had greater knee flexor, knee extensor, and hip extensor strength and faster motor and physical reaction times tended to score higher on the video games. While these results indicate that game scores are significantly correlated to measures of physical function in young, healthy individuals, future research should focus on applying this technology to improving physical function in older adults.

RESULTS: EBG increased (p<0.05) FFM by 3.6% and PP by 6.4%. MFWG divided into two groups: 1) EB group (EBG), 22.1 ± 3.5yr, 12.8 ± 4.6% fat mass; and 2) weight Machine and Free Weight Group (MFWG), 21.2 ± 2.6yr, 12.7 ± 7.1% fat mass. An 11 week resistance-training program of 2-sessions-wk was performed. During the first 5 weeks, 6 exercises of 5 sets with 10 maximum repetitions (RM) and 60-90 sec of recovery time between exercises were performed. During weeks 6-11, 12 exercises of 5 sets with 8RM were performed in supersets with 90 sec of rest time between supersets. Subjects did not modify their usual diet habits. Pre-post training measurements were performed for arm FFM with a dual-energy X-ray absorptiometer and for elbow flexion peak power (PP) using an isokinetic device. Three nonparametric tests were performed assuming a p-value less than 0.05 (Wilcoxon test for paired samples, Kruskal-Wallis test and Mann-Whitney U test for 2 samples using the Bonferroni correction coefficient when there were differences between groups).

RESULTS: EBG increased (p<0.05) FFM by 3.6% and PP by 6.4%. MFWG increased (p<0.05) FFM by 3.2% and PP by 2.9%. There were no differences between groups. CONCLUSIONS: It is possible to improve PP and FFM in well-trained recreational men using EB alone during a short-term resistance program. Furthermore, improvements from EB training are similar to those of traditional weight devices. More studies are needed regarding the effects of EB on maximal voluntary strength in this population.

PURPOSE: Inadequate physical activity (PA) levels are reported in Indian youth, with lowest levels among school-going adolescents, particularly girls. The primary objective was to identify barriers to and enablers of PA among school children and examine how these differed by student gender, and school type (public vs private).

METHODS: 174 students (private school students=88, 47% girls; public school students=86, 48% girls) were involved in grades VIII and IX in two Delhi schools, aged 13-16 years participated in focus group discussions (FGDs). A total of 16 FGDs were conducted by trained bilingual moderators using a piloted FGD guide. FGDs were conducted separately for girls and boys, for students in grades VIII and IX, and for private and public schools. FGDs among public school students were conducted in Hindi, and the transcriptions were translated to English for analysis. Transcriptions were coded using a combination of inductive and deductive approaches and analyzed using NVIVO 8.0.

RESULTS: Various personal, social, and environmental barriers and enablers to participation in PA were identified. Personal barriers - Compared to boys, girls, particularly those from the private school, cited greater negative consequences related to body image. Social barriers - Girls from both the private and public school faced more social censure for participating in PA. Environmental barriers - Increasing academic workload and reducing opportunity for active play by cutting PA classes were most commonly reported across all participants in both schools. Students from the public school reported more community-related barriers (lack of access to parks, exposure to pollution, traffic). Personal enablers - Perceived health benefits of PA were reported by girls and boys from both schools. Social enablers - Girls from both institutions and boys from the private school mentioned active parents and sports role models as motivators for increasing PA. Few environmental enablers were identified. The present study was conducted in two schools in Delhi, the capital city of India, which may limit the generalizability of the findings to other settings.

PURPOSE: Exergaming has been widely used as an innovative approach for improving physiological and psychological outcomes in various populations, including college students. This study evaluated the effects of exergaming on college students’ energy expenditure (EE), moderate-to-vigorous physical activity (MVPA), and light physical activity (LPA), rating of perceived exertion (RPE), and enjoyment as compared to traditional treadmill exercise, while also examining gender effects on these outcomes.

METHODS: Sixty college students (30 female; Age=23.6 ± 3.8 years, SDB= ± 1.9) non-Hispanic white) were split into three separate 20-minute exercise sessions on Xbox 360 Kinect Just Dance, Xbox 360 Kinect Reflex Ridge, and treadmill walking (4.0 mph) in a controlled lab. EE, MVPA, and LPA were assessed by ActiGraph accelerometers while RPE was assessed every four minutes. Enjoyment was assessed via an established scale following each session. Repeated-measures ANOVAs assessed gender effects on all outcomes across exercise sessions.

RESULTS: Results revealed significant overall differences on all outcomes among the three activities (all p< 0.01). Follow-up analyses indicated treadmill walking resulted in significantly higher METs and MVPA (p< 0.01), yet lower LPA (p< 0.01), compared to the two exergaming sessions. Notably, significantly higher METs (p< 0.01) but lower MVPA (p< 0.01) were seen for Reflex Ridge versus Just Dance. Further, participants’ RPE was higher during treadmill walking than during exergaming (p< 0.01) while exergaming elicited significantly higher enjoyment (p<0.01) over treadmill walking, indicating exergames appeal to participants. Finally, a significant activity by gender interaction was seen for RPE (p<0.01) while females engaged in marginally significantly higher LPA (p< 0.06) and experienced greater enjoyment (p< 0.01) than males.

CONCLUSIONS: Consistent with previous studies, findings suggest that playing Kinect-based exergaming has not yet reached the moderate intensity level of fast treadmill walking. Nonetheless, exergaming may increase perceived enjoyment among college students versus treadmill exercise which may improve exercise adherence. Further study on eliciting greater physiological stimulation during exergaming among college students is needed.

PURPOSE: Implementation of Self-Determination Theory in College Physical Activity Classes

METHODS: 36 college students (34 classes, 730 students). Other instructors (n = 7) received conventional training (n = 36 classes, 775 students). Students (N = 1,505, M age = 19.4 ± 1.4 years) completed online questionnaires at the beginning, middle, and end of the semester. Self-determined motivation was assessed with the Behavior Regulation in Exercise Questionnaire-2R. Physical activity was assessed with three self-report measures. Need satisfaction was assessed with the Perceived Need Satisfaction in Exercise Scale and student perception of need support from instructors was assessed with the Learning Climate Questionnaire. Physical activity enjoyment was assessed with the Physical Activity Enjoyment Scale and Stage of Change was assessed using a four-item
Assessing Usability of Active Infrastructure on a College Campus

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RESULTS: The purpose of this study was to observe active transportation frequency rates across a college campus to determine the impact on usability related to proximity to center of campus, and proximity to high-volume motorized traffic. Methods: The college campus was divided into thirty-two segments where trained observers collected observational data on frequency rates of walking, running, and cycling. The thirty-two segments were collapsed into three clusters: 1) the campus perimeter (n=18), 2) midway between center of campus and the perimeter (n=7), and 3) center of campus (n=7). Data was collected once in the morning and once in the afternoon for a total of 10 minutes. A Krukal-Wallis H test was used to determine active transportation frequency rates as it related to proximity to center of campus and high-volume motorized traffic. Results: Krukal-Wallis H test demonstrated a significant difference in walking frequency among the campus clusters, \( Z(2) = 20.180, p < 0.001 \). Walking frequency was highest near center of campus. Post-hoc Mann-Whitney analyses concluded that walking frequency was higher than in the middle (\( U = 116, p < 0.05 \)) and higher for inner campus than on the perimeter (\( U = 0.00, p < 0.001 \)), and higher for inner campus than midway (\( U = 3.5, p = 0.007 \)). Krukal-Wallis H test revealed a significant difference in cycling frequency among the campus clusters, \( Z(2) = 12.581, p = 0.002 \). Cycling frequency was the highest near the center of campus. Post-hoc Mann-Whitney analyses concluded that cycling frequency was higher for inner campus and higher than on the perimeter (\( U = 6, p = 0.001 \)), and higher for inner campus than midway (\( U = 63, p = 1.0 \)). There was no significant difference in running frequency among the three campus clusters, \( Z(2) = 1.577, p = 0.455 \). Conclusions: Results demonstrate that proximity to center of campus is related to higher frequency rates of walkers and cyclists, but not runners.

Increased Movement in Low Fitness Students

Jeffrey M. Janot, Allison Stone, Liza Malley, Shannon Doherty, Melanie Meister, Marquell Johnson, Saori Braun. University of Wisconsin-Eau Claire, Eau Claire, WI. (Sponsor: Mark Blegen, PhD, FACSM)

Methods: College students spend a majority of their day in sedentary behavior. Sedentary behavior has been shown to be detrimental as it relates to cardiovascular and metabolic disease. Increasing total daily energy expenditure can be a useful strategy to limit the tendency for weight gain and risk of chronic disease development. Therefore, the aim of the present study is to investigate strategies in a classroom environment that will increase energy expenditure. Methods: Thirty university students (19-24 years) participated in this study. Each participant underwent an initial 10 minute meeting where anthropometric measures were taken. Participants were seated on a physioball, standing, and an unaltered conditions where students sat in a sitting position. Participants completed each of the conditions twice within a span of two weeks and were outfitted with an accelerometer to measure energy expenditure from each condition during a 40 minute time period. Results: A one-way repeated measures analysis of variance showed significant differences among the three conditions (\( p = .004 \)). A paired-samples T-test revealed a significant difference in energy expenditure between the sitting (0.32 ± 0.75 kcal) and physioball (2.10 ± 2.60 kcal) conditions (\( p = .001 \)), and between the sitting and standing (1.17 ± 1.74 kcal) conditions (\( p = .002 \)). No significant differences were found between the physioball and standing conditions.

CONCLUSIONS: The need-supportive teaching condition had no meaningful effect on changes in any variable across time. The disparity between the need-supportive and conventional teaching conditions may not have been distinct enough to elicit differential effects for the two groups, which may explain why no teaching condition effect was found.


Kelly R. Rice, Timothy K. Behrens, FACSM, Rachel L. Cline, Lisa Hines, Kristin Sturm. Eastern Oregon University, La Grande, OR. Northern Arizona University, Flagstaff, AZ. Arizona State University, Phoenix, AZ. University of Colorado - Colorado Springs, Colorado Springs, CO. (Sponsor: Timothy Behrens, FACSM)

Methods: An online questionnaire was administered at a regional comprehensive university over three years (2011-2014). Respondents were queried on awareness of the EIMA campaign and modified BFSS PA questions. Descriptive statistics and odds ratios were calculated across all years. Results: Questionnaire responses were as follows: Y1 (n = 1411), Y2 (n = 622), and Y3 (n = 888). There was a significant difference across all years for awareness of the EIMA campaign by PA level (\( p < .05 \)), and both awareness and PA increased during each year. During Y3 awareness of the campaign increased the likelihood of being physically active by 1.76 times over those who were not aware. Conclusions: It is difficult to draw a causal link between awareness of PA, but these results may suggest that more aggressive awareness techniques should be examined in an effort to influence social norms and promote PA in university settings.

Inclusion of High Fitness Students Helps Encourage Increased Movement in Low Fitness Students

Ethan A. Hull, Istvan Kovacs, Wennao Liu, FACSM, Emily Kostek, Morris Sarah. Slippery Rock University, Slippery Rock, PA.
Email: ethan.hull@sruc.edu

CONCLUSIONS: The highest level of activity occurred when individuals played on mixed fitness teams. On a subsequent day, new teams were formed of mixed fitness levels. During mixed game play (1820 ± 471 vs. 1815 ± 578), most individuals were aware of the health problems associated with being overweight, and many physical activity (PA) programs employ fitness activities and games to encourage greater PA. These programs are in need of evidence based practices that show how to increase the PA level of their participants. Purpose: To examine how PA level changes when individuals are among peers of similar fitness level compared to peers of mixed (differing) fitness levels.

METHODS: Participants (n=135, 41% female, 22.6 ± 1.4 years old) consisted of students from general PA classes at Slippery Rock University. Participants completed a fitness assessment (PACER) and based on a median split were placed on teams of either high or low fitness levels. Low fitness teams played one another as did the high fitness teams. On a subsequent day, new teams were formed of mixed fitness levels such that high and low fitness players were on the same team. Participants wore a research-grade pedometer while they played soccer in either of these two situations for 15 minutes. Step count data were recorded immediately following each game situation. General linear models and t-tests were used to examine the step count differences between individuals of high and low fitness levels.

RESULTS: The highest level of activity occurred when individuals played on mixed fitness teams, with low fitness individuals moving significantly more (\( p = 0.01 \)) when they played on a mixed team (steps = 1815 ± 578) compared to when they played on a team of low fitness levels (steps = 1568 ± 369). High fitness level individuals did not show a significantly higher step count (\( p = 0.32 \)) when they played on a mixed team (steps = 1820 ± 471) compared to a similar fitness team (steps = 1750 ± 478). High fitness individuals were significantly more active (\( p = 0.05 \)) compared to low fitness individuals during the equal fitness game play (1750 ± 478 vs. 1568 ± 369), but not during mixed game play (1820 ± 471 vs. 1815 ± 578). Conclusions: These results suggest that low fitness individuals display greater movement when they are grouped in with individuals of higher fitness levels compared with their low fitness peers. Thus, PA interventions may encourage more movement in their participants if they include individuals with higher levels of fitness.
Physically active academic lessons are a novel teaching technique that combines physical activity (PA) and academic content in theoretical subjects like mathematics and language.

**Purpose:** To compare differences in PA during physically active academic lessons, physical education (PE) lessons and normal academic classroom lessons.

**Methods:** A total of 119 children (10-11 years) from three primary schools wore an accelerometer (ActiGraph GT1M/ GT3X) for seven days. Eighty-seven children (37 boys) were included in the analysis. Physically active academic lessons were mainly outdoor lessons and included games, relays and quizzes with curricular questions from theoretical subjects. PE lessons included a variety of activities including track and field. Academic lessons covered music, social studies and Norwegian. All lessons lasted 45 minutes. The following cut points were used: sedentary <100 counts per minute (cpm), light 101-2295 cpm, moderate 2296-4011 cpm and vigorous >4012 cpm. We used a GLM repeated measures analysis with a Bonferroni comparison test to compare the PA levels in the three different lessons.

**Results:** During physically active academic lessons, children spent 26% of the time in moderate to vigorous PA (MVPA). No significant differences in cpm or MVPA were found between the physically active academic lessons and the PE lessons, but the participants completed 17% fewer steps in PE lessons. Children spent 78% of the time sedentary during academic classroom lessons, which was twice as much as the other lessons (Table 1).

**Conclusion:** Physically active academic lessons yield PA levels comparable to PE lessons, and can be a successful teaching method to increase children’s MVPA level and decrease their sedentary time.

**Table 1. Physical activity variables during three different school lessons, n=87.**

<table>
<thead>
<tr>
<th></th>
<th>Physically active academic lessons</th>
<th>Physical education lessons</th>
<th>Academic lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedentary activity</td>
<td>16 (6)*</td>
<td>18 (5)</td>
<td>34 (5)**</td>
</tr>
<tr>
<td>Light PA (min)</td>
<td>17 (4)</td>
<td>16 (3)</td>
<td>9 (4)**</td>
</tr>
<tr>
<td>MVP (min)</td>
<td>12 (4)</td>
<td>11 (4)</td>
<td>2 (2)**</td>
</tr>
<tr>
<td>Vigorous PA (min)</td>
<td>6 (2)</td>
<td>6 (3)</td>
<td>0 (1)**</td>
</tr>
<tr>
<td>Counts per minute</td>
<td>1559 (470)</td>
<td>1481 (508)</td>
<td>277 (193)**</td>
</tr>
<tr>
<td>Steps (number)</td>
<td>1699 (544)**</td>
<td>1451 (451)</td>
<td>387 (244)**</td>
</tr>
</tbody>
</table>

Mean (standard deviation).

*Different from the other lessons (p<0.001).

**Introduction Of A Home-based Physical Activity Curriculum In Children With And Without Prader-willi Syndrome**

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(No relationships reported)

A 6-month home-based physical activity curriculum was designed for children with Prader-Willi Syndrome (PWS), a genetic disorder resulting in obesity and motor, intellectual, and behavioral challenges. Children without PWS but with excess body weight (OB) also received the program. **PURPOSE:** To determine program adherence, perceived difficulty and enjoyment of activities and program implementation facilitators and barriers.

**METHODS:** Participants included 33 youth with PWS (10.6±2.2 y; 18M:16F), 52 youth with OB (9.8±1.1 y; 27M:25F), and one parent child (N=85). The curriculum included playground and interactive console games 4 days a week. Training and program materials were provided at baseline with follow-up communication every two weeks. Intervention compliance (>70%), enjoyment, and difficulty of activities (1-5 low to high scale) were monitored using daily self-report checklists (children reports). Facilitators and barriers were recorded at 24 weeks (parent reports).

**RESULTS:** Dropout and compliance rates were comparable at 11% and 88% in PWS and 9% and 91% in OB, respectively. Median enjoyment of activities was also comparable (p>0.05) between the groups for the warm-up (PWS=3.7, OB=3.8), strength exercises (PWS=3.6, OB 3.5) and games (PWS=4, OB=4). Activities were...
The goal for preschool aged children is 60 minutes of moderate to vigorous physical activity per day. Caregivers are often encouraged to allow two 30 minute play periods to achieve this goal. It has been suggested that with the 30 minute play period moderate to vigorous intensity physical activity (MVPA) is mostly achieved in the first 10 to 15 minutes. PURPOSE: To determine if age appropriate music would increase the intensity of physical activity in preschool aged children at the Fairmont State University Laboratory Preschool, when played half-way through a 30 minute play period. METHODS: Eleven preschoolers, age 4, were allowed unrestricted play for 30 minutes, where during the first 15 minutes of play no music was heard by the preschoolers (pre-music). The age appropriate music was played from minutes 15 through 30 at a level loud enough to excite the subject’s attention, but without bystanders needing to raise the volume of normal conversation (during music). Heart rates were measured during minutes 10-15 of pre-music play and then again during minutes 25-30 of during music play. To compare pre-music and during music heart rates, a dependent t-test was used with the alpha level set to $p \leq 0.05$. RESULTS: Age appropriate music significantly increased the heart rate of pre-school aged children during unrestricted free play (pre-music = 100.3 ± 4.2 bpm vs during music 110.5 ± 7.6 bpm, $p = 0.05$). Furthermore, only 23% (3 of 11) of the preschoolers achieved a HR that reached the MVPA level for their age during the pre-music session while 73% (8 of 11) reached a MVPA intensity during music. CONCLUSION: Four year old preschool children showed a significant increase in their intensity of physical activity when age appropriate music was played halfway through a 30 minute play period.

### Impact Analysis of a University Wellness Course on Behavior Regulation to Exercise

Heather Barton-Weston, Lisa Colvin, FACSM, Randall Griffiths, Gregory Soukup, University of the Incarnate Word, San Antonio, TX. (Sponsor: Dr. Lisa Colvin, FACSM)

**Purpose:** The purpose of this study is to determine if a sixteen-week wellness course offered at a southern university can affect participant behavioral regulation to exercise.

**Methods:** A longitudinal study (pre-post study) of 151 participants ($f = 100$, $m = 51$; $n = 19.6$ yrs) was conducted to evaluate the effects the wellness course had on behavior regulation to exercise. Participating students attend two classes every week: 45 minutes of content covering six dimensions of wellness (physical, emotional, social, intellectual, spiritual, and occupational) with a focus on increasing competency in recommendations and health-related illness and benefits followed by 30 minutes of aerobic exercise. The Behavioral Regulation to Exercise Questionnaire (BREQ-2) measures five motivational variables (intrinsic, identified, introjected, external, and amotivation) associated with exercise participation and adherence. Reported are the One-Sample Wilcoxon Signed Rank test for BREQ-2 scores.

**Results:** Of the five constructs measured both Identified ($p = 0.02$) and Intrinsic Regulation ($p = 0.007$) reflect significant increase.

### Formative Evaluation of a Web-Based Professional Development Program to Increase Physical Activity in Classrooms

Michelle B. Stockton, Hebrild Ullman, Trey Martindale, Lisa J. Krull, Sami Yli-Piipari, Barbara S. McClanahan, Kenneth D. Ward. University of Memphis, Memphis, TN. (Sponsor: Fairmont State University, Fairmont, WV. (Sponsor: Dr. Lisa Colvin, FACSM)

**Purpose:** FitWizard is a free web-based professional development tool designed to equip classroom teachers with knowledge, materials and methods needed to integrate activity into K-12 classroom curriculum. The purpose of the study was to assess the process and impact of FitWizard with classroom teachers.

