

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)

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
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(No relationships reported)

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 rehab 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 will 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

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
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(No relationships reported)

PURPOSE: We compared the changes in ambulatory outcomes between men and women with symptomatic peripheral arterial disease (PAD) following completion of a supervised, on-site, treadmill exercise program, and we determined whether baseline clinical characteristics and exercise training variables were predictive of changes in the ambulatory outcomes in men and women.

METHODS: Twenty-three men (ankle-brachial index = 0.66 ± 0.26) and 25 women (ankle-brachial index = 0.69 ± 0.24) completed the supervised exercise program, consisting of intermittent walking to mild-to-moderate claudication pain for three months. Ambulatory outcome measures were peak walking time (PWT) and claudication onset time (COT) during a treadmill test, and distance recorded during a 6-minute walk test (6MWD).

RESULTS: Men and women had significant increases in the change in COT ($p < 0.001$ and $p < 0.01$, respectively), and in the change in PWT ($p < 0.001$ for each group). However, the change in PWT was significantly less in the women than in the men ($p < 0.05$). Neither group had a significant change in 6MWD. In women, baseline COT was the only predictor that entered the model for the change in COT ($p = 0.007$) and the

change in PWT ($p = 0.094$). In men, baseline COT ($p < 0.01$) and obesity ($p < 0.10$) were the predictors that entered the model for the change in COT, and obesity was the only predictor that entered the model for the change in PWT ($p = 0.002$).

CONCLUSIONS: We conclude that following a supervised, on-site, treadmill exercise program, women had less improvement in PWT than men, and neither men nor women improved submaximal, over-ground 6MWD. Furthermore, obese men and patients with lower baseline COT were least responsive to supervised exercise.

2405 Board #3 June 3, 9:30 AM - 11:30 AM
Community-based Cardiac Rehabilitation Led By Ceps Improves Physical And Mental Health Of Phase 2 Patients
Brendon Roxburgh, Tyler Elliott, Stacey Reading. *The University of Auckland, Auckland, New Zealand.*
(No relationships reported)

Post-event phase 2 cardiac rehabilitation (CR) improves cardiorespiratory fitness (CRF) and quality of life (QoL) while reducing depression and anxiety. Unfortunately many patients decline hospital-based CR because it is inconvenient to attend the facility. Community-based programs have been developed to increase CR program accessibility however; these programs often lack adequately-trained staff and it remains unclear how effective they are.

PURPOSE: This study sought to examine the effectiveness of a community-based cardiac rehabilitation exercise program lead by clinical exercise physiologists on CRF, self-reported QoL, depression and anxiety in adults with CVD.

METHODS: Participants ($n=43$; 86% male) with CVD (63.4 ± 9.6 yrs) were referred to a community-based CR program located in Auckland, NZ. All participants underwent baseline and follow-up assessment which included a ramped ECG monitored maximal exercise test with gas analysis, a QoL (Short Form-36), and Hospital Anxiety and Depression Scale (HADS) questionnaire. Participants completed 3 weekly sessions of aerobic (40-70% VO_{2R}), resistance (1-2 sets; 12-15 reps at 40-80% 1RM) and flexibility exercise, totalling approximately 60 minutes/session. Significantly different ($p < .05$) pre- vs. post-program values were identified by dependent t-tests. Data are the mean \pm SD.

RESULTS: Participants attended 83.3% \pm 16% of total prescribed sessions. Post-program CRF significantly increased (27.5 ± 7.3 to 30.4 ± 7.4 ml.kg⁻¹.min⁻¹) despite no significant increase in HRpeak (149.5 ± 19.8 to 148.5 ± 21.9 bpm) and respiratory exchange ratio (1.01 ± 0.1 to 1.01 ± 0.1) during maximal exercise testing. SF36 component scores for physical (44.2 ± 10.6 to 51.1 ± 7.3) and mental health (47.2 ± 13.3 to 52.9 ± 6.9) increased while the HADS anxiety (4.2 ± 3.2 to 3.5 ± 2.9) and depression (2.9 ± 3.0 to 1.4 ± 1.4) scores were significantly lower post-program. No deaths or medical events occurred during maximal exercise testing or during regular exercise programming.

CONCLUSIONS: Twelve weeks of community-based exercise cardiac rehabilitation led by clinical exercise physiologists is safe and effective for increasing CRF, and QoL while reducing depression and anxiety in phase 2 CR patients.

2406 Board #4 June 3, 9:30 AM - 11:30 AM
Improvement In Functional Exercise Capacity Differs By Attendance Duration But Not Intake Diagnosis In A Hospital-based Phase II Outpatient Cardiac Rehabilitation Program.
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(Sponsor: Dr. Ann L. Gibson, FACSM)
(No relationships reported)

PURPOSE: Investigate differences and interactions between intake diagnosis and time-to-completion on functional exercise capacity (FEC) improvement in a hospital-based outpatient cardiac rehabilitation (CR) program in New Mexico.

METHODS: During a 12-month span, 10 women and 39 men eligible for participation in a CR program completed all authorized 36-sessions in the Phase II CR program. Eligible diagnoses were: heart failure (HF), acute coronary syndrome (ACS), and cardiothoracic surgery (CT). A modified Atterbom protocol (2-min stages of increasing treadmill speed and incline) was used to assess differences between FEC at intake and immediately following completion of the 36-session program. Handrail support was allowed during the exercise tests as needed. FEC was determined by the attainment of an RPE of 15 (Borg 6-20 scale) and reported in METs. As part of a chart review, all data were deidentified prior to collection and analyses. Patients were separated into groups based on time-to-completion ($\leq 4mo$ and $>4mo$) and diagnosis. Separate, group-specific independent t-tests were initially applied to examine changes in FEC by diagnosis and time-to-completion. All groups significantly improved FEC ($p < .05$). Consequently, ΔFEC ((post- pre/pre)*100) was calculated and analyzed. A 2 (time) by 3 (diagnosis) analysis of variance (ANOVA) was applied to assess group differences and interactions for ΔFEC .

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 ≤4mo (n=33) and >4mo (n=16) were 3.30 ± 1.92 METs, and 1.97 ± 1.27 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 ≤4mo (n=33) and >4mo (n=16) were 82.2 ± 68.7%, and 46.5 ± 34.8%, respectively. Results indicate a significant (F (1,43)= 6.344, p = .016, partial η² = .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 4mo or less produced the greatest improvement in FEC regardless of intake diagnosis.

2407 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-Abdul³, Dhvani S. Soni¹, Beverly J. Hoover⁴, Mary K. McCrate⁴, Beverly A. Kester⁴, Duc T. Nguyen⁴, Thomas J. Pujol, FACSM¹. ¹Southwest 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)
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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 and per session time 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 and 11 (5 female, 6 males, 64±16 yr) in the MICE program. 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 8.4±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 [t(15) = -4.02, p<0.001] and 6MWS [t(15) = -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

2408 Board #6 June 3, 9:30 AM - 11:30 AM
3 Months of Nitrate plus Exercise Training Improves Hemodynamic Profile in Peripheral Arterial Disease

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 (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 plasma nitrite and NO. We have previously shown changes in resting hemodynamics following chronic exercise training and after an acute oral nitrate beverage.

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) beverage (EX+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 (RHBF). 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 RHBF between groups. At 3M, ABI increased 0.10±0.15 (p=0.05) and 0.15±0.11 (p<0.01), RHBF 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 = -0.17 to +1.51). Resting ASBP were significantly lower at 3M for EX+BR versus EX+PL (128.45±17.31 v 147.67±23.27mmHg, p0.05, 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

2409 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

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 (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 is implicated in exercise performance. Plasma nitrite (NO₂⁻) may act as a protected circulating source that can be converted to NO during hypoxic conditions. We have previously observed that an acute increase in plasma NO₂⁻ via oral nitrate supplementation (beetroot juice-BR), 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) beverage (EX+BR) versus exercise training and placebo beverage (EX+PL-currently the best available treatment) on claudication onset time (COT) and 6-minute walk distance (6MW) in PAD subjects. The study was a double-blind, randomized controlled trial (as part of a larger clinical trial).

METHODS: At baseline testing, all subjects underwent a maximal graded cardiopulmonary exercise test using a modified Gardner protocol. On a separate day a 6MW test was performed. 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 COT or 6MW between groups at baseline. At 3M EX+BR increased COT 180±154 sec, p<0.01, v 58±208 sec, p=0.37 for EX+PL. This translated to an ES of 0.67 95%CI = -0.22 to +1.49 for EX+BR > EX+PL. For 6MW both treatments increased significantly (175±213 v 91±143 feet, p<0.05). This translated to an ES of 0.47 95%CI = -0.44 to +1.21 for EX+BR > EX+PL.

CONCLUSION: Chronic administration of a high nitrate drink plus supervised exercise training shows a medium to large effect size (Cohen's d) on exercise performance, suggesting the potential for a therapeutic benefit beyond exercise training alone in subjects with PAD.

Supported by grants R21HL111972 and R21HL113717 to JDA

2410 Board #8 June 3, 9:30 AM - 11:30 AM
Long-Term Exercise Therapy Induces a Flattening of the Heart Rate Performance Curve in CAD Patients
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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, 128 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±9 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 k <0.2 (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±39, CG: 157±34 W) and factor k (k; TG: 0.22±0.29, CG: 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.

E-14 Thematic Poster - Exercise Psychology and Women's Health

Friday, June 3, 2016, 9:30 AM - 11:30 AM
 Room: 104

2411 **Chair:** Michelle Martin. University of Tennessee, Birmingham, AL.
 (No relationships reported)

2412 Board #1 June 3, 9:30 AM - 11:30 AM
Psychological Effects Of Resistance Exercise During Pregnancy
 Melanie Poudevigne, FACSM¹, Patrick O'Connor², Kristen Johnson², Juliana Brito De Araujo², Christie Ward-Ritacco³. ¹Clayton State University, Morrow, GA. ²University of Georgia, Athens, GA. ³University of Rhode Island, Kingston, RI.
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PURPOSE: To evaluate the influence of 12-weeks of low-to-moderate intensity resistance exercise training during weeks 22-34 of pregnancy on quality of life and mood.
METHODS: A parallel group trial was completed at a single site. Second trimester women (n=136) were randomly assigned (in blocks of 3) to 12-weeks of wait list, bi-monthly pregnancy education classes or twice weekly low-to-moderate intensity resistance training. Resistance training involved one abdominal exercise with no external load and five exercises with an external load that gradually progressed (dual leg extension, dual leg press, dual arm lat pull, dual leg curl, and lumbar extension). Eight quality of life constructs and six mood states were measured before and after the interventions using the SF-36 Health Survey and Profile of Mood States (POMS). Intent-to-treat mixed model ANOVAs (3 Groups X 2 Times, pre- and post-intervention) tested the hypothesis that outcomes would worsen for the controls and not change for the resistance training group.

RESULTS: Mean (±SD) exercise session attendance was 78.4% (14%; range of 40 -100%). SF-36 vitality scores were unchanged after resistance training (-1.9±14.3) but decreased for the education (-8.1±14.2) and wait list (-11.4±16.2) groups (Group x Time F_{2,106}=4.048, P=.02). POMS fatigue scores were unchanged after resistance training (-0.45±4.68) but increased for the education (2.03±4.59) and wait list (2.06±4.82) groups (Group x Time F_{2,106}=3.628, P=.03).
CONCLUSIONS: Increases in feelings of fatigue and reductions in vitality from weeks 22-34 of pregnancy are attenuated by low-to-moderate intensity resistance training.

2413 Board #2 June 3, 9:30 AM - 11:30 AM
Sprint Interval Versus Moderate Intensity Training On Quality Of Life In Prediabetic Women
 Nicole M. Gilbertson, Joan A. Mandelson, Kathryn L. Hilovsky, David L. Wenos, Jeremy D. Akers, Trent A. Hargens, FACSM, Elizabeth S. Edwards. James Madison University, Harrisonburg, VA.
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 (No relationships reported)

Health-related QOL (HRQOL), an aspect of overall QOL, encompasses both physical and mental health. HRQOL is lower in people with diabetes, in both genders and at any given age, than healthy individuals with no chronic conditions. Multiple studies have indicated that exercise can improve HRQOL in diabetics, yet there is limited research on exercise intensity and its affect on HRQOL in prediabetics. **PURPOSE:** To compare the effects of run sprint interval training (RSIT) to moderate intensity training (MIT) on HRQOL. **METHODS:** Sedentary, prediabetic women were randomized into 16-week RSIT (n=6, age 39.17±8.38, BMI 40.65±3.74) or MIT (n=9, age 53.56±2.85, BMI 40.41±4.10) interventions. Participants attended three weekly supervised training sessions and a once weekly Diabetes Prevention Program (DPP) session. RSIT participants performed 4-10 x 30-second maximal treadmill sprints interspersed with a 4-minute active recovery. MIT participants walked continuously at 45-55% heart rate reserve for 30-60 minutes. HRQOL was assessed at baseline and post-intervention using the CDC Healthy Days Core Module. **RESULTS:** There was no baseline or post intervention between group differences in HRQOL. In the MIT group there were significant improvements in reported healthy days (p=0.042) and physically unhealthy days (p=0.049). There was a non-significant trend towards improvement in reported days which health affected usual activities (p=0.080) from baseline to post intervention in the MIT group. There were no significant improvements in the RSIT group. **CONCLUSION:** MIT resulted in significant improvements in HRQOL over 16-weeks in women with prediabetes, while RSIT did not. Past literature supports exercise interventions resulting in improvements in physical functioning. The improvement in healthy days in the MIT group was likely a result of there being significantly less physically unhealthy days reported after the 16-week intervention. It should be noted, however, that while not significant, the RSIT group had a higher baseline HRQOL, which may explain why similar findings were not found for this group. Supported by: Sentara-Rockingham Memorial Regional Hospital (Harrisonburg, VA) and an Inter-Professional Education Grant through the College of Health and Behavioral Studies at James Madison University

2414 Board #3 June 3, 9:30 AM - 11:30 AM
Relationships between Preference for Proxy Assistance and Self-Efficacy for Various Modalities of Pregnancy Physical Activity
 Rebecca S. Weller¹, Christopher P. Connolly¹, Alison Ede². ¹Washington State University, Pullman, WA. ²Michigan State University, East Lansing, MI. (Sponsor: James M. Pivarnik, FACSM)
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Self-efficacy (SE) has been shown repeatedly to predict physical activity (PA) among pregnant women. Low SE can impede participation in certain types of exercise. However, individuals with low SE may benefit from receiving help from fitness instructors or trainers with expertise to guide them. **PURPOSE:** We sought to investigate pregnant women's preferences for an instructor-led approach (proxy assistance) compared to self-guided exercise for various modalities of pregnancy physical activity. For each modality, we also sought to determine the relationship between SE and preference for proxy assistance. **METHODS:** An online survey containing questions on beliefs, preferences, and behavior with respect to specific physical activity modalities was completed by 498 pregnant women. Exercise SE was assessed for each on an 11-point Likert scale. Additionally, participants reported whether they preferred the modality to be instructor-led, self-guided, or preferred not to participate in that exercise. Relative frequencies were calculated for these responses. Spearman correlations were calculated to examine relationships between SE and preference for proxy assistance for each modality. **RESULTS:** Brisk walking (90.4%) and prenatal yoga (64.9%) were the most preferred modalities. A self-guided approach

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 prenatal yoga (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

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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 completed 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 weight 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 ± 8.80 , 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

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PURPOSE: Weight loss interventions do not consistently improve health-related quality of life (HRQOL), but some weight loss programs do improve vitality, a component of HRQOL defined as perceived increases in feelings of energy and reductions in fatigue. Behavioral and physiological factors most strongly associated with improvements in vitality during a weight loss intervention are poorly understood. The aim of this prospective study was to identify variables associated with improvements in vitality following an exercise and weight loss intervention in older women, known to be lower in vitality compared to male counterparts. **METHODS:** Eighty older women (66.9 ± 5.9 years; 97.1% White, BMI = 31.5 ± 5.4 kg/m²) completed a 6-month intervention designed to facilitate 10% loss of body weight that included randomization to either A) EX+D; three 75-minute sessions/week that integrated cardiorespiratory, resistance, balance and flexibility training and a recommendation to reduce energy intake by ~500 kcal/day (n = 60), or B) D; a recommendation to reduce energy intake by ~500 kcal/day alone (n = 20). Changes in outcomes of interest included vitality (SF-36 subscale; SF-36-VIT), sleep quality

(Pittsburgh Sleep Quality Index; PSQI), speed of cognitive flexibility (Trail Making Test - B; TRAILS-B), physical function (6 Minute Walk Test; 6MWT), and a fasting serum measure of inflammation (IL-6).

RESULTS: Both EX+D and D similarly (all $p > .05$ for group difference in change) improved (all $p < .027$) body weight (-7.7 ± 4.3 kg), SF-36-VIT (12.2 ± 16.3 units), 6MWT (53.3 ± 45.0 meters), PSQI (-0.6 ± 2.5 units), TRAILS-B (-8.7 ± 16.3 seconds) with no change in IL-6 ($.40 \pm 2.6$; $p = .31$). Multiple linear regression analysis [F(7, 72) = 9.68, $p < .001$, adjusted R² = .485] indicated that change in SF-36-VIT was predicted from (standardized betas reported) baseline SF-36-VIT ($-.521$, $p < .001$), PSQI ($-.380$, $p < .001$), intervention group (EX+D or D; .285, $p = .006$), body weight ($-.088$, $p = .304$), TRAILS-B ($-.166$, $p = .06$), 6MWT ($-.158$, $p = .138$), and IL-6 ($-.063$, $p = .488$).

CONCLUSIONS: Vitality is improved after intentional weight loss in older, overweight women and the change is independently predicted by low baseline vitality, if the weight loss program included exercise, and improved sleep quality.

2417 Board #6 June 3, 9:30 AM - 11:30 AM
Single Bouts of Resistance Exercise are Associated with Improved Feelings of Energy and Fatigue in Pregnant Women

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PURPOSE: Physical inactivity likely contributes to fatigue and low energy during pregnancy but whether acute resistance exercise attenuates these symptoms is unknown. The present study describes the changes in physical and mental energy and fatigue 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 (\pm SD) increases 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 ($F_{12,79, 319.66} = 1.45$, $p = .136$) or mental energy ($F_{13,04, 326.04} = 1.25$, $p = .242$). Mean decreases in feelings of physical and mental fatigue across all 24 sessions were 11.1 ± 52.5 and 16.7 ± 44.9 , respectively. These decreases did not differ significantly across the 24 exercise sessions for feelings of physical ($F_{13,14, 328.50} = 1.66$, $p = .067$) or mental fatigue ($F_{12,45, 311.18} = 1.71$, $p = .06$). 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 decreases 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

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 (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 ± 1.5 yr) 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 $p \leq 0.05$.

RESULTS: No differences in cardiovascular variables were observed at rest, however, mean HR was significantly higher during CI (98.9 ± 17.3 vs 94.1 ± 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 ; $p = 0.05$) 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 elicit 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

2419 **Chair:** Melicia C. Whitt-Glover, FACSM. Gramercy Research Group, Winston Salem, NC.
(No relationships reported)

2420 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

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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 ± 9.93 kg/m²); and sedentary (3990 ± 1828 steps/d; 24.0 ± 37.7 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.

2421 Board #2 June 3, 9:30 AM - 11:30 AM

Recruitment Challenges And Strategies In A PA Intervention For Latino Men

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Latinos are less likely to engage in physical activity (PA) compared to non-Hispanic whites. While various PA interventions specifically target Latino women, research promoting PA among Latino men is scant. ACTIVO is one of the first PA interventions adapted for this population.

PURPOSE: Recruiting men to ACTIVO has presented various challenges, which are illustrated through this descriptive analysis and reflection.

METHODS: Recruitment was conducted through online postings, community events, outreach through former female participants, and flyer distribution in communities. Through qualitative methods, we collected information from 10 men who were scheduled for orientation but did not attend.

RESULTS: During the first four months of recruitment, 103 men expressed initial interest in participating in ACTIVO, and 70% were screened. Of those screened, 39% were eligible, 49% were ineligible, and others were not interested or unreachable. The main reasons for ineligibility were currently engaging in over 60 minutes of PA per week (66% of ineligible), not living in San Diego (9%), and medical reasons (6%). Additionally, 14% of men met multiple ineligibility criteria. Of those eligible, 39% attended orientation. Men shared various obstacles in attending in-person orientation and measurement visits, even when the rest of the study was to be conducted remotely. They commented on their changing and inflexible work schedules, and most suggested telephone sessions would be more feasible.

CONCLUSIONS: Overall, it has been challenging to engage Latino men in a PA promotion study. Various possible strategies for future recruitment are discussed.

2422 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

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Introduction: Childhood obesity affects ~20% of children ≤ 19 yr 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 ≤ 19 yr 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 (9.7 ± 5.0 yr), normal weight ($68.6 \pm 29.2\%$ kg/m²), African American (76.6%), girls (54.1%). Following park construction the exposure group showed a non-significant change in BMI% (74.6% vs. 75.1% , $p > 0.05$), 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.

2423 Board #4 June 3, 9:30 AM - 11:30 AM
Does Change in Physical Activity Predict Mental Health Outcomes in Pre-Adolescent African American Girls?

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Pediatric obesity is a significant clinical and public health issue for African American (AA) girls in which low physical activity (PA) is a contributor. In this population, the mother-daughter relationship (MDR) has rarely been examined in the context of improving health behaviors such as PA and mental health outcomes (MHO). **PURPOSE:** To examine if changes in PA following a 12-week culturally tailored mother-daughter PA intervention predicted change in MHO variables (self-esteem, depressive symptoms, and body image dissatisfaction) and MDR in pre-adolescent AA girls. **METHODS:** Mothers (n=27; age=36.0±17.0 years; body mass index (BMI)=34.0±7.4 kg/m²) and daughters (n=27; age=9.0±1.4 years; BMI=20.3±5.7 kg/m², BMI percentile=73%) randomized to the mother-daughter dance group were examined in this analysis. Physical activity levels were assessed with Actigraph GT3X accelerometers for seven days and validated questionnaires. Mental health outcome variables and MDR were assessed using validated questionnaires. MANOVA was used to assess differences in PA levels across three time points. Paired t-tests and ANOVA were used for MHO variables and MDR across two and three time points, respectively. Simple regression was used to assess if PA self-efficacy and MDR mediated changes in PA. Hierarchical linear modeling (HLM) assessed if changes in PA variables predicted changes in MHO variables. **RESULTS:** There were significant reductions in daughters' self-reported PA (p=0.04) from pre- to post-intervention. No significant change in MDR was observed. PA self-efficacy did not mediate changes in objective or subjective measures of PA. Changes in PA did not predict changes in MHO variables, but there was a negative effect of average BMI percentile on self-esteem (p=0.017) and body image dissatisfaction (p=0.002). **CONCLUSION:** In this sample of pre-adolescent AA girls, changes in objectively and subjectively measured PA did not predict change in MHO. The lack of significant findings could be attributed to low intervention attendance. Future studies should examine these relationships in a larger sample and explore ways to combat low attendance.
 Supported by: NIH:NIDDK (K01 DK087812)

2424 Board #5 June 3, 9:30 AM - 11:30 AM
A Mosque-Based Physical Activity Intervention for South Asian Muslim Women - a Pilot Study.

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PURPOSE: South Asian's (SA) are one of the largest visible minority groups in Canada. SA Muslim women living in Canada have higher mortality and morbidity from cardiovascular diseases (CVD) and type 2 diabetes compared to the general population. For those living with or at risk for CVD and diabetes, physical activity reduces mortality and symptoms, improves disease control and quality of life. However, low levels of physical activity have been reported in people of SA origin, particularly in SA Muslim women. Practical barriers (e.g. lack of time, childcare) are often interwoven with cultural barriers (e.g. religious modesty, avoidance of mixed-sex activity) and inhibit participation. Health promotion programs in religious institutions have shown clinical and psychosocial benefit to women of various ethnic groups. The primary aim of this study was to evaluate the acceptability, feasibility and effectiveness of a mosque-based physical activity program for SA Muslim women in Ontario, Canada.

METHODS: SA Muslim women participated in a 24-week physical activity intervention in a mosque setting. Demographic information, attendance, participant experience, and self-efficacy related to exercise were collected. The Duke Activity Status Index (DASI) and International Physical Activity Questionnaire (IPAQ) were administered pre and post intervention.

RESULTS: Sixty-two women participated from June to December 2014. Data was obtained from 28 participants who consented to participate (mean age 51.0 years (SD 12.0)). On average, 13 women attended each session (range: 3-28) over the 67-session period. Each participant attended an average of 22 exercise sessions (range: 1-51). Fewer participants were classified "inactive" on the IPAQ at the end of the intervention (42% pre vs. 10% post; p=0.006). Pre-post DASI scores did not significantly change. Participants were highly satisfied with their exercise experience. The women stated they felt healthier and were able to participate in more activities, including prayer. **CONCLUSIONS:** Mosque-based physical activity programs may reduce CVD, diabetes and associated disease risk in SA Muslim women. Culturally relevant

structured networks, such as places of worship, are important assets when designing lifestyle interventions for SA Muslim women.

2425 Board #6 June 3, 9:30 AM - 11:30 AM
Effect Of Home-based Strength Training Program On Igf-i, Igfbp-1 And Igfbp-3 In Obese Latino Boys Participating In A 16 Week Randomized Controlled Trial.

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BACKGROUND: Accumulating evidence indicates circulating concentrations of insulin-like growth factor 1 (IGF-1), or IGF-1 relative to IGF binding proteins (IGFBP's) is associated with increased risk for the development of several forms of cancers. Similarly, exercise has been linked with reduced cancer risk.

PURPOSE: To assess the effects of a 16-week (2xweek) home-based strength training (HBST) program on serum IGF-1, IGFBP-1, IGFBP3, and their ratio we randomized 32 obese Latino adolescent males (aged 14-18 years) into a twice-weekly Home Based Strength Training group (HBST;n=16) or a Control group (C;n=16) for 16 weeks.

METHODS: Home-based strength training for 16 weeks, composed of two one-hour sessions per week. Outcome Measures were assessed pre- and post intervention/control condition and included IGF-1, IGFBP-1 and IGFBP-3, fasting glucose, two-hour glucose, Body Mass Index (BMI), dual energy X-ray absorptiometry (DEXA) scan, dietary intake and physical activity using the Actigraph GT1X. GLM was used to assess differences in changes in outcome measures, between the C and the HBST groups.

RESULTS: Over the 16 weeks of the intervention there was a trend for a significant within-subject's differences for IGF 1 (p=0.078), but no significant within-subject's differences for IGFBP-1 (p=0.187), IGFBP-3 (p=0.490), fasting glucose (p=0.87), and 2-hr glucose (p=0.38). There were also no between subject differences noted in fasting glucose (p=0.36), 2-hr glucose (p=0.84), SI (p=0.34), AIR (p=0.27), and DI (p=0.73). There was a trend for a between subject differences in IGF1 (p = 0.081). There were also no between subject differences noted in IGFBP-1 (p=0.194), IGFBP-3 (p = 0.202), fasting glucose (p=0.36), and 2-hr glucose (p=0.84).

CONCLUSIONS: These preliminary results suggest that a twice per week 16-week home based strength training program does not affect concentrations of IGF-1, IGFBP-1, and IGFBP-3, in obese Latino boys.

2426 Board #7 June 3, 9:30 AM - 11:30 AM
Effects Of After-school Exercise Programing In An Over-weight Latino/a Adolescent Population

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PURPOSE: Determine the effect of a long term after-school exercise program on fitness and body weight in over-weight Latino/a adolescents.

METHODS: Youth (enrolled at age 10) were assented (parental consent) and enrolled into the intervention group (cohort) and received 200 +/- 50 minutes per week of structured MVPA during the school year in addition to required PE classes and recreational sports. Fitness sessions were offered 3 days/week immediately after school. Testing was completed at baseline and every 6 months for 2 yrs. Cohort subjects were matched with peers of the same grade at the same school (control). A significant selection bias and differences were evident at baseline (body weight, BMI, fitness) and aligned with the purpose of the intervention program: to form healthy habits and reduce risk-behaviors in students identified as at risk for development of chronic disease. Testing included aerobic capacity, core strength, back strength, upper body strength, and flexibility. Height (fixed, calibrated stadiometer) and body weight (BWt) (Tanita model BWB-800) were measured and used to calculate z-score BMI.

RESULTS: At baseline, BWt and BMI of the cohort was significantly greater than control (110 vs 80 lbs, 90th vs 50th percentile for BMI) and were significantly (p<0.05) below their peers (control) in all fitness assessments except Trunk Lift. Over the two years, the cohort gradually and significantly increased performance in 20m Pacer test (Pre: 26.2; Post: 45.5; P<0.001), Push-ups (Pre: 3.1; Post: 10.8; P<0.001), Curl-ups (Pre: 19.1; Post: 54.8; P<0.001), and Trunk Lift with modest increases in Hamstring Flexibility. After 2 years, Cohort were not significantly lower than control for any fitness assessments. Despite the significant improvement in all fitness variables, the BWt and BMI of the cohort remained significantly higher than controls. However, the cohort gained a smaller percentage of body weight and significantly reduced BMI percentile when compared to the control suggesting an exercise effect.

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. Documet¹, Russell R. Pate, FACSM², Ruth P. Saunders², Laura Macia¹, Ivonne Sanchez¹, Lisa Wisniewski¹. ¹University of Pittsburgh, Pittsburgh, PA. ²University of South Carolina, Columbia, SC. (Sponsor: Russell R. Pate, FACSM)
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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 action (i.e., goal setting). 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 10-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.

E-16 Thematic Poster - Soccer

Friday, June 3, 2016, 9:30 AM - 11:30 AM
 Room: 110

2428 Chair: Nina Moore. University of Massachusetts, Amherst, MA.

(No relationships reported)

2429 Board #1 June 3, 9:30 AM - 11:30 AM
Changes in Performance, HRV, and Inflammation Following an Individualized Soccer Specific Training Program

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Sport-specific periodization programs are becoming increasingly popular among youth, collegiate, and professional athletes. These programs aim to systematically, and appropriately, induce training stimuli to optimize fitness gains without inducing a state of overtraining. Technological advances have made it increasingly easy for sport scientists to accurately assess both physiological and mechanical load in training and competition as a means of monitoring acute and chronic load. **PURPOSE:** The aim of this study was to examine inflammatory markers and mediators of innate and natural

immunity before and after an individualized soccer-specific running program. We hypothesized that our methodological approach to the training periodization would not significantly alter markers of inflammation or immunity between pre- and post-training. **METHODS:** Sixteen male athletes completed pre- and post-training measures of fitness (Yo-Yo Intermittent Recovery Test 1; YYIR1), body composition (BodPod), and heart rate variability (HRV) following a six-week training program. Indices of HRV and complexity were assessed during an orthostatic challenge. Fasting blood draws were performed pre- and post-training. A Luminex MAGPIX multiplex reader was used to run a 21-analyte panel of inflammatory and immunological markers. Multivariate equivalence tests were performed using R 3.2.2 to assess similarity. **RESULTS:** Training increased YYIR1 scores (18.4%; p<0.001) and a decrease in body adiposity from 11.8% (±3.7) to 9.6% (±2.9) (p=0.001). Significant main effects were reported for HR (p=0.034) and ApEn (p=0.026). HR was significantly reduced in the standing position during post-training measures (p=0.002) while ApEn (p<0.001) was significantly higher. Multivariate equivalence tests indicate similarity between pre- and post-training markers of inflammation and immunity. **CONCLUSION:** Our results suggest that an individualized sport-specific training program can significantly improve fitness and athletic performance without adversely affecting innate immunity or the inflammatory response. Concurrent consideration of the results suggests that we were able to optimize training in highly trained collegiate athletes without invoking chronic stress, thus, reducing risk of injury and optimizing performance.

2430 Board #2 June 3, 9:30 AM - 11:30 AM
Heart Rate Variability And Autonomic Activity In A Nonfunctional Overreached Professional Soccer Player

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Purpose: In order to investigate nonfunctional overreaching (NFOR) related adaptations in the autonomic nervous system, heart rate variability (HRV) was examined in a professional soccer player (age: 28.6 years; weight: 77.4 kg; height: 177.1 cm; adiposity: 12.1 %; VO2 Max 57 ml/kg/min) who showed reduced performance in competitions, frequent muscular fatigue during some training sessions (same period), and finally getting upper respiratory tract infection (URTI). **Methods:** HRV analysis was performed once a week during three periods of competitive season: initial, NFOR state and post-recovery (5-month follow-up). Short-term recordings (5 minutes) were made with a Polar RS800CX heart rate monitor in two positions: supine (S) and 90° head-up tilt (T), immediately after awakening (match day morning). Root mean square of successive differences (RMSSD) and power spectral density were measured. LF/HF ratios in S and T positions were calculated and mean resting heart rate (RHR) was also analyzed. Seven players from the same team and with normal performances during the season were used as a control group (age: 26.6 ± 3.1 years; weight: 73.2 ± 6 kg; height: 176.7 ± 10 cm; adiposity: 12.9 ± 1.6 %; VO2 Max 55.7 ± 1.8 ml/kg/min). The typical 95% confidence interval (CI) in every HRV parameter was calculated in this group. To be diagnosed as NFOR, the subject (case) had to reveal a 95% difference with respect to the lower or upper CI limit reported in the control group. Values are expressed as mean ± SD. **Results:** LF/HF ratio decreased progressively throughout the competitive period in S and it was substantially different in comparison with control subjects in T during the NFOR state (0.26 ± 0.62 vs. 2.03 ± 1.25). Relevant differences of RMSSD in S (107.6 ± 20.2 vs. 74.6 ± 23.8 ms) and T (140.3 ± 15.3 vs. 61.6 ± 21.6 ms) were found in NFOR. According to this phenomenon, RHR was lower than the control group in S (45.3 ± 1.7 vs. 55.7 ± 6.5 bpm) and T (48.2 ± 2.4 vs. 59.8 ± 9.1 bpm) and returned to baseline after recovery. **Conclusions:** The results suggest a sympathovagal imbalance with extensive parasympathetic modulation in a player identified as overreached. Relevant increase of RMSSD and decrease of LF/HF ratio reflect alterations in autonomic function, which should be taken into account when complete recovery is essential to prevent overtraining syndrome.

2431 Board #3 June 3, 9:30 AM - 11:30 AM
Neuromuscular Fatigue In Response To 120 Minutes Of Soccer-specific Exercise

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Soccer matches are normally played over 90 minutes, however it is common for players to encounter a period of extra-time (ET; 30 min) during knockout competitions

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 ($\dot{V}O_{2max}$ 56 ± 2 mL·kg⁻¹·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 physical performance (20 m sprint time, countermovement jump height), perceived exertion (RPE) and core body temperature (T_{core}) were also measured. **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, $P \leq 0.001$), potentiated twitch force (-14, -21 and -19%, respectively, $P \leq 0.031$), voluntary activation (-8, -16 and -20%, respectively, $P \leq 0.010$) and voluntary activation measured with TMS (-12, -16 and -19%, respectively, $P \leq 0.001$) were evident compared to pre-exercise. Furthermore, all physical performance measures declined while RPE and T_{core} increased ($P \leq 0.010$). **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.

2432 Board #4 June 3, 9:30 AM - 11:30 AM

A Test Battery to Identify Elite Talent Among Youth International Soccer Players

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(No relationships reported)

Methods of assessing soccer players' performance have developed significantly in recent times. The fitness profiles and skill levels of a prospective elite soccer player is a valuable resource for coaches in the process of identifying talent.

PURPOSE: The aim of this study was to use a battery of validated sport-specific tests to identify elite talent among youth international soccer players in Hong Kong.

METHODS: International soccer players from the Hong Kong Football Association (HKFA) youth academy (U-19) squad took part in this study. Following two familiarization trials using the Loughborough Soccer Passing Test (LSPT), the exercise protocol consisted of a standardized 10 minute dynamic warm-up, followed by baseline LSPT measurements. Then, each participant completed a validated, soccer-specific, repeated-sprint ability test (RSA) in order to induce game-specific, short-term fatigue. Upon completion of the RSA, each participant was immediately re-tested on the LSPT. Each participant then completed a vertical jump (VJ) test and finally, the yo-yo intermittent recovery test level 2 (YYIR2). Heart-rate (HR) monitors were used to monitor exercise intensity. Data was analysed using SPSS (v. 20).

RESULTS: 30 youth (U-19) HKFA international squad members took part in this study (mean \pm SD: age 18 ± 0.8 y; height 1.73 ± 0.5 m; body mass 64.3 ± 8.5 kg). The re-test scores of the LSPT indicated that 6 of participants (20%) maintained their skill performance, in spite of a significantly elevated heart rate induced by the RSA; i.e. no significant differences were observed in any of the movement (mov), penalty (pen) or total (tot) time taken to complete the LSPT between the pre- and post-RSA scores (Mov: pre 48.2 ± 2.9 s, post 48.0 ± 2.1 s; Pen: pre 5.9 ± 7.5 s post 6.5 ± 8.4 s; Tot: pre 54.1 ± 8.4 s, post 54.5 ± 10.6 s, $p > 0.05$). Vertical jump scores were 106.6 ± 8.5 cm. Participants completed 10.9 ± 2.9 stages of the YYIR2, with those above the 86 percentile completing greater than 13.5 stages.

CONCLUSIONS: This study highlights the ability of validated sports-specific tests to effectively identify elite level talent among international youth soccer players. Each of LSPT, RSA and YYIR2 scores proved sensitive in separating the top quartile of elite level players from the remainder of the squad, while the VJ did not.

2433 Board #5 June 3, 9:30 AM - 11:30 AM
Effect of Rest Time in Sprint Training in Young Soccer Players

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Sprint Training in Soccer is a determinant component in performance therefore ATP-PCr energy system has a critical role in the competition for high intensity actions. Its suggest ATP-PCr energy system should be trained with the highest specificity for correct adaptation and support sprint performance.

PURPOSE: To determine an effective rest time for repeated sprint ability training without decreased in performance (speed) during bout's sequence.

METHODS: 15 male soccer's players (17.7 ± 0.5 years) performed 2 sprint of 4 sets (4 rep. x 30-m) all-out bouts, in 2 different days, with 5-days rest between bouts. Sprint protocols were: a)- 4 sets (4 reps. x 30-m) with 60-second and 3-minutes rest, between reps and sets, respectively (ATP-PCr1); b)- 4 sets (4 reps. x 30-m) with 30-second and 3-minutes rest, between reps and sets, respectively (ATP-PCr2). We register time of each rep. (sec., measured by photocells), blood lactate levels (La) and heart rate (HR), at the end of the set. A two-way repeated measurement ANOVAs was performed to determine statistical differences (SD) at $p < 0.05$. When we detect SD in any ANOVA analysis, we apply Tuckey Test to determine which variables are different.