**Method:** A formative evaluation was conducted to assess the initial phase of the FitWizard program. The priority population was K-12 teachers in the Greater Memphis Area. Program reach, awareness and content exposure were determined through monitoring of server registrations, completion of online courses, and submissions of original classroom physical activity (PA) exercises. Program impact was determined through online surveys assessing PA knowledge, benefits and risks as well as the availability of classroom PA resources.

**Results:** The FitWizard.org website was developed, tested, and implemented as designed. Preliminary results indicated that 1,520 promotional items were distributed at teacher events, 219 teachers ($na = 5$, $n6 = 8 - 27$, $n9 = 2 - 54$, specialists = 32) registered and completed at least two of the three educational courses, 1,259 database searches were conducted for in-class PA exercises, and 0 ideas were submitted to the idea portal. After completion of the educational courses, findings indicated that there were no significant differences in knowledge about physical activity and associated benefits and risks ($t (202) = 1.10$, $p > 0.274$) (pre: $M = 13.39$, $SD = 1.35$; maximum knowledge score of 16). However, there was a significant increase in knowledge of the available resources for increasing PA to improve academic performance and classroom management ($t (192) > 9.13$, $p < 0.001$) (pre: $M = 5.78$, $SD = 1.14$; post: $M = 6.64$, $SD = 1.07$; maximum score of 7).

Conclusion: These results document the feasibility of implementing a web-based professional development program for teachers focusing on classroom physical activity.

### Are Teacher Characteristics Associated With Quality Of Implementation Of Physically-active Academic Lessons?

Vanessa L. Errisuriz, Esbele M. Jowers, Kelsey N. Brown, John B. Bartholomew, FACSM. The University of Texas at Austin, Austin, TX. (Sponsor: John B. Bartholomew, FACSM)

**Purpose:** To determine whether teacher characteristics (i.e. attitudes, perceived behavioral control (PBC), perception of principal behaviors) were associated with physically active academic lesson implementation outcomes (i.e. physical activity (PA) intensity, ease of implementation, overall rating, duration, number of lessons).

**Methods:** Participants were 87 fourth grade teachers ($M$ age $= 39.1$; $92.9$% Female; $92.9$% White) from 19 intervention schools of the Texas Initiatives for Children’s Activity and Nutrition (I-CAN!) program. Teachers reported attitudes (Cronbach’s $\alpha$ = 0.91) and PBC ($\alpha$ = 0.92) regarding implementation of I-CAN! lessons. Supportive (e.g. “The principal goes out of his/her way to help teachers”), directive (e.g. “The principal monitors everyone things do”), and restrictive (e.g. “Administrative paperwork is burdensome”) subscales of the OCQD-RE were adapted to assess principal behaviors (PB). Items were rated from rarely occurs (1) to very frequently occurs (4) and summed for each scale. Average number of lessons per week was calculated for the Fall semester. Each lesson, teacher, and PA intensity, ease of implementation, overall rating, and duration from 1 (Low) to 5 (High/Excellent). Semester averages for each outcome were calculated. Hierarchical linear regression analyses were run, controlling for age, number years teaching overall, intervention condition (math, language arts), and school.

**Results:** Direct PB was positively associated with average PA intensity ($b = 0.38$, $p < 0.003$). Ease of implementation was associated with greater directive PB ($b = 0.28$, $p = 0.03$ and $b = 0.38$, $p = 0.02$). PBC ($b = 0.35$, $p = 0.03$) and directive PB ($b = 0.35$, $p = 0.01$) were positively associated with average overall rating. Average duration of lessons was
positively associated with attitudes (β = .29, p < .05) and supportive PB (β = .32, p < .03). Average number of lessons per week was positively associated with PBC (β = .42, p < .01) and restrictive PB (β = .41, p < .01).

CONCLUSIONS: Ensuring physically active academic lessons are implemented with high quality is imperative for success. Teacher trainings should focus on enhancing attitudes and PBC towards lesson implementation and address facilitators/barriers to implementation associated with perception of principal behaviors.

NIHRO11HD070741

2742 Board #265 June 3, 9:30 AM - 11:00 AM Self-Reported Physical Activity in Student Athletes at Pre-participation Physical Evaluations Amy E. Valasek, Nationwide Children’s Hospital / The Ohio State University College of Medicine, Westerville, OH. (Sponsor: James MacDonald, FACSMD) Email: amy.valasek@nationwidechildrens.org (No relationships reported)

INTRODUCTION: The American Academy of Pediatrics recommends children and adolescents accumulate at least 60 minutes of moderate to vigorous physical activity (MVPA) daily in the context of family, school, and community activities with additional muscle strengthening three times per week. The current study aimed to quantify the physical activity of current student athletes in middle school and high school.

METHODS: A voluntary survey questioned middle school and high school student athletes on physical activity during mass pre-participation evaluations. Athletes self-reported total days of MVPA, average daily minutes of MVPA, total number activities, and current activities. Age, grade level, and gender were also recorded for each candidate. Independent sample t-tests evaluated differences between gender and high school and middle school participants. A Holm’s adjustment was applied to all reported p values.

RESULTS: 365 respondents completed the survey between 10 to 18 years of age. 180 high school athletes and 177 middle school athletes (n=8 missing) completed the survey fully. 162 were female and 198 were male (n=5 missing). Mean age was 14.2±1.168. Mean daily minutes of MVPA was 68.3±33.26. Mean weekly minutes of MVPA was 314±229.72. Mean number of activities per week reported was 2.95±1.34. High school subjects participated in significantly fewer activities than middle school subjects (p<.008). No significant differences were uncovered between daily minutes, weekly minutes, or days per week of MVPA between high school and middle school subjects. No significant differences were found in days of MVPA, Minutes per day of MVPA, Minutes per week of MVPA or number of activities per week between females and males.

CONCLUSION: National physical activity guidelines are often assumed to be fulfilled by youth participating in organized sports. The current study demonstrated student athletes do not necessarily meet the current activity recommendations based on self-report. Less than 5% of middle school and high school student athletes reported 60 minutes MVPA daily. Only 27% of respondents met the weekly recommendations of 420 minutes. The middle school athletes self-reported participation in more diverse activities compared to high school athletes.

E-39 Free Communication/Poster - Population Based Surveillance Friday, June 3, 2016, 7:30 AM - 12:30 PM Room: Exhibit Hall A/B

2743 Board #266 June 3, 11:00 AM - 12:30 PM Youth Weight Status and Perceptions of Neighborhood Safety Promt Community-Level Engagement: A GIS Approach Elizabeth Ackley-Holbrook, Jessica Petersen. Roanoke College, Salem, VA. Email: holbrook@roanoke.edu (No relationships reported)

Due to the confounding influence of factors which have given rise to the pervasiveness of childhood obesity, spatial epidemiology is becoming a prevalent methodological option for exploring the influence of non-biological factors on unhealthy weight gain in youth. Through the exploration of contributors to obesity across a known geographic area, researchers can better understand the community-level impact of those factors on youth health status. PURPOSE: To explore the relationship between perceptions of neighborhood-level safety and youth health status in a target school zone.

2744 Board #267 June 3, 11:00 AM - 12:30 PM Individual Metabolic Syndrome Criterion, Elevated C-reactive Protein And Physical Activity In U.S. Adolescents: Nhanes 2007-2010 Bethany D. Williams, Michael R. Richardson, Tammie M. Johnson, James R. Churilla, FACSM, University of North Florida, Jacksonville, FL. (Sponsor: James R. Churilla, FACSM) Email: n00771498@ospresys.unf.edu (No relationships reported)

PURPOSE: Estimate the prevalence of individual metabolic syndrome (MetS) criterion, elevated C-reactive protein (CRP), and volumes of self-reported physical activity (PA) using a representative sample of U.S. adolescents. METHODS: The study sample (n=676) included male and female adolescents 12-17 years of age who participated in the 2007-2010 National Health and Nutrition Examination Survey. The cardio-metabolic risk factors analyzed were based on a modified definition of MetS using the Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults. Prevalence of meeting the federal PA recommendation for adolescents was estimated using the reported days per week and minutes per day of moderate and vigorous recreational PA. RESULTS: The MetS criteria with the highest and lowest overall prevalence estimates were elevated fasting glucose and elevated blood pressure (20.7% and 5.7%, respectively). The overall prevalence of elevated CRP was 7.1% (6.3% in males; 7.8% in females). The overall prevalence of not meeting the current PA recommendations for adolescents was 75.0%. Mexican American and Other/Multi-Racial females had the highest prevalence of not meeting the daily PA recommendation (91.3% and 91.7%, respectively) CONCLUSION: In a representative sample of U.S. adolescents, elevated fasting glucose is the most prevalent individual MetS criterion. Estimates indicate that seven out of 10 U.S. adolescents have elevated CRP, and three out of four U.S. adolescents do not meet the federal PA recommendations.
respectively. RESULTS: Only 19.7% of young people in Shanghai meet the PA guideline. Boys (21.6%) are more active than girls (17.6%) (p<0.01). The rates of meeting PA guidelines are notably from primary school (boy: 27.9%, girl: 27.5%), secondary school (boy: 19.3%, girl: 12.4) to upper secondary (boy: 9.7%, girl: 3.5%) (p<0.001). For sedentary behavior, 75.2% young people report at least 2 hours SED per day during weekday and 88.6% during weekend (p<0.01). Girls have more sedentary time than boys on both weekday and weekend (p<0.01). The proportion of at least 2 hours SED increase with age grows (p<0.01). CONCLUSION: The present study demonstrated that over three-quarters of young people in Shanghai are physically inactive and sedentary. Interventions and policies should be encouraged to promoting PA and reducing SED for school children, especially for girls and for students in upper secondary schools.

Supported by General Administration of Sport of China (2014B070) and “Shuguang Program” from Shanghai Education Development Foundation and Shanghai Municipal Education Commission (14SG64).

2747 Board #269 June 3, 11:00 AM - 12:30 PM Trajectories Of Us Adolescent Moderate-to-vigorous Physical Activity Over 4 Years Beginning In10th Grade Kaigang Li1, Denise Haynie1, Leah Lipsky2, Ronald J. Iannotti3, Charlotte Pratt4, Mary Ann D’Elio5, Bruce Simons-Morton2.

1Colorado State University, Fort Collins, CO. 2National Institute of Child Health and Human Development, Bethesda, MD. 3CDM Group, Bethesda, MD. 4National Heart, Lung, and Blood Institute, Bethesda, MD.

Email: kaigang.li@colostate.edu

(No relationships reported)

PURPOSE: To examine the patterns of moderate-to-vigorous physical activity (MVPA) of a youth cohort from 10th grade (Wave 1) over 4 years (W4).

METHODS: A national sample of US adolescents (N=518, 55% female, 50% overweight/obese) wore accelerometers for 4-7 days (≥500 min/day, ≥1 weekend day) annually from 2009-10 to 2012-13 school year. Latent growth modeling (LGM) was used to determine trajectories in log-transformed min/day of MVPA. W1 weight status, W4-W1 difference (i.e., W4 minus W1) of body mass index (BMI), demographics (i.e., sex, race/ethnicity, family affluence, parental education), and three social context variables (i.e., W4 school status, residence, work hours) were included as potential time-invariant covariates and peer physical activity (PA), family support, and PA planning as time varying covariates.

RESULTS: Fewer than 9% of participants met the recommended 60+ min/day MVPA for at least one assessment. On weekdays, the quadratic model was identified as the best fit model (linear slope of time B=0.46, p<0.01; quadratic slope of time B=0.20, p<0.01). Sex (B=0.46) and race/ethnicity (Hispanic vs. White B=0.34) but not W1 weight status were associated with W1 MVPA (p<0.01). W4-W1 BMI difference was negatively associated with linear slope of time (B=0.02, p=0.1) indicating increased BMI from W1 to W4 was associated with decreased MVPA. W1 through W3 PA planning was positively associated with W1 through W3 MVPA (W1: B=0.10, p<0.01; W2: B=0.06, p<0.05; W3: B=0.08, p<0.01). Peer PA and family support were not associated with MVPA in corresponding waves. Additionally, those attending 4-year college vs. not attending school (B=0.32, p<0.001), and college students living on campus vs. at home (B=0.07, p<0.001) were more likely to engage in MVPA at W4, indicating that attending college and living on campus were associated with increased MVPA post high school. On weekends, a dynamic pattern of MVPA in terms of significant LGM time slopes was not identified, indicating that weekend MVPA remained relatively constant over W1 through W4.

CONCLUSIONS: High school students engaged in little MVPA and maintained this low level through the transition to adulthood. Emerging adults not attending college and those with high BMI may benefit most from interventions to promote MVPA.

2748 Board #271 June 3, 11:00 AM - 12:30 PM Nutritional Status Of First Grade School Children From Easter Island. What Had Changed From 2005? Norman MacMillan, Fernando Rodriguez, Jacqueline Paez. Catholic University, Vina del Mar, Chile. (Sponsor: Alvaro Gurovich, FACSM)

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(No relationships reported)

The people of Easter Island live in a natural environment that encourage healthy lifestyles. During 2005, we studied a sample of 64 first grade children from the only public school of the island. Nutritional evaluation revealed a lower incidence of childhood obesity in relation to continental data. The application of an oral survey also revealed healthy eating patterns, regular physical activity and low levels of TV viewing.

PURPOSE: To evaluate the nutritional status of first grade children from Easter Island in 2014, analyzing eating and physical activity habits, and compare results with those obtained in 2005.

METHODS: This study performed during 2014, included 50 first grade students from the same public school of the island. The nutritional status was calculated according to their BMI and the same 2005 survey was applied, obtaining information about their eating patterns, physical activity and TV viewing (“screen hours”).

RESULTS: Average obesity in this sample was 24%, similar than described for national obesity levels in this age group. This finding contrast with that found in 2005, when obesity levels were much lower than the continental average. The actual study revealed a healthy eating behavior, but a poor physical activity profile: the main change with 2005 was the increase in the “screen hours”. 62% of the students spent more than two hours/day viewing TV, computer or video games, which may explain the higher obesity levels (table 1).

<table>
<thead>
<tr>
<th>Year</th>
<th>n</th>
<th>% Male/ Female</th>
<th>Age (y)</th>
<th>Obesity (%)</th>
<th>Obesity (national%)</th>
<th>&gt;2Screen hours/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>64</td>
<td>41/59</td>
<td>6.7±0.5</td>
<td>12.5%</td>
<td>17.2%</td>
<td>13%</td>
</tr>
<tr>
<td>2014</td>
<td>50</td>
<td>48/52</td>
<td>6.8±0.4</td>
<td>24.0%</td>
<td>25.3%</td>
<td>62%</td>
</tr>
</tbody>
</table>

Table 1

CONCLUSION: Compare to year 2005, we found an increase in the obesity level in first grade school children from Easter Island. Despite a relative healthy eating profile it appears that the increase in “screen hours” is probably the factor that influenced the deterioration of nutritional status.
Impact of Property on Chinese Children's Physical Growth and Fitness: An Equity Study

Zhiping Zhen1, Zhenming Mao1, Weimo Zhu, FACSM2, Qiuqiang Yang1, Bingyi Li1, Junqi Wang3, Hanran Li3, Beiwei Du1, Yue Liang1, 1Beijing Normal University, Beijing, China. 2University of Illinois at Urbana-Champaign, Urbana, IL. 3East China Normal University, Shanghai, China. 4The Experimental School Affiliated to National Academy of Education Administration, Beijing, China. 5Fengtai Branch of Beijing Institute of Education Affiliated School, Beijing, China. 6China University of Mining and Technology, Beijing, China. (Sponsor: Weimo,Zhu, FACSM)

RESULTS: Some major differences in both physical growth and fitness were observed between children from Beijing and BTPB (see Table 1). CONCLUSIONS: Due to the main impact of low socioeconomic status, therefore lack of PE resources (e.g., lack of PE teachers and equipment, insufficient PE curriculum hours etc.), there was a significant unequal PE opportunities to the students in BTPM. As a result, their physical growth and fitness levels were significantly lower than their counterparts in Beijing. Effect intervention to remove the inequality is urgently needed.
Previous studies have examined the prevalence of participation for specific types of leisure-time physical activities among US adults. However, information on the total time adults spend in each activity is also important for developing effective interventions to promote physical activity.

**Purpose:** To estimate the proportion of total volume attributable to specific activities (attributable proportion) overall and by population subgroups.

**Method:** The proportion of total volume of leisure-time physical activity attributable to each of 9 specific types of physical activity was estimated using self-reported data from 21,685 adult participants aged 18 years in the National Health and Nutrition Examination Survey 1999-2006. The attributable proportion was defined as the activity specific moderate-intensity equivalent minutes/week divided by total moderate-intensity equivalent minutes/week. For the moderate-intensity equivalent of minutes spent in vigorous-intensity activity, vigorous-intensity minutes were multiplied by two.

**Results:** Overall, walking (28%), sports (22%), and dancing (9%) contributed the most to population leisure physical activity volume among US adults. The attributable proportion was significantly higher among men than women for sports (30% vs. 11%) and higher among women than men for walking (36% vs. 23%), dancing (16% vs. 4%), and conditioning exercises (10% vs. 5%). The proportion was significantly lower for walking, but higher for sports, among active adults than those insufficiently active. The proportion significantly increased with age for walking. Compared with other racial/ethnic groups, the attributable proportion was significantly lower for sports among non-Hispanic white men and for dancing among non-Hispanic white women. The attributable proportion for walking significantly decreased with level of education among women; however, among men, there was no difference in the attributable proportion for walking by level of education.

**Conclusion:** Walking, sports, and dance account for the most activity time among US adults overall, yet some demographic variations exist. Strategies for physical activity promotion should be tailored to the differences across population subgroups.

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**Active commuting has health, economic, and environmental benefits, but participation rates within the United States are low.**

**Purpose:** To examine cross-sectional relationships of demographic and workplace factors with active commuting.

**Methods:** Participants in the 2009 National Household Travel Survey reported demographics (age, gender, family income, education level, race, and household geographic location), workplace factors (time and distance to work, flextime availability, option to work from home, and work start time), and active commuting behavior (walking or biking to and from work). Multiple logistic regression examined relationships between demographics and workplace factors with active commuting.

**Results:** Among 111,809 participants, active commuting was reported in 0.56% by biking and 1.86% by walking. Increased odds of <0.05 of active commuting were consistently associated with younger age, male gender, lower income, urban dwelling, and the highest and lowest education categories. Inconsistent patterns were observed by race, but whites had greater odds of any biking (<0.05). For workplace factors, odds of active commuting were higher with flextime availability compared to no availability (walking OR=2.06, p=0.001, biking OR=1.52, p=0.01; males OR=0.002, >10 miles OR=0.001, biking OR=1-5 miles OR=0.002, >10 miles OR=0.001, biking; >1-5 miles OR=0.58, >5-10 miles OR=0.21, >10 miles OR=0.03, p=0.05) or longer time to work compared to 20-30 mins OR=0.10, >30 mins OR=0.07; biking: ≥20-40 mins OR=0.77, >20-30 mins OR=0.67, >30 mins OR=0.53, all p<0.05.

**Conclusions:** Relationships of demographics and workplace factors with active commuting can help to identify low user groups, modifiable workplace factors, geographic patterns, and other patterns that can be used to encourage active commuting through changes in workplace policy, multi-use land programming, infrastructure design, and public health.

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**Purpose:** The isometric grip test is a simple measure of muscle strength that was recently added to the National Health and Nutrition Examination Survey (NHANES). Previous research has shown an inverse relationship between grip strength and cardiovascular mortality. Since grip strength in an American population-based study has never been reported, this study describes grip strength in American adults by demographics, obesity category, and physical activity (PA) level.

**Methods:** Adults (n=4252) completed the 2011-2012 NHANES body measure, grip test, demographic and physical activity questionnaires. Data were analyzed via SAS 9.4 SURVEY procedures using NHANES analytic guidelines.