RESULTS: We find no SD between 1-2-3-4 set's speed (m/sec) in ATP-PCr1 or ATP-PCr2, respectively. However, exists SD ($p < 0.05$) between ATP-PCr1 vs. ATP-PCr2 in speed (7.017 ± 0.448 vs. 6.820 ± 0.225 m/sec., respectively); La (5.96 ± 1.62 vs. 5.30 ± 1.44 mMol/L, respectively); and HR (166.43 ± 11.41 vs. 170.35 ± 11.35 bpm, respectively). Additionally, we find a low correlation coefficient (r) between La and HR values in each test (ATP-PCr1: $r = 0.50$; ATP-PCr2: $r = 0.52$).

CONCLUSION: The main conclusions of the present study are three-fold: 1) Decrease speed's performance in ATP-PCr2, influenced by shorter rest time, hypothetically for less PCr rephosphorylate rate; 2) La level is higher in ATP-PCr1 for significant high speed (assuming more elevated glycolytic rate); 3) Evidence for low r between La vs. HR, showing that HR is not a valid and reproducible variable to control intensity of sprint training.

2434 Board #6 June 3, 9:30 AM - 11:30 AM

Impact Of "Extra-time" On Performance And Physiological Responses To Simulated Soccer Match-play

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The physiological and performance responses to 90 min of soccer-specific exercise are well known. However, the responses to 120 min of soccer-specific exercise (i.e., inclusion of an extra-time period; ET) are unclear. This is despite the importance of ET in determining match outcomes in tournament match-play.

PURPOSE: To profile the performance and physiological responses to 120 min of simulated soccer match-play.

METHODS: Following protocol habituation, 12 amateur soccer players (22 ± 3 y; estimated $\dot{V}O_{2max}$: 55.8 ± 1.6 mL·kg⁻¹·min⁻¹) completed 120 min of soccer-specific exercise, covering 14.4 km. Performance indices (15 m and 20 m sprint speeds, countermovement jump height (CMJ), dribble speed and precision) were measured during the protocol. Blood was collected during exercise to assess blood glucose and lactate, plasma glycerol, non-esterified fatty acids (NEFA), and creatine kinase (CK) concentrations. Core temperature (T_{core}) and perceived exertion (RPE) were also measured.

RESULTS: Compared to baseline, 20 m sprint speed was reduced after ET ($-8 \pm 8\%$) and 45 min ($-6 \pm 8\%$, $p < 0.05$). CMJ height was reduced after ET compared to baseline ($-11 \pm 10\%$, $p < 0.05$). Sprint speeds over 15 m were reduced during ET compared to all time-points ($-3 \pm 4\%$ vs. 76-90 min, $p < 0.05$). Glucose concentrations were lower during ET (3.9 ± 0.7 mmol·L⁻¹) compared to all time-points, except the first 15 min of the second half ($p < 0.05$). Lactate concentrations were lower in ET than the first half (-2.5 ± 2.2 mmol·L⁻¹). Glycerol and NEFA concentrations were higher ($p < 0.05$) in ET compared to 90 min ($+59 \pm 42\%$ and $+37 \pm 24\%$, respectively). ET increased RPE relative to the first 90 min (16 ± 3 vs. 13 ± 2 , $p < 0.05$) and T_{core} was elevated during the last 15 min of ET ($38.7 \pm 0.8^\circ\text{C}$) compared to the first 15 min of ET ($38.1 \pm 0.7^\circ\text{C}$, $p < 0.05$) and the first 15 min of the second half ($38.0 \pm 0.1^\circ\text{C}$, $p < 0.05$).

CONCLUSIONS: The ET period negatively impacts performance and physiological responses compared to 90 min of simulated match-play. Reductions in blood glucose

and lactate with increases in plasma NEFA and glycerol may indicate endogenous CHO depletion and increased fat oxidation during ET. Future research is required to investigate interventions that attenuate decrements in performance and physiological perturbations.

2435 Board #7 June 3, 9:30 AM - 11:30 AM
The Relationship between Common Anthropometric Measurements and Isokinetic Strength in Men's College Soccer Team

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The use of Isokinetic testing has been widely utilized by clinicians to evaluate lower extremity strength. Prior research has demonstrated its efficacy and reliability in clinical evaluation of muscular performance. Prior research has also investigated the relationship of anthropometric measurements such as BMI and body fat percentage in determining strength output with the non-athletic populations. However, in a prior study conducted by the authors no correlation between anthropometric measurements and men's basketball athletes' isokinetic torque were found.

PURPOSE:

To investigate the relationship between the use of common anthropometric measurements and average torque production of the knee extensors measured by isokinetic testing at three angular velocities in a college men's soccer team.

METHODS:

Fifteen healthy male college soccer athletes aged between 18-22 participated. Athletes were screened on standard anthropometric measurements that included: height, weight, and common skinfold measures. The measurements allowed for calculation of BMI, LBMI, lean mass, and body fat percentage. The athletes' isokinetic strength of extension was measured through three angular velocities of 60, 180 and 300 degrees/sec.

RESULTS:

The relationship between LBMI, body fat, lean mass and average peak torques at three angular velocities were analyzed through hierarchical linear regression and produced significant relationship for 180 degrees/sec $F=6.67$ (3, 11) $p=.008$ and 300 degrees/sec $F=11.349$ (3, 11) $p=.001$. Further analysis utilizing Pearson's bivariate correlation found significant inverse correlation between body fat and peak torque produced at 180 and 300 degrees/sec range from $-.547$ to $-.692$ $p<0.05$ and significant positive correlation between lean mass and average peak torque at 180 and 300 degrees/sec range from $.646$ - $.790$ $p<0.05$

CONCLUSION:

The results supported prior research indicating specific anthropometric measurements and isokinetic torque production are related. In this investigation, significant relationships between body fat percentages and lean mass existed between the anthropometric measurements of interest and the muscle torques at two angular velocities. The results suggest that the uses of anthropometric measurements in male soccer athletes are significantly correlated.

E-17 Free Communication/Slide - Cardiorespiratory Physiology

Friday, June 3, 2016, 9:30 AM - 11:30 AM
 Room: 313

2436 **Chair:** Paul J. Fadel, FACSM. University of Texas at Arlington, Arlington, TX.

(No relationships reported)

2437 June 3, 9:30 AM - 9:45 AM
Convective O₂ Transport and Skeletal Muscle Mitochondrial Function in Peripheral Arterial Disease Patients: In Vivo and In Vitro Assessments

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Peripheral arterial disease (PAD) is characterized by insufficient oxygen (O₂) supply secondary to reduced blood flow, which provides a unique model to assess the effects of chronic limited O₂ delivery on skeletal muscle oxidative capacity. Previous

evidence, collected in vivo, suggests that reductions in peak mitochondrial ATP synthesis rates (V_{max}) 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 (JO₂) despite ample O₂ supply, 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 V_{max} in the calf muscle of 10 PAD patients and 10 physical activity-matched healthy controls (HC). Complex I and II, State 3 JO₂ was assessed in vitro on muscle biopsies from the medial gastrocnemius. **RESULTS:** RH significantly increased post-exercise limb blood flow in HC (FF: 874 ± 271 ; RH: 1204 ± 284 ml.min⁻¹, $P<0.05$) with a corresponding improvement in V_{max} (FF: 14 ± 3 ; RH: 19 ± 4 mM.min⁻¹, $P<0.05$). In contrast, in PAD patients there were no differences in initial post-exercise limb blood flow (FF: 379 ± 136 ; RH: 441 ± 112 ml.min⁻¹) or V_{max} (FF: 11 ± 4 ; RH: 11 ± 3 mM.min⁻¹). Interestingly, State 3 JO₂ assessed in vitro 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.

2438 June 3, 9:45 AM - 10:00 AM

Beetroot Supplementation Improves Microvascular Hemodynamics and Diffusive Oxygen Transport in Chronic Heart Failure Rats

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At any intensity of exercise, the attainable oxygen consumption ($\dot{V}O_2$) is a product of the interaction between perfusive ($\dot{Q}O_2$) and diffusive (DO_2) transport of O₂. The exercise intolerance of chronic heart failure (CHF) that increases morbidity and mortality results from impaired $\dot{Q}O_2$ and DO_2 . The key determinant of DO_2 is red blood cell (RBC) volume contained within flowing capillaries. The proportion of capillaries supporting RBC flux (%cap) is substantially reduced in CHF which may be due to decreased nitric oxide (NO) bioavailability. Nitrate (NO₃⁻) supplementation via beetroot juice (BR) increases the concentrations of NO precursors (NO₃⁻; nitrate) in the blood and also increases $\dot{V}O_{2max}$ in CHF patients. **PURPOSE:** We hypothesized that by increasing the proportion of capillaries supporting RBC flux, BR would increase DO_2 at rest and during contractions in CHF rats. **METHODS:** CHF was induced in young adult male Sprague-Dawley rats by surgically induced myocardial infarction (MI). Following a 5-week recovery period rats were given BR ([NO₃⁻] 1 mmol/kg/day, CHF+BR) or placebo (CHF) for 5 days. MI size was not different between groups (CHF 28 ± 5 , CHF+BR 28 ± 6 %). Intravital microscopy was used to study the *in vivo* spinotrapezius muscle circulation at rest and during twitch contractions (180 s, 1 Hz, 6 – 8 V). **RESULTS:** BR increased %cap at rest (76 ± 2 vs 65 ± 6 %, $P<0.05$) and during contractions (82 ± 2 vs 78 ± 6 %, $P<0.05$) in CHF+BR vs. CHF. DO_2 was increased 17% at rest and 5% during contractions in CHF+BR. **CONCLUSION:** These findings support that 5 days of BR supplementation is an effective means for increasing DO_2 in CHF rats and this, in concert with elevated $\dot{Q}O_2$, will enhance O₂ transport at rest and during exercise. In addition, because $\dot{V}O_2$ kinetics is O₂-delivery dependent in CHF patients, enhanced perfusive and diffusive O₂ transport will likely speed $\dot{V}O_2$ kinetics and reduce the O₂ deficit incurred during metabolic transition.

2439 June 3, 10:00 AM - 10:15 AM

Vascular K_{ATP} Channels Reduce Severe Muscle O₂-delivery-utilization Mismatch During Contractions In Chronic Heart Failure Rats

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The vascular ATP-sensitive K⁺ (K_{ATP}) channel is a regulator of skeletal muscle microvascular O₂ pressure (PO_{2mv}; set by O₂-delivery to O₂-utilization ratio) during contractions. Inadequate tissue PO_{2mv} during exercise in heart failure (CHF) constrains

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_{2mv} , and decrease the mean PO_{2mv} during contractions of the spinotrapezius muscle 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_{2mv} 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_{2mv} (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:** K_{ATP} channels protect against severe 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 Increases 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 (SNA) 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 ~1 hour prior to exercise (CT) and 2) without 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 (EPmR) increased from rest to exercise with PL ($P \leq 0.015$) however; this increase was attenuated with the ingestion of CT during both exercise intensities ($P \geq 0.3$). Furthermore, CT reduced MSNA burst/min at rest (PL, 28.2 ± 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 ($P \leq 0.05$). **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.

2441 June 3, 10:30 AM - 10:45 AM

Sympathetic Neural and Hemodynamic Responses to Painful Stimuli are Related to Perception of Pain

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Painful stimuli cause activation of the sympathetic nervous system, increasing efferent 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 (Qc), 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=9; and Pain ≤ 6, 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 >6 had significantly larger increases during the CPT in MSNA total activity (1208 ± 631 vs. 173 ± 87 a.u./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), Qc (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 (n=6). Changes in HR and 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 hypoalgesia (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

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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 recruited 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% or ~70% of their maximal inspiratory mouth pressure (P_{imax}) 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%P_{imax}, 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 between men and women during the 20 min. Women had less ($p < 0.05$) of a decrease in FABF compared to 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%P_{imax}.

CONCLUSION: These data suggest a sex difference in the inspiratory muscle metaboreflex in healthy humans with women exhibiting an attenuated inspiratory muscle metaboreflex compared to men.

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

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(No relationships reported)

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 (Q) and cerebral oxygen delivery (CDO₂) via increased venous return. Although not experimentally investigated, this suggests CDO₂ is limited by the reduced Q secondary to lung inflation. The purpose of this study was to investigate whether a higher Q 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. 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 Q did not change from baseline (P>0.05). In contrast, during the TLC trial SV and Q were decreased until 80% and 40% of apnea duration, respectively, (P<0.05). Consistent with Q, 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=0.004) in the FRC trial, CaO₂ 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. Lung volume has a profound effect on SV, Q and gCBF during the early stages of apnea. However, at apnea end, Q, gCBF and CDO₂ are the same irrespective of lung volume. A comparable CaO₂ despite a lower PaO₂ at FRC apnea end highlights 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.

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

Paolo B. Dominelli¹, Yannick Molgat-Seon¹, Giulio Dominelli², William Henderson¹, Carli Peters¹, Carli Peters¹, Jean-Sebastien Blouin¹, Lee Romer, FACSM³, Michael Koehle¹, Glen Foster², William Sheel, FACSM¹. ¹University of British Columbia, Vancouver, BC, Canada. ²University of British Columbia, Kelowna, BC, Canada. ³Brunel University, London, United Kingdom. Email: paolo321@interchange.ubc.ca
(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 ± 2 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 inspiring 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.

RESULTS: Men exercised at a higher absolute work rate (273 ± 9 vs. 203 ± 12 W, p > .05) as women. During the control TTE (data pooled), nadir arterial oxyhemoglobin saturation (SaO₂) was 95 ± 0.4% and pH_a 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 > .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 hyperoxic trials.
Funding: NSERC

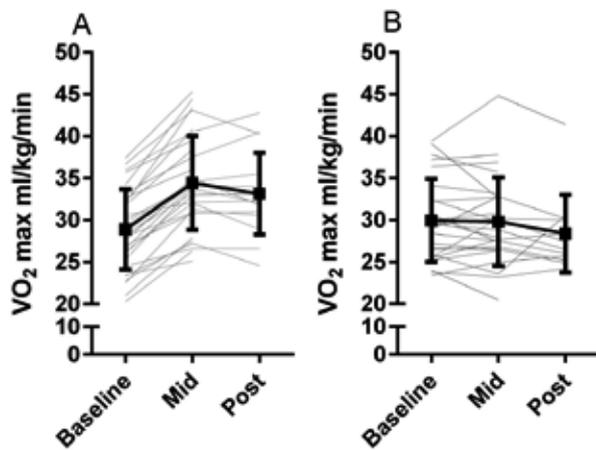
E-18 Free Communication/Slide - Exercise Training in Health/Disease

Friday, June 3, 2016, 9:30 AM - 11:30 AM
Room: 102

2445 **Chair:** Matthew D. Barberio. Children's National Medical Center, Washington, DC.
(No relationships reported)

2446 **June 3, 9:30 AM - 9:45 AM**
Dose Matters: Effect Of Two-years Of Intensive Supervised Endurance Training On Aerobic Capacity
Erin J. Howden¹, Satyam Sarma¹, Justin Lawley¹, Mitchell Samels², Dean Palmer², Braden Everding², Sheryl Livingston², Benjamin Levine, FACSM¹. ¹UT Southwestern Medical Center, Dallas, TX. ²Texas Health Presbyterian Dallas, Dallas, TX. (Sponsor: Benjamin D. Levine, FACSM)
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(No relationships reported)

Short-term exercise training increases VO₂ max, but not to levels seen in athletes. It is unclear whether extending the duration of training while maintaining a constant load will result in further increases in aerobic capacity. Purpose: To determine the effect of a two-phase exercise program on aerobic capacity, which consisted of 9 months of progressive endurance training followed by 15 months of maintenance training. Methods: Sixty-one healthy subjects (52.4 ± 5.1 yrs, 46% male) were randomized to control (Con; n=27) or exercise training (ExT; n=34). For the ExT group, the dose of exercise was progressively increased from month 1-6, followed by 4 month peak phase [2/wk interval "4x4" (>95% peak HR); 60min base pace (~70-80% peak HR), 30min base pace and a recovery session]. The maintenance phase (10-24mo) dose was kept constant [1/wk: "4x4"; 60min base; 30min base; max steady state (ventilatory threshold); recovery session]. An incremental maximal treadmill test was performed at baseline (Pre), following the peak phase (Mid) and at the end of two-years of training (Post) to measure change in VO₂max (Douglas bags). Post testing has been completed on 33 subjects. Results: The progressive training phase increased VO₂max in all ExT subjects. Preliminary findings suggest no further increase in VO₂max after completion of the maintenance phase, when training load was kept constant (Fig. 1A). VO₂max was not changed in the Con (Fig. 1B). Conclusion: Progressive endurance training increases VO₂max, whereas maintenance of training load over a period of 15 months results in no further augmentation. We speculate that additional increases in training load, either via duration or intensity may be required to further enhance aerobic capacity.



2447 June 3, 9:45 AM - 10:00 AM

Exercise Redox Signaling: Intensity Matters

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(No relationships reported)

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: The average intensity of the CW trial was 69.1% and the average intensity of the HIIP intervals was 83.8% VO₂ max. Interestingly the mean oxygen consumption averaged over the 30-min exercise bout did not differ between the two trials (CW: 34.1 vs. HIIP: 33.5 ml·kg⁻¹·min⁻¹, p>0.05). Baseline levels did not differ in any of the variables between trials. High intensity interval cycling induced a significantly greater responses in SOD activity (p=0.003) and GR activity (p=0.018) while differences in F₂-isoprostanes were not significant.

CONCLUSION: Taken together, these data suggest that delivering an exercise stimulus in short "pulses" of high intensity such as the HIIP as compared to a block of moderate CW intensity, elicits a greater protective enzymatic response without inducing greater oxidative stress.

2448 June 3, 10:00 AM - 10:15 AM

Individual Variability in Aerobic Fitness Adaptations to 70 Days of Bed Rest and Exercise Training

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(Sponsor: Lori Ploutz-Snyder, FACSM)
(No relationships reported)

Changes in maximal aerobic capacity (VO₂pk) in response to exercise training and disuse are highly variable between individuals. Factors (e.g., lean mass, daily activity, diet, sleep, stress) that could contribute to the observed variability are often not controlled in studies. The NASA bed rest (BR) studies use a highly controlled, hospital-based model as an analog of spaceflight. In this study, diet, hydration, physical activity, and light/dark cycles were precisely controlled and provided the opportunity to investigate individual variability. **PURPOSE:** Evaluate the effects of exercise

intensity and lean mass on change in VO₂pk during 70 days of BR or BR + exercise. **METHODS:** Subjects completed 70 days of BR (CON, n=9) or BR + exercise (EX, n=17). The exercise prescription included 6 d/wk of aerobic exercise at 70 – 100% of VO₂pk and 3 d/wk of lower-body-resistance exercise. Subjects were monitored 24 h/d. VO₂pk and lean mass (iDXA) were measured pre and post BR. ANOVA was used to evaluate changes in VO₂pk pre to post BR. Subjects were retrospectively divided into high and low responders based on change in VO₂pk (CON > 20% loss, n=5; EX > 10% loss, n=4, or > 5% gain, n=4) to further understand individual variability. **RESULTS:** VO₂pk decreased from pre to post BR in CON (P<0.05) and was maintained in EX; however, significant individual variability was observed (CON: -22%, range: -39% to -1%; EX: -2%, range: -16% to 13%). The overlap in ranges between groups included 3 CON who experienced smaller reductions in VO₂pk (<16%) than the worst responding EX subjects. Individual variability was maintained when VO₂pk was normalized to lean mass (range, CON: -34% to -6%; EX: -16% to 11%), and the overlap included 5 CON with smaller reductions in VO₂pk than the worst responding EX subjects. High CON responders to disuse also lost the most lean mass; however, this relationship was not present in EX (i.e. the largest gains/losses in lean mass were observed in both high and low responders). Change in VO₂pk was not related to exercise intensity. **CONCLUSION:** Change in VO₂pk in response to disuse and exercise was highly variable among individuals, even in this tightly controlled study. Lean mass loss accounts for a significant degree of the variability in CON; however, in EX, training induced changes in VO₂pk appear unrelated to lean mass or exercise intensity.

2449 June 3, 10:15 AM - 10:30 AM

The Respiratory Compensation Point Is Not A Valid Surrogate Of Critical Power

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(No relationships reported)

There is a growing opinion in the literature that Critical Power (CP) may be confidently estimated from the respiratory compensation point (RCP) obtained during incremental cycling. Opponents of this view argue that any reported correspondence between the RCP and CP is coincidental. It is known that the RCP is labile: i.e., its manifestation defers to higher work rates during fast compared with slow incremental protocols.

PURPOSE: We sought to examine the agreement between CP and the work rates corresponding to the RCP obtained during incremental cycling protocols of varying ramp slopes.

METHODS: 11 recreationally-active men (23 ± 1 yr; 75 ± 2 kg; 179 ± 2 cm; peak O₂ uptake: 53 ± 2 ml·kg⁻¹·min⁻¹) completed 3 separate incremental protocols, where the work rate increment was slow (SR: 15 W·min⁻¹), medium (MR: 30 W·min⁻¹) and fast (FR: 45 W·min⁻¹). Protocol order was randomised. The gas-exchange threshold (GET) and RCP were obtained via computerised analysis of the relationships between O₂ uptake and CO₂ output, and CO₂ output and expired ventilation, respectively. CP was determined via the 3-min "all-out" cycling test. The assumption that the RCP and CP occur at equivalent work rates was assessed by evaluating the concordance correlation coefficient (CCC), and root-mean square error (RMSE), between RCP and CP for each protocol, separately.

RESULTS: The GET was similar across ramp protocols (pooled average: 149 ± 8 W). RCP augmented (P < 0.05) with increasing ramp slope (SR = 237 ± 9 W; MR = 253 ± 10 W; FR: 271 ± 10 W). The RCP work rates determined during each ramp protocol were not different from the group-mean CP (249 ± 8 W). The degree to which the relationship between RCP and CP approximated the "line-of-identity" was relatively poor for SR (CCC = 0.589; RMSE = 31 W), MR (CCC = 0.587; RMSE = 32 W) and FR (CCC = 0.438; RMSE = 30 W).

CONCLUSIONS: Our findings agree with those of previous studies in that the work rate at RCP augments with increasing ramp slope during incremental cycling. Moreover, despite occurring at similar mean work rates, the relatively poor CCC and large RMSE between CP and RCP for each ramp protocol suggests that the RCP should not be considered a valid surrogate of the CP.

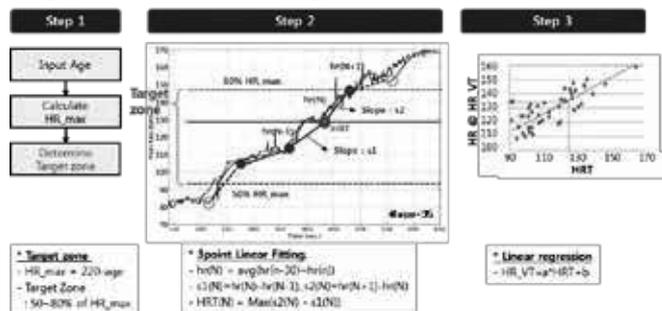
2450 June 3, 10:30 AM - 10:45 AM

Evaluation of an Algorithm to Detect the First Ventilatory Threshold from Heart Rate

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(No relationships reported)

PURPOSE: Evaluate the accuracy of an algorithm we previously developed to detect VT1 using heart rate and physical characteristics.

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).



2451 June 3, 10:45 AM - 11:00 AM

Speed and Incline-Based Vs Resistance-Based Treadmill Walking Tests for Determining Cardiorespiratory Fitness

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Reported Relationships: C.P. Hurt: Salary; Partial Salary Support to conduct this study was provided by the State of Alabama Department of Commerce Innovation Fund Grant to CPH and DAB. Intellectual Property: A patent has been filed with regard to the algorithm related to the method of testing reported in the abstract..

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 deliver 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 against resistive forces throughout the exercise protocol - compare to a traditional Bruce Protocol, in a cohort of healthy individuals.

METHODS:

To date, analysis of four healthy adults (30±6.1 yrs) has been conducted. Participants performed two maximal exercise tests. One test was performed with the Bruce protocol (increases in grade and speed of the treadmill every three minutes). The second test was performed while individuals walked at 1.1 m/s throughout the testing paradigm. Work rates were increased, stage-to-stage, by applying a horizontal resistive force at the participants center of mass using a robotic device that is partnered with a treadmill.

RESULTS:

On a stage by stage basis an average difference of 5% in oxygen consumption was detected between test modes. A 4% difference was observed between the maximum obtained V02 measures between the two tests (37.1 ml/kg/min horizontal resistance vs. 38.7 ml/kg/min Bruce). No difference was observed in peak HR (198 vs. 198 bpm) and a 2% (1.19 vs. 1.17) difference was observed in measured RER values.

CONCLUSION:

These preliminary data suggest horizontal resistive forces can be used to increase aerobic effort in a way that closely simulates work rates of the Bruce Protocol.

Support for this study was provided by the Alabama Department of Commerce Innovation Fund.

Technical assistance was provided Sarah Graham, Avantika Nadu, Adam Wieckart, and Craig Tuggle.

2452 June 3, 11:00 AM - 11:15 AM

The ACSM Physical Fitness Guideline Ratios for Cardiovascular, Strength, And Flexibility Training Minimize Overuse Injury

Jinger S. Gottschall¹, Bryce Hastings². ¹The Pennsylvania State University, University Park, PA. ²Les Mills International, Auckland, New Zealand. (Sponsor: W. Larry Kenney, FACSM)

Reported Relationships: J.S. Gottschall: Ownership Interest (Stocks, Bonds); co-owner of FITOLOGY, a group fitness and cycling studio.

The ultimate goal for many research scientists who perform exercise interventions is to define the optimal physical fitness protocols that will encourage adults to train regularly while maximizing health and minimizing injury. We recently completed a series of these interventions with multimodal group fitness classes. The exercise protocols were devised using the ACSM physical fitness guidelines with respect to the ratios of cardiovascular (60% total time, 225-300 min/wk), strength (30%, 120-150 min/wk), and flexibility (10%, 60-80 min/wk) training. Another similarity between our past protocols is the astonishing adherence rate to group fitness classes with a mean value of 96%. This is an encouraging statistic that translates globally in that individuals who participate in group fitness have greater compliance while attaining the physical fitness guidelines. However, it is possible that this consistency could possibly lead to a greater rate of overuse injuries? **PURPOSE:** Our aim was to correlate weekly training regimens with injury incidence using the ACSM physical fitness guidelines for cardiovascular, strength, and flexibility ratios. **METHODS:** 3,175 group fitness participants (age range 16-70 years) answered electronic questions related to current training practices and typical musculoskeletal injuries. **RESULTS:** Overall, the population exceeded the recommended 7-9 hr/wk of physical fitness activities by typically completing 11-13 hr/wk, but the ratio of cardiovascular, strength, and flexibility training was parallel to the ACSM guidelines. Despite the above average number of exercise hours, just 13% reported injuries intense enough to demand a week of unplanned rest. Finally, although statistically significant (p < 0.01), there were only weak correlations between type of training and specific injury. The number of hours per week of cardiovascular training was positively correlated to pain in the lower leg (shank, ankle, foot) while the number of hours per week of strength training was negatively correlated to pain surrounding the spine (neck, upper back, lower back). **CONCLUSION:** The ACSM physical fitness ratios for cardiovascular, strength, and flexibility training minimize musculoskeletal overuse injury in group fitness participants who exceed the recommended guidelines.

2453 June 3, 11:15 AM - 11:30 AM

Disease Centricity Versus Prevention? Physician Barriers to Pediatric Physical Activity Evaluation and Treatment

Jennifer Luz¹, Gregory Walker², Nicholas Edwards², Michael Pepin¹, Avery Faigenbaum, FACSM³, Gregory Myer, FACSM⁴, Andrea Straccolini, FACSM¹. ¹Boston Children's Hospital, Boston, MA. ²Cincinnati Children's Hospital Medical Center, Cincinnati, OH. ³The College of New Jersey, Ewing, NJ. ⁴Cincinnati Children's Medical Center, Cincinnati, OH.

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(No relationships reported)

Purpose: Current health care practices regarding pediatric physical activity (PPA) are disease centric relative to most cost productive preventative care strategies. This study assessed current physician practice, attitudes, and barriers surrounding PPA evaluation and treatment during clinical visits with children and adolescents.

Methods: Electronic questionnaires were emailed to 4500 pediatricians, family practice and sports medicine healthcare professionals. Measures included physician effort and attitudes surrounding PPA evaluation and treatment, financial barriers to PPA evaluation and treatment, and medical education in exercise prescription. Simple descriptive statistics were used.

Results: 479 physicians responded. On average, respondents spent 15.5% and 13.9% of patient interaction time on PPA evaluation and treatment, respectively, for a normal weight child and 29.9% and 25.6% of their time on the same issues with an obese child. 96% of physicians strongly agree that PPA is important for disease prevention. However, 72% never made the diagnosis of PPA deficiency. Regarding extreme obstacles in making this diagnosis, 62% reported limited clinic time and 56% reported lack of parental concern. 85% were unaware that ICD-9 codes exist for reimbursement of PPA evaluation and intervention and 80% reported that insufficient insurance reimbursement was an obstacle for properly diagnosing and treating PPA deficiency. Regarding a lack of exercise science education, 81% reported none in medical school

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 physicians 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 Patel¹, Camille M. Minder¹, Juan Carlos Soliven⁴, Robert Garcia⁴, Randall Griffiths², Heather Barton Weston², Greg Soukup². ¹Duke 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)

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(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. Chest pain has continued for over 1 year with moderate exercise.

PHYSICAL EXAMINATION: In 2014, the athlete presented to the ED with 102.0°F fever, SOB, chest pain (8/10), nausea, vomiting. Symptoms changed to Strider breathing, SOB, chest pain, vomiting and muscle cramping. The patient was transferred to isolation ICU then released home after stabilization. Chest pain returned after increasing HR during moderate exercise, resulting in another hospital admission.

DIFFERENTIAL DIAGNOSIS: Myopericarditis, MERS.

TEST AND RESULTS: Echocardiogram: 6/2014 - EF 35-40% with posterior lateral wall motion abnormalities; 10/2014 - EF 60%, wall motion WNLs; 6/2015 - EF 48%, posterior lateral wall motion abnormalities; 10/2015 - EF 58%, wall motion WNLs. Heart catheterizations (cath) indicated the following: 5/2014 EF 28%, posterior lateral wall motion abnormalities; 6/2014 EF 50%, no wall motion abnormalities, RHC WNLs; 12/2014 - RHC WNLs, 9/2015 EF - WNLs, RHC. EKG results: 6/2014 - Sinus bradycardia, nonspecific ST-T wave changes; same in 10/2014, and 10/2015. GXT results: 10/2014 - peak VO₂ of 33.7, 9/2015 - peak VO₂ of 34.4 - both stopped due to chest pain. Troponin: elevated in 6/2014, 10/2014, 6/2015, 9/2015. No evidence of troponin on 10/2015.; cMRI - no evidence of scarring.

FINAL WORKING DIAGNOSIS: viral myopericarditis

TREATMENT AND OUTCOMES: Treatment consisted of colchicine, indomethacin, and pain medications as needed (dilaudid, Norco). As of 10/2015, the athlete still remains on PRN dilaudid and still has unexplained chest pain with moderate exercise. There has been both physical and psychological improvement over time and less breakthrough pain with moderate exertion.

2458 June 3, 9:50 AM - 10:10 AM

Chest Pain - Cross Country

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(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 complains 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

TEST AND RESULTS:

Chest radiographs:

— mildly enlarged cardiac silhouette, blunting of the costophrenic angles bilaterally

12-lead Electrocardiogram:

— Diffuse ST elevation sparing AVR, V1 and lead 3; reciprocal changes in AVR;

periodic PR depression

Echocardiogram:

— normal left ventricle size, motion, and function with an ejection fraction of 60%.

— small, generalized pericardial effusion.

— no evidence of cardiac tamponade

FINAL/WORKING DIAGNOSIS:

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 normal 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. ¹Ball Memorial Hospital, Muncie, IN. ²Central 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 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:

- Normal shoulder
 Right upper extremity venous Doppler
 - Partial obstruction of the right subclavian vein
 Diagnostic venography of the right upper extremity
 - Obstruction of the right subclavian vein
FINAL WORKING DIAGNOSIS:
 Paget-Schroetter disease (DVT of right upper extremity from venous compression)
 Heterozygosity of the PAI-1 mutation (rare hypercoagulable mutation)

TREATMENT AND OUTCOMES:
 1. Percutaneous thrombectomy of DVT in right subclavian vein.
 2. 1st right rib resection.
 3. 3 months of anticoagulation with Xarelto.
 4. Strict discontinuation of oral contraceptive pills.
 5. Repeat thrombosis of right subclavian vein, while on anticoagulation.
 6. Repeat percutaneous thrombectomy, switched anticoagulation to Pradaxa.
 7. Gradual reintroduction of range of motion through physical therapy, recommendation of no overhead sporting events given possibility of re-clotting.
 8. No recurrence of clot to date.

2460 June 3, 10:30 AM - 10:50 AM
Progression of Metabolic Syndrome Component Improvement Following a Behaviorally Focused Worksite Weight Loss Intervention

Conrad P. Earnest, FACS¹, Timothy S. Church². ¹Texas A&M University, College Station, TX. ²ACAP Health and Pennington Biomedical Research Center, Dallas, TX and Baton Rouge, LA.
Reported Relationships: C.P. Earnest: Salary; Dr. Church is the Chief Medical Officer for ACAP Health. Contracted Research - Including Principle Investigator; Dr. Earnest was contracted by ACAP Health for the analysis, writing and presentation of this project.

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, -0.22, -0.18).* 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.

E-20 Clinical Case Slide - Head and Neck I

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

- 2461 **Chair:** Scott A. Paluska, FACS¹. Christie Clinic Sports Medicine, Champaign, IL.
 (No relationships reported)
- 2462 **Discussant:** Delmas Bolin, FACS¹. Performance Medicine of Southwestern Virginia, Roanoke, VA.
 (No relationships reported)
- 2463 **Discussant:** Tamerah N. Hunt, FACS¹. Georgia Southern University, Statesboro, GA.
 (No relationships reported)

2464 June 3, 9:30 AM - 9:50 AM
Closed Head Injury in a High School Football Player
 Adriana Isacke. *Maine Medical Center, Portland, ME.* (Sponsor: William Dexter, FACS¹)
 Email: isacka@mmc.org
 (No relationships reported)

History: 15 yo male football player presents to training room for evaluation of a concussion sustained during a game 4 days prior. The patient was hit helmet-to-helmet, had no loss of consciousness at that time. On the sideline, he felt dizzy and lightheaded, removed from contact and sent home. The following week he reported occasional balance problems and sensitivity to light. Denied nausea, vomiting, dizziness, fatigue, trouble sleeping, increased somnolence, sensitivity to noise, irritability, sadness, nervousness, numbness, tingling, difficulty concentrating, difficulty with memory, visual problems. The patient was asymptomatic x2 days. He began the return to play exercise protocol. He completed that protocol without return of symptoms and was cleared to return to contact 1.5 weeks after initial injury.
Physical Exam: Alert, oriented, cooperative. Strength 5/5 in upper and lower extremity bilaterally. Cranial Nerves II-XII intact, no dysdiadochokinesia, finger to nose accurate. Orientation 5/5, Immediate Memory 14/15, Concentration 9/12 with months, 7/7 on days of the week. BESS testing: 2 errors on single leg stance. 2 weeks after initial injury after a football game, he collapsed and lost consciousness. He regained consciousness shortly thereafter, was given a snack and diagnosed with hypoglycemia by the ATC. Two days later, he was at a party and with a strobe light and lost consciousness for 10 second with twitching. When the patient he arrived home, he had a headache. He walked in the front door and then fell to the ground, was cyanotic and twitching. He was post ictal for 10 minutes. He went to the Emergency Room.

Differential Diagnosis:
 Second Impact Syndrome
 Intracranial bleed
 Intracranial Mass
 Seizure Disorder
 Hypoglycemia
 Vasovagal syncope
 Arrhythmia

Tests and Results
 CT of the head without contrast: negative
 Referred to neurology
 EEG showed mildly abnormal with some left hemispheric sharp waves in the posterior temporal and central/parietal areas.
 MRI Brain without contrast: negative
Final/Working Diagnoses:
 Seizure Disorder
 Concussion
Treatment and Outcomes:
 The patient was removed contact sports after his third seizure episode He was placed on Kepra 500 BID. The patient will not be allowed to participate in contact sports until seizure disorder is under control, if at all.

2465 June 3, 9:50 AM - 10:10 AM
Exacerbation of Anxiety and Depression Symptoms following Concussion in a High School Softball Athlete.

Michael D. Clark, Kevin Carneiro, Melissa Fraser, Jason Mihalik, Kevin Guskiewicz, FACS¹. *University of North Carolina at Chapel Hill, Chapel Hill, NC.* (Sponsor: Kevin Guskiewicz, FACS¹)
 Email: michael_clark@med.unc.edu
 (No relationships reported)

HISTORY: A 16-year-old female softball athlete with a history of pre-pubertal migraines sustained a concussion while doing hill sprints. The injury coincided with a loss of consciousness and anterograde amnesia of 20-30 minutes. She presented to clinic six weeks post-injury with symptoms including headache, academic difficulty, and mood lability. Sleep habits were stable, though quality was reported as poor. Headaches occurred daily with variable intensity, were predominately frontal, and were exacerbated by cognitive effort and bright lights. A previously high-achieving student, she experienced difficulty in her classes, particularly foreign language studies. Patient reported pre-injury mood was poor, but had become more irritable than usual with frequent mood swings. Friends and family commented on her increased irritability. Social history significant for death of mother two years previously.
PHYSICAL EXAMINATION: Accommodation insufficiency and difficulty with smooth pursuit on visual examination. Cervical spine tenderness and reproduction of headache with palpation. Otherwise normal neurologic and musculoskeletal exams.
DIFFERENTIAL DIAGNOSIS:
 1.Post-concussion syndrome with visual dysfunction
 2.Depression or anxiety disorder exacerbated by trauma

TESTS AND RESULTS:

Sensory Organization Test:

-Composite score of 68 - abnormal Visual domain.

Computerized neurocognitive testing:

-Composite score of 48 (baseline 105).

-Multiple domains affected.

Patient Health Questionnaire-9:

-12 of 27 (baseline 7).

-21% age-adjusted positive predictive value for depressive disorder.

Generalized Anxiety Disorder-7:

-12 of 21 (baseline 9).

-Increased risk of generalized anxiety disorder.

Buffalo College Treadmill Testing:

-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.
3. Visual assessment and rehabilitation with neuro-optometrist.

2466 June 3, 10:10 AM - 10:30 AM

Head Injury in a Soccer Player

Kevin Ting, *Presence Resurrection Medical Center, Chicago, IL.*
(No relationships reported)

Head Injury - Soccer

History: 18 year old collegiate women's soccer player with a 2 day history of headache and anisocoria. She sustained a concussion 11 days prior to this evaluation after being kicked in the left occipital region during competition. Evaluation at that time revealed a normal neurologic and ophthalmologic exam. Her initial concussion symptoms, which included headache and difficulty focusing, had resolved by day 9 after injury. She denied any repeat trauma, visual complaints, confusion, lethargy, neck pain or neurologic changes. The athletic training staff noted that her anisocoria came and went with her headaches.