**Results:** Over 35% of American adults were obese (body mass index >30 kg/m2); 55.07% were reportedly obese (sagittal abdominal diameter >22 cm for males, and >20 cm for females). Males (42.73 ± 0.36 kg) demonstrated significantly stronger grip strength than females (26.83 ± 0.17 kg; p<0.0001). Adults 20-39y had significantly stronger grip strength than those 40-59y (p=0.0008) and 60+ y (p=0.0001), and adults 40-59y had stronger grip strength than those 60+y (p=0.0001). Non-Hispanic Blacks (NHB) had stronger grip strength than non-Hispanic Whites (NHW, p=0.003), Hispanics (His; p=0.0024) and Non-Hispanic Asians (NHA, p=0.0001), and both NHW and NHB had stronger grip strength than NHA (p=0.0001). There was no difference between grip strength of NHB and NHA (p=0.99). High income adults had significantly stronger grip strength than non-obese adults (p=0.0004) and viscerally obese adults had stronger grip strength than those not viscerally obese (p=0.016). Adults who reported no moderate-to-vigorous leisure-time physical activity (MVLTAPP) participation had significantly weaker grip strength than those who reported MVLTAPP participation (p=0.0006).

**Conclusions:** Grip strength varies by demographics, obesity category, and PA level. Future research is needed to link grip strength to other risk factors (e.g., dietary patterns) and health conditions in American adult population.

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**Purpose:** Indices predictive of central obesity include waist circumference (WC) and waist-to-height ratio (WHtR). The aims of this study were to establish a Colombian smoothed centile charts and LMS tables for WC and WHtR; appropriate cut-offs were used to evaluate the optimal cut-off point of WC and WHtR for overweight and obesity based on the WHO definitions.

**Methods:** We used data from the cross-sectional, national representative nutrition survey, 2010. A total of 83,220 participants (aged 20-64 years) were enrolled. Weight, height, body mass index (BMI), WC and WHtR were measured and percentiles were calculated using the LMS method. Receiver operating characteristics curve analyses were used to evaluate the optimal cut-off point of WC and WHtR for overweight and obesity based on the WHO definitions.

**Results:** We found a strong positive correlation between WC and BMI (r=0.847, p<.01) and WHtR and BMI (r=0.878, p<.01). To overweight category in men, the cut-off point value of 87.6 cm for the WC provided a sensitivity of 87.6%, a L (+) value of 7.01, specificity of 85.5% and LR (+) value of 1.14. In women, the cut-off point value of 84.0 cm for the WC provided a sensitivity of 84.0%, a L (+) value of 7.30, specificity of 88.5% and LR (+) value of 1.18. In obesity category in men, the cut-off point value of 96.4 cm for the WC provided a sensitivity of 92.9%, a L (+) value of 7.31, specificity of 87.3% and LR (+) value of 0.08. In women, the cut-off point value of 91.6 cm for the WC provided a sensitivity of 89.2%, a L (+) value of 6.42, specificity of 86.1% and LR (+) value of 0.13.

**ROC curve for WHtR was also obtained and the cut-off point value of 0.521 was used.** To overweight category considering this cutoff point, in men sensitivity was 88.8%, LR (+) value of 3.60, specificity 84.7% and LR (-) value of 0.13. In women the cut-off point value was...
value was 0.536, sensitivity 85.3%, LR (+) value of 6.01, specificity 85.8% and LR (-) 0.17. To obesity in men the cut-off point value of 0.579 was used. The sensitivity was 90.7%, LR (+) value of 6.98, specificity 87.0% and LR (-) 0.11. In women, the cut-off point value was 0.587 with sensitivity 84.5%, LR (+) value of 5.80, specificity 84.5% and LR (-) 0.12.

CONCLUSIONS: By providing LMS tables for adults based on Colombian reference data, we hope to provide quantitative tools for the study of obesity and its complications.

2757 Board #280 June 3, 11:00 AM - 12:30 PM A Profile Of The Most Active Adults In The U.S.: Self-report Or Objective Accelerometer-based Metries? Eugene C. Fitzhugh1, Dana L. Wolf-Hughes2, David R. Bassett, FACSM1, William Boyer1. 1University of Tennessee, Knoxville, Knoxville, TN. 2National Cancer Institute, Rockville, MD. Email: fitzhugh@utk.edu

Physical activity (PA) epidemiologists frequently construct population-level profiles of those most likely to acquire high or low-levels of physical activity. The National Health and Nutrition Examination Survey (NHANES) now provides an opportunity to examine these profiles using both self-reported and accelerometer-based metrics, especially population-referenced data based upon total activity counts per day (TAC/d).

PURPOSE: To contrast self-report PA and TAC/d profiles of adults most likely to be in the top quartile of activity. METHODS: This study utilized data from respondents 20 years and older (N=2,854) within the 2003-2004 NHANES. Subjects provided PA data from both a self-report survey (leisure-time, transportation, and domestic domains) and an accelerometer (four or more valid days, ≥10 hour/day). Measures used to construct profiles were age, gender, race, education, partner status, BMI, self-reported health, chronic disease status, alcohol consumption, smoking, TV/video use, and computer/ gaming use. Logistic regression (SAS PROCLOGISTIC) was performed separately on self-report and TAC/d data with those in the top PA quartile being modeled. Because the TAC/d data are based on gender and age, these measures were not included in that model.

RESULTS: The self-report model had four measures predict being in the top quartile of PA: age (p=0.005), gender (p=0.0001), health status (p=0.0083), and TV/video hours (p=0.0067). Excluding age and gender, the TAC/d model had the same significant measures in the model with the addition of two others: BMI (p=0.0003) and computer/gaming hours (p=0.0069). Only the TAC/d model was able to detect dose-response within the odds ratios. For example, compared to obese adults, overweight (OR=1.95, 95% CI=1.40-2.71) and normal weight adults (OR=2.18, 95% CI=1.45-3.30) were more likely to be in the top PA quartile. CONCLUSIONS: Among adults, TAC/d population-based data, compared to self-reported PA across multiple domains, allows for more complex and sensitive PA risk profiles to be identified. TAC/d, as a model of PA volume, should be considered as a viable metric for epidemiologists constructing risk profiles in studies that utilize objective accelerometers.

2758 Board #281 June 3, 11:00 AM - 12:30 PM Sedentary Behavior and Physical Activity Patterns Using Accelerometry among Women 64-79 Years: The Women's Health Initiative OPAC Study Kelly R. Evenson, FACSM1, Chongzhi Di2, Fang Wen1, David M. Buchner, FACSM3, Amy H. Herring1, Michael J. LaMonte, FACSM4, I-Min Lee, FACSM5, Lesley Fels Tinker6, Andrea Z. LaCroix7. 1Unc-Chapel Hill, Chapel Hill, NC. 2Fred Hutchinson Cancer Research Center, Seattle, WA. 3University of Illinois at Urbana Champaign, Champaign, IL. 4University at Buffalo – SUNY, Buffalo, NY. 5Harvard Medical School, Boston, MA. 6University of CA - San Diego, LaJolla, CA.

PURPOSE: This study described the patterns of accelerometer-registered physical activity and sedentary behavior among women 64-69 years with latent class analysis (LCA).

METHODS: Overall, 5660 women 64-79 years wore an ActiGraph GT3X+ accelerometer for 4-7 days of wear for ~10 hours/day. Cutpoints derived among similar women defined sedentary behavior (0-18 vector magnitude counts (VM)/15-seconds (s)), light low (19-225 VM/15-s), light high (226-518 VM/15-s), and moderate to vigorous physical activity (MVP/A) (≥519 VM/15-s). LCA classified participants based on daily (Monday-Sunday) physical activity time in the top 3 activities or with >15% participation in the Americas (basketball, soccer), Asia (tennis, running), Europe (soccer, basketball), and Latin America (soccer, basketball). This study included adults across 6 regions (Africa, Americas, Eastern Mediterranean, Europe, Southeast Asia, Western Pacific).

RESULTS: A total of 73,304 articles were retrieved with 65 articles representing 47 countries being included in the final meta-analysis. All six global regions reported adult data, while adolescent data was found for five regions (Africa, Americas, Eastern Mediterranean, Europe, Western Pacific) and child data for three regions (Americas, Europe, Western Pacific). Walking was the most popular activity for adults in all regions (range: 15-42%), except Europe where soccer was most prevalent (10%). Running was the second or third most popular activity for all regions. For adolescents, swimming was a top three activity or had greater than 15% participation in all five regions. Other activities with greater than 15% participation, but not necessarily in the top three activities for a region were soccer (Americas, Europe), bowling, baseball (Americas), walking and running (Eastern Mediterranean, Western Pacific). All three regions with child data reported high rates of swimming participation (10-34%). Ball sports were also popular; either in the top 3 activities or with greater than 15% participation in all five regions. Other activities with greater than 15% participation, but not necessarily in the top three activities for a region were soccer (Americas, Europe), bowling, baseball (Americas), walking and running (Eastern Mediterranean, Western Pacific). There appears to be a general shift away from ball sports during childhood to adolescence towards walking and running in adults.

E-40 Free Communication/Poster - Research Methodology Friday, June 3, 2016, 7:30 AM - 12:30 PM Room: Exhibit Hall A/B

2760 Board #283 June 3, 9:30 AM - 11:00 AM Association between International Physical Activity Questionnaire and Triaxial Accelerometry in Detecting Intervention-Related Physical Activity Changes Britney S. Lange-Maia, Kelly Karavolos, Elizabeth F. Avery, Lisa Nackers, Lynda H. Powell, Elizabeth B. Lynch, Sheila A. Duman, FACSM1, Rush University Medical Center, Chicago, IL. (Sponsor: Sheila Dugan, FACSM) (No relationships reported)

Cross-sectional studies have examined associations between the International Physical Activity Questionnaire (IPAQ) and objective physical activity (PA), though the responsiveness of the IPAQ to change in intervention studies has not been well explored.
PURPOSE: To examine the association of PA changes assessed using the IPAQ and hip-worn triaxial accelerometer.

METHODS: Participants were from two intervention studies which emphasized physical activity (MVPA) and walking time. Patients who wore a Fitbit Charge, a Fitbit One, and an Actigraph GT3X. Oxygen consumption during recovery was added to EE reported by the Actigraph. Repeated measures ANOVA was used to assess the main effects for measurement device and stage.

RESULTS: There was a significant main effect for measurement device and stage. Post-hoc analysis determined that the Fitbit Charge (P < 0.01), the Fitbit One (P < 0.01), and the Actigraph (P = 0.01) all differed from IC in measuring EE. The Fitbit Charge (P < 0.01) overestimated EE across all stages (25.3 ± 4.7, 31.0 ± 3.7, 33.0 ± 5.8 and 34.2 ± 6.1 vs 13.2 ± 2.3, 18.8 ± 3.0, 20.5 ± 2.8 and 26.9 ± 5.0 for Fitbit One and IC, respectively). The Fitbit One (14.4 ± 2.7, 15.3 ± 2.7, 19.9 ± 3.4 and 21.1 ± 4.6; P < 0.01) and the Actigraph (6.7 ± 3.8, 7.4 ± 25.4 ± 8.5 and 26.4 ± 7.9; P < 0.01) underestimated EE across all stages. Significant interactions between IC and the Fitbit One (P < 0.01), and IC and the Actigraph (P < 0.01), however, indicate that they are less sensitive to grade changes than IC.

CONCLUSION: Results show that the wrist-worn Fitbit Charge overestimates EE, which may negatively impact the fitness goals of the wearer, particularly as it relates to their rehabilitation. Factors identified by patients that aided their compliance included device ease of use and cost, and patient engagement to use new technology. Factors identified by patients that aided their compliance included device comfort and simplicity, and no need to remove the device for charging or showering. Data loss occurred from lost devices and syncing malfunctions. CONCLUSION: Wireless monitoring patient mobility with consumer physical activity monitors is feasible and provides an opportunity to objectively track patients' recovery on a scale not previously possible with dedicated research devices, while engaging patients in their rehabilitation. This type of information can help us better understand the role of pre and post-operative physical activity, and changes in technique or protocol, on patients' return to function. Device features aided compliance. Device loss and syncing malfunction contributed to data loss.
to energy balance and weight loss. The hip worn devices appear to be closer to IC in EE measures, but do not accurately reflect changes in treadmill grade, impacting those who use this exercise mode.

2764 Board #287 June 3, 9:30 AM - 11:00 AM Validation Of A Low-cost Commercially-available Accelerometer During Low And High Physical Activity Conditions In Children
Curtis Fennell, Mallory Kobak, Ellen L. Glickman, FACSIM, Jacob Barkley, Kent State University, Kent, OH. (Sponsor: Ellen L. Glickman, FACSIM)
Email: cfennell1@kent.edu

(No relationships reported)

Physical activity behavior in children is typically assessed using objective activity monitoring devices (e.g., accelerometers) or subjective survey instruments. Because of the cognitive limitations of children, survey instruments are not ideal. However, the cost of most validated accelerometers makes their use in large samples sizes untenable for many researchers. The proliferation of low-cost accelerometers may provide an alternative to researchers who wish to objectively measure physical activity in children but have limited financial resources. No studies we are aware of have assessed the validity of a new, low-cost accelerometer to measure physical activity in children.

PURPOSE: To test the relationship between accelerometer counts of a low-cost physical activity monitor (MOVband) and a previously-validated monitor (Actigraph GT1M) during two conditions of differing amounts of physical activity (low, high) in children.

METHODS: Twenty children (n = 10 boys, 10 girls) participated in 30 minutes of physical activity/sedentary behavior in a controlled gymnasium setting on two separate occasions: low activity and high activity. During the conditions, each child was in the gymnasium with no other children present and had free access to physical activity (e.g., obstacle courses and sedentary options (e.g., books, toys)). To manipulate physical activity behavior children were given access to a popular internet-connected tablet computer (Apple Pad) during one condition (low) but not the other (high). Using this approach children were 40% more physically active in the high activity condition than the low activity condition. During both conditions the MOVband and Actigraph were simultaneously worn around the wrist and waist, respectively.

RESULTS: There was a large, significant, positive association between the MOVband and Actigraph ($r = 0.91$, $p < 0.001$) in the low activity condition. This was also true during the high activity condition, however the strength of the correlation ($r = 0.77$, $p < 0.001$) was lower.

CONCLUSION: The MOVband could be considered a valid predictor of physical activity behavior in children playing in a controlled environment. However, the strength of the relationship between the two accelerometers was lessened as physical activity behavior increased.

2765 Board #288 June 3, 9:30 AM - 11:00 AM Establishing Normative Reference Values For The 20-meter Shuttle-run Test Among Schoolchildren In Bogota, Colombia: The Fuprecol Study
Adalberto Palacios-López1, Katherine González-Ruíz1, Lorena Benavides Rodríguez1, Diana Lorena Cameló-Prieto1, Jorge Enrique Correa-Bautista1, Robinson Ramírez-Vélez1. ‘Universidad del Rosario, Bogotá D.C. Colombia. Universidad Santo Tomas, Bogotá D.C. Colombia.
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(No relationships reported)

PURPOSE: There is increasing evidence that cardiorespiratory fitness (CRF) is an important health marker in youth. CRF values for children and adolescents from different countries have been published, but there is a scarcity of reference values for Latin American children and adolescents using recommended CRF estimation field tests such as the 20-m shuttle-run test as evidence of CRF in Colombian schoolchildren. In addition to presenting normative reference values, we also aim to establish the proportion of subjects whose aerobic capacity is indicative of future cardiovascular risk.

METHODS: A total of 7244 children and adolescents (55.7% girls, with a sample age range of 9.7-17.9 years) completed the 20 m shuttle-run test (median age, in years = 12.8 (SD 2.3); 25th-75th percentile: 11.0-15.0). We expressed performance as the number of shuttle-runs completed and the estimated peak oxygen consumption (VO2peak). In all age-specific groups. The proportion of subjects with a CRF indicative of future cardiovascular risk was 11.5%. By sex, 9.65% of boys and 13.1% of girls (X2 p < .001) displayed an unhealthy aerobic capacity in this study.

CONCLUSIONS: Our results provide reference standards for sex- and age-specific twenty-meter shuttle-run test scores and VO2peak values in Colombian schoolchildren aged 9-17.9 years for the first time. These values are particularly important in public health and educational settings, and future research should establish a cut-off value for test performance that can predict present or future ill health.

Funding COLCIENCIAS (Contract N° 671-2014 Code 122265743978).

2766 Board #289 June 3, 9:30 AM - 11:00 AM Establishing Face Validity of a Digital Program on Parent/Caregiver Roles in Enhancing Child Physical Activity
Matt Cady1, Barbara Lobse2, Loren D. Masters1. ‘The Pennsylvania State University, University Park, PA. 2Rochester Institute of Technology, Rochester, NY.
Email: mdc317@psu.edu

(No relationships reported)

PURPOSE: To examine face validity of “Active Kids: What’s Your Role?” (AKWYR) a digital program based on the Satter Division of Responsibility in Activity.

METHODS: 43 children with parents/caregivers participated in AKWYR. The program is designed for children playing in a controlled environment. The program is delivered on a tablet computer and consists of 14 sections: “Let’s Move!” and “Let’s Move in Our Community!” Each section is composed of 3 steps: (a) PA Nutrition Education TRACKS, a part of USDA’s Supplemental Nutrition Assistance Program (SNAP). Having a lower BMI was associated with a higher level of physical activity, but neither was associated with program response. AKWYR was deemed useful by 95% and 94% learned new information. Furthermore, 96% would recommend the program to others, 94% found it interesting, 98% the right length and 95% not difficult to read.

CONCLUSION: AKWYR was well received by parents/caregivers of 2nd - 5th grade children. High levels of overweight, obese, and inactive parents support attention to AKWYR dissemination strategies and development of accompanying materials.

FUNDING: Funded by the Pennsylvania (PA) Department of Human Services (DHS) through PA Nutrition EDUCATION TRACKS, a part of USDA’s Supplemental Nutrition Assistance Program (SNAP).

2767 Board #290 June 3, 9:30 AM - 11:00 AM Reference Values For Standing Broad Jump In Colombian Schoolchildren: The Fuprecol Study
Andres Vivas1, Katherine González-Ruíz1, Lorena Benavides Rodríguez1, Diana Lorena Cameló-Prieto1, Jorge Enrique Correa-Bautista1, Robinson Ramírez-Vélez1. ‘Universidad del Rosario, Bogotá D.C. Colombia. Universidad Santo Tomas, Bogotá D.C. Colombia.
Email: robin640@hotmail.com

(No relationships reported)

PURPOSE: Muscular power refers to the ability to perform high-intensity exercise for a fraction of a second to several minutes. Therefore, the purpose of this study was to develop age- and sex-specific normative reference values for lower-body muscular power assessed by the standing broad jump (SBJ) in Colombian schoolchildren.

METHODS: A total of 724 children and adolescents (55.7% girls, with a sample age range of 9-17.9 years) completed the SBJ test (median age, in years = 12.8 (SD 2.3); 25th-75th percentile: 11.0-15.0). We expressed performance as the number of shuttle-runs completed and the estimated peak oxygen consumption (VO2peak). Smoothered percentile curves and tables for the 3rd, 10th, 25th, 50th, 75th, 90th and 97th percentiles were calculated using Cole’s LMS method. In addition, we calculated the number of participants who fell below proposed cut-offs for low CRF based on either completed shuttle-runs or by VO2peak.

RESULTS: In general CRF levels increased with age. Among boys CRF, where higher between the ages of 14 and 17 and in girls between the ages of 12 and 14, but this increase was more modest. Shuttles and VO2peak were higher in boys than in girls in all age-specific groups. The proportion of subjects with a CRF indicative of future cardiovascular risk was 11.5%. By sex, 9.65% of boys and 13.1% of girls (X2 p < .001) displayed an unhealthy aerobic capacity in this study.

CONCLUSIONS: Our results provide reference standards for sex- and age-specific twenty-meter shuttle-run test scores and VO2peak values in Colombian schoolchildren aged 9-17.9 years for the first time. These values are particularly important in public health and educational settings, and future research should establish a cut-off value for test performance that can predict present or future ill health.

Funding COLCIENCIAS (Contract N° 671-2014 Code 122265743978).
Identifying an accurate and feasible measurement tool for assessing physical activity (PA) is a priority in epidemiologic research. Although wearable activity monitors yields high potentials for being utilized in research, little information is available on the accuracy of those measures in young children.

**PURPOSE:** To evaluate the validity of the Fitbit Flex (FF) activity monitor for assessing preschooler PA and sedentary behavior (SED) in free-living conditions, using the previously validated accelerometer-based monitor, ActiGraph GT3X+ (AG), as a criterion measure.

**METHODS:** 27 preschool age children (Girl: 41%; Age: 4.9 ± 1.1 yrs; BMI: 16.5 ± 1.6 kg/m2) were AG (on dominant hip) and FF (on the non-dominant wrist) simultaneously for 24 hours. Using age-appropriate cutpoints for AG (Pate’s 2006) and manufacturer-specific algorithms for FF, data from AG (15-sec epoch) and FF (60-sec epoch) were reduced in terms of time spent (min/day) in SED, moderate-to-vigorous PA (MVPA), and Total PA (TPA). Pearson correlations were used examine agreement between the estimates from AG and FF. Mean absolute percent errors (MAPEs) were computed as measurement errors. Equivalence test using SAS PROC MIXED procedure was used to compare the 85% confidence intervals (CI) of the estimates from the FF with the respective equivalence zone (EZ: ±15% of the mean estimates) from the AG.

**RESULTS:** The FF yielded significantly equivalent estimates of SED (FF: Mean (M) = 673 min, 85% CI: 632 - 714 min vs. AG: M = 631, EZ: 537 - 726 min) and TPA (FF: M = 337 min, 85% CI: 309 - 365 min vs. AG: M = 379 min, EZ: 303 - 435 min) as the AG. However, the estimate of MVPA from the FF was not equivalent to that from the AG. Correlations between FF and AG were consistently high for SED (r = 0.86, P <0.01) and TPA (r = 0.70, P <0.01), but moderate for MVPA (r = 0.59, P <0.01). MAPEs were 9.2, 7.0, and 14.5% for SED, MVPA, and TPA, respectively.

**CONCLUSIONS:** The accuracy of the FF for estimating SED and TPA was supported by the high correlations and significant equivalence to AG. However, relatively large MAPEs and results from equivalence test suggest that the MVPA estimates from the FF were not equivalent to those from AG. Future studies utilizing FF in preschool age children should be aware of these findings. Efforts to replicate our findings with longer studies are warranted.

The negative health consequences of physical inactivity are independent from those of sedentary behaviour. However, injurious health prognoses occur when these behaviours coalesce. Whilst physical inactivity and sedentary behaviour are irreducible components of modern lifestyles, the evidence base connecting the two behaviours is limited. Aggregating our knowledge of how these behaviours cluster and who they cluster with may facilitate the development of more effective policy and intervention. PURPOSE: This study investigates how physical activity and sedentary behaviour cluster. It further examines how individuals cluster through shared behaviours and characteristics.

**METHODS:** A non-probability sample of 22,836 participant’s self-reported demographics and completed the International Physical Activity Questionnaire (IPAQ). Using an observational between-subjects design, a 2-step hierarchical cluster analysis identified the optimal number of clusters and the subset of distinguishing variables. Univariate analyses assessed significant cluster differences. RESULTS: A cluster solution was identified. There were 27.7% (n=6,254) of participants from cluster 1 Ambulatory Active (n=6,254) who were allocated to cluster 1 (Ambulatory Active) and 27.9% (n=6,286) of participants allocated to cluster 3 Sedentary Low Active. The ‘Ambulatory Active’ cluster (n=6,254) cluster for 2.5 to 5 hours daily and were highly active. In comparison, the ‘Sedentary Low Active’ cluster (n=6,286) achieved ≤60 MET.min.wk-1 of physical activity and sat for ≥8 hours daily.

**CONCLUSIONS:** This study adopted an original approach to understanding how people can be classified according to similarities in physical activity and sedentary behaviour. Data indicated that high levels of sedentary behaviour, determined by sitting time, clustered with low levels of physical activity. Importantly, the clusters can be

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**Board #293**  June 3, 9:30 AM - 11:00 AM  **Theoretical Approach To Understand The Influence Of Economic Resources In Physical Activity: A Review**

Monica Montenegro1, Diana Alexandra Camargo Rojas2. 1Universidad del Rosario, Bogotá, Colombia; 2Universidad Nacional de Colombia, Universidad Santo Tomás, Bogotá, Colombia.

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Physical activity (PA) is defined as a polysomic concept. There are some external context factors which affect the imaginary boundary that the subjects establish around it, implying the adoption of definitions and specific practices. This qualitative study intends to analyze the influence of the economic resources in the social reproduction of the concepts and the PA practices from the determinant models and social determination.

In order to understand the physical activity concept as a polysomic conception, with a perspective from the health social determinants theory and the social determination theory, it was necessary to obtain a more comprehensive and integrated approach, for that, it was essential to make a compendium and analysis of concepts and practices that have been developed PA over the past 10 years in the academic literature.

Search 10,239 references in PubMed was obtained with certain equations, of which 2695 were selected with the first inclusion criterion: Full text last 10 years, in humans, English, Portuguese or Spanish language. The 2695 titles and abstracts were reviewed the defined criteria. By reading summaries 1324 items that did not meet the inclusion criteria or were studies that did not contribute to the objective of the study were excluded. “Income”, “possessions”, “wages”, “wealth” or “material goods”: After the analysis method and detecting the items to be included within the unit of analysis “economic factors” category was varied. Total 363 this filter more studies were excluded. Finally, two assessors reviewed 71 papers independently in accordance with defined criteria and evaluation template CASPE for quasi-experimental study and the qualitative and cross STROBE template for documents, including 23 articles for the analysis was applied. The results of the research showed a trend of PA concept from a biological dimension and “economic resource” is analyzed mainly from a reductionist point of view. The relationship between physical activity and economic resources are clearly established, however, the orientation of relationships changes with the theoretical perspective of the author. Most of the documents reviewed are based on the model of determinants, nevertheless, it is starting to show how some elements of the social determination appear in the articles.

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**Board #294**  June 3, 9:30 AM - 11:00 AM  **Sedentary Behaviour And Physical Activity: A 2-step Hierarchical Cluster Analysis**

Stephen Zolwinsky, Jim McKenna, Andy Pringle, Paul Widdop, Claire Griffiths, Michelle Mellis, Zoe Rutherford, Peter Collins.  Leeds Beckett University, Leeds, United Kingdom.

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The negative health consequences of physical inactivity are independent from those of sedentary behaviour. However, injurious health prognoses occur when these behaviours coalesce. Whilst physical inactivity and sedentary behaviour are irreducible components of modern lifestyles, the evidence base connecting the two behaviours is limited. Aggregating our knowledge of how these behaviours cluster and who they cluster with may facilitate the development of more effective policy and intervention. PURPOSE: This study investigates how physical activity and sedentary behaviour cluster. It further examines how individuals cluster through shared behaviours and characteristics.

**METHODS:** A non-probability sample of 22,836 participant’s self-reported demographics and completed the International Physical Activity Questionnaire (IPAQ). Using an observational between-subjects design, a 2-step hierarchical cluster analysis identified the optimal number of clusters and the subset of distinguishing variables. Univariate analyses assessed significant cluster differences. RESULTS: A cluster solution was identified. There were 27.7% (n=6,254) of participants from cluster 1 Ambulatory Active (n=6,254) who were allocated to cluster 1 (Ambulatory Active) and 27.9% (n=6,286) of participants allocated to cluster 3 Sedentary Low Active. The ‘Ambulatory Active’ cluster (n=6,254) cluster for 2.5 to 5 hours daily and were highly active. In comparison, the ‘Sedentary Low Active’ cluster (n=6,286) achieved ≤60 MET.min.wk-1 of physical activity and sat for ≥8 hours daily.

**CONCLUSIONS:** This study adopted an original approach to understanding how people can be classified according to similarities in physical activity and sedentary behaviour. Data indicated that high levels of sedentary behaviour, determined by sitting time, clustered with low levels of physical activity. Importantly, the clusters can be
distinguished conceptually and are likely to respond differently to varying approaches and/or interventions; therefore they are amenable to Public Health campaigns. Given the associated health implications, policy or intervention that is responsive to ‘Sedentary & Low Active’ group’s needs is not only a major Public Health challenge, but a best buy.

2772 Board #295
June 3, 9:30 AM - 11:00 AM
Effect Of Hand Dominance On Accuracy Of Wrist-worn Physical Activity Trackers
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(No relationships reported)

The increasing public awareness regarding the importance of physical activity (PA) for health has contributed to the rising popularity of personal PA trackers that track energy expenditure, activity intensity, and steps. Many popular PA trackers are worn on the wrist, but it is unclear if their accuracy is impacted by whether the trackers are worn on the dominant (D) or non-dominant (ND) wrist.

PURPOSE: The purpose of this study was to investigate the impact of D vs. ND wrist placement on estimates of energy expenditure (EE, kcal), active minutes (ActMin), and steps between two types of PA trackers during a semi-structured protocol.

METHODS: Thirty adults (15 male; age 49±20 years) wore two types of PA trackers (FB and JB, both worn on each wrist) and a portable metabolic analyzer while completing an 80-min, semi-structured protocol. Participants performed at least 12 of 21 sedentary, household, and exercise/ambulatory activities, with at least half of the visit time spent in sedentary activities. PA tracker estimates for EE, ActMin (METTS >3.0), and steps were compared to criterion values measured by the metabolic analyzer (EE and ActMin) and manually counted steps (steps). Repeated measures analysis of variance and dependent t-tests were used to analyze differences between D and ND wrist placement and the accuracy of the trackers compared to criterion measures.

RESULTS: Estimates of EE, ActMin, and steps between the D and ND FB trackers were not significantly different (276.1±19 vs. 258.1±11 kcal; 12.1±1 vs. 11.9±1 ActMin; 2483±147 vs. 2502±141 steps, respectively). Similarly, EE, ActMin, and steps from the D and ND JB trackers were not significantly different (217.5±13 vs. 213±12 kcal, 19.1±1 vs. 19.1±1 min, 2394±181 vs. 2341±167 steps, respectively). However, both the FB and JB on both wrists underestimated EE (13.26% p<0.001). ActMin (30.55%, p<0.001), and steps (24.29%, p<0.001) relative to criterion measures.

CONCLUSIONS: Choice of wrist PA tracker placement did not affect PA tracker accuracy during an 80-min, semi-structured protocol. Estimates from wrist-worn, commercial PA trackers should be interpreted with caution due to their underestimation of PA variables.

Support from the Ball State University ASPIRE Student Research Grant, and CAST Internal Grant.

2773 Board #296
June 3, 9:30 AM - 11:00 AM
Evidence of Convergent Validity for Measuring Free-Living Walking Using Wearable Devices
Miyoung Lee1, Ji-Yeob Choi2, Kwanghee Lee1, Jiye Min1, Jaemyung Kim1, Mun Cheong Choi1, 1Kooin University, SEOUL, Korea. 2Seoul National University, SEOUL, Korea. (Sponsor: Dr. Kathleen F Janz, FACSMD)
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PURPOSE: To determine the convergent validity of consumer-based wearable devices for assessing walking during free-living activities.

METHODS: A total of 48 healthy adults (10 males, 50±10.6 yrs & BMI 24.9±2.5; 38 females, 53±7.4 yrs & BMI 24.4±2.9) participated. The consumer-based wearable devices included ActiGraph GT3X+(AT), BodyMedia Armband (BM), Fitbit Charge (FC), Fitbit One (FO), Jawbone up (JB), Misfit (MF), and the Nike Fuelband (NF) worn on wrist, waist, or upper arm. The Omron HJ720IT pedometer served as the reference measure. While simultaneously wearing all devices, walking time (6.64±0.80 min), steps (13.28±1.22), and speed (1.43±0.20 m/sec) were assessed (10 m walk). Participants also completed selected free-living activities including moving boxes, cleaning desks, mopping, walking up & down stairs, and outdoor walking. Participants also completed selected free-living activities including moving boxes, cleaning desks, mopping, walking up & down stairs, and outdoor walking. On the other hand, quality control and measurement error associated with JB and MF suggest they should not be used.

Corresponding author: Miyoung Lee
This study was supported by National Research Foundation of Korea (NRF- 2014R1A1A0409992)

2774 Board #297
June 3, 9:30 AM - 11:00 AM
Video Analysis Verification of Wearable Sensor-based Head Impacts
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(No relationships reported)

Wearable sensors are increasingly being used to quantify the frequency and magnitude of head impacts in multiple sports. Thus far, little research has verified the frequency of impacts recorded by sensors using other sources of information (e.g., video).

PURPOSE: To verify the frequency of head impacts during girls’ high school lacrosse games recorded by a wearable sensor technology using video analysis.

METHODS: 35 female participants (16.2±1.3 years, 1.66±0.05 m, 61.2±6.4 kg) volunteered for the study during the 2014 and 2015 lacrosse seasons. Participants were instrumented with Xsens sensors at right mastoid process prior to each game. Simultaneous game video was recorded by trained videographer using a single camera located at highest mid field location. Videographers framed 1/3 of field while following the ball during game play. Camera and Xsens software were time synchronized. A “dummy sensor” was triggered in view of the camera signaling the start and end of each game. All impacts recorded by the sensors during games were compared with video recordings. Impacts were considered valid if the following criteria were met: a) linear acceleration ≥20g, b) player was identified on the field, c) player was in camera view, and d) impact mechanism could be clearly identified. Descriptive statistics (frequency, mean and standard deviation of linear (g) and rotational acceleration (RA)) of all impacts were calculated.

RESULTS: A total of 2830 game day impacts ≥20g were recorded (2014 n=1021, 2015 n=1817). Of the total wearable sensors of these total recorded impacts, only 203 impacts (2014 n=80, 2015 n=123) were recorded between game start and end times (p=36125; RA=6573±3517rad/s)’. Only 58% (29%; p<0.01: RA=6853±3293rad/s)’ game time impacts were verified via video analysis. Of these 58, 25 (43%) were between 20-29.9g, 20 (34%) 30-49.9g, and 13 (22%) ≥50g.

Conclusions: Overall, 29% of all head impacts recorded during lacrosse game play were verified by video. The remaining 71% either were not a result of game play or could not be identified on video. Wearable accelerometers are an emerging technology that provides the ability to quantitatively expose head impacts during gameplay. However, our findings indicate a need for cross verification of accelerometer data via other sources of information (e.g., video).

Supported by US Lacrosse

2775 Board #298
June 3, 9:30 AM - 11:00 AM
Accuracy of Wrist and Hip-worn Commercial Physical Activity Monitors In Free Living Conditions
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It is recommended that individuals participate in 150 minutes of moderate intensity physical activity or 75 minutes of vigorous physical activity each week. Commercially-available PA monitors are becoming popular for everyday use. These PA monitors provide feedback on steps, energy expenditure, moderate-to-vigorous intensity physical activity (MVPA), and sleep quality, with new models introduced to the public at an increasing rate. Whether these devices provide the consumer with accurate information is not well understood.

PURPOSE: To examine the accuracy of a wrist worn commercial device (Fitbit Charge) and a hip worn device (Fitbit One) in regard to steps and MVPA under free living conditions, compared to a research-grade accelerometer (Actigraph GT3X).

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Boston, Massachusetts
METHODS: Participants (n=17, Mean SD, Age: 27.8±9.0; BMI: 24.7±4.2) wore 3 devices (Actigraph GT3X, Fitbit Charge and Fitbit One) for 7 consecutive days. Participants were told to go about their regular daily activities while wearing all 3 devices at the same time. The GT3X was worn on the right hip.

RESULTS: Paired t-tests showed that mean steps per day between the Actigraph (10510.6 2443.7) and the Fitbit Charge (12357.7 3936.2) differed significantly (P = 0.016). Mean steps per day between the Actigraph and the Fitbit One (11726.7 11726.7) also differed (P = 0.01). Steps between the Fitbit Charge and Fitbit One did not differ (P = 0.195). No significant differences were found in active minutes recorded between any of the devices (53.0 15.2; 52.0 42.9 and 52.8 28.9) for the Actigraph, Charge and One, respectively. Bland-Altman analysis concluded that the Actigraph and Charge (P = 0.02) and the Actigraph and One (P < 0.01) did not agree for steps, whereas the Charge and the One did agree (P = 0.2). All three devices showed good agreement with regard to MVPA.

CONCLUSION: Results showed that the 2 commercial devices did not agree with the Actigraph, a widely used PA monitor for research purposes, in mean step data. However, the devices did show good agreement with regard to MVPA, suggesting that these commercial devices may provide useful feedback for individuals seeking to achieve the current public health PA guidelines for MVPA.

2776 Board #299 June 3, 9:30 AM - 11:00 AM
Comparison In Non-wear Time Validation Criteria Between Choi And Troiano For The GT3X+ Activity Monitor
Allison Barry, Donna Terbizan, FACSM, Bryan Christensen, Wonwoo Byun. North Dakota State University, Fargo, ND.

The use of an accelerometer for determining habitual physical activity and sedentary behavior (SB) is now a routine concept in epidemiologic research. There is a lack of consensus on how to distinguish the estimated SB for non-wear time (NWT), which is the estimated time while the accelerometers were not worn. Given the adverse affect of SB on health, this methodological issue is crucial because the estimates of SB can vary depending upon classification of NWT. Two different algorithms (Choi 2011 and Troiano 2007) are used for NWT classification, but the effect of choosing different algorithms on NWT classification has not been well understood.

Purpose: To compare the estimates of NWT using two different NWT classification algorithms for the Actigraph GT3X+ (AG) accelerometers. Methods: A total of 68 participants (41.9±14.1 yrs, female=74%, BMI=25.9±4.4) wore an AG on their dominant hip for seven consecutive days except for during water activities. AGs were initialized using 60-s epoch, and data were converted into estimates of NWT (min/day) using Choi 2011 and Troiano 2007 algorithms in ActiLife (6.12) software. A paired t-test was used to determine the difference between estimates from two algorithms. A two-way chi-square was used to examine the classification difference of wear-time and NWT when applying two different algorithms. Cohen’s Kappa was calculated to assess the agreement in NWT classification between these two algorithms. Results: There was a significant mean difference between the NWT algorithms (t=-13.2916, p<0.001). The mean NWT was 262.5 (Choi) and 407.3 (Troiano) min/day with a mean absolute agreement in NWT classification between these two algorithms (k=0.01, p=0.001).

Conclusions: The estimated NWT was significantly different when two different algorithms were applied although there was a substantial agreement in NWT classification between Choi and Troiano algorithms. These findings provide important information for future research utilizing the AG for measuring PA.

2777 Board #300 June 3, 9:30 AM - 11:00 AM
Low Accelerometer Wear Time Adherence Underestimates Sedentary Behavior and Physical Activity
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Purpose: Missing data may contribute to inaccuracies in determining if study participants are meeting physical activity recommendations. The purpose was to determine how accelerometer wear time adherence estimates effects estimates of sedentary behavior and physical activity. Methods: One-hundred participants (age=25.5±7.9 yrs) wore Actigraph GT3X+ accelerometers for 23.3±1.0 hrs/day, totaling 697 days (RAW). A technique to remove data was used to simulate lower adherence. First, times identified as sleep were removed by inserting missing values. Then, 60 minute blocks of waking time were randomly removed for each participant by inserting missing values, until participants had data for 17 through 10 hrs of wear time. This technique simulates how sleeping times and non-wear during waking times may be treated in practice. For each participant, sedentary (SED) time was defined as <150 cpm, light physical activity (LPA) was defined as 150-2,689 cpm, and moderate-to-vigorous physical activity (MVPA) was defined as ≥2,690 cpm. Estimates for SED, LPA, and MVPA were compared to RAW for the 10 and 17 h adherence levels using paired t-tests. Linear regression was used to compare the prediction of RAW sedentary behavior and physical activity for 10 and 17 h estimates. Results: The estimates for LPA at 10 h adherence significantly underestimated RAW LPA by 175.5±46.2 min/d (p<0.01). As adherence increased to 17 h, estimates for LPA improved (39.7±14.0 min/d; p<0.01). MVPA was underestimated by 28.4±14.6 min/d (p<0.01) at 10 h compared to 1.5±2.0 min/d (p<0.01) at 17 h. The prediction of RAW from the estimates of LPA at 10 h (β=1.66, R²=0.86) improved as adherence increased to 17 h (β=1.02, R²=0.97). Prediction of MVPA at 10 h (β=1, R²=0.85) of wear time improved as adherence increased to 17 h (β=1.01, R²=0.99). Sed was significantly underestimated by 609.8±54.4 min/d (p<0.01) at 10 h of wear time compared to 450.4±48.6 min/d (p<0.01) with 17 h of time. Prediction of SED did not improve as adherence increased from 10 (β=1.60, R²=0.85) to 17 h (β=1.01, R²=0.77). Conclusions: Researchers should improve adherence to more correctly identify if study participants are meeting physical activity recommendations. Future efforts are needed to improve the accuracy of estimation with imputation techniques that account for lower accelerometer adherence.
Purpose: Examine the validity of the Actical (AC) and ActiGraph wGT3X-BT (AG) accelerometers in estimating energy expenditure (EE) in METs during sedentary, light, and moderate activities. The study also wanted to examine if activity monitor placement impacted EE outcomes. METHODS: Twenty-two participants aged 20.4±1.7 years participated in the study. All participants completed 3 tasks (in each activity category) for a duration of four minutes. Participants simultaneously wore a portable indirect calorimetry device and both accelerometer models placed at five locations on the body: left and right wrist, left and right hip, and the right ankle. A counterbalanced design was used to minimize potential “order” effect. The manufacturer’s 1-regression EE equation was used for all AC placements. The Swartz (2000) EE algorithm was used for all AG placements. One-way repeated-measures ANOVAs were used to examine differences between estimated EE by accelerometer model/placement and tasks compared to EE measured by indirect calorimetry.