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 5mm 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/working 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.

2467 June 3, 10:30 AM - 10:50 AM

Rugby Union Collisions - Anticipate More Than Just Concussion

Pierre L. Viviers, FACS. *Stellenbosch University, Stellenbosch, South Africa.*

Email: plv@sun.ac.za

(No relationships reported)

History:

A 20 year old rugby player presented with complaints of severe headache and not feeling well. He noted a "funny feeling" of something moving at the side of his

skull when yawning. A concussion was diagnosed 3 days before. At the time he was immediately removed from the field of play and transferred to the side-line emergency room. He could not remember what happened on the field and was disoriented. There were no other abnormal neurological signs. He was referred to the hospital ER for further management. Further questioning confirmed dizziness, sensitivity to light, drowsiness with blurred vision and a pressure in his head. There were no predisposed conditions such as depression, ADHD, headaches, migraines or other psychiatric conditions. He uses no medications and is generally healthy. He confirmed a previous uncomplicated concussion 1 year ago. There was no applicable family history.

Physical Findings:

General observations and clinical examination were within normal limits. Swelling and skin discoloration of the left orbit was present. A subconjunctival bleeding of the left eye was prominent and severe bony tenderness over zygoma and temporal bone of the skull (left). Deep palpitation was impossible due to severe discomfort and bony tenderness. A detailed neurological examination did not prove structural brain injury and the funduscopy was normal. A SCAT 3 examination was performed with a symptom score of 13 and severity score of 57. Orientation, immediate memory and backwards digital memory was normal. The balance was impaired as well as the delayed recall memory.

Differential Diagnosis:

Concussion with facial fractures

Structural brain injury

Concussion with soft tissue contusion

Investigations:

Skull x-ray: crack fracture (frontal bone). Non-contrast CT of the brain: comminuted, depressed temporal fracture with haemorrhagic contusion and subdural hematoma, pneumocranium and orbital fracture (left).

Final Diagnosis:

Structural brain injury with left orbital and temporal fracture

Treatment and Outcomes:

The player was advised to rest completely and avoid driving or flying. He received standardized head injury advice. He withdrew from rugby for 6 months. Regular follow-up was scheduled. A discussion regarding further participation in contact or collision sport will follow.

2468 June 3, 10:50 AM - 11:10 AM

Facial Injury In An Elite Greco-Roman Wrestler

Michael Baria, *Mayo Clinic, Rochester, MN.* (Sponsor: Edward Laskowski, FACS)

Email: baria.michael@mayo.edu

(No relationships reported)

History

A 26 year old Greco-Roman wrestler was competing in an international event. During a high-amplitude throw, the opponent's shoulder landed on the athlete's face. He experienced immediate left facial pain and visual disturbance. His first comment was, "Is my eye still in?" Pain was localized to the infraorbital region. He had normal mentation, infraorbital tenderness to palpation, normal pupillary response and normal extraocular motion. He complained of diplopia with any eye motion and inability to perceive light in his left eye. His visual deficits resolved within minutes and his examination normalized. Tournament medical staff cleared the athlete to return to the match. After completion of the bout, the athlete was then taken to the locker room by USA staff and re-evaluated.

Physical Examination

Left infraorbital erythema, edema and tenderness to palpation. Mild subconjunctival hemorrhage.

Normal mentation. Normal visual fields and pupillary response. Lateral gaze normal. On upward gaze, he had both a binocular vertical diplopia and left eye upward gaze impairment. Infraorbital numbness.

Funduscopy exam was normal

Differential Diagnosis

Orbital blowout fracture

Zygomaticomaxillary complex fracture

Retinal detachment

Retinal hemorrhage

Intracranial injury / hemorrhage

Tests and Results

CT: left orbital floor blowout fracture with entrapment of inferior rectus

Final Working Diagnosis

Left orbital floor blowout fracture with herniation and entrapment of inferior rectus

Treatment and Outcomes

The patient was taken to the operating room for definitive management. There were no complications. Review of literature indicates that despite operative management, these athletes struggle with persistent diplopia and binocular visual field loss, which has significant return to play implications which should be considered when returning these athletes to their sport.

2469 June 3, 11:10 AM - 11:30 AM

A Case of Otorhea Induced by a Fall From a Skateboard

Jason Wilt, Cheree Padilla. *University of Florida, Gainesville, FL.*
 Email: jswilt29@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. Otoloscopic exam revealed what appeared to be a small bump with associated laceration, oozing blood. There was no hemotympany. 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.

DIFFERENTIAL DIAGNOSIS: 1. Basilar skull fracture. 2. Mandibular fracture. 3. Cervical spine fracture. 4. Foreign body introduced into ear canal from fall.

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. No other acute abnormality noted. These findings combined with a chin laceration suggest impact on the chin, with traumatic impaction of the mandibular condyle onto the mandibular fossa of the right temporal bone.

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 ciprofloxacin 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

2470 **Chair:** Anastasia Fischer, FACSM. Nationwide Children's Hospital, Columbus, OH.
 (No relationships reported)

2471 **Discussant:** Holly J. Benjamin, FACSM. University of Chicago, Chicago, IL.
 (No relationships reported)

2472 **Discussant:** Scott A. Magnes, FACSM. Lovell Federal Health Care Center, North Chicago, IL.
 (No relationships reported)

2473 June 3, 9:30 AM - 9:50 AM
Pelvis Injury - Running

Samuel T. Dona, Jr.¹, Terry L. Nicola, FACSM.² ¹Rush University Medical Center, Chicago, IL. ²University 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 hamstring 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 DIAGNOSIS:

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, periosteal reaction at the inferior ramus 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

McKenna J. Thurston, Tamara Huff, George G.A. Pujalte, FACSM. *Mayo Clinic, Jacksonville, FL.* (Sponsor: George Pujalte, FACSM)
 Email: thurston.mckennan@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, catching, or cracking 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

Peritrochanteric bone marrow edema on the coronal T2 MR images and a fracture line noted on coronal T1 imaging were consistent with a nondisplaced, right, basicervical hip fracture.

FINAL WORKING DIAGNOSIS:

Right basicervical femoral stress fracture

TREATMENT:

Operative fixation of right basicervical 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 50-K, May of 2015
5. Completed six 30+-mile runs and is training for 100-mile run

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:**PHYSICAL EXAMINATION:****DIFFERENTIAL DIAGNOSIS:****TEST AND RESULTS:****FINAL WORKING DIAGNOSIS:****TREATMENT AND OUTCOMES:**

HISTORY: 37 year old female presented with abrupt onset of right lateral hip pain following a routine 3 mile run on pavement. Patient reported running approximately 20-30 miles per week and was training for a half-marathon. There was no sentinel event during the run.

PHYSICAL EXAMINATION: Examination revealed patient to be able to rise from a seated position, stand with some degree of weight on right leg, and ambulate with antalgic gait. Right hip exam demonstrated the described pain to be located laterally and superior to, but not over the greater trochanter, not reproduced by palpation. No ecchymoses, bruising, or other skin changes noted; Reproduction of pain with active hip flexion and passive hip extension and extreme internal rotation; No pain or restriction with passive external rotation, flexion abduction external rotation, flexion adduction internal rotation, or 'hip loading' testing. +4/5 strength testing of hip flexion, extension, adduction, and abduction. No neurovascular involvement apparent. Peripheral pulses +2/4 globally. Abdominal exam demonstrated a soft, non-tender, non-distended abdomen with normoactive bowel sounds.

DIFFERENTIAL DIAGNOSES:

1. Femoral Neck Stress Fracture
2. Hip Labral Tear
3. Femoroacetabular Impingement
4. Trochanteric/Iliopsoas Bursitis
5. Iliotibial Band Tendinitis

TEST & RESULTS:

Anteroposterior and cross-table lateral hip radiographs:

- Fracture of base of right femoral neck, undisplaced; left hip normal

FINAL/WORKING DIAGNOSIS:

- Basicervical Femoral Neck Stress Fracture

TREATMENT AND OUTCOMES:

1. Percutaneous pinning of right femoral neck.
2. Post-operative progression, including repeat imaging six weeks after operation and transition to partial weight-bearing at that time.
3. Metabolic work up and dual energy x-ray absorptiometry scan to rule out any pathological cause.
4. Maintain aerobic activity and core muscle strengthening throughout rehabilitation process.
5. Anticipated return to recreational running in six months.

2476 June 3, 10:30 AM - 10:50 AM

Hip Pain-15 y/o Soccer Player

Heather L. Grothe¹, Louise Mattson², John Hill, FACSM¹.
¹University of Colorado, Denver, CO. ²University of Minnesota, Minneapolis, MN. (Sponsor: John Hill, DO, FACSM)
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(No relationships reported)

Hip Pain- 15 y/o soccer player**History:**

12 y/o soccer player presents to family medicine clinic with gradual onset of right hip pain for 1 week. Pain located over left lateral hip worse with walking and abduction movements. Able to play soccer through the pain. Denies a history of sudden onset, injury, trauma or mechanical symptoms. He was initially seen, diagnosed with a gluteus strain, and then returned to the clinic 2 weeks later due to worsening left hip pain, now unable to play soccer.

Physical Examination:

L Hip: TTP over greater trochanter and gluteus muscles. Non-TTP over the ASIS, AHS. Full, symmetric ROM at hip. 5/5 strength w/ flexion/extension/adduction at the hip. Painful resisted abduction, and w/ contraction of the gluteus medius. Negative

FABER, FADIR. Neg ober and snapping hip. Negative SLR, neural slump test.

Sensation intact and symmetric over L3, L4, L5 S1 dermatomes.

Differential Diagnosis:

1. Dystrophic soft-tissue calcification
2. Myositis ossificans
3. Extra-skeletal osteosarcoma
4. Soft tissue neoplasm

Tests and Results:

1. Xray L hip: Loculated calcification of the soft tissue lateral to left hip near AHS.

2. Labs: CBC wnl. CRP 5.2, Sed Rate 67

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 buttock mass: Low grade fibrous lesion with myxoid change. Immunohistochemistry results recommend FISH to r/o low grade fibromyxoid sarcoma

5. FISH Interphase: No evidence of FUS rearrangement

6. Pathology: Open biopsy of L buttock 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

2477 June 3, 10:50 AM - 11:10 AM

Just Playing Kick Ball.

Cathia Vazquez, John J. Tierney, Marissa 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 orchiectomy, 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 ttp 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 AHS. 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 AHS 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:

AHS/sub-spine impingement with mild femoral acetabular impingement and anterior superior labral tear.

Treatment:

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

Outcome:

1. Pending laparoscopic surgery.

2. Meanwhile in physical therapy to work on pelvic stability and strengthening, quadriceps and hamstring flexibility.
Return to Activity and Follow up:
Advised to return to activities as tolerated while he awaits 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.*
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(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), arm ergometer (AE), isometric bicep curl (IC), Illinois Agility test (IA), 2 kg medicine ball put (MP), 20 m sled drag (RP), standing long jump (LJ), 300 m spring (300), beep test (BT), 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)
Approximately 59 percent of the variability in the prediction (i.e. R2) of move under fire performance can be explained by the combination of the 8 PFT. The IA and PT were positively correlated with performance of move under fire while LJ, PU, SL, BT, MP, and AE were negatively correlated. **CONCLUSIONS:** To predict MUF performance eight PFTs are required. While these PFTs can be used to assess performance on multiple tasks, these data show that it may be more expedient to administer the MUF task itself.
The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.

**2479 Board #2 June 3, 9:30 AM - 11:00 AM
The Six Minute Walk Test in Mitochondrial Myopathy Patients**

Phillip S. Wyrick¹, Ronald G. Haller². ¹*Institute for Exercise and Environmental Medicine, Texas Health Presbyterian Hospital of Dallas, Dallas, TX.* ²*IEEM, Texas Health Presbyterian Hospital - Dallas & Department of Neurology and Neurotherapeutics, University of Texas Southwestern Medical Center, Dallas, TX.*
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(No relationships reported)

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; 30-71yr). **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 503 to 647m and the relative exercise intensity ranged from 70 to 100% of max HR. 6MWD was not highly correlated with pk VO₂ (p=0.267, r=0.541). **Conclusion:** The 6MWT is not a sensitive measure of functional capacity in this group of MM patients.

**2480 Board #3 June 3, 9:30 AM - 11:00 AM
Peak VO2 and 12:00 Walk Distance In Diabetics and Non-Diabetics In A Phase II Cardiac Rehab Program**

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(No relationships reported)

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. .

Peak VO ₂ and distance walked			
Variable	Diabetics	Non-Diabetics	p-value
Peak VO ₂ (ml/kg/min.)	17.7 + 4.3	21.2 + 5.7	< .0001
12 MWT distance (ft.)	3409.8 + 711.5	3027.0 + 615.2	< .0001

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.

**2481 Board #4 June 3, 9:30 AM - 11:00 AM
Exercise Test Duration does not Affect Obtained VO2max**

Gabriel Espinosa¹, Flávia Porto², Jonas Lirio Gurgel¹. ¹*Fluminense Federal University, Niterói, Brazil.* ²*Rio de Janeiro State University, Rio de Janeiro, Brazil.*
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(No relationships reported)

Individualized ramp-type protocols are one of the most used protocols to assess cardiorespiratory fitness. These are often programmed based on 10 min duration, which comes from the postulate that optimal exercise test should last between 8 and 12 min to elicit real maximal oxygen uptake (VO₂max) values. Nevertheless, there is no sufficient scientific support standing such affirmation, apparently. **PURPOSE:** Test the agreement of the VO₂max obtained from the incremental exercise test (IET), independently of test duration. **METHODS:** 10 healthy man participated in this study. Their mean age, weight, height, and VO₂max are 19.47±0.64 yrs, 64.24±7.48 kg, 171.29±6.44 cm, 57.55±3.13 mL.kg⁻¹.min⁻¹. The volunteers came five times to the laboratory. In the first visit, clinically examination and anthropometric measures were done. They also performed a TEI with an individualized ramp protocol on a treadmill. With the maximum velocity (VELmax) reached in the 1st test, we programmed other 4 IET for different time durations: 5 min (IET-5), 10 min (IET-10), 15 min (IET-15) and 20 min (IET-20). In every test, the start velocity was 50% of the VELmax obtained in the 1st, and the work rate increment was set considering the target time durations. Tests order were randomized and separated by 2-7days interval. The variables have the Normality tested by Shapiro-Wilk. Then an ANOVA for repeated measures for the duration and other for VELmax were applied, and also intraclass correlation (ICC) was used for VO₂max. **RESULTS:** Durations were significantly different among tests (p<0.001), IET-5 (6.32±0.33 min), IET-10 (10.25±0.79 min), IET-15 (14.42±0.95 min), IET-20 (17.91±0.85 min). As shorter the test were, higher were the maximal velocity reached (18.7±1.5 km·h⁻¹; 17.0±1.5 km·h⁻¹; 16.3±1.5 km·h⁻¹; 15.9±1.3 km·h⁻¹ for IET 5, 10, 15 and 20 respectively). However, the VO₂max kept stable from the IET-5 to the IET-20: 55.27±6.48; 54.2±5.86; 55.66±04.88; 55.70±4.22 mL·kg⁻¹·min⁻¹, ICC 0.948 (95%CI= 0.864 to 0.985).

CONCLUSIONS: Test duration inversely influences the maximal velocity reached with no VO₂max changes. The differences in VEL_{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.

2482 Board #5 June 3, 9:30 AM - 11:00 AM

Designing a Treadmill Ramp Protocol to Evaluate Aerobic Capacity of Ambulatory Hemiparetic Post-Stroke Patients

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(No relationships reported)

Patients who have had stroke often exhibit neurological and motor sequels 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 VO_{2max} 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 VO_{2peak} (20.3 ± 6.1 vs. 18.6 ± 5.0 ml.kg.min⁻¹; P= 0.04), 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; P0.05), the current protocol produced lower standard errors of estimate for HR vs. workload (2.95 ± 1.3 vs. 3.82 ± 1.0; 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.

2483 Board #6 June 3, 9:30 AM - 11:00 AM

Determining the Minimal Clinically Important Difference for Six-Minute Walk Distance in Fibromyalgia

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(No relationships reported)

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 of fibromyalgia (FM), the minimum amount of change in 6-minute walk distance (6MWD) necessary for patients to perceive an improvement in functional status remains unknown.

PURPOSE: To estimate the minimal clinically important difference (MCID) for 6MWD in patients with FM.

METHODS: Data from a recently completed trial that included 187 patients who completed the 6MWT, Fibromyalgia Impact Questionnaire (FIQ), and Short-Form 36 (SF36) at 12 and 36 weeks were used to examine longitudinal changes in 6MWD. An anchor-based approach that used linear regression analyses was used to determine the MCID for 6MWD, using the total FIQ score (FIQ-Total) and SF36-physical function domain (SF36-PF) as clinical anchors.

RESULTS: The mean (SD) change in 6MWD from baseline to week 36 was 34.4 (65.2) m (p<0.001). The anchor-based MCID's for the 6MWD were 156 m and 167 m for the FIQ and SF36-PF, respectively. These MCID's correspond with clinically meaningful improvements in FIQ (14% reduction) and SF36-PF (10 point increase). **CONCLUSIONS:** In a group of patients with FM, the MCID for 6MWD was 156 to 167 m. Establishment of the MCID for 6MWD would aid the clinician's ability to interpret improvement in measures of functional status after the implementation of a particular treatment. Further, these findings will aid clinicians in goal setting for patients with FM and help researchers in the design of clinical trials that use 6MWD as an outcome measure.

E-23 Free Communication/Poster - Age and Muscle

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

2484 Board #7 June 3, 9:30 AM - 11:00 AM

Chronic Amateur Endurance Practice Improves Oxidative Stress Response For Preserving Muscle Mass In Senior Adults

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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 lifelong physical activity practices. Methods: Twenty-three healthy senior men (60±1.88 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). Blood sampling was performed at rest to analyze plasma malondialdehyde by 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 method 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 v.22. Results: The lowest value of malondialdehyde was shown in the Amateur group. The nuclear DNA-damage was significantly lower in Recreational group than in the Sedentary and Amateur groups (MD=5.53±1.70; p=0.013. MD=5.61±1.62; p=0.008), respectively. Amateur group showed trends toward higher glutathione peroxidase enzymatic activity than Recreational and Sedentary groups. Alpha-actin levels were significantly higher in Amateur compared with Recreational (MD=4.34±0.46; p<0.001) and Sedentary groups (MD=4.89±0.46; p<0.001). Sedentary group presented a significant lower muscle mass (MD=3.67±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).

2485 Board #8 June 3, 9:30 AM - 11:00 AM

Physical Activity and Fitness Level are Associated with Superoxide Dismutase in Older Adults

Mike A. Deal, Lisa C. Tagariello, Adam Meisler, Jenna M. Karrow, Gabrielle Volk, Kyle L. Timmerman. *Miami University, Oxford, OH.* (Sponsor: Helaine Alessio, FACSM)
(No relationships reported)

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 (M/F = 9/17, age=68±4y, BMI=26±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 (Amsbio, 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 VO_{2max} values were 1640±231 kcal·wk⁻¹ and 30±6 ml·kg⁻¹·min⁻¹, respectively. The mean values for skeletal muscle SOD and serum 8-OHdG were 1.3±0.06 arbitrary units and 88.8±4.0 nM, respectively. There were significant

($p < 0.05$) correlations between the following: PA and SOD ($r = 0.53$), CRF and SOD ($r = 0.45$), and MVPA and 8-OHdG ($r = -0.60$). 8-OHdG was not significantly correlated with either CRF or SOD. **CONCLUSIONS:** These data suggest that the skeletal muscle endogenous antioxidant expression and oxidative damage are associated with PA level in older adults. Thus, higher PA level in older adults may be protective against free-radical oxidative damage due to higher expression of endogenous antioxidants.

2486 Board #9 June 3, 9:30 AM - 11:00 AM
Low Knee Extensor Strength Limits Walking Functional Reserve Capacity of Older Adults

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 (No relationships reported)

In older adults, low strength is related to fall risk, mobility limitation, difficulty performing activities of daily living, and low levels of physical activity. **PURPOSE:** To determine if low strength contributes to walking difficulty of older adults by limiting functional reserve capacities. **METHODS:** Twenty-seven, men and women, 70.5 ± 5.5 yr, 1.66 ± 0.11 m, 79.7 ± 23.6 kg, performed three maximal voluntary isometric knee extensions on both the right and left legs. The peak knee extensor torque was averaged across contractions and normalized to body mass. Low strength (LS, $n = 15$) and normal strength (NS, $n = 12$) groups were identified using established knee extensor torque thresholds of 1.34 Nm kg^{-1} for women and 1.71 Nm kg^{-1} for men. Participants then walked on an instrumented gait analysis treadmill at self-selected preferred and maximal speeds while the vertical ground reaction force was recorded for the determination of peak weight acceptance and push-off forces. Concurrently, the peak of the rectified and integrated electromyogram signal was recorded from the vastus lateralis and gastrocnemius lateralis muscles to determine the level of muscle activation. Group differences were compared using a one-way ANOVA, $p < 0.05$. **RESULTS:** Preferred walking speed was similar between LS ($1.24 \pm 0.24 \text{ m s}^{-1}$) and NS ($1.42 \pm 0.23 \text{ m s}^{-1}$, $p = 0.069$) whereas maximal speed was 38% slower in LS ($1.35 \pm 0.32 \text{ m s}^{-1}$ vs. $1.74 \pm 0.35 \text{ m s}^{-1}$, $p = 0.006$). When expressed as a percentage of maximal, preferred speed was $92 \pm 10\%$ of maximal for LS and $82 \pm 14\%$ for NS ($p = 0.055$). At preferred walking speed, peak weight acceptance force was $95 \pm 7\%$ of maximal for LS vs. $88 \pm 9\%$ for NS ($p = 0.045$), push-off force $99 \pm 7\%$ vs. $98 \pm 8\%$ ($p = 0.831$), vastus lateralis activation $72 \pm 28\%$ vs. $55 \pm 15\%$ ($p = 0.076$), and gastrocnemius lateralis activation was $72 \pm 25\%$ vs. $51 \pm 18\%$ ($p = 0.019$), respectively. **CONCLUSIONS:** When walking at preferred speed, older adults with low strength have limited reserve speed capacity, utilize a higher proportion of their lower extremity force capacity, and activate their lower extremity muscles to a greater degree than older adults with normal strength. Walking at a high percentage of functional capacity likely increases the effort of ambulation and contributes to walking difficulty in older adults with low strength.

2487 Board #10 June 3, 9:30 AM - 11:00 AM
Anterior Rectus Femoris Electromyographic Characterization in Mexican Elderly

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From age 65 the risk of falls in the elderly is 5%, increasing with age up to 50% at 85. One reason is sarcopenia, whose prevalence increases by 3% annually. In terms of function, this means decreased strength, tone, and muscle mass; which translate in deficit of the stability of walking function, making it difficult for older adults exercise on ground. Surface electromyography of the anterior rectus femoris (ARF) allows the functional characterization, estimating the likelihood of falls and scheduling preventive measures in an increasingly broad sector of the Mexican population. Up to date no electrophysiological studies have been reported in the population of interest. **PURPOSE:** to characterize electromyographically the anterior rectus femoris in Mexican Elder. **METHODS:** prospective, descriptive, and cross-sectional study in 71 adults attending regularly to a geriatric center in Leon, Mexico. Being previously informed, participants signed consent. Electrophysiological records were obtained setting three surface electrodes on previous cleaned and scrubbed skin; impedances were always lower than 5 Ohms. The active electrode placed on the motor point of the right ARF muscle. The reference electrode collocated on the posterior face of thigh, and the ground electrode on the lateral femoral condyle. Records were done by duplicate at maximal voluntary contraction (MVC) of the ARF muscle, against force opposition. Recording time in MVC was 5 s. 2 min of rest between records was allowed. The power (root mean square, RMS) of the signals was obtained. Descriptive statistics was used to analyze results.

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 developed for public health authorities. In young adults it could help to prevent muscle function deterioration; mean while in elder adults to maintain and recover muscle force.

2488 Board #11 June 3, 9:30 AM - 11:00 AM
The Effect of Running Status on Muscle Quality in Older Adults

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 (No relationships reported)

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 adult 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 relative to muscle size). **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 $p \leq 0.1$. 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 by activity group or in females, while there was a significant linear relationship in males ($p = .06$, $r = -.8$). **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 #.					
Velocity (°/sec)	Runners		Sedentary		p-value
	Mean (Nm/cm ³)	SD	Mean (Nm/cm ³)	SD	
-270	0.15	0.03	0.20	0.03	0.95
-180	0.15	0.03	0.16	0.04	
-90	0.16	0.04	0.19	0.03	
0	0.11	0.02	0.16	0.03	<0.001
90	0.09	0.02	0.11	0.02	
180	0.08	0.02	0.09	0.03	
270	0.07	0.02	0.07	0.03	

2489 Board #12 June 3, 9:30 AM - 11:00 AM
In Situ Force-Sarcomere Length Relationship in Old Rats

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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-L) relationship as related to SL during electrically evoked tetanic contractions in the rat medial gastrocnemius (MG). **METHODS:** Two groups of Fisher344xBN rats were used; young (7-8 mo.) ($n = 9$) and old (30-35 mo.) ($n = 10$). The MG was isolated surgically, attached in series to a

muscle puller and force transducer. The tibial nerve was electrically stimulated via a nerve cuff. Contractions were evoked at 200 Hz for 250 ms separated by 2 min rest across muscle lengths corresponding to the: ascending, plateau, and descending limb of the F-L relationship. The rats were then sacrificed and the hind limb was placed immediately in 10% Formalin (fixative) at the muscle length corresponding to peak force ($L_{0.5}$). After 1 h of fixation, the MG was secured to a stick and allowed to fix for 2 weeks. The muscle was then dissected into 4 lengthwise sections medial and lateral to the longitudinal axis of the muscle. After a 4 hour, 30% nitric acid digestion process, 5 individual fascicles from each muscle section were isolated and placed on slides for SL measurement at 5 locations along the fascicle by laser diffraction. **RESULTS:** At $L_{0.5}$ muscle fascicles were ~14% shorter in old compared to young, with no difference in average SL, resulting in ~10% fewer sarcomeres in series in the old. Peak tetanic force (N) was ~18% lower in the old as compared with young. Upon activation, SL was not different between young and old on the ascending limb or plateau region of the F-L relationship but was ~20% longer in old on the descending limb. Upon accounting for passive force, the old had a smaller plateau region as compared with young. **CONCLUSION:** The functional consequences of these age related changes could be a reduced range of motion for older adults and less force production capacity throughout that range of motion (particularly long muscle lengths) to perform activities of daily living.

Supported by: NSERC and CIHR

2490 Board #13 June 3, 9:30 AM - 11:00 AM

Age-related Decline in Handgrip Strength and Loss of Forearm Muscle Size and/or Muscle Quality in Men

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Age-related decline in handgrip 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 quality (MQ) was defined as a ratio of HGS to MT-ulna. A one-way ANOVA determined differences between 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 [7.5] 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 33.4 [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 age 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 HGS in each age group ($r = 0.344-0.759$).

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/MQ and mortality.

2491 Board #14 June 3, 9:30 AM - 11:00 AM

The Influence Of Muscle Architecture On The Age-Related Changes In Maximal And Rapid Strength

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Although age-related reductions in muscular strength have been well documented, few studies have examined the specific muscle architecture variables that contribute to the age-related reductions in both maximal and rapid strength.

PURPOSE: The purpose of this study was to examine the influence of the medial gastrocnemius architecture on the age-related changes in maximal and rapid strength.

METHODS: Thirty-three healthy young (20.8±2.4 yrs) and nineteen older (69.2±3.2 yrs) recreationally-active men performed two maximal plantar flexion isometric muscle actions on a calibrated isokinetic dynamometer. Maximal strength, or isometric peak torque (PT), was calculated as the highest 500ms value. Rapid strength, or the peak rate of torque development (RTDpeak), was calculated as the peak value of the first derivative of the ascending phase of the torque-time curve. Panoramic brightness-mode ultrasound (US) images of the medial gastrocnemius (MG) were taken to determine anatomical muscle size (CSA), subcutaneous fat corrected echo intensity (EI) to represent muscle quality, pennation angle (PA), and fascicle length (FL). Participants lay prone with their right leg fully extended and their ankle joint secured at 90°. The US probe was perpendicularly moved along the transverse plane of the MG for the CSA and EI measurements, whereas the PA and FL measurements were obtained along the fascicle plane. All US assessments were analyzed with Image-J software. Independent t-tests were performed on all variables to examine differences between the young and older men and the Pearson's correlation coefficient was used to examine the relationship between PT and RTDpeak and all the muscle architecture variables. An alpha of $P \leq 0.05$ was used to determine statistical significance.

RESULTS: The older men had lower PT ($P < 0.001$), RTDpeak ($P < 0.001$), and PA ($P = 0.006$), and higher EI ($P < 0.001$) values when compared to the young men. There were significant relationships between PT and EI ($r = -0.519$, $P < 0.001$) and PA ($r = 0.381$, $P = 0.005$). There was also a significant relationship between RTDpeak and EI ($r = 0.429$, $P = 0.001$).

CONCLUSIONS: The age-related reductions in maximal strength appear to be due to changes in muscle quality and PA, whereas the reduction in rapid strength is likely due to alterations in muscle quality.

2492 Board #15 June 3, 9:30 AM - 11:00 AM

Hand Grip and Knee Extension Force Characterization in a Sample of Elder Mexicans.

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Muscle strength is a key component of physical functionality (PF) in human beings. PF decreases with advancing age, and has been related to the loss of muscle tissue denominated sarcopenia, causing frailty and disability in the elderly. In Mexico, other factors like modern lifestyle, progressing to sedentarism, feeding patterns becoming predominantly to industrial processed foods, rich in saturated fats, carbohydrates and salt, have driven the ageing population to high prevalence of obesity, diabetes mellitus and hypertension. In addition, the attention to the elderly is incipient, without health preventive programs addressed to such sector of the general population. The sum of the above mentioned factors makes of importance to characterize the strength of Mexican elder people. **PURPOSE:** to characterize the hand grip and knee extension strength in a sample of Mexican elder to be compared with internationally reported values. **METHODS:** a descriptive, transverse and correlational study of a group of 129 persons attending an open invitation to elder people (250) affiliated and assisting regularly to a gerontology centre. The knee extension and hand grip strengths (KES and HGS, respectively) were measured by dynamometry. To characterize the sample, body weight (BW), height, circumferences of the right arm (rAC) and right thigh (rTC), as well as skin folds were measured. Data was used to calculate body fat percentage (BF%), and body mass index (BMI).

RESULTS: all expressed as mean ± s.d. were, age of the sample 70.1 ± 6.4 years; height 162 ± 0.1 cm; weight 67.2 ± 11.7 kg; BMI 28.7 ± 5.1 kg/m². Mean rAC was 30.8 ± 6.0, while rTC was 50.6 ± 7.0 TC of KES (right/left) were 14.9 ± 5.2/14.4 ± 5.5 kg, while HGS, in the same order were 14.9 ± 5.1/14.4 ± 5.5 kg. A significant correlation was found between muscle strength and age, for the right knee (Spearman, $p = 0.001$, $r = -0.286$).

CONCLUSIONS: the results obtained indicate that muscle strength in Mexican elder people is reduced and lower than the values found in other international populations.

2493 Board #16 June 3, 9:30 AM - 11:00 AM

Sarcopenic Obesity Alters Ecm-related Gene Expression In Mouse Skeletal Muscle

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(No relationships reported)

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 C57/BL6J 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 9-fold increase in collagen I gene expression in young HFD mice compared to young lean mice ($p < 0.05$). However, there was no difference 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 a 73% reduction in collagen III in aged HFD mice compared to aged lean mice ($p < 0.05$). There was a 2-fold increase in fibronectin 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.

2494 Board #17 June 3, 9:30 AM - 11:00 AM

Hand-grip Strength Relates to Total-Body Muscle Strength Among Older Adults

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(No relationships reported)

Skeletal muscle mass reductions are inherent with age. Synergistically, as muscle strength depreciates, maximal strength assessments become difficult to complete. Hand-grip strength has been used as a non-invasive strength measure, but has not been well examined in relation to total-body strength, as assessed by one repetition (1-RM) maximum. **PURPOSE:** The purpose of this study was to examine hand-grip strength as it relates to total-body strength among older adults.

METHODS: Participants included 57 adults aged 78.2 ± 6.6 years. Hand-grip strength was assessed with use of a hand-grip dynamometer, and the summation of maximal right and left hand values indicative of total hand-grip strength. Total-body strength was assessed with one repetition maximum (1-RM) testing of the following exercises: chest press, seated row, shoulder press, biceps curl, triceps extension, knee extension, and knee curl. Maximal total-body strength was indicated by the summation of all 1-RM values.

RESULTS: There was a strong, positive correlation between hand-grip strength and total-body muscle strength ($r = .847, p < .001$). Examining handedness, grip strength of both the right and left hands were also positively correlated to total-body muscle strength among men (right: $r = .469$; left: $r = .526$) and women (right: $r = .517$; left: $r = .623$).

CONCLUSIONS: Hand-grip strength is positively correlated with total-body muscle strength, as assessed by 1-RM. Regardless of handedness, hand-grip remains positively correlated to overall body strength. As such, hand-grip strength assessment provides a convenient and cost effective approach to assessment of total body muscle strength and functional depreciation with age.

2495 Board #18 June 3, 9:30 AM - 11:00 AM
Musculoskeletal Alterations And Complaints Found In A Sample Of Elder Mexicans.

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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 not previous reports on musculoskeletal's characteristics nor 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 exam. They also answered a modified version of the Standardised Nordic Questionnaire for Musculoskeletal Symptoms. Data were 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 MSC. 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, MSC and MSA 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.

2496 Board #19 June 3, 9:30 AM - 11:00 AM

Age-Associated Protein Aggregation in Skeletal Muscle

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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 spectroscopy. 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 Elongation 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 $30 \pm 6\%$ ($P < 0.01$) 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 Mouse**

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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 associated 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 presented by group since there was no sex difference within group. **RESULTS:** Exercise dams ran an average of 7.22 ± 0.41 km/day until mid-pregnancy and gradually decreased to low levels (1.39 ± 0.43 km/day) through the remainder of gestation. Weight gain during pregnancy was not significantly different between exercise (14.45 ± 0.99 g) and sedentary (15.99 ± 1.13 g) pregnant dams. There were no significant differences in litter size, sex distribution, and average fetal body weight per litter between sedentary and exercise dams. Genes associated with mitochondrial biogenesis, including Pparg1a (peroxisome proliferator-activated receptor gamma, coactivator 1 alpha), Nrf1 (nuclear respiratory factor-1), and Nrf2 (nuclear respiratory factor-2) were significantly upregulated in fetuses from exercise dams. **CONCLUSION:** Although total kilometers run per day (km/day) were significantly decreased in later stage of pregnancy, maternal exercise initiated at day 1 of gestation significantly increased genes associated with mitochondria 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**

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Cardioprotection induced by exercise preconditioning involves downregulation of LC3II/I and K_{ATP} channel subunits SUR2A

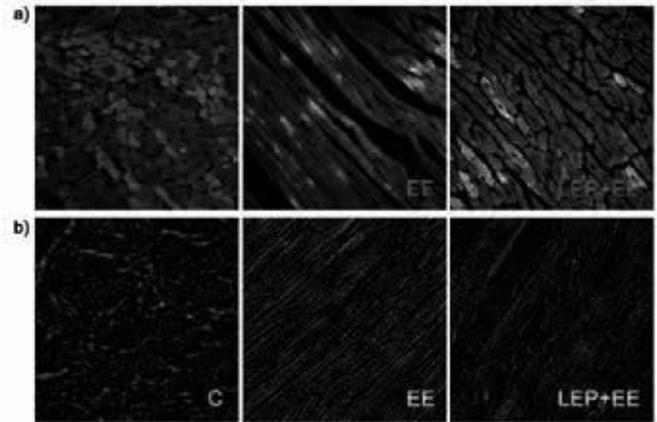
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The cardioprotective effects of exercise preconditioning (EP) in late phase has been proved, while the intracellular mechanism still under investigation. Evidences showed activation of autophagy and sarcolemmal K_{ATP} channel took effect in myocardial protection. **PURPOSE:** This research was aimed to probe the alteration of autophagy-related LC3 and K_{ATP} 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 K_{ATP} channels are involved in late cardioprotection against exhaustive exercise in rats through the downregulation of LC3II/I and SUR2A.

Supported by the National Natural Science Foundation of China (Grant No. 31471136)



Immunofluorescence results in myocardium $\times 400$

a) LC3 was localized in cytoplasm with bright green in cardiomyocytes. b) SUR2A was present in the cell membrane as well as in the striated pattern with bright red in cardiomyocytes. C, control group; EE, exhaustive exercise group; LEP+EE, late exercise preconditioning plus exhaustive exercise group.

**2499 Board #22 June 3, 9:30 AM - 11:00 AM
High Cardiorespiratory Fitness Alleviates the Negative Impact of Increasing Sitting Time on CD31+ T-Cell Number**

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(No relationships reported)

Sitting time and other forms of physical inactivity are associated with ill-effects on cardiovascular health. Short periods of physical inactivity result in reductions in insulin sensitivity as well as vascular function. Circulating CD31⁺ T-cells (T_{ANG}) possess significant pro-angiogenic capabilities and may contribute to maintenance of endothelial function. These cells can be influenced by cardiorespiratory fitness level (CRF) and thus may also be affected by physical inactivity. Therefore any effect of sitting time has on these cells needs to be investigated.

PURPOSE: To determine the effects of sitting time on T_{ANG} number and to investigate if high levels of CRF attenuates any impact of sedentary behaviour on these cells. **METHODS:** Self-reported sitting time data was collected from 42 healthy males aged 31-65yrs. CRF was estimated in the participants through the use of a submaximal cycling ergometer test. T_{ANG} were quantified by flow cytometry in a resting blood sample, defined as co-expression of CD3 and CD31. These cells were further characterised using antibodies against CD4 and CD8. Cell surface expression of CXCR4 was also quantified. Linear regressions were performed to examine association between T_{ANG} and self-reported sitting time and CRF individually, and where appropriate, hierarchical multiple level regressions were performed. **RESULTS:** Self-reported sitting time was inversely associated with T_{ANG} number ($r = -0.291$, $p < 0.05$). After correcting for VO_{2max} (CRF), sitting time was no longer associated with these CD31⁺ T-cells (from $t = -1.924$, $p = 0.061$ to $t = -1.153$, $p = 0.256$). This was attributed to the positive impact of CRF on CD4⁺ T_{ANG} cells (from $t = -1.838$, $p = 0.074$ to $t = -1.144$, $p = 0.260$). Increasing levels of sitting time was associated with an increase in CXCR4 expression on CD4⁺ T_{ANG} cells, with no effect on CD8⁺ T_{ANG} cells. The effects of sitting time was observed in the absence of any effect on cardiometabolic risk factors such as fasting glucose, blood pressure, cholesterol and IL-6.