Results: No significant differences in EE estimation were observed for sedentary activities (readings, standing still, laying) for both types of accelerometers, regardless of placement.

Results showed that AC EE estimation significant differences included TM at 1.57 m∙s⁻¹ at the ankle placement (p < .001); stair climbing/descending for both hip and ankle placements (p values ≤ .02). AC EE was also significantly different for arts and crafts at both wrist and hip placements (p values ≤ .04). During moderate activities, significant differences in EE estimation were observed for the AG during TM walking at 1.57 m∙s⁻¹ at the ankle placement (p < .001); stair climbing/descending at both wrist and ankle placements (p values ≤ .04); vacuuming at the right hip placement (p < .001). AC EE estimation significant differences included TM at 1.57 m∙s⁻¹ at both hip and ankle placements (p values ≤ .04); stair climbing/descending at both wrist and hip placements (p values ≤ .03); vacuuming at the left wrist placement (p = .01). Conclusions: Accelerometer model and monitor placement impact EE estimates during sedentary, light, and moderate activities.

Purpose: In order to quantify the acceleration due to physical activity from an accelerometer signal, the gravity component of acceleration is typically removed from the signal. Yet, when inactive, the orientation of the gravity vector of a triaxial accelerometer provides valuable information, particularly when the monitor is worn on the wrist as utilized in the Sedentary Sphere. We aimed to further explore use of the gravity vector to 1) identify accelerometer wear-site and 2) classify posture using the Sedentary Sphere in data from two brands of wrist-worn accelerometer. METHODS: 1) Wear-site: 22 children, aged 10-12 y, wore a GENEActiv at the wrist and at the hip for 7 days. The angle between the forearm and vertical for the wrist-worn monitor was calculated for each 5 s epoch. The standard deviation of this angle (SDangle) was calculated over time for windows of varying lengths (1-720 min). We hypothesised that the wrist angle would be more variable than the hip angle. 2) Posture: 34 adults, aged 20-40 y, wore a GENEActiv and an ActiGraph GT3X+ on their non-dominant wrist and an activPAL3 on their thigh for 24 h. Posture (sitting/lying vs upright) was estimated based on the orientation of the gravity vector for both the GENEActiv and ActiGraph and compared with the activPAL. RESULTS: 1) Wear-site: Wear site could be discriminated based on SDangle; the shorter the time window the lower the optimal threshold and area under the receiver-operating-characteristic curve (AUROC) for discrimination of wear-site (AUROC = 0.833 (1 min) - 0.952 (12 h)). Classification accuracy was good for time windows > 1 min (sensitivity = 92%, specificity = 88%, AUROC = 0.93). 2) Posture: Time estimated sitting/lying was 534±144 min/d (activPAL), 523±134 min/d (GENEActiv) and 528±137 min/d (ActiGraph). Strong intra-class correlations were evident between the activPAL and accelerometer posture classifications, irrespective of brand (r = 0.91, 95% confidence interval = 0.84-0.97). Conclusion: The gravity component of the acceleration signal of a triaxial accelerometer provides valuable information on the orientation of the monitor. This can be exploited to distinguish between hip and wrist wear-sites and to estimate posture from a wrist-worn accelerometer, independent of brand.

Purpose: Relationship between Walking Speed and Step Detection Accuracy Using Wrist and Hip-Worn ActiGraph GT3X+ monitrors. Authors: Alvin Morton1, Diego Argueso1, Dinesh John1. Northeastern University1, Boston, MA. PURPOSE: To detect walking speed thresholds when wrist and hip-worn ActiGraph GT3X+ monitors return reasonably accurate step counts (90%) during treadmill walking between 2 and 4mph at increments of 0.1mph. METHODS: Nineteen subjects (Age: 22.0±2.6 yrs; BMI: 24.3±2.9 kg/m²) wore the GT3X+ on the dominant wrist and waist and walked freely on a treadmill for 30s at speeds between 2.0 and 4mph in increments of 0.1mph. Monitor data were processed using the ActiLife 6 default wrist and hip step algorithms. Manually counted steps were used as the criterion variable. One-way ANOVAs with post-hoc pairwise comparisons (p<0.05) were used to compare criterion and estimated steps at each speed.

Results: Criterion steps were significantly higher than hip estimates at all speeds below 2.9 mph and at all speeds for wrist estimates (p<0.05). Step detection accuracy for both the wrist and hip were positively associated with increasing speed up to 2.6 and 2.9mph, respectively, and then plateaued without attaining a 100% accuracy rate (Fig. 1). Wrist estimates were consistently inferior to those from waist worn devices. 90% of criterion steps were first detected at 2.9mph for the hip. Peak accuracy for the wrist was 69% at 2.6mph.

Conclusion: The threshold walking speed for the hip-worn GT3X+ when at least 90% of steps were detected was 2.9 mph. Wrist-worn GT3X+ did not achieve a 90% accuracy rate during walking. It is likely that wrist worn GT3X+ in particular, may underestimate step-based estimates of free-living physical activity.

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reliability (of at least an interval of 48 hours) was assessed using intra-class correlation coefficients (ICC). To determine validity and the optimal cut-off points of KAI and KFAAM, a receiver operating characteristic (ROC) curve analysis was conducted. The area under the curves (AUCs), as well as sensitivity, specificity, and the positive and negative likelihood ratio were also analyzed.

**RESULTS:** There was a strong intra-class reliability for KAI (ICC=0.984, SEM=0.40), KFAAM-ADL (ICC=0.991, SEM=0.90) and KFAAM-Sports (ICC=0.992, SEM=1.93). The AUCs of KAI was at a 96.9% (95% CI: 99.9-1.0), KFAAM-ADL was exhibited a percentage of 98.2% (95% CI: 96.1-1.0), and FAAM-Sports was 99.2% (95% CI: 97.1-1.0). The cut-off score, sensitivity, specificity, positive and negative likelihood ratio of KAI, KFAAM-ADL, and KFAAM-Sports were as follows: 5.5, 0.94, 0.98, 51.0 and 0.06 for KAI; 94.6%, 0.93, 0.89, 8.33 and 0.08 for KFAAM-ADL; 83.9%, 0.98, 0.83, 5.98 and 0.02 for KFAAM-Sports, respectively.

**CONCLUSIONS:** The ability and validity of KAI and KFAAM were accurate and precise enough to assess for CAI. Compared to the IAC, it is recommended that the cut-off point to identify CAI should be increased to 5.5 for KAI, 94.6% for KFAAM-ADL, and 83.9% for KFAAM-Sports.

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**Official Journal of the American College of Sports Medicine**

2784  
**Board #307**  
**June 3, 9:30 AM - 11:00 AM**  
**Comparison on Activity Trackers and Subjectively Reported Physical Activity: A Pilot Study**  
Melissa Powers, Matt Frigge, Angelina Kiser, Nicholas Rader, Larissa Boyd. University of Central Oklahoma, Edmond, OK.  
Email: mpowers3@uco.edu  
(No relationships reported)

Activity trackers have become a popular way to monitor daily steps, active time, sedentary time, and sleep, but many activity trackers hit the market without much information regarding their accuracy. **PURPOSE:** The purpose of this pilot study was to examine the relationship between daily activity assessed by an activity tracker, the Jawbone UP2, and physical activity assessed by the International Physical Activity Questionnaire (IPAQ) using both continuous measurements and categorical classifications of physical activity. **METHODS:** Participants were 12 full-time faculty members who volunteered to participate in a one-year pilot study of standing workstation use and physical activity. Participants completed two measures of physical activity: (1) the IPAQ, a valid measure of physical activity in diverse populations ranging in age from 18-65 years; and (2) average daily steps and active time measured using the Jawbone Up2 activity tracker worn over 7 days. Correlation coefficients were calculated to determine relationships between continuous physical activity variables. Crosstabs calculations were used to examine trends in categorical classification of physical activity using the two methods. **RESULTS:** The IPAQ continuous physical activity score was not correlated with average daily steps, average daily active time, over the period the Jawbone UP2 was worn. Most, but non-significant, correlations were observed between vigorous physical activity assessed using the IPAQ and average daily steps (r = .56) and average daily active time (r = .44). When IPAQ scores and daily steps were converted to categorical levels of physical activity (low, moderate, and high), the activity tracker misclassified 50% of levels. A high rate of misclassification by the Jawbone UP2 suggests activity trackers may not be as accurate as expected. Since new activity trackers are constantly hitting the market, it is important to know the accuracy of each. While the IPAQ is a valid measure of physical activity, it does not measure daily steps or active time, like most activity trackers. The IPAQ may capture areas of activity that are not assessed by the activity tracker. Further study of this topic in a larger, more diverse, sample and with additional measures of physical activity is suggested.

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2785  
**Board #308**  
**June 3, 9:30 AM - 11:00 AM**  
**Trends in Kinesiology Research Quality over Three Decades**  
David A. Rowe, FACSM, Anne Brown. University of Strathclyde, Glasgow, United Kingdom.  
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(No relationships reported)

The quantity of published research in kinesiology has increased exponentially over the past three decades. During this period, journal editors have published recommendations for improving the quality of research studies and of research reporting. However, limited evidence has been collected to systematically investigate longitudinal trends in the quality of kinesiology research. **PURPOSE:** To examine trends in the quality of published kinesiology research over the past three decades. **METHODS:** The journal Research Quarterly for Exercise and Sport was selected as representative of a broad range of disciplines within kinesiology. All articles in the 1993 (n = 62), 2003 (n = 56), and 2013 (n = 62) volumes were evaluated using quality indicators recommended in editorials and research methods textbooks. Trends were assessed using either one-way ANOVA or KWANOV for numeric variables or chi square for categorical variables. **RESULTS:** After initial examination, 117 of the 180 articles (65%) were determined to include primary quantitative data collection. The percent of these studies using experimental or quasi-experimental designs did not change from 1993 (36.8%) to 2003 (44.2%) or to 2013 (47.2%). Sample size did not change from 1993 (Mdn=64) to 2003 (Mdn=38) or to 2013 (Mdn=42). Mean (±SD) number of authors did not change from 1993 (3.1±1.7) to 2003 (3.1±1.5) but increased (p < 0.05) in 2013 (4.3±2.4). The percent of articles reporting a clear purpose statement in the abstract did not change from 1993 (31.6%) to 2003 (30.2%) but increased (p < 0.05) in 2013 (97.2%). Within the body text, a high percent of studies included a clear purpose statement in all three volumes (68.4% in 1993; 83.7% in 2003; 86.1% in 2013). Among experimental studies, the percent that reported effect sizes increased (p < 0.05) from 1993 (21.4%) to 2003 (52.6%) and to 2013 (76.5%). **CONCLUSIONS:** Across three decades, no discernible changes were noted in the use of stronger (experimental) designs, or in sample size. Improvements in reporting of effects, 7.3% in 2003 to 33.7% in 2013, were observed in this editorial commentary. The increase in clear reporting of the study purpose in the abstract was likely due to a change in editorial policy in 2012. Improvements in research quality may require more stringent editorial and reviewing decisions.
phenomena and compare the characteristics of the biphasic patterns such as the age of peak performance.

METHODS: Performances data were gathered for human (200, 400 and 800m races, n=5065, 5013 and 5080, respectively), greyhound (480m competitions, n=47991), mice (distance run on wheels during 24h, n=14241) and Caenorhabditis elegans (using an experimental eletrotaxis device). Other data-sets included performance in face recognition, lung functionality, muscle width in human-related systems plus physical performance in greyhounds and mice photosynthesis yield in cotton leaves, the aboveground net primary production in Picea abies with stand age.

RESULTS: A U-inversed biphasic pattern is found in all the studied processes, in both the athletic (human Olympians and elite greyhound) and non-athletic (mice, Caenorhabditis elegans) species. The pattern is always asymmetrical and we found that the estimated ages of peak performance always occur in the early part of life: 20.6 % ±6.7% of estimated lifespan.

CONCLUSIONS: The pattern is robust, whatever the type of effort and duration: free activity vs. constrained running or overall distance traveled vs. maximum speed. Our results suggest a similar age-related pattern in very different species. The description of the physiological limits shows that there is no brutal transition between the developmental and senescent periods. It thus questions the narrowed link between those two processes.

2787 Board #310
June 3, 9:30 AM - 11:00 AM
An Interactive Database Of Maximal Aerobic Capacity
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(No relationships reported)

PURPOSE: Report on the features of, and a selection of results from, a large database of Maximal Aerobic Capacity (VO\textsubscript{2max})

METHODS: Data on VO\textsubscript{2max} and associated attributes from 2,500 arbitrarily selected peer-reviewed original reports from 118 journal titles over the years 1965-2014 that passed inclusion criteria were entered into a Microsoft data table. Fields for each of the 5,350 records included: author, title, journal titles over the years 1965-2014 that passed inclusion criteria were entered attributes from 2,500 arbitrarily selected peer-reviewed original reports from 118

RESULTS: One example of a tabular agedivision report resulting from a query follows:

<table>
<thead>
<tr>
<th>AGE</th>
<th>Male - Sedentary</th>
<th>Male - Trained</th>
<th>Female - Sedentary</th>
<th>Female - Trained</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-24</td>
<td>1818</td>
<td>8921</td>
<td>47</td>
<td>1887</td>
</tr>
<tr>
<td>25-29</td>
<td>374</td>
<td>5219</td>
<td>46.8</td>
<td>477</td>
</tr>
<tr>
<td>30-34</td>
<td>278</td>
<td>6322</td>
<td>46.3</td>
<td>462</td>
</tr>
<tr>
<td>35-39</td>
<td>102</td>
<td>1878</td>
<td>43.0</td>
<td>299</td>
</tr>
<tr>
<td>40-44</td>
<td>60</td>
<td>2195</td>
<td>40.1</td>
<td>85</td>
</tr>
<tr>
<td>45-49</td>
<td>48</td>
<td>2468</td>
<td>43.8</td>
<td>38</td>
</tr>
<tr>
<td>50-49</td>
<td>63</td>
<td>2848</td>
<td>40.6</td>
<td>54</td>
</tr>
<tr>
<td>50-44</td>
<td>47</td>
<td>1363</td>
<td>34.3</td>
<td>34</td>
</tr>
<tr>
<td>55-59</td>
<td>48</td>
<td>1555</td>
<td>33.7</td>
<td>47</td>
</tr>
<tr>
<td>60-64</td>
<td>87</td>
<td>2406</td>
<td>29.7</td>
<td>66</td>
</tr>
<tr>
<td>65-69</td>
<td>112</td>
<td>5186</td>
<td>28.6</td>
<td>59</td>
</tr>
<tr>
<td>70-74</td>
<td>64</td>
<td>1801</td>
<td>24.9</td>
<td>48</td>
</tr>
</tbody>
</table>

RECORDS: 1,576

TOTAL: 41,422

AVERAGE: 844

CONCLUSION: Information resulting from this example query reveals the lifelong profiles including maxima and minima of male and female sedentary and endurance trained VO\textsubscript{2max} by age-division. Male and female sedentary VO\textsubscript{2max} profiles declined linearly with age and the linear regression lines were significantly different. Both male and female endurance trained profiles peaked at age-division 25-29 and the polynomial regression lines were significantly different. Results reconfirm the importance of gender when selecting subjects, designing investigations, and reporting results. This large and growing interactive database provides a comprehensive, unique, adaptable, expandable, user-friendly data-mining tool of benefit to scientists, coaches, and trainers as well as to recreational, amateur, and professional athletes.

2788 Board #331
June 3, 9:30 AM - 11:00 AM
Development Of Conventions For Probabilistically Determining Differences In VO\textsubscript{2} From Measurement Error
Matthew S. Tenan. United States Army Research Laboratory, Aberdeen Proving Ground, MD.

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(No relationships reported)

Indirect caloriometry and oxygen consumption (VO\textsubscript{2}) is an accepted tool in exercise science. A common study design entails VO\textsubscript{2} testing before and after a training, nutrition or equipment intervention. Small variations in VO\textsubscript{2} are often described as “significant” though they may be within the measurement error of the device.

PURPOSE: Use a custom statistical simulation which probabilistically determines if two day-to-day measurements of VO\textsubscript{2} are different. Define the conventions for interpretation of the statistical simulation.

METHODS: Day-to-day repeatability data and standard error were extracted across a continuum of volumes from previous validation work (Crouter et al., 2006). Based on this data, multivariate normal distributions (n=1000) were simulated for hypothetical VO\textsubscript{2} data, one measure remained constant at 1.7 L/min and the second measure was a series of 3000 distributions simulated from VO\textsubscript{2} measurements of 0.4 - 3.4 L/min. The multivariate normal distributions were assessed using fuzzy c-means clustering algorithms. The algorithm classified group was compared to the known groupings and the probability that the measures can be correctly classified was determined.

RESULTS: The plot indicates there is a distinct separation of sections that are “clearly different”, “possibly different” and “not different” when examining the results of the probabilistic simulation.

CONCLUSIONS: Claims that interventions can cause measurable changes in oxygen consumption need to be re-examined. The present simulation suggests that the measurement error of indirect calorimetry is too great to make definitive claims about small changes in VO\textsubscript{2} in response to an intervention.

Early and accurate identification is important for effective concussion management. Several commercially available helmet- or head-mounted environmental sensors (ES) have been developed to detect and quantify head exposures. These sensors may offer a valuable tool for assessing exposure conditions related to concussion; however, their ability to detect a physical event needs to be evaluated. Research involving ES in athletic and military environments often requires confirmation of a physical event. PURPOSE: To present a methodology for correlating electronic events recorded by an ES with physical events using video analysis. METHODS: Soldiers were instrumented with multiple ES types during drills from two military training environments to record head impact events exceeding a specified threshold. Additionally, the Soldiers were videotaped during the drill to visually identify head impact events. The drills were recorded from multiple views and all videos were time synchronized. Researchers watching the recordings used a custom program to mark the timestamp of observed head impacts for each Soldier. A “nearest neighbor” search algorithm was then used to identify the three nearest sensor events to an observed video event. The time differential between the observed video event and the sensor events was used to determine a time-window around observed video events that
minimized the likelihood for matching multiple sensor events with a single video event. RESULTS: During drills from the first training environment, nearly 50% of the video events had a corresponding sensor event within ±1 second. The drills from the second training environment were slightly more accurate, with 55% of the video events having a corresponding sensor event within ±1 second. The drills from the third training environment were distributed to the Soldiers just prior to the drill. During drills from the second training environment, between 5% and 50% of the videos had a corresponding sensor event within ±30 seconds depending on the ES used. The drills for the second training environment typically lasted a minimum of four hours and the sensors were distributed up to two hours before a drill started. CONCLUSION: The relatively low percent of video events with a corresponding sensor event may be due to the accumulation of time-drift in the sensors or video. ES alone are not able to completely represent the exposure conditions of a drill/game/match at this time.

2790  Board #313  June 3, 9:30 AM - 11:00 AM  From Raw Acceleration Data to Activity Count
Zhihiao Rao, Fadh Albinai. Omedic Health Inc., Boston, MA. Email: zrao@omedichealth.com
(No relationships reported)

PURPOSE
Activity counts from raw acceleration data are widely used to assess and measure physical activity. Activity counts facilitate the interpretation of acceleration data including quantifying intensities of physical activities, classifying activity types and estimating energy expenditure. Proprietary Software from Actigraph, namely ActiLife, is the most popular tool among researchers that converts raw acceleration to activity counts. The purpose of this work is to explore the ActiLife algorithm and to develop a transparent open-source algorithm that produces a highly correlated activity count comparable to the ActiLife activity count method.