CONCLUSION: Sitting time is associated with a decreased level of CD31⁺ T-cells, however this effect is alleviated by correcting for CRF levels, indicating that maintaining high levels of aerobic fitness can attenuate negative impact of physical activity on this subset of circulating angiogenic cells.

2500 Board #23 June 3, 9:30 AM - 11:00 AM
Aging And Obesity: Mitochondrial mRNA Translation At The Heart Of The Problem

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(No relationships reported)

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 detriments in 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-IV), biogenesis (PGC-1 α , TFAM), mitochondrial mRNA translation machinery (12S and 16S rRNAs, mtF2/3, 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-1 α was ~100% higher in YO compared to YL (p<0.05) and ~75% higher in AL vs. YL (p0.05). 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). mtF2 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.

2501 Board #24 June 3, 9:30 AM - 11:00 AM
Effects of Physiological Oxygen Tension on In Vitro Fluid Shear Stress-Induced endothelial NO Synthase Activation

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Unidirectional laminar shear stress (LSS) induces downregulation of endothelial aerobic respiration by accelerating peroxynitrite formation in vascular endothelial cells (ECs). However, these in vitro studies have been carried out under ambient oxygen condition (21% O₂) which is notably above the physiological levels (5-13% O₂). Knowledge underscoring the effect of physiological oxygen tension on eNOS activation and NO production will help to better understand the biological implication of EC response to LSS. **PURPOSE:** To determine the effect of physiological levels of oxygen tension (5% and 10% O₂), compared with conventional hyperoxic ambient oxygen tension (21% O₂), on eNOS activation under LSS in ECs. **METHODS:** Human umbilical vein endothelial cells (HUVECs) were subjected to physiological level of LSS (15 dyne/cm²) for 24 hrs using a cone-and-plate shear apparatus under 21% O₂ (ambient oxygen), 10% O₂ (simulating arterial blood), or 5% O₂ (simulating venous blood). HUVECs were maintained for three passages under the designated O₂ conditions prior to the shear experiments to prevent an acute hypoxic effect. Protein samples were collected in ice-cold RIPA lysis buffer and resolved by SDS-PAGE, and transferred to PVDF membrane for standard western blotting. **RESULTS:** HUVECs presented typical cobble-stone shapes, and the size and morphology were indistinguishable among the cells grown under different oxygen tensions. The growth rate was slightly higher at 10% O₂ at low confluency (< 30%) but similar at higher confluency (60 - 100%). Basal eNOS levels were marginally higher in 5% and 10% O₂ compared to those in 21% O₂. In all oxygen conditions, we observed eNOS phosphorylation via Ser1177, a prototypic regulatory phosphorylation site, as early as 5 min after shear stimulation. During the early shear response (5, 15, 30, 60 min), the pattern of eNOS phosphorylation at the Ser633 residue was comparable. However, after 24 hrs of LSS, the levels of eNOS protein expression and eNOS phosphorylation at both Ser1177 and Ser633 were 2-3 fold higher in 10% O₂ compared to that of 21%

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

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

2502 Board #25 June 3, 11:00 AM - 12:30 PM
Influence Of Social Support On Adherence And Compliance With Recommendations Of Healthy Practice

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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 (FaS) and friends support (FrS) on the stages of change (SC) for healthy physical activity based on the recommendations of the ACSM. **METHOD:** A total of 533 subjects (48% female and 51.8% male; 33.22 \pm 15.27; range = 11-76). The social support scale (family and friends) and the questionnaire of the stages of change for physical activity were used. Both instruments were translated into Spanish from Mexico. **RESULTS:** The internal consistency of the subscales of FaS (alpha = .81) and FrS (alpha = .83) were satisfactory. The results of One-Way ANOVA revealed significant differences in the FaS ($F(4,524) = 5.935, p < .001$) and FrS ($F(4,508) = 10.755, p < .001$) in different SC. The Tukey's test indicated that people in the PC (2.14 \pm .84) received less FaS than those found in the P (2.58 \pm .944), A (2.60 \pm .960) and M (2.61 \pm .928). On the other hand, people in the PC (2.33 \pm .884) showed lower scores of FrS than those in the stages of M (2.92 \pm .994) and A (3.03 \pm .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).

2503 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.

Mynor G. Rodriguez-Hernandez, Shelby Foote, James McDonald, David D. Pascoe, FACSM, Danielle D. Wadsworth. *Auburn University, Auburn, AL.* (Sponsor: David D. Pascoe, FACSM)

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(No relationships reported)

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 \pm 7.4) participated in a 10-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 one week before 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

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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(No relationships reported)

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 or women do not want to perform resistive 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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(No relationships reported)

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 Well 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 bodily discomfort (0-100 scale) prior to and during each minute of the 6MWT. RPE was also recorded at the end of the walk. An SPA index was created by subtracting the initial bodily discomfort ratings from the peak ratings. Measures of average moderate to vigorous physical activity (MVPA) and steps per day were obtained and recorded from the accelerometer. Each dependent variable was analyzed with a hierarchical linear regression with SPA as the final predictor. **RESULTS:** Sixty percent of older adults experienced SPA (25/42), with an average SPA of 9.5±15.6. After accounting for age, sex, BMI and meters walked on the 6MWT, SPA significantly predicted steps per day, (R^2 change=13%, $\beta = -.37$), MVPA per day (R^2 change=10%, $\beta = -.33$), RPE on the 6MWT (R^2 change=30%, $\beta = .55$), and severity (R^2 change=8%, $\beta = .31$) and frequency (R^2 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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(No relationships reported)

PURPOSE: To determine if male participants in a fitness facility had negative perceptions of women performing strength training

METHODS: This study examined male responses to selected questions given in a university-wide electronic survey which identified the practices, preferences, knowledge, attitudes and barriers to strength training participation of young college aged students. This study mainly focused on the questions that pertained directly to women performing strength training and the male responses to those questions. A total of 179 males, between the ages of 18 and 32, responded to the survey. Twelve questions were examined. Statistics were calculated based on the men's frequency of responses for each of those twelve questions.

RESULTS: Approximately 62% marked "False" when asked if strength training causes women to "bulk up". When asked if strength training takes away from a woman's femininity, 81% responded that they disagreed or strongly disagreed. When asked if strength training is primarily a macho male activity, 67% either disagreed or strongly disagreed. When asked if strength training negatively impacts a woman's physique, 75% either disagreed or strongly disagreed. When asked if women should perform different exercises while strength training than men, 63% marked "False".

CONCLUSIONS: These findings suggest that the men's beliefs are supportive of women participating in resistance training. There are many benefits that could potentially be gained in order to optimize the health of college aged female women by strength training. Addressing barriers to women's participation in resistance training is important because research shows low participation, in spite of the documented benefits.

2507 Board #30 June 3, 11:00 AM - 12:30 PM

Feeling Measures and Cognitive Beliefs as Predictors of Physical Activity

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(No relationships reported)

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 feeling 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 belief 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 significance. Logistic regression will be completed upon completion of data collection, but preliminary results suggest that positive cognitive beliefs ($p = .090$) and positive feelings ($p = .087$) 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).

2508 Board #31 June 3, 11:00 AM - 12:30 PM

Influence Of Self-efficacy On The Enjoyment And Fulfillment Of The Recommendations Of The Acsm

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*(No relationships reported)***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 ($F_{(4,524)} = 23.775, p < .001$) and E ($F_{(4,523)} = 20.842, p < .001$) in different EC. The Tukey's test indicated that people in M and A perceived more SE than those in P, C and PC; people in A and P perceived higher SE than those in C and PC; and people in P and C showed high levels of SE than those in the PC. Meanwhile, people in M had higher E than those in P, A, C and PC; and people in P, A, and C showed higher levels of E than those in PC. The relation of E vs SE was significant ($F_{(1,528)} = 109.403, p < .001$). **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 PAICYT, 2015 (UANL).

2509 Board #32 June 3, 11:00 AM - 12:30 PM

Neuro-electric And Behavioral Differences Between Yoga Practitioners And Novices During A Cognitive Control Task

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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, alongside 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 ($F(1,19)=31.99, p<0.001, \eta^2=0.63$). All subjects, regardless of group, responded more accurately on congruent trials (98±0.5%) than on incongruent trials (87.5±0.2%). There were also main effects of congruency ($F(1,19)=121.14, p<0.001, \eta^2=0.86$) and group ($F(1,19)=6.28, p=0.021, \eta^2=0.625$) 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, and will continue to be studied.

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.

2510 Board #33 June 3, 11:00 AM - 12:30 PM

Fighting Crime and Inactivity: Using Individual Differences as Predictors of Physical Performance and Fitness in Police Recruits

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First responders are often exposed to highly demanding physical and mental situations. Specifically, police officers are required to react quickly and effectively to a wide variety of work related duties and situations. With such physically demanding jobs, it seems instrumental to explore factors that may influence a police officer's physical capabilities. **PURPOSE:** Determine the extent to which individual difference factors can predict muscular strength, muscular endurance, and fitness. **METHODS:** Participants were police recruits (N=239; 215 male; 27.30±5.5 yrs *M±SD* age) from the University of Illinois Police Training Institute (PTI) who completed baseline fitness assessments [1.5-mi run; 1 rep max (1RM) bench press; 60 sec sit-up and push-up tests] as well as measures of dispositional resilience (with components of Commitment, Control, & Challenge) and preference (Pref) for and tolerance (Tol) of high intensity exercise. **RESULTS:** Performance on the fitness assessments resulted in: 1.5-mi run time= 12:28±1:25; 1 RM= 111.7±30.3 kg; Sit-ups= 43.6±7.4; Push-ups= 44.9±14.2. After accounting for age and BMI, Pref predicted an additional 5.4% ($P=0.006$), 5.5% ($P=0.001$), 3.7% ($P=0.003$), and 5.9% ($P=0.009$) unique variance on the 1.5-mi run test, bench press, sit-up, and push-up tests, respectively. Tol predicted an additional 6.0% variance on the 1.5-mi run test ($P=0.004$), after accounting for age and BMI. Challenge accounted for 5.1% unique variance in 1.5-mi run time ($P=0.009$), after accounting for age and BMI, and Commitment accounted for 3.4% variance in sit ups ($P=0.042$), after accounting for age and BMI. **CONCLUSIONS:** The present study highlights the importance individual difference factors play at a fundamental level of fitness in recruit police officers (i.e., accounting for part of variation in physical performance). Preference was able to predict a significant variance in muscular strength, endurance, and overall measures of fitness. As mentioned previously, police officers need to perform their work related duties at an optimal level and further understanding of individual difference factors may help in the recruitment and training of future police officers.

2511 Board #34 June 3, 11:00 AM - 12:30 PM

Stress, Psychological Well-being And Dietary Quality In College Women: Examining The Confounding Factors Of Physical Activity And Sleep

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PURPOSE: The purpose of this study was to examine the relationship between overall psychological well-being and stress on diet quality in young adult women. We also examined the potential confounding influence of physical activity and sleep on these relationships.

METHODS: Participants included 351 women university students (20.2 ± 1.6 y). The study was cross-sectional. Psychological well-being was assessed using the General Well-being Schedule (GWB) and the Perceived Stress Scale (PSS). Diet was assessed using three 24-hour recalls over a seven day period. The Healthy Eating Index (HEI) was used to assess diet quality. Physical activity (PA) and sleep were objectively measured using accelerometers over seven consecutive days.

RESULTS: The average HEI score was 58.3 ± 12.1 out of 100. Significant relationships were seen with specific aspects of psychological well-being, however global psychological well-being as measured by the General Well-being schedule was not related to any measure of diet quality. Chronic stress was related to low adherence to dietary guidelines ($F = 12.01$ and $p = 0.0002$). Chronic stress was also related to low consumption of fruits and vegetables ($F = 5.44, p = 0.0199$). Feeling in control of emotions and behaviors was related to low consumption of non-nutrient dense foods (NND) ($F = 3.33, p = 0.0198$). Controlling for PA and sleep time reduced the magnitude of all of these relationships between 11% and 42%. Results from the PSS were positively related to the consumption of NND ($F = 3.97, p = 0.0472$). Controlling for PA and sleep time increased the magnitude of this relationship by 34%. **CONCLUSIONS:** Subscales of psychological well-being such as chronic stress, acute stress, and emotional behavioral control were related to diet quality. While these observed relationships were independent of the influence of physical activity and sleep, controlling for these variables had a moderating effect.

2512 Board #35 June 3, 11:00 AM - 12:30 PM
A Systematic Review of the Effects of Resistance Training on Body Image
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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.

2513 Board #36 June 3, 11:00 AM - 12:30 PM
Change In Exercise Self-efficacy As A Predictor Of Physical Activity And Weight Loss
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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 for 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 engaging in PA. **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 ($R^2=0.121, p=0.009$) when controlling for age, gender, race, and baseline weight. Change in ESE from zero to six months was a significant predictor of weight loss ($R^2=0.147, p=0.005$) 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.

2514 Board #37 June 3, 11:00 AM - 12:30 PM
Student Exercise Narratives
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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 meeting 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 when in 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.

2515 Board #38 June 3, 11:00 AM - 12:30 PM
The Relationship of Reflective and Impulsive Systems and Physical Activity Participation in College Students
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PURPOSE: The Reflective-Impulsive Model is based on the assumption that all human behaviors are a joint function of reflective and impulsive information processing mechanisms. As postulated, both reflective and impulsive systems contribute to the act of engaging in physical activity (PA). This study examined the relationship of reflective and impulsive systems and PA participation in college students. **METHODS:** We recruited 872 college students (age range 18-23 yrs). Of those, 522 students met criteria for final data analyses. PA level was measured using the International Physical Activity Questionnaire. Psychological measures were affect association for impulsive system and ten variables for reflective system, including attitude behavior, risk perception, social support, subjective norm, perceived behavior control, preactional self-efficacy, coping self-efficacy, recovery self-efficacy, positive outcome expectations, and negative outcome expectations. Correlation coefficients and regression analyses were used to test the associations and predictive effects of the reflective and impulsive systems with and on PA participation. Statistical analyses were conducted using SPSS for Windows 18.0 and alpha was set at $P \leq 0.05$. **RESULTS:** Results showed that correlations of affect association for impulsive system and 7 out of the 10 measures for reflective system were statistically significant. The regression analysis revealed that the linear combination of the five measures (affect association, preactional self-efficacy, attitude behavior, positive outcome expectations, and subjective norm) was significantly related to PA participation, $R^2 = 0.285$, adjusted $R^2 = 0.278$, $F(5, 516) = 41.037$, $P < 0.001$, accounting for 28.5% of the variance for PA participation. **CONCLUSION:** College students' participation in PA is associated with reflective and impulsive systems and both systems can predict PA participation. As scores increased for affect association, preactional self-efficacy, attitude behavior, positive outcome expectations, and subjective norm, the greater the rates individuals would participate in PA. Incorporating dual-process based interventions may help to improve public health efforts.

2516 Board #39 June 3, 11:00 AM - 12:30 PM
Differences Among College Students Motivational Readiness for Regular Physical Activity
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PURPOSE: The purpose of this study is to determine if group differences exist within majors and between majors of undergraduate college students' stage of behavior change for regular physical activity within the Physical Education Department (PED). **METHODS:** This study involved a convenience sample that consisted of 138 undergraduate PED (Athletic Training (AT) = 35, Physical Education Exercise Science (PEEX) = 59, and Physical Education Teacher Certification (PETC) = 44) students. Informed consent forms and the survey packet were completed during the first 10 minutes in selected classrooms. The survey packet included a demographic questionnaire as well as Marcus and colleagues (1992), Physical Activity Stages of Change questionnaire that measures current stage of exercise behavior. The questionnaire was found to have acceptable levels (above .90) of internal consistency (Marcus et al., 1992). **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 0.724. A Scheffe post hoc test analysis 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 level mean being the highest 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 PETC majors are in the maintenance level. Possibilities 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.

2517 Board #40 June 3, 11:00 AM - 12:30 PM
Cardiorespiratory Fitness and Physical Activity are Low in Young Men with Elevated Symptoms of ADHD
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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 than average cardiorespiratory fitness. **PURPOSE:** The purpose of this study was to examine associations between adult ADHD symptoms and cardiorespiratory fitness and physical activity in a sample of male university students. Hypotheses included that young adult men reporting elevated ADHD symptoms would have low cardiorespiratory fitness and self-reported physical activity. **METHODS:** ADHD symptoms were measured with the 6-item Adult ADHD Self-Report Scale V1.1; elevated scores (≥ 9) were required for inclusion in the study. Leisure time physical activity was measured using the Godin Leisure-Time Exercise Questionnaire. Cardiorespiratory fitness, defined as VO_{2peak} , was measured during incremental leg exercise using a computer-controlled, electronically-braked cycle ergometer. For all participants, peak respiratory exchange ratio was ≥ 1.10 and peak heart rate ≥ 180 beats per minute. **RESULTS:** 30 men (age = 20.7 ± 1.8 years, range = 18-26 years; $BMI = 23.9 \pm 3.1$, range = 16.6-32.4) with elevated ADHD symptom scores were tested. Peak exercise responses (mean \pm SD) included $RER = 1.23 \pm .07$, heart rate = 189 ± 8 bpm and perceived exertion = 18.3 ± 1.6 . VO_{2peak} (38.7 ± 7.2 ml/kg/min) was > 0.5 SD lower than sex-matched reference values for men 20-29 years of age. Total leisure time physical activity scores (57 ± 24) were lower than a prior study of 411 college students (67 ± 43). Correlations between ADHD symptoms and VO_{2peak} and leisure time physical activity were $-.39$ ($p = .034$), and $-.02$ ($p = .917$), respectively. A linear regression showed that VO_{2peak} was significantly predicted from the combination of ADHD symptoms and leisure time physical activity, $F(2, 27) = 5.095, p = .013, R^2 = .523$, $BADHD$ symptoms = -1.276 ($p = .028$), $BGodin = .106$ ($p = .042$). **CONCLUSIONS:** College men reporting elevated symptoms of ADHD appear to report low levels of leisure time physical activity and are characterized by low cardiorespiratory fitness.

2518 Board #41 June 3, 11:00 AM - 12:30 PM
Examining The Relationship Between Social Support And Physical Activity In Older Adults
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While barriers to participation in regular physical activity (PA) exist, older adults have a particularly difficult time being physically active. Previous research suggests that social support from friends and family is a strong determinant of PA. **PURPOSE:** To examine the relationship between social support from family and friends and light, moderate, and vigorous intensity PA in sedentary older adults. **METHODS:** Older adults (50+ years) enrolled in a randomized controlled intervention study completed a questionnaire prior to randomization that assessed age, education, marital status, and race. Social support from friends and family related to PA habits were also assessed. Height and weight were measured objectively to calculate body mass index (BMI). Participants wore an Actigraph accelerometer for one week on their right hip and data were reduced to express total daily minutes and percent of each day spent in sedentary, light, and moderate-to-vigorous PA. Multiple linear regression models were used to examine the relationship between social support (friends and family separately) and PA behaviors. All analyses controlled for education, gender, and marital status. **RESULTS:** On average, participants ($n = 71$) were 64.0 ± 8.5 years old and BMI values averaged 33.3 ± 7.1 kg/m². Most participants were Caucasian (80%), female (75%), married (61%) and attended at least some college (82%). Total daily minutes of sedentary, light, and moderate-to-vigorous PA averaged 527.1 ± 121.5 , 307.8 ± 91.3 and 6.8 ± 8.5 , respectively. The average percentages of each day spent in sedentary, light, moderate/vigorous activity were 62%, 37%, and 1%. There were no significant relationships between social support from family or friends and sedentary ($p = .79; .47$), light ($p = .70; .50$), and moderate-to-vigorous ($p = .19; .43$) PA. **CONCLUSION:** Our findings indicated no relationship between social support from family or friends and any intensity of PA. However, the potential importance of social support should not be dismissed. The non-significant findings may have been influenced by the small sample size and the low level and variability in social support and PA among participants. Future studies should include a larger, more diverse group of participants to clearly quantify the relationship between social support and PA behaviors.