METHODS
Using the recently published GT3X format, we developed software that systematically generates pure sinusoidal acceleration signals with a variety of amplitudes and frequencies that span the full range of naturalistic human movement in GT3X format. We then processed the generated artificial signals using the ActiLife software to explore the characteristics of the proprietary algorithm and to estimate its parameters such as filter shape, amplitude thresholds, and scale factors.

RESULTS
By utilizing the estimated parameters of the algorithm, we demonstrate that the proposed open-source method closely matches the activity count generated by ActiLife. The correlation between the proposed method and ActiLife counts is approximately 0.91 which is significantly smaller than the expected 0.56% error among Actigraph devices based on hardware specification from the datasheet (e.g. due to non-linearity, quantization and measurement errors). Our results are further validated using 10 datasets (representing 1000 days in total of raw acceleration) in free-living conditions.

CONCLUSION
This work presents an open-source algorithm that generates activity counts comparable to ActiLife activity counts which can be easily enhanced and adapted to a variety of use cases and cohorts.

2791  Board #314  June 3, 9:30 AM - 11:00 AM  Gesture Analysis For Yoga Alignment
William Seffens*, Nataly Gonzalez*, Paula Seffens*. Morehouse School of Medicine, Atlanta, GA. *University of North Georgia, Gainesville, GA. (Sponsor: Walter Thompson, FACSM) (No relationships reported)

INTRODUCTION: Yoga Therapy research has recently become the focus of rigorous scientific inquiry in the interest of understanding and quantifying its benefits for a wide variety of medical conditions. There remains a disparity between segments of the population who can readily access yoga classes and therapies. For difficult to reach individuals, Yoga Therapy via an exergame format could be utilized in clinical or home environments. The purpose of this study was to analyze Yoga posture alignment using a gesture analysis program in order to produce a yoga exergame using the Microsoft Kinect. We captured six yoga postures demonstrated by an advanced yoga teacher, using 6 postures before, at the mid-point and at the conclusion of a 10-week yoga class. The drills for the second training environment were distributed to the Soldiers just prior to the drill. During drills from the second training environment, between 5% and 50% of the videos had a corresponding sensor event within ±30 seconds depending on the ES used. The drills from the second training environment typically lasted a minimum of four hours and the sensors were distributed up to two hours before a drill started. CONCLUSION: The relatively low percent of video events with a corresponding sensor event may be due to the accumulation of time-drift in the sensors or video. ES alone are not able to completely represent the exposure conditions of a drill/game/match at this time.

2792  Board #315  June 3, 9:30 AM - 11:00 AM  Examining The Validity Of Fitbit Charge HR For Measuring Heart Rate In Free-living Conditions
Jung-Min M. Lee*, Hyeunsoo An*, Seoungi Kang*, Youngdeok Kim*, Danae Dinkel*. 1University of Nebraska at Omaha, Omaha, NE. 2Yong-In, Yong-In, Korea. Republic of. 3Texas Tech University, Lubbock, TX. Email: jungmilee@unomaha.edu
(No relationships reported)

Optical blood flow sensors (i.e. photoplethysmographic techniques) have recently been utilized in wearable activity trackers. The Fitbit Charge HRTM (FBHR) is one of the widely recognized wearable activity trackers that utilizes Fitbit’s proprietary PurePulse optical heart rate (HR) technology to automatically measure wrist-based HR. Despite its increasing popularity, however, no study to date has addressed the validity of FBHR for measuring HR in free-living conditions. PURPOSE: The purpose of this study was to examine the validity of FBHR for measuring HR using a chest strap Polar HR monitor (PHR) as a reference measure in free-living conditions. METHODS: Ten healthy college students (8 males; mean age = 26.5 ± 5.4 years; mean body mass index (BMI) = 24.5 ± 3.23 kg/m2) participated in the study. The participants were asked to perform normal daily activities over a period of 24 hours for 8 hours while wearing the PHR (model RS400) on their chest and two FBHRs on their dominant and non-dominant wrists, respectively. HR was recorded every minute and the minute-by-minute HR data from each sensor were synchronized by time of day. Pearson correlation was used to examine the linearity of average beats-per-minute (bpm) estimated from FBHRs with respect to the PHR. Mean differences in average bpm between the monitors were examined by a general linear model for repeated measures. Lastly, mean absolute percentage error (MAPE) of minute-by-minute bpm estimated from the FBHRs were calculated against the PHR. RESULTS: Average HRs (mean ± SD) for PHR, FBHR non-dominant, and FBHR dominant were 73.6 ± 18.5 bpm, 72.8 ± 16.7 bpm, and 73.9 ± 17.06 bpm, respectively. Pearson correlation coefficients (r) between the PHR and FBHR non-dominant and dominant were r=0.80 and r=0.79, respectively. MAPE were 9.17 ± 10.9% for FBHR non-dominant and 9.71 ± 12.4% for FBHR dominant. ANOVA and post-hoc analyses with Bonferroni revealed significant differences in estimating HR from FBHR non-dominant wrist (p<0.001) and FBHR dominant wrist (p<0.001) compared to PHR monitor. CONCLUSION: The results indicated that the wrist-oriented Fitbit Charge HRTM device does not provide an accurate measurement of HR during free-living condition in this study. However, further research is needed to validate these monitors with a larger sample with different population groups.

2793  Board #316  June 3, 9:30 AM - 11:00 AM  Compositional Data Analysis of Sedentary Behavior Patterns in Overweight and Non-Overweight Adults
Heontae Kim, Seungho Ryu, Brian G. Ragan, Minsoo Kang, FACSM. Middle Tennessee State University, Murfreesboro, TN. (Sponsor: Minsoo Kang, FACSM) Email: hk3m@mtmail.mtsu.edu
(No relationships reported)

Sedentary behavior (SB) time data, which consists of several domains, such as work related sitting, non-work related sitting, and lying down/reclining, is compositional in nature. Analyzing the patterns of SB data with traditional analyses are not appropriate because increased time in one of the domain forces the other domains decreased. PURPOSE: To investigate SB patterns in overweight and non-overweight adults using compositional data analysis.

METHODS: Forty-nine adults (age=17 years; overweight n=28) volunteered for this study. The Sedentary Behavior Record (SBR) instrument was used to collect SB data. The SBR quantifies time spent in SB across day and across two weekdays (noon-related sitting, non-work related sitting, and lying down/reclining) in 15-minute blocks. Participants completed the SBR by documenting the amount and type of SB for 7-days. The three domains were converted into percentages of total SB time to allow for compositional data analysis. Adults were classified as overweight (≥25kg/m2) or non-overweight (<25kg/m2) using body mass index. Normality assumptions were examined using Anderson-Darling, Cramer-Wons Mises, and Watson tests. Maximum likelihood estimation (MLE) tests were examined to compare overweight and non-overweight adults’ SB patterns. A ternary diagram was used to illustrate the compositional pattern of the data.

RESULTS: The data met the assumption of a logistic normal distribution. The MLE tests indicated significant differences in SB patterns between overweight and non-overweight adults (Likelihood: Mean and Covariances equal=139.61,31, p<0.001; Means equal=120.85, p=0.04). The ternary diagram indicated that overweight adults spent more time in non-work related sitting (overweight=57%; non-overweight=52%) versus work related sitting during the 7-day period.
and work related sitting (overweight=35%; non-overweight=33%), but less time in lying down/reclining (overweight=8%; non-overweight=15%) compared to non-overweight adults that did not work in a seated position.

CONCLUSIONS: This study provides support for the use of compositional data analysis for analyzing SB patterns. Overweight adults had significantly different SB patterns compared with non-overweight adults. This information could be useful for the development of intervention programs targeted at reducing SB in overweight adults.

2794  Board #317  June 3, 9:30 AM - 11:00 AM  
Compositional Data Analysis of Total Activity Patterns by Sex and Obesity Status  
SeungHo Ryu, Huentae Kim, JunBae Mun, Brian Ragan, Minsoo Kang, FACSM. Middle Tennessee State University, Murfreesboro, TN. (Sponsor: Minsoo Kang, FACSM)  
Email: sr4s@mtmail.mtsu.edu  
(No relationships reported)  

Activity time data, which includes sedentary behavior (SB), light physical activity (LPA), and moderate to vigorous physical activity (MVPA), is compositional in nature. Because of the dependent nature of compositional data, traditional analysis methods may not be appropriate.

PURPOSE: To examine total activity (TA) patterns by sex and obesity status using compositional data analysis.

METHODS: Activity times (308 adults ≥18 years; male=208; obese=103) from the 2003-2004 National Health and Nutrition Examination Survey (NHANES) were analyzed for this study. Participants were included in the analysis if they wore an accelerometer for a minimum of seven valid days (i.e., wear-time ≥13 hours/day). Accelerometer (Actigraph AM-7164) data were classified as SB (<100 counts per minute (cpm)), LPA (100 - 2019 cpm), or MVPA (≥2020 cpm) using previously established thresholds. Adults were classified as obese (<30kg/m2) or non-obese (<30kg/m2) using body mass index. Normality assumptions were examined using Anderson-Darling, Cramer-won Mises, and Watson tests. A ternary diagram was used to illustrate TA patterns. Maximum likelihood estimation tests were used to examine TA patterns by sex and obesity status.

RESULTS: The data met the assumption of a logistic normal distribution. Ternary diagrams illustrated a difference in the composition of TA patterns by sex and obesity status. The result of the maximum likelihood estimation test showed significant differences in TA patterns by sex (likelihood statistic=297.54, p<0.05) and obesity status (likelihood statistic=259.42, p<0.05). Males engaged in more LPA (male=40.1±11.03%, female=59.8±5.39%), and more MVPA (male=6.3±2.34%, female=2.2±2.71%), but less LPA (male=36.1±9.49%, female=37.9±9.16%) compared with females. Obese adults engaged in more SB (62.0±9.29%, non-obese=59.3±10.52%), but less LPA (obese=35.0±7.34%, non-obese=37.6±9.63%) and MVPA (obese=2.4±3.22%, non-obese=3.02±3.32%) compared with non-obese adults.

CONCLUSIONS: Obese adults and males were more likely to engage in SB compared with non-obese adults and females, respectively. Compositional data analysis is a promising technique for evaluating patterns in compositional data.

2795  Board #318  June 3, 9:30 AM - 11:00 AM  
Discrepancy between Self-Reported and Objectively Measured Physical Activity  
Tomoa Sakai1, Takahiro Nakano1, Kosho Kasugar2, Kazuo Oguri2. 1Nagoya Gakuen University, Seto, Japan. 2Gifu University, Gifu, Japan. 2Gifu Gakuen University, Gifu, Japan. (Sponsor: Kiyoji Tanaka, FACSM)  
Email: tsakai@ngu.ac.jp  
(No relationships reported)  

PURPOSE: The aim of this study was to evaluate whether the predictive accuracy of the amount of physical activity undertaken increases by wearing an accelerometer.

METHODS: Thirty community-dwelling women (65.3±4.7 years) who did not exercise regularly and had no prior experience of habitually wearing an accelerometer participated in the study. The participants were instructed to wear an accelerometer on their waist all day for six weeks. The instrument measures the number of steps and duration of intensity levels of various activities. The study period was divided into three sets consisting of two weeks each. The first set comprised of weeks one and two, (b) second comprised of weeks three and four, and (c) the third comprised of weeks five and six. In the first and third periods, the participants were requested to wear monitors that could not confirm step count and then asked to guess the number of steps they walked in one day. In the second period, they were requested to wear an accelerometer and then asked about the number of steps covered when they walked continuously for ten minutes. In other words, they were consciously made aware of the question, “How many steps do I take in a given time period?”

RESULTS: No significant difference was observed between the three experimental periods based on the step counts and duration of moderate-to-vigorous physical activities (6656.3±3149.1, 7034.1±3415.5, 7277.2±3374.2 steps; and 687±34.4, 741±38.6, 720±38.8 minutes, respectively). However, the estimated step counts and the absolute value (obtained by subtracting estimated step counts from actual counts) for the first and third experimental periods were found to be significantly different (4961.5±2951.5 and 5766.0±2893.9 steps; and 2811.2±2186.7 and 2055.9±1807.9 steps, respectively).

CONCLUSIONS: The results confirmed that teaching women to ascertain their activity level with wearable physical activity monitors increased their predictive accuracy on the amount of physical activity undertaken. One reason is that monitoring step counts over a smaller time span made it easier for the participants to comprehend their daily physical activity levels. This allowed them to overcome the challenges of predicting the amount of such activity, thereby, increasing their predictive accuracy.

2796  Board #319  June 3, 9:30 AM - 11:00 AM  
Examining The Reliability of Dexa on Body Compositions in Korean Athletes  
Hyun-Sung An1, Hyun-Seong Gwak2, Seoung-Ki Kang2, Jung-Min Lee1. 1University of Nebraska at Omaha, Omaha, NE. 2Yong-In University, Yong-In, Korea, Republic of.  
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(No relationships reported)  

Measuring and monitoring body compositions play a significant role for athletes to achieve their optimal performance. A DEXA (Dual Energy X-ray Absorptiometry) scan is one of the accurate measures to screen body compositions as a reference measure, however, the reliability-especially in athletes-has not been studied yet.

PURPOSE: To assess the reliability of DEXA for measuring body compositions in Korean athletes. METHODS: Twenty-nine male athletes (age = 21.03 ± 2.31 years old, height 174.17 ± 6.26 cm, weight 68.71 ± 8.11 kg) registered for the college athletic program volunteered to participate in the study. Muscle mass (kg), lean mass (kg), bone mineral density (BMC) (g·cm⁻²), and total fat mass (kg) were assessed by DEXA: liver DEXA (GE Lunar, Madison, USA) four times within a day to examine the difference by each trial and time frames (morning vs. after lunch). Four trials consisted of ‘early in the morning × 2 with fasting’ and ‘after lunch × 2’. Intra-class correlation coefficient (ICC) was used to determine overall reliability (p<0.05) and a repeated measure ANOVA was performed to compare the difference for each trial (p<0.05) and time frames (p<0.05).

RESULTS: The mean ± SD for each trial of muscle mass were 56.41 ± 4.73 kg, 56.14 ± 4.80 kg, 56.52 ± 4.64 kg, and 56.36 ± 4.69 kg, lean mass were 59.44 ± 5.07 kg, 59.16 ± 5.12 kg, 59.54 ± 4.96 kg, and 59.28 ± 5.01 kg, BMC were 3.03 ± 0.42 cm², 3.02 ± 0.41 cm², 3.02 ± 0.41 cm², and 3.01 ± 0.40 cm², and fat mass were 9.28 ± 4.91 kg, 9.24 ± 4.80 kg, 9.28 ± 4.89 kg, and 9.30 ± 4.87 kg, respectively. The ICC for testing the reliability showed strong accuracy on muscle mass (r=0.99 and p<0.001), lean mass (r=0. 995 and p<0.0001), BMC (r=0. 995 and p<0.0001), and fat mass (r=0. 998 and p<0.0001). Cronbach’s alpha were 0.99 (muscle mass), 0.99 (Lean Mass), 0.99 (BMC), and 1.00 (Fat Mass). No significant difference between each trial was observed in fat mass (p>0.36). However, there were significant differences in muscle mass (p<0.001), lean mass (p<0.001), and BMC (p<0.043) between trials. Additionally, a significant difference was observed in the time frame on BMC (p<0.041).

CONCLUSIONS: Although all of the variables showed strong agreement on overall reliability from the ICC test, the reliability for the muscle mass, lean mass, and BMC showed significant differences in each trial.

E-41  Free Communication/Poster - Soccer  
Friday, June 3, 2016, 7:30 AM - 12:30 PM  
Room: Exhibit Hall A/B  

2797  Board #320  June 3, 11:00 AM - 12:30 PM  
Can The Weather Condition Influence The Spectators’ Attendance During The 2022 Fifa World Cup?  
Monoom Haddad, Hiba Zubair Valiyakath, Ruben Goebel. Qatar University, Doha, Qatar.  
Email: mhaddad@qu.edu.qa  
(No relationships reported)  

PURPOSE: It is well known that spectators are one of the cornerstones of sports. Their importance during a competition is like salt for food. Actually, spectator is one the important sources of motivation for athletes and players particularly for elite athletes and professional players. Therefore factors that might influence the spectators’ attendance should be well controlled and studied particularly before the event. The aim of the present study is to determine the effect of extreme weather conditions on spectators’ attendance during the 2022 FIFA World Cup in Qatar if it is scheduled to be played in regular timetable (i.e., summer).

METHODS: Three important weather variables (i.e., temperature, relative humidity and heat index) were correlated to the number of spectators of the FIFA World Cups.
To decrease the possible influence of the economic development, transportation and stadiums facilities, standard of living, interest and acceptance of football on the spectators’ attendance, only last five world cups (past 20 years) were followed. The magnitude of correlation suggested by Hopkins was used.

**RESULTS:** The means of spectators’ number, temperature, relative humidity and heat index during the last five Football world cup are 3178856 ± 31917 spectators, 18 ± 3.18, 70°C ± 13.44 and 17 ± 3.42, respectively. Negative correlations were observe between the spectators’ number and various weather variables (i.e., temperature, relative humidity and heat index). None of these correlations was statistically significant. Trivial and small corrections were observed between spectators’ number and both temperature and heat index, respectively. A trend of significant correlation was observed between the spectators’ number and the relative humidity. Despite non-significant, this correlation is considered meaningful (large). Negative and non-significant correlation was shown between the weather variables and the spectators’ attendance. “Trivial” correlation was shown between the temperature and the spectators’ attendance. A “Small” correlation was observed between the heat index and the spectators’ attendance.

**CONCLUSIONS:** The extreme summer weather conditions in Qatar would affect the spectator numbers and thus the decision taken by FIFA to change the host time to December seems to be appropriate.

**RESULTS:** The prospective cohort study investigated N=14.178 talented players from the German soccer talent development program. Under-12 age group born between 1993 and 1995. These players participated in a SWEET program to improve anaerobic performances in young soccer players.

**Purpose:** Performance optimization of athletes through exercise training interventions is a major task. The aim of this study was to compare the effectiveness of repeated sprint exercise (RSE) and the repeated square wave endurance exercise training (SWEET) to enhance the repeated sprint ability, power, and aerobic capacity in soccer players.

**Methods:** 22 male soccer players (age 19.9 ± 1.4 years) participated in the study. They were randomized in two groups: RSE group trained 3×20min, with 4:30min of recovery between series and repetitions respectively and Sweet group trained 1min at 90% VO2peak, 4min at 50% VO2peak during 30 min both groups in addition to their traditional soccer training. The following parameters were measured before and after 7 training weeks (with 2 sessions per week): 10, 20, and 30 m linear sprints, blood lactate after repeated sprint performances (peak time, post peak and HIR values), the 5-jump performance, repeated sprint test (RST) and peak oxygen uptake (VO2peak). Results: Linear sprint improved more after RSE than SWEET training (p<0.01). RSE training showed larger improvements in the 5-jump scores and in RST. Peak power output and pedaling speed improved significantly higher than RSE training compared to the SWEET training (p<0.01). Delta blood lactate concentration was reduced after training. The reduction was more pronounced in SWEET group (p<0.05). Significant group x time interaction was found in the VO2peak (p<0.001), with SWEET showing larger improvement (4.9±1.3% than SWEET group (4.3± 1.5%). Conclusion: The effects of repeated sprints on both aerobic and anaerobic metabolism shown in the present study are in agreement with other studies (Tomnessen et al. 2011, Serpiaulo et al. 2011). In agreement with the literature, the repeated sprint performances were increased significantly only in RSE group (Tomnessen et al. 2011). The improvement in power of the lower limbs and Vpeak for the RSE group reflects an enhancement in the ability to utilize the stored elastic energy and indirectly assists in the first phase of force-time curve initiated by the rate of force development in leg extensors within the RSE training group.