2519 Board #42 June 3, 11:00 AM - 12:30 PM
Self-concept Or Motor Skills: Which Matters More For Physical Activity Of Children With Motor Difficulties?
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Children with poor motor abilities tend to be less physically active than typically developing children. Previous findings have shown that fundamental movement skills (FMS) and self-concept of physical competence are potential factors that facilitate subsequent PA participation in children. However, little is known about the association of PA with FMS and self-concept towards PA (SCPA) in children with motor difficulties (MD).

PURPOSE:

1) to examine the differences in PA participation and FMS proficiency between children with MD and an age-matched group of children with typical development (TD); and 2) to determine the association of PA with FMS proficiency and SCPA.

METHODS:

Participants included 43 children with MD (8.9 ± 0.8 years) and 41 children with TD (8.4 ± 0.9 years). Movement Assessment Battery for Children-2 was used to detect MD (≤ 5 th percentile in any of the three components). PA was monitored using accelerometers over 7 consecutive days and total volume (counts/min, cpm) was analyzed. FMS (i.e., locomotor skills and object control skills) was assessed with the Test of Gross Motor Development-2. SCPA was measured using a subscale of the Physical Self-Description Questionnaire. Higher scores represented higher levels of PA, FMS proficiency, and SCPA. Two-way (MD vs. TD and boys vs. girls) ANCOVAs were used to compare group difference after controlling for age and body mass index (BMI). Partial correlations were used to determine the association of PA with FMS proficiency and SCPA after controlling for age, BMI, and sex.

RESULTS:

The MD group scored significantly lower in object control skills (13.6 ± 3.4 vs. 16.1 ± 3.5) and SCPA (3.3 ± 1.1 vs. 4.1 ± 1.0) than the TD group (both $p < .01$). Girls had lower scores in object control skills (14.3 ± 3.1 vs. 15.2 ± 4.0 , $p < .05$) and PA volume (406.4 ± 89.1 cpm vs. 488.2 ± 101.8 cpm, $p < .01$) than boys. PA volume was positively related to SCPA ($r = 0.34$, $p < .01$) in the MD group and to object control skills ($r = 0.37$, $p < .01$) in the TD group. In the MD group, SCPA was positively associated with locomotor skills ($r = 0.35$, $p < .05$).

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.

2520 Board #43 June 3, 11:00 AM - 12:30 PM
Women's Perception Of Benefits Of Regular Physical Activity

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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.

2521 Board #44 June 3, 11:00 AM - 12:30 PM
Weight Management and Appearance Motivate Non-Competitive CrossFit Participants

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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%) completed CF workouts 4+ days / week. Participants indicated if they competed in any local competitions, the CF Open, CF Regionals, or CF Games. Participants completed the 51-item 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), Challenge (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 (vs G2, G3), Enjoyment (vs G2, G3), Challenge (vs G3), Social Recognition (vs G2, G3), Affiliation (vs G1-G3), and Competition (vs G1-G4). However, G0 had significantly higher scores for Weight Management (vs G2-G4) and Appearance (vs G4). No significant post hoc differences were found for Strength & Endurance.

CONCLUSIONS: Although non-competitors had similar BMIs to the competitive groups (p = .60), 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.

2522 Board #45 June 3, 11:00 AM - 12:30 PM
Do Self-Reported Individual Differences in Preference For and Tolerance Of Exercise Intensity Predict CrossFit WOD Performance?

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CrossFit is an increasingly popular, wide-ranging strength and conditioning exercise program. Exercise research has begun to shed light on the exercise intensity-affect-adherence relationship, but this kind of exercise is unique and has yet to be systematically studied. By examining individual difference characteristics (e.g., personality) of participants as well as their responses to single sessions of training, important information could be gained about the psychological makeup of the type of individual who does best in these high intensity group training settings. **PURPOSE:** Examine several individual difference factors, along with psychological responses to an individual workout session (i.e., WOD). **METHODS:** Participants (N=29; 17 female; 33.2±8.3 yrs; BMI=24.89±3.62; M±SD) completed measures of exercise intensity preference (Pref) and tolerance (Tol). On a separate day they performed a workout (WOD) consisting of 5 pull-ups, 10 box jumps, and 15 weighted ball overhead throws, which were done repeatedly for 12 min. Performance was the total number of repetitions completed. Measures of affect were completed Pre and immediately post (PO) WOD, along with measures of satisfaction and enjoyment. **RESULTS:** Average WOD performance was 196±39.3 repetitions, with satisfaction of 5.1±1.2 (somewhat satisfied) and enjoyment of 103.1±11.6. Affect changed from Pre to PO with Energy (d= 1.35) and Tension (d= -1.21) increasing while Tiredness (d= 0.97) and Calmness (d= -0.73) decreased. Visual analog fatigue also increased (d= -1.40). Further, after accounting for age, sex, and BMI, Pref predicted unique variance in WOD performance (β= 0.57, R²Δ=28.3%, P= 0.004); after accounting for age, sex, and BMI, Tol predicted unique variance in WOD performance (β= 0.54, R²Δ=26.3%, P= 0.005). Those completing more repetitions also had greater satisfaction (r= 0.43, P= 0.008) and enjoyment (r= 0.45, P= 0.007) of the WOD. **CONCLUSION:** These findings extend previous research by examining affective responses to high-intensity exercise along with providing evidence of individual difference factors that predict behavior in such types of exercise. Specifically, the findings suggest that individuals preferring and tolerating higher intensities of exercise push themselves more in such exercise settings.

2523 Board #46 June 3, 11:00 AM - 12:30 PM
Neuroticism And Gender On Affect And Feelings During And After A Crossfit Workout

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Few studies have examined affect during and after a CrossFit workout of the day, or WOD. Male and female CrossFitters were found to vary on Neuroticism (Tobar et al., 2015), and Neuroticism has been found to influence affect after exercise (e.g., Tobar & Serene, 2008). **PURPOSE:** To examine the effects of Neuroticism on affect and feelings in men and women after an acute CrossFit WOD.

METHODS: Men (n=14; M=35yrs) and women (n=15; M=31yrs) CrossFitters performed the "Cindy" WOD: 20 mins of pull-ups, pushups, and body-weight squats. Neuroticism (NEO-FFI), affect (Physical Activity Affect Scale), and feeling (Feeling Scale) were measured prior to, during, and 0-, 30-, 60-, 120-min post-exercise. A median split procedure on Neuroticism (N) scores was used to categorize men (Md=14) and women (Md=13) into low (LN: n=7 men; 8 women) and high (HN: n=7 men; 7 women) N groups.

RESULTS: 2 (N groups) x 2 (gender) x 6 (time) MANOVA with repeated measures was conducted on Positive Affect (PA), Negative Affect (NA), Fatigue (FA), and Tranquility (TR). A 3-way interaction (p<.05) was found for NA. HN women reported increased NA during exercise which immediately returned to baseline post exercise, while NA remained stable across time for LN women. Both LN and HN men reported similar increases in NA during exercise which gradually decreased to baseline levels 2 hours post exercise. Main effects for Time were found (ps<.05) for PA, FA, and TR. PA increased immediately post exercise and remained elevated for 2 hours. FA increased during exercise and remained elevated immediately post exercise before gradually decreasing to baseline levels 2 hours post exercise. TR increased 30-min post exercise and remained elevated up to 2 hours post exercise. A separate ANOVA revealed similar findings for feeling states which decreased during exercise, especially for HN women, and improved immediately post exercise (p<.05).

CONCLUSIONS: A CrossFit WOD was associated with positive changes in affect and feelings post exercise, but this intense exercise adversely influenced affect and feelings during exercise. This finding may have implications on adoption and

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.

2524 Board #47 June 3, 11:00 AM - 12:30 PM

Physical Activity Partially Mediates The Relationship Between Depressive Symptoms And Cognition 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 lowers 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 s, p=0.01) and lower total PA counts (190,791±25,523 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 = -4337±2209, 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 - A (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.) Grant 1154 (KSH) and NIH NIA P30 AG0344645 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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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 knowledge, 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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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 (PF) 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 Jurca 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 ($R^2_{adj} = .18$; males = .27, females = .10), PF ($R^2_{adj} = .10$; males = .38, females = .09), and EXMOT ($R^2_{adj} = .26$; males = .34, females = .13). Oneway ANOVA indicated significant differences between mean scores on the PESFEEL factors across the five categories of PA (NOSSAC, POSSAM, EXMOT $p < .001$; 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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PURPOSE: Engaging in regular physical activity (PA) is important in maintaining health and increasing the overall quality of life of 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 are lacking. Understanding the 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 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=0.01) and social interaction (2.8 (0.1), p<0.001). 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

(3.3 (0.2) vs 3.1 (0.1), $p < 0.001$). There was no difference in barriers based on age and depression level, but women with depression felt more fatigued by exercise (2.5 (0.7) vs 2.0 (0.8), $p = 0.044$). **CONCLUSIONS:** Our sample of HIV+ women was predominantly sedentary and obese. They perceived physical exertion as the greatest barrier to exercise. The results of this study can be helpful when designing and implementing PA interventions for this population.

2528 Board #51 June 3, 11:00 AM - 12:30 PM
Exercise Related Differences in PTSD Severity, Sleep Quality and Psychological Distress in Adults With PTSD

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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 cutoffs: <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 severity and related symptoms were significantly worse in the Insufficiently Active group. Specifically, when compared to the Active/Moderately Active group, the mean scores of the Insufficiently Active group were 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; $t=4.29$, $p<.01$) 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.

2529 Board #52 June 3, 11:00 AM - 12:30 PM
Pain-Related Fear is a Greater Predictor of Physical Activity in Older Adults than Pain Itself

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 (No relationships reported)

Prior studies have demonstrated that fear of pain can be just as disabling in chronic pain patients as the pain itself. To date, little research has examined the functional consequences of pain-related fear of movement in healthy older adults. **PURPOSE:** To determine whether self-reported bodily pain and fear of movement due to pain predict physical activity behavior in healthy older adults. **METHODS:** Forty-two healthy older adults (32 female, age=67.5±5.1) completed the Tampa Scale for Kinesiophobia (TSK), the Short-form health survey (SF-36), and wore an accelerometer on the hip for 7 days to measure physical activity behavior. The TSK assessed pain related fear of movement. Bodily pain was assessed with the Bodily Pain subscale of the SF-36. Measures of average light physical activity and average moderate to vigorous physical activity (MVPA) per day were obtained from the accelerometer. Average time spent in light physical activity and MVPA per day were analyzed using hierarchical linear regression with age, sex, body mass index, and education entered in the first step, SF-36 Bodily Pain subscale score entered in the second step, and TSK score entered in the final step. **RESULTS:** The analyses revealed that Bodily Pain score and TSK score significantly predicted average time spent in light physical activity (Bodily pain: R^2 change= 6.2%, $\beta=0.27$; TSK: R^2 change= 27%, $\beta=-0.49$) and MVPA (Bodily pain: R^2 change= 7.4%, $\beta=0.23$; TSK: R^2 change= 8.4%, $\beta=-0.31$). **CONCLUSIONS:** The results indicated that healthy older adults who reported greater bodily pain and greater pain-related fear of movement spent less time in light and MVPA per day. Furthermore, pain-related fear of movement was a stronger predictor of physical activity behavior than reports of pain itself. Fear of pain may be a significant risk factor for inactivity in healthy older adults. This study was funded by the IUPUI School of PETM Faculty Research Opportunity Grant.

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2530 Board #53 June 3, 11:00 AM - 12:30 PM
Relationship Of Children'S Mindfulness With Health-related Quality Of Life, Weight Status, And Behavioral Variables

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Mindfulness is paying attention on purpose, being aware of the moment, and accepting one's feelings and thoughts. Mindfulness may relate to favorable health behaviors, but this has not been studied thoroughly in children. **PURPOSE:** The purpose of this study was to examine the relationship of mindfulness with weight status, health-related quality of life, physical activity, screen time, and diet in children from a low-socioeconomic status community. **METHODS:** Children ($N=754$; 8-13 y; 47% girls; 56.2% black, 13.7% white, 30.1% multi-racial/other; 44.0% overweight) completed surveys, including Child and Adolescent Mindfulness Measure (10 items, max 40, higher score is favorable), Physical Activity Questionnaire for Children (PAQ-C; 9 items, max 5), KidsScreen-27 (27 items across 5 quality of life dimensions), and School Physical Activity and Nutrition Survey (SPAN; 25 items, max 3 per item). From the SPAN, single items described vegetable and fruit intake, and a junk food index was calculated (6 items, max 18). Body Mass Index was calculated from measured height and weight. One-way ANOVA (Tukey post-hoc) was used to determine differences in mindfulness by grade, sex, weight status, and ethnicity. Regression analysis evaluated the relationship of mindfulness with weight status, health-related quality of life, physical activity, screen time, diet, and moderators ethnicity, grade and sex, with significance at $p < 0.05$. **RESULTS:** Average mindfulness was 16.4±9.4 and was higher in multi-racial/other (17.9±9.5) vs. black children (15.5±9.1), girls (17.2±9.6) vs. boys (15.7±9.1), and lower in 6th (14.8±9.3) vs. 4th (17.7±9.6) or 5th (16.8±9.1) graders. Overall, the model was significant (adjusted $R^2=0.141$, $p < 0.001$). Ethnicity ($\beta=0.114$, $p=0.007$), grade ($\beta=-0.109$, $p=0.010$), junk food index ($\beta=0.140$, $p=0.003$), school-related ($\beta=-0.110$, $p=0.018$) and psychological quality of life ($\beta=0.287$, $p < 0.001$) were associated with mindfulness. **CONCLUSION:** In this sample, psychological and school-related quality of life and junk food index accounted for a small percentage of variance in mindfulness, with two variables contributing in the unexpected direction. Mindfulness may have benefits not captured in this study, but more research is needed on the relationship of mindfulness with health variables.

2531 Board #54 June 3, 11:00 AM - 12:30 PM
Psychosocial Factors Related to Physical Activity Enjoyment in Adolescent Girls

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Adolescent girls have a higher prevalence of obesity, are more sedentary, and suffer from psychosocial distress at greater rates than their male counterparts. These challenges are compounded by the fact that adolescence represents a time period where individuals are highly preoccupied with their social image and are therefore more likely to be high "social comparers." However, little is known about the relationship between psychosocial health, physical activity enjoyment, and social comparison levels in adolescent girls. **PURPOSE:** To begin to fill this void we examine the potential relationship between self-esteem, social comparison, and physical activity enjoyment in adolescent girls. **METHODS:** In Fall 2015 272 6th-8th grade girls from two schools in the Southeastern United States completed an electronic Qualtrics survey assessing their self-esteem, level of social comparison, and physical activity enjoyment. Before proceeding with relationship testing we conducted a Confirmatory Factor Analysis (CFA) of the five factor 26 item scale. After confirming the scales validity and reliability we produced a structure equation model (SEM) investigating the potential direct and indirect effects of self-esteem (SE) and social comparison (SC) on physical activity enjoyment (PAE). **RESULTS:** The results of the CFA of the five factor scale and the final measurement model indicated a high level of both validity and reliability ($\chi^2(424) = 806.923$, $p \leq .001$, RMSEA = .059 (90% CI, .053-.065), CFI = .914). The SEM results indicate a moderate direct effect of SE (.45, $p \leq .001$) on PAE, indicating those participants with higher SE scores reported more enjoyment of physical activity. Additionally, a weaker direct effect was found between lower SC on PAE (.16, $p \leq .001$), indicating those participants with lower SC scores reported more enjoyment of physical activity. **CONCLUSION:** Our results indicate that higher SE and lower SC positively influence PAE. These findings demonstrate the potential increase in physical activity enjoyment and subsequent positive health outcomes of improving SE and reducing SC in adolescent girls.

Boston, Massachusetts

2532 Board #55 June 3, 11:00 AM - 12:30 PM
An Investigation of the Relationship Between Body Composition, Social Physique Anxiety, and Exercise Motives
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Health and fitness professionals widely promote physical activity recommendations as put forth by ACSM, however, according to recent data from the CDC, only 20.2% of U.S. adults currently meet the combined recommendation for aerobic exercise and strength training on a weekly basis. The possibilities of factors that may impact this lack of exercise compliance is infinite. Variations among individuals in terms of body composition and psychological variables may have synergistic functions and may differ by age.

PURPOSE: Investigate the relationship between body composition, exercise motivations, social physique anxiety (SPA), exercise confidence, and exercise stage of change (SOC) among adults across the age span.

METHODS: 192 participants (males = 89, females = 103) completed a demographic questionnaire, the Stages of Change for Exercise—Short Form, Social Physique Anxiety Scale, Exercise Confidence Survey, and Exercise Motivations Inventory-2, and body composition via DEXA.

RESULTS: One-way ANOVA revealed that males were more motivated by social recognition ($p = 0.003$), affiliation ($p = 0.029$), and competition ($p < 0.001$); females were more motivated by weight management ($p = 0.050$) and appearance ($p < 0.001$). Males also had lower SPA (28.20 ± 9.71 vs. 35.25 ± 10.87) ($p < 0.001$), higher exercise confidence (24.91 ± 13.31 vs. 30.42 ± 17.32) ($p = 0.016$), and were more likely to be maintainers for SOC ($p = 0.006$). Age was correlated to weight management ($r = 0.305$, $p < 0.001$), ill-health avoidance ($r = 0.271$, $p < 0.001$), social recognition ($r = -0.258$, $p < 0.001$), health pressures ($r = 0.219$, $p = 0.002$), nimbleness ($r = 0.204$, $p = 0.004$), challenge ($r = -0.232$, $p = 0.001$), and appearance ($r = 0.172$, $p = 0.017$). %BF was correlated to weight management ($r = 0.495$, $p < 0.001$), enjoyment ($r = -0.427$, $p < 0.001$), competition ($r = -0.374$, $p < 0.001$), revitalization ($r = -0.351$, $p < 0.001$), social recognition ($r = -0.303$, $p < 0.001$), challenge ($r = -0.280$, $p < 0.001$), stress management ($r = -0.274$, $p = 0.001$), affiliation ($r = -0.159$, $p = 0.027$), and ill-health avoidance ($r = -0.153$, $p = 0.034$).

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 be maintainers than females, regardless of age.

2533 Board #56 June 3, 11:00 AM - 12:30 PM
Exercise Motivations and Life Goals among Undergraduate Students: A Self-Determination Theory Perspective
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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 vigorously 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 between 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.

2534 Board #57 June 3, 11:00 AM - 12:30 PM
An Observational Study of Parental Practices on Children's Physical Activity
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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; observing 20 seconds then recording 10 seconds using a modified SOFIT 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; $p \leq 0.001$). Overweight children had parents discourage SA more compared to normal weight children (0.73 vs. 0.10 times; $p \leq 0.001$). Parents of overweight children also verbally discouraged (SA) more relative to parents of normal weight children (0.64 vs. 0.10 times; $p \leq 0.001$).

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.

2535 Board #58 June 3, 11:00 AM - 12:30 PM
The Influence of Parent Involvement on Child Physical Activity
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INTRODUCTION: Regular physical activity (PA) in children is associated with several health benefits, but a majority of children do not achieve the recommended amount of PA. Research suggests that parent involvement in PA predicts greater child PA. Research on other predictors of child PA, such as parent encouragement and parent conversations with their child about PA have evidenced contradictory findings.

PURPOSE: This study examined 1) whether more parent involvement in child PA predicts greater child PA; 2) whether more parent conversations with their child about PA predicts