The present data showed that a specific training program based on RSE is superior to SWEET program to improve anaerobic performances in young soccer players.
Isokinetic Strength Differences In Elite Youth Soccer Players Compared With Respect To Field Position

Tomas Malý1, Frantisek Zahalka1, Lucia Mala1, Lee Cabról1, David Bujnovsky1. Charles University, FEPES, Prague, Czech Republic. 1Charles University, FPES, Prague, Czech Republic. 2Seton Hall University, New Jersey, NJ. Email: maly@ftvs.cuni.cz

No relationships reported

Every player has different physical abilities, technical skills, tactical thinking and psychological characteristics, and there is a specific role on the team. In terms of physical activity, there are individualized demands on physical, physiological, and bioenergetic expenditure depending on player position.

PURPOSE: To determine muscle strength (MS) and SA at different velocities with respect to field position in youth elite soccer players

METHODS: Soccer players of the U19 highest Czech league (n = 104, age 18.2 ± 0.6 years) were divided according to the field position into: goalkeepers (GK), fullbacks (FB), central defenders (CD), wide midfielders (WM), central midfielders (CM), and attackers (A) and were tested on a isokinetic dynamometer. The following parameters were obtained for both limbs: Peak torque (PT), knee extensors (KE) ratio (Q/Q) and knee flexors (K/F) ratio (H/H), unilateral ratio between H and Q for both legs (H/Q). Mixed model MANOVA, Bonferroni post hoc test, and partial eta squared (η2) were used for statistical assessment.

RESULTS: The greatest MS of KEs was produced by GKs (PT = 253.1 ± 37.3 N.m) and conversely, the lowest by FBs (PT = 204.9 ± 29.3 N.m). When expressed in relative values, the greatest strength was achieved by CDs (PT = 3.24 ± 0.27 N.m.kg-1) and the lowest by CMs (PT = 2.96 ± 0.33 N.m.kg-1). MANOVA showed a significant effect of field position on absolute PT (F30,374 = 3.24, λ = .66; p < .01, η2 = .18). Despite differences in absolute values, no significant difference in relative strength regarding the playing position was found (F = 0.50, F15,187 = 1.09; p > .05, η2 = .012). The test of the effect between groups revealed significant differences in PT of KEs in both limbs (p < .05). Post hoc analysis revealed lower absolute PT of FBs in comparison to GKs and CDs at all velocities (p < .05). An insignificant effect in unilateral strength ratio (F = 0.66, F15,187 = 1.39; p > .05, η2 = .008) and bilateral strength ratio (F = 0.68, F15,187 = 1.24; p > .05, η2 = .07) was found.

CONCLUSION: In assessment of MS in absolute values, there are significant differences among the players with respect to field position. A higher bilateral deficit was found in KEs, specifically in GKs and CDs. Sixty one players (59%) had muscle imbalance in KEs or KFs between the extremities at least at one velocity. Supported by PRVOUK P38.

Isokinetic Strength Differences In Elite Youth Soccer Players

Tomas Malý1, Frantisek Zahalka1, Lucia Mala1, Lee Cabról1, David Bujnovsky1. Charles University, FEPES, Prague, Czech Republic. 1Charles University, FPES, Prague, Czech Republic. 2Seton Hall University, New Jersey, NJ. Email: maly@ftvs.cuni.cz

No relationships reported

A total of 131 professional soccer players (first division, age 26.7 ± 5.0 years, body height 184.7 ± 7.1 cm, body weight 84.2 ± 6.3 kg) were tested using a force platform in three types of jumps: countermovement jump free arms (CMJFA), countermovement jump (CMJ), squat jump (SJ). The following parameters were monitored: jump height (JH), maximum take-off force (Fmax), force impulse (FI) and NTr. The results were processed using ANOVA and Bonferroni post-hoc test, effect size (η2) and Pearson’s correlation coefficient (r) as well as coefficient of determination (r2).

RESULTS: Analysis of variance showed a significant effect of the type of jump on the JH (F1,167 = 31.75, λ = .36; p < .01, η2 = .18). Players achieved the following values: (CMJFA = 46.3±4.69 cm, CMJ = 40.5±3.7 cm, SJ = 38.4±9.4 cm). The type of jump revealed significant differences in all monitored parameters (p < .05). A significant relationship (p < .01) and the strongest correlation was found in NTr in all types of jumps (CMJ: r = .49, r2 = .24; CMJ: r = .38, r2 = .15; SJ: r = .50, r2 = .25). Correlation coefficient values of Fmax and FI were lower than in NTr in all types of jumps. The highest value of the NTr was found in CMJ (3.4 ± 0.34 N.m.s-1) and the lowest in SJ (2.77 ± 0.22 N.m.s-1). Bonferroni’s post hoc test revealed significant differences in NTr between types of the jump (p < .01).

CONCLUSION: The study revealed significant differences in the monitored parameters with respect to the type of jump. The best predictor of jumping performance was the NTr. Results of this investigation provide better insight for identification and prediction of power performance in different types of jumps in professional soccer players. Supported by PRVOUK P38.

Female soccer players. The relationship is weaker on an individual level, however, but similar across age groups. This suggests that objective and subjective TL measures should not be used interchangeably when prescribing or monitoring exercise intensity on an individual level in female youth soccer players.
RESULTS:
The results showed significant differences between GKs and OFs in the following variables: (age: GK = 27.69 ± 5.73 vs. OF = 24.67 ± 3.99 years, p < .05, d = 61; BMI: GK = 189.86 ± 3.88 vs. OF = 182.55 ± 6.55 cm, p < .05, d = 1.36; BM: GK = 85.56 ± 4.41 vs. OF = 77.46 ± 10.94 kg, p < .05, d = 1.97; EBCM: GK = 73 ± 0.06 vs. OF = .62 ± 0.07, p < .05, d = .49; VO2max: GK = 54.19 ± 2.59 vs. OF = 60.78 ± 4.50 ml/kg/min, p < .05, d = 1.79; CMJ: GK = 48.36 ±3.35 vs. OF = 45.47 ± 4.34 cm, p < .05, d = .75; CMJ: GK = 43.42 ± 2.98 vs. OF = 40.01 ± 4.09 cm, p < .05, d = .96; LS: GK = 40.79 ± 2.93 vs. OF = 37.82 ± 3.95 cm, p < .05, d = .85). There were no more significant differences in the rest of the variables (p < .05).

CONCLUSION:
Goalkeepers achieved significant differences in aerobic capacity, power, anthropometric characteristics and, moreover, they were older than outfielders. For GK and fitness coaches, it is imperative to understand differences and demands on the level of physiological parameters in order to optimize the training process. Differences in anthropometric indicators confirm that these differences should be considered as a part of predictors in the selection of talented young athletes, especially goalkeepers. Supported by PRVOUK P38.

2805
Board #328
June 3, 11:00 AM - 12:30 PM
Comparison of the Body Adiposity Index, Bioelectrical Impedance Analysis, and Air Displacement Plethysmography in Collegiate Division II Female Soccer Players
Ashley N. Hoden, Brian M. Tyo, Clayton R. Nicks, Michael Mangum. Columbus State University, Columbus, GA.

(No relationships reported)

Purpose: To compare body fat estimates using the body adiposity index (BAI), bioelectrical impedance analysis (BIA (Tanita TBF-300, InBody 520)), and air displacement plethysmography (Bod Pod) in collegiate division II female soccer players. Methods: Sixteen NCAA division II female soccer players (19.8 ± 1.0 y) from the same team participated in the study. Anthropometric variables of participants (weight, height, abdomen circumference, waist circumference, hip circumference, WHR, body fat percentage) were measured. Pearson’s correlation coefficients were used to determine if relationships exist between BAI, Tanita, InBody, and Bod Pod. Results: Bland Altman plots were used to determine the agreement of body fat estimates between BAI, Tanita, and InBody with Bod Pod. Results: Both Tanita (r = 0.815, P < 0.01) and Inbody (r = 0.816, P < 0.05) showed a weak correlation with Bod Pod body fat percent. Bland Altman plots revealed that the Tanita (-1.33%) and InBody (-1.93%) underestimated body fat percent and BAI (4.69%) overestimates when compared to the Bod Pod. Conclusion: The strong correlations of BIA and plethysmography in estimating body fat percentage are similar to studies in female athletes that compared BIA to DEXA. Similar studies have also found body adiposity index to show large individual errors when compared to DEXA. Therefore, BIA may be more appropriate than the body adiposity index for measuring body fat percentage in this population.

2806
Board #329
June 3, 11:00 AM - 12:30 PM
Anthropometric and Physiological Characteristics of Division I College Female Soccer Players.
Tomás Barrett, Gavin Connolly, Paul O’Connor. Central Michigan University, Mt Pleasant, MI.
Email: barre11@cmich.edu

(No relationships reported)

Women’s soccer is one of the fastest growing sports in the U.S. Over the last 30 years, the sport at college level has witnessed an exponential increase in participation rates. There are currently 1022 teams and 26358 athletes registered with the NCAA, however limited information exists about the physical attributes required to play at the elite college level.

Purpose: To examine the anthropometric and physiological profile of Division I college female soccer players. A secondary purpose was to investigate any differences in relation to playing position and starters versus non-starters.

Methods: 24 college female soccer players took part in pre-season testing (3 goalkeepers, 7 defenders, 8 midfielders, and 6 forwards). The battery of tests included height and body mass, percent body fat by skinfold measurements, speed (10 m, 20 m, 30 m and flying 20 m), agility (arrowhead), lower body power (countermovement jump), aerobic capacity (Yo-Yo IR1 test) and test-retest sprint ability (RSA).

Results: No significant differences were observed for any of the variables in relation to playing position. A significant difference was observed between starters and non-starters for aerobic capacity (p = 0.038). No significant differences were observed for any of the other measures between starters and non-starters (Table 1).

Table 1. Comparison of anthropometric and physiological measurements between starters and non-starters. Means ± SD

BMI

Starters Non-starters

22.8 ± 1.6 23.4 ± 2.2

% Body Fat

21.9 ± 4.2 23.8 ± 4.5

Vertical Jump (cm)

36.3 ± 5.5 33.2 ± 3.6

10m (s)

1.96 ± 0.08 1.97 ± 0.12

20m (s)

3.35 ± 0.13 3.38 ± 0.12

30m (s)

4.67 ± 0.21 4.74 ± 0.17

Flying 20m (s)

1.32 ± 0.08 1.36 ± 0.06

Agility Right (s)

8.28 ± 0.35 8.5 ± 0.37

Agility Left (s)

8.35 ± 0.25 8.52 ± 0.31

Yo-Yo IR1 test (m)

1188 ± 284* 903 ± 229

RSA%*

7.76 ± 3.15 8.95 ± 6.62

*significant difference (p <0.05)

Conclusion: Results provide a reference for the pre-season physical attributes required to play Division I college soccer. Starters had higher Yo-Yo IR1 test results than non-starters but no other differences were observed between playing positions or starters versus non-starters.

2807
Board #330
June 3, 11:00 AM - 12:30 PM
The Relationship between Anthropometric Variables and Isokinetic Strength in a Women’s Collegiate Soccer Team
Paul A. Burkett, Shawn D. Felton, Mitchell L. Cordova, FACSM. Florida Gulf Coast University, Fort Myers, FL. (Sponsor: Mitchell L. Cordova, FACSM)

(No relationships reported)

Knee isokinetic strength has been reported to be correlated with body fat, fat free mass, and BMI in college students. It is unclear if these anthropometric variables are related to isokinetic performance in relatively homogeneous groups of athletes.

PURPOSE: To investigate the relationship between common anthropometrics and average torque production of the knee extensors in a women’s collegiate soccer team.

METHODS: Twenty-eight healthy female collegiate soccer athletes aged 18-22 years participated. The participants had no history of significant lower leg injuries. Participants were screened using standard anthropometric measurements that included: height, weight, and skinfold measures of the triceps, suprailiac, and thigh areas.

The measurements allowed for calculation of the BMI, lean body mass, lean body mass index (LBMI), and body fat percentage. Isokinetic strength of knee flexion and extension was measured through three angular velocities of 60, 180, and 300 degrees/sec. The relationships between the anthropometric measurements (height, weight, BMI, lean body mass, LBMI, body fat percentage) and average peak torques at the three angular velocities were assessed utilizing hierarchical linear regression and bivariate correlation coefficients.

RESULTS: Hierarchal linear regression revealed a significant relationship for average peak torque at 180 degrees/sec (F = 3.994 (3, 24); p = .019), with BMI, lean body mass, and body fat as the predictors. Further analysis utilizing Pearson’s bivariate correlation coefficient matrix found moderate correlations between average peak torque and BMI (r = .362 to .557; p < .05), lean body mass (r = .404 to .425; p < .05), and LBMI (r = .376 to .413; p < .05).

CONCLUSION: The results found in this athletic population differ from previous research involving physically active nonathletes of a similar age. While anthropometric measures have been reported to be related to isokinetic strength in nonathletes, in this athletic population the relationship varied depending on the angular velocity. The results suggest that anthropometric measurements such as height, weight, BMI, lean body mass, LBMI, and body fat percentage may not be strong predictors of isokinetic knee muscle strength across angular velocities in an athletic population.

2808
Board #331
June 3, 11:00 AM - 12:30 PM
Interpreting Individual Heart Rate Variability Responses to Preseason Training in High Level Female Soccer Players
Andrew A. Flatt1, Michael R. Esco, FACSM1, Fabio Y. Nakamura2, 1University of Alabama, Tuscaloosa, AL. 2State University of Londrina, Londrina, Brazil. (Sponsor: Michael R. Esco, FACSM)
Email: aflatt@crimson.ua.edu

(No relationships reported)

PURPOSE: This study aimed to determine relationships between changes in heart rate variability, training load (TL) and perceived recovery status indicators (psychometrics) following a 2-week preseason and to interpret these changes on an individual basis among 8 Division-1 collegiate female soccer players. METHODS: Weekly averages for Smartphone-derived resting logarithm of the root mean square of successive RR

Abstracts were prepared by the authors and printed as submitted.
intervals multiplied by 20 (lnRMSSD), TL (training impulse) and psychometrics were compared with effect sizes (ES) and magnitude based inferences. Relationships between variables were determined with Pearson correlations. Individual increases in lnRMSSD and decreases in lnRMSSD coefficient of variation (CV) were interpreted as a positive coping response and vice versa for a negative coping response. RESULTS: Group analysis showed an unclear small increase in daily TL (week 1 = 176.4 ± 27.6, week 2 = 195.5 ± 57.7; proportion = 74/19/1, ES = 0.45) and a likely small increase in lnRMSSD (week 1 = 74.2 ± 11.1, week 2 = 78.1 ± 10.2; proportion = 81/14/5, ES = 0.35). Fatigue demonstrated a very likely small improvement (week 1 = 5.03 ± 1.09, week 2 = 5.51 ± 1.00; proportion = 95/4/1, ES = 0.45) while the other psychometrics did not meaningfully change. A very large negative correlation was found between the changes in TL and lnRMSSD (r = -0.85) while small to large correlations were found between lnRMSSD and psychometric variables (r values of 0.56, 0.34, 0.54, 0.46 and -0.03 for fatigue, sleep, soreness, stress, and mood, respectively). Individual analysis determined that 2 subjects may benefit from decreased TL, 2 subjects may benefit from increased TL and 4 subjects require no intervention based on their psychometric and mean CV lnRMSSD responses to the TL. CONCLUSION: Weekly mean changes in lnRMSSD are related to changes in TL and perceived levels of fatigue and soreness in female soccer players. Monitoring TL and recovery status indicators during preseson may be useful for managing fatigue and optimizing TL on an individual basis.

2809 Board #332 June 3, 11:00 AM - 12:30 PM Monitoring Of A Yearlong Training Program On Performance Markers In Division-I Male College Soccer Players Bridget A. McFadden, Alan J. Walker, Morgan L. Hofacker, Meaghan Rabideau, Anthony N. Poyssick, Sean P. Conway, Joseph K. Pelligrino, Nicholas Mackowski, Christopher E. Ordway, Shawn M. Arent. FACSM, Rutgers University, New Brunswick, NJ. (Sponsor: Dr. Shawn Arent, FACSM) (No relationships reported)

Keeping athletes healthy and injury-free while promoting peak performance is imperative to any successful athletic program. Optimal training programs should monitor the physiological effects that a season imposes on the athletes that may lead to breakdown in physical functioning and decreased performance. PURPOSE: To monitor changes in aerobic capacity, power output, ventilatory threshold (VT), and body composition of male Division I college soccer players throughout a yearlong training cycle. METHODS: Division I male college soccer players (N = 20, M_age = 19.6 ± 6.9 yr, M_Mweight = 76.6 ± 4.9 kg, M_LBM = 70.2 ± 2.7%) participated in performance testing, which consisted of vertical jump (VJ) to assess power and a maximal graded exercise test (GXT) to assess VO2max and VT through direct gas exchange. Body composition was assessed via air-displacement plethysmography. Testing was carried out four times throughout the training cycle: before (T1) and after (T2) spring training, at the beginning of pre-season (T3), and within 3 days of the last game of the season (T4). RESULTS: There were no significant changes in bodyweight or % BF over the course of the year (P> .05). There were no significant changes in vertical jump scores (P> .826) with a mean of 67.9±6.9 cm at (T1). There were no significant effects on time on VO2max (P> .160) with an average value of 59.1±3.67 ml O2/kg/min at the start of the pre-season. However, there was a significant increase (P< .001) in VT in T3 (70.1±6.1% VO2max) to T2 (80.5±3.6% VO2max), T3 (78.2±2.5% VO2max), and T4 (78.5±2.9% VO2max). CONCLUSION: The improved VT from T1 to the remaining time points was most likely due to an increase in soccer-specific training. However, the lack of increase in V3 over the course of the season illustrates the potential impact of resistance training on soccer performance, as the team did not regularly lift weights in the Spring or Fall. VJ has been shown to be an important predictor of performance in soccer players. The lack of significant changes for the performance markers of power and aerobic capacity throughout the entire year suggests the need for a well-designed periodized training program. Interestingly, these data corresponded to a season riddled with injuries and poor success.

2810 Board #333 June 3, 11:00 AM - 12:30 PM Practice vs Competition Work Rates in Collegiate Soccer Players: Do They Practice Like They Play? Morgan L. Hofacker, Alan J. Walker, Bridget A. McFadden, Meaghan M. Rabideau, Sean P. Conway, David J. Sanders, Nicholas Mackowski, Shawn M. Arent, FACSM. Rutgers University, New Brunswick, NJ. (Sponsor: Shawn M. Arent, FACSM) (No relationships reported)

To prepare for the demands of match play, athletes should train at an intensity similar to that experienced during a game. However, this does not always occur, and by developing a method for determining work rate the relative intensity of practices and games can be analyzed and compared across athletes. PURPOSE: To use rate of point accumulation (RPA) to quantify the intensity of practices and games for male and female collegiate soccer players. METHODS: Division I female (N= 18, M_age = 18.5 ± 6.3 yr, M_Mweight = 165 ± 0.01 kg, M_LBM = 73.8 ± 5.6 kg, M_VO2max = 19.9 ± 1.3 yrs, M_LBM = 1.78 ± 0.01 m) soccer players were evaluated. Athletes were monitored using the Polar Team2 system to assess workload during the season. Training load (TL) was assessed during practices and games via the Polar algorithms. From this, a work rate was calculated per minute of play and expressed as the rate of point accumulation (RPA). Only practices with RPA were included in analysis. RESULTS: The mean TL and RPA for practice were 109.1 ± 3.3 pts and 1.2 ± 0.1 pts/min, respectively. Across genders, for the mean TL and RPA were 184 ± 12.5 pts and 3.3 ± 0.1 pts/min, respectively (P> .05). Compared to men, women had a significantly lower practice TL (79.7 ± 4.9 vs 120 ± 4.3 pts, P< .05), but a trend towards a significantly higher game TL (207.2 ± 18.8 vs 162.4 ± 16.5 pts, P< .083). There were no differences in RPA for men vs women as a function of practice (P>.58). Women spent more time ±5% HRmax compared to the men in practice (P< .01), though men spent more time ±75% HRmax compared to women (P< .01). A trend was observed for women spending greater time ±5% and 95% of HRmax during game play (P< .1). CONCLUSION: With women had a higher total TL and had a higher RPA compared to men, normalizing this load as a function of time indicated no difference in actual intensity. Likewise, the higher game TL in men was not significantly different than women when expressed as RPA. In both cases, the RPA in training was almost 3-fold lower than that for games, suggesting that training did not simulate competition. The greater time spent in higher HRZs by women during games may be due to the greater frequency of substitutions, to allow them to sustain higher intensities during gameplay.
but little is known about the applicability of these equations to estimate %BF changes over time.

**PURPOSE:** To compare the ability of AE to correctly evaluate changes over time in %BF using DXA as the reference method.

**METHODS:** Forty two soccer players (16 to 34 years old), were evaluated on several occasions with DXA and 4 anthropometric equations from 2009 to 2015 with at least a difference of six months (range 2 to 7 evaluations). For each subject all results of %BF were compared between them. The %BF changes in DXA and AE were classified as: a) increase (>1%); b) decrease (<-1%); c) no change (between ≥ -1% and ≤1%). When DXA and AE had the same change or no change (a, b or c) it was counted as a coincidence and as an inconsistency when both results were not the same.

**RESULTS:** The complete analysis is shown in table 1. When there was an increase in %BF (a), the equations by Oliver and Durnin & Womersley had the same percentage of coincidences and were the ones that had more coincidences with DXA. With a decrease in %BF (b), the Oliver’s equation was the one with more coincidences with DXA, and with no change in %BF (c), the Civar’s equation had more coincidences with DXA. In the overall results Oliver’s and Wilmore’s equations had the most coincidences with DXA.

**CONCLUSIONS:** In this study Oliver’s and Wilmore’s equations were the ones that showed a better follow up in changes in %BF, but from an overall perspective, and given the low percentage of coincidences, caution should be taken when interpreting results of %BF over a period of time.

### Table 1. Percentages of coincidences of %BF changes assessed with AE compared with DXA.

<table>
<thead>
<tr>
<th>Change in %BF with DXA</th>
<th>Change in %BF with AE</th>
<th>Overall coincidences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease</td>
<td></td>
<td>63.8 ± 5.7 %</td>
</tr>
<tr>
<td>No change</td>
<td></td>
<td>49.3 ± 3.6 %</td>
</tr>
<tr>
<td>Increase</td>
<td></td>
<td>16.8 ± 3.4 %</td>
</tr>
</tbody>
</table>

The assessment of the appendicular lean soft tissue (ALST) can provide an estimation of skeletal muscle mass, but little is known about monitoring changes in athletes using anthropometric equations (AE).

**PURPOSE:** To compare the ability of AE to correctly evaluate changes over time in ALST using DXA as the reference method.

**METHODS:** Two soccer players (16 to 34 years old), were evaluated on several occasions with DXA and 4 anthropometric equations from 2009 to 2015 with at least a difference of six months (range 2 to 7 evaluations). For each subject all results of %BF were compared between them. The %BF changes in DXA and AE were classified as: a) increase (>1%); b) decrease (<-1%); c) no change (between ≥ -1% and ≤1%). When DXA and AE had the same change or no change (a, b or c) it was counted as a coincidence and as an inconsistency when both results were not the same.

**RESULTS:** The complete analysis is shown in table 1. When there was an increase in ALST (c), the Sugurbjom’s (3 skinfolds) and Quiterio’s equations had the most change in ALST (c), the Kulkarni’s equation had more coincidences with DXA. In the overall results, Sugurbjom’s (3 skinfolds) and Quiterio’s equations had the most coincidences with DXA.

**CONCLUSION:** Sugurbjom’s (3 skinfolds) and Quiterio’s equations assessed better the changes of ALST in our sample. Nonetheless, the overall results found in this study show that estimating ALST by AE is not a reliable method to follow up changes over time on this tissue.

### Table 1. Percentages of coincidences of ALST changes assessed with AE compared with DXA.

<table>
<thead>
<tr>
<th>Change in ALST with DXA</th>
<th>Change in ALST with AE</th>
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</thead>
<tbody>
<tr>
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2813 Board #336
June 3, 11:00 AM - 12:30 PM
Appendicular Lean Soft Tissue Changes Monitored by DXA And Anthropometric Equations in Professional Soccer Players
Email: robertogm@hotmail.com

The assessment of the appendicular lean soft tissue (ALST) can provide an estimation of skeletal muscle mass, but little is known about monitoring changes in athletes using anthropometric equations (AE).

**PURPOSE:** To compare the ability of AE to correctly evaluate changes over time in ALST using DXA as the reference method.

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and IMUs are especially useful in clinical settings for spatio-temporal gait analysis. Few studies have compared these systems. PURPOSE: To determine the concurrent validity of Zeno electronic walkway (ProtoKinetics Inc., Havertown, PA) and Mobility Lab consisting Opal IMU sensors (APDM Inc., Portland, OR) to measure spatio-temporal gait parameters in healthy older adults. METHODS: 30 healthy adults (mean age 74.7, SD. 6.44, 19 females, 11 males) completed 5 passes at self-selected and fast walking speeds across Zeno Walkway while wearing the Opal sensors. The intraclass coefficient ICC(2,5) for spatio-temporal gait parameters (listed in Table 1) was used to determine concurrent validity. RESULTS: See Table 1. CONCLUSION: The concurrent validity of Zeno walkway and Opal sensors were moderate to strong for the variables compared. The software used with Zeno walkway outputs more spatio-temporal variables than the Mobility Lab system. However, the Mobility Lab system allows measurement of additional gait parameters, e.g. arm swing velocity, arm range of motion and foot clearance, that are inacculable with walkway systems. Additionally IMUs are not constrained to a specified area for data collection as are walkways and may be used more easily in different environments.

Table 1. ICC(2,5) values for spatio-temporal gait parameters at each speed condition.

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Normal speed condition</th>
<th>Fast speed condition</th>
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<tbody>
<tr>
<td>Cadence</td>
<td>0.998</td>
<td>0.970</td>
</tr>
<tr>
<td>Double Support Time %</td>
<td>0.703</td>
<td>0.769</td>
</tr>
<tr>
<td>Gait Cycle Duration</td>
<td>0.998</td>
<td>0.952</td>
</tr>
<tr>
<td>Gait speed</td>
<td>0.988</td>
<td>0.969</td>
</tr>
<tr>
<td>Single Limb Support %</td>
<td>0.681</td>
<td>0.741</td>
</tr>
<tr>
<td>Stance %</td>
<td>0.707</td>
<td>0.798</td>
</tr>
<tr>
<td>Step Time</td>
<td>0.995</td>
<td>0.966</td>
</tr>
<tr>
<td>Stride Length</td>
<td>0.982</td>
<td>0.941</td>
</tr>
<tr>
<td>Swing %</td>
<td>0.707</td>
<td>0.798</td>
</tr>
</tbody>
</table>

2016

Board #339

June 3, 11:00 AM - 12:30 PM

Assessing a Wireless Inertial Measurement Unit for Monitoring Complex Strength and Conditioning Movements.

Lydia K. Philpott, Sean J. Spencer, Paul P. Conway, Andrew A. West. Loughborough University, Loughborough, United Kingdom.

Email: l.k.philpott@lboro.ac.uk

With an increase in understanding of the role of strength and conditioning in the prevention of disease and disability, more gym users are incorporating this training style into their programs. The ability of a device that monitors relevant movement parameters for the mass market is, thus, becoming more desirable. Currently monitoring of such parameters is expensive and/or limited to a laboratory setting making it inaccessible for the regular gym user. PURPOSE: To determine the ability of a financially accessible, portable wireless Inertial Measurement Unit (IMU) to monitor simple and complex strength and conditioning movements with the aim of providing users with relevant and accurate performance feedback.

METHODS: After a warm up period, four healthy male participants (mean ± SD: age 23 ± 1.89y, height 182.15 ± 8.91cm, body mass 88.12 ± 18.51kg), with weightlifting experience, performed 5 deadlifts, 5 hang cleans and 5 power cleans, using an Olympic lifting bar and weights, totalling 50kg. Participants had 1 min rest between reps and 3 min between lift types. A VICON Nexus motion analysis system (Vicon Metrics Ltd.), sampling at 250Hz was used to monitor the participant’s movement as well as the movement of the weighing bar and IMUs. The custom made wireless IMUs, containing a tri-axial accelerometer and tri-axial gyroscope sampling at 50Hz, were positioned on the weighting bar. These data were then processed and comparisons between VICON and the IMUs were carried out for key acceleration trace features of the lifts.

RESULTS: Deadlift timing accuracy of the wireless IMU was ± 0.021s and the acceleration accuracy ± 0.309m/s² (standard error in the mean) Hang clean accuracy was ± 0.023s and ± 1.618m/s² for timing and acceleration respectively. Finally the power clean showed to be within ± 0.022s and ± 2.555m/s² of accuracy.

CONCLUSIONS: An IMU has the ability to monitor successfully key performance characteristics of the deadlift to a satisfactory level of accuracy (timing ± 1.05 frames, accelerations ± 8.17%). However the greater degree of bar rotation that occurs during the cleans: 17º for the deadlift compared to 363º and 387º for the hang clean and power clean respectively, causes the increase in acceleration errors (± 17.9% and ± 38.8% for hang clean and power clean respectively) with more complex movements.

Previous authors have examined the isokinetic rapid velocity capacities of young and old individuals. However, these approaches may not be applicable for all individuals, especially those who are older and more frail. Alternatively, the sit-to-stand (STS) test may be a more practical and functionally-relevant assessment tool for examining PV and AV in these types of individuals. Consequently, it may be of great value to examine the reliability of PV and AV using a portable linear transducer in conjunction with the STS. PURPOSE: To determine the reliability of PV and AV measurements during STS assessments using a linear transducer. METHODS: Sixteen healthy males (mean±SD: age=24±4y; height=171.7±cm; mass 86±19kg) participated in this investigation. Participants visited the laboratory 2 times, separated by 2-7 days at the same time (12hr). For each visit, participants performed 3 STSs from an adjustable table at 90º (STS90) and 120º (STS120) of knee flexion in a randomized order. To determine PV and AV, the testing device was attached to the posterior portion of a belt fastened around the participants’ waistline. Participants performed all STSs with feet shoulder width apart and hands positioned on the hips. For each STS, participants were asked to stand up as explosively as possible. Reliability for PV and AV during the STS90 and STS120 were determined using the intraclass correlation coefficient (ICC, model 2,1) and standard error measurement (SEM). Systematic variability was examined using separate one-way repeated measures analyses of variance (ANOVARs).

RESULTS: The ANOVAs indicated no systematic variability in PV and AV across trials (P=0.05). The ICCs and SEM values expressed as a percentage of the mean for PV ranged from 0.796-0.921 and 6.277-6.454%. Additionally, ICCs and SEM values for AV ranged from 0.361-0.727 and 14.30-19.98%. CONCLUSIONS: The results of the present investigation reveal that a portable linear transducer may be highly consistent and equally reliable for assessing PV and AV during STS measurements. These findings demonstrate portable devices may be a relevant tool in assessing velocity capacities during a practical STS test. Future researchers or current practitioners may consider utilizing such devices to assess functional performance in older community-dwelling individuals.

2018

Board #341

June 3, 11:00 AM - 12:30 PM

The Effectiveness of a Video Game Camera System for Measurement of Landing and Squatting Kinematics.

Adam Kelly1, Christopher Kuenze2, Chang Young Kim3, Hyung-Pil Jun2, Richard Campbell2, Moataz Eltouhky2, 1Michigan State University, East Lansing, MI. 2University of Miami, Coral Gables, FL. 3University of Miami, Coral Gables, FL.

Email: Kellyad3@miami.edu

Cost effective and objective assessment of lower extremity movement represents potential improvement over standard tools for field expedient and clinical evaluation of biomechanical factors of injury risk. PURPOSE: To compare the effectiveness of 2 orientations (anterior and 45° oblique) as well as a combined 2 camera array of a commercially available portable videogame camera system in assessing lower extremity frontal and sagittal plane kinematics during drop jump and overhead squat tasks. METHODS: Ten healthy participants (Sex = 5 Male/5 Female, Weight = 70.8±15.8kg, Height = 172.2±9.2cm) completed this descriptive laboratory study. Participants completed 3 trials of a drop jump task from a 30cm platform and 3 trials of an overhead squat task. Frontal and sagittal plane hip and knee kinematics were assessed concurrently using an 8 camera motion analysis system as well as a commercially available portable videogame camera with open source data processing software. Interclass correlations coefficients (ICC) are utilized to assess the consistency and agreement between the 8 camera motion analysis system and both video game camera alignments individually as well as the 2 camera array method.

RESULTS: For peak sagittal plane knee and hip angle, consistency was excellent for the anterior [Range ICC = 0.879-0.951], 45° oblique [Range ICC = 0.872-0.933], and 2 camera array [Range ICC = 0.879-0.952] when compared to the 8 camera motion analysis system while absolute agreement ranged from acceptable to poor regardless of system and task [Range ICC = 0.154-0.596]. In the frontal plane, consistency [Range ICC = 0.204-0.689] and absolute agreement [Range ICC = 0.246-0.502] ranged from acceptable to poor across all tasks with the highest values being derived from the 2 camera array. Conclusion: A single videogame camera or 2 camera array may not be an effective alternative tool to motion analysis technology due to significant limitations in assessing frontal plane hip and knee kinematics; however, this technology may have potential utility as a clinical tool for movement feedback.
Evidence supports the use of external accelerometers to estimate ground reaction forces (GRFs). Modern smartphones come equipped with a tri-axial accelerometer and thus potentially provide a more cost-effective and convenient means to track GRFs. The ability of smartphone accelerometers to accurately estimate GRFs has not been established. PURPOSE: To compare the ability of smartphone accelerometers to other commercially available accelerometers in estimating GRFs during walking and running. METHODS: Nine subjects had a custom smartphone application downloaded onto their phones. This application allowed access to and recording of the smartphone’s raw accelerometer data. The subject’s smartphone (SP), as well as two other commercial accelerometers (A1 and A2) were placed on the most lateral aspect of the subject’s iliac crest. Subjects walked on an instrumented treadmill (measuring GRF) at a self-selected pace (SSW) for one minute and ran on the instrumented treadmill at a self-selected pace (SSR) for one minute. Using dynamic equations of motion, GRF’s were estimated from accelerometer data collected from the three accelerometers (SP, A1, A2). The accuracy of the three accelerometers to predict GRF was calculated as the root mean square difference (RMSD) between resultant GRF from the instrumented treadmill and resultant GRF estimated from the accelerometers across the middle 30 s of the one minute SSW and SSR trials. RMSDs were normalized to average treadmill resultant GRF across the 30 second trials. Two separate one-way ANOVAs were used to assess differences in normalized RMSD between the accelerometers (SP, A1, A2) for both the SSW and SSR trials. RESULTS: There were no significant differences in normalized RMSD between the three accelerometers predictions of GRF during SSW (normalized RMSD - SP: 0.181±0.055, A1: 0.151±0.030, A2: 0.153±0.030, p=0.215) or SSR (normalized RMSD - SP: 0.280±0.087, A1: 0.228±0.036, A2: 0.233±0.043, p=0.126). CONCLUSION: Smartphone accelerometer predicted GRF data did not differ from that provided by previously validated commercial accelerometers. Smartphone accelerometers thus potentially offer a valid means of tracking GRFs through the design of appropriate applications.

Clinicians, coaches, and trainers would benefit from a reliable and practical tool to analyze movement patterns such as a drop vertical jump (DVJ) which is often used to screen for lower extremity injury risk. Smart devices such as handheld tablets and phones offer attractive possibilities for analyzing these skills. However, little is known about the validity of using these devices in the day to day clinical or field settings. PURPOSE: The purpose of this study was to develop a system for monitoring heart rate during exercise in nonclinical settings. METHODS: Six college students studying human movement analysis were arbitrarily assigned to hold one of two tablets while concurrently recording the frontal plane of a standard DVJ. The students held the tablets close to chest height while standing side by side 3.7 m in front of the DVJ landing area creating variability in tablet positioning of approximately 25 cm in vertical height, 30 cm left or right from midline, and 20 cm in front of the landing. The six students were then randomly assigned to measure left leg frontal plane projection angle (FPPA) at the instant of maximum downward displacement of the initial DVJ landing using a free video analysis app. No student analyzed the same DVJ on both tablets. In total, 90 DVJs performed by 30 college students were analyzed. RESULTS: There were no significant differences in normalized RMSD between the three accelerometers predictions of GRF during SSW (normalized RMSD - SP: 0.181±0.055, A1: 0.151±0.030, A2: 0.153±0.030, p=0.215) or SSR (normalized RMSD - SP: 0.280±0.087, A1: 0.228±0.036, A2: 0.233±0.043, p=0.126). CONCLUSION: Smartphone accelerometer predicted GRF data did not differ from that provided by previously validated commercial accelerometers. Smartphone accelerometers thus potentially offer a valid means of tracking GRFs through the design of appropriate applications.
The muscles involved in the lumbopelvic-hip complex work collectively to provide core stability. The transverse abdominis (TrA) is one of the key local stabilizers and affords individuals a preparative and protective contraction around the spine when performing lower extremity movements. The function of the TrA is often associated with thickness changes in the muscle as measured by ultrasound imaging. Examining thickness changes during functional tasks can help determine the role of the muscle in unloaded and loaded positions. However, it is not known whether there are side-to-side differences when performing these tasks.

**PURPOSE:** To examine the role of TrA in loaded and unloaded positions in healthy, active subjects using ultrasound imaging and to perform a side-to-side comparison to determine whether muscle function changed when it was assessed on the loaded or unloaded limb during unilateral stance. **METHODS:** Ultrasound imaging (B-mode) thickness measures of the TrA were collected on 35 healthy subjects (21.3±2.7yrs, 12M, 23F) in supine, standing (bipedal and unipedal stance) and during a single leg squat (SLS) in rested and contracted states. The abdominal draw-in maneuver was utilized for contraction with no prior training in this maneuver. Images were deidentified and saved so that the thickness of the TrA was measured at a later time. Three rested and contracted values for each position were averaged for comparison. Paired t-tests were used to generate mean differences between sides and across positions. **RESULTS:** There were no significant differences found between sides and across positions among subjects. All positions had similar mean differences in rested and contracted states and supine had the same difference of 0.04cm. Standing bipedal and unipedal were 0.03cm and 0.04cm at rest, respectively and both had 0.02cm difference contracted. SLS had a mean difference of 0.04cm at rest and contracted. All p-values were >0.05 in all positions. **CONCLUSION:** There were no significant differences found between sides and across positions in the TrA thickness as measured by ultrasound imaging. The anatomy of the TrA and its function as a local stabilizer further supports the results of this study in that measurement on a single side may be sufficient in future studies examining core stability with ultrasound imaging.

**PURPOSE:** Massage therapy is a popular treatment for attenuating muscle soreness and accelerating recovery following eccentric exercise (ECC). Despite the purported benefits of this therapy, the biological mechanisms in response to the applied tissue loads are not fully understood. It is well-known that skeletal muscle is highly sensitive to the loads applied to it and that mechanical stimuli such as stretch alter gene expression. To that end, we have developed both idealistic and realistic two dimensional (2D) finite element models (FEM) to investigate the local changes in tissue stress and strain associated with massage. **METHODS:** An idealized geometry was used wherein the soft tissues were modeled as a simple rectangle. A realistic geometry model was also constructed by reconstructing magnetic resonance images. The soft tissue layer was modeled as a hyperelastic, viscoelastic material. Experimental stress-relaxation data was input directly into the FEM (Abaqus 6.11) material evaluation option wherein pertinent material properties were calculated. The bone layer was modeled as an isotropic material with material properties determined from the literature. The massage tip was ramped down to 50% compressive strain and moved laterally with a velocity consistent with experiments (6.25 mm/s). For the idealistic geometry, low (0.15) and high (0.3) friction coefficients were used to compare the stress and strain distributions. **RESULTS:** The max von Mises stresses were 127% greater in the high friction compared to the low friction model (20.166 and 11.7 MPa, respectively). Tensile stresses were 230% greater in the high friction compared to the low friction model (5.6 and 18.5 MPa, respectively), but compressive stresses were comparable between the two conditions (low: 0.91 MPa, high: 0.97 MPa). The max tensile strains were 187% and 103% in the high and low friction models, respectively. The realistic 2D model predicted higher stresses than the idealized geometry with max von Mises, tensile, and compressive stresses of 42.3, 25.3, and 11.3 MPa, respectively. Max tensile strain was 143%. **CONCLUSIONS:** Finite element modeling can be used for identifying localized material property changes due to massage. Future studies will determine how these tissue internal properties regulate host biologic signaling responses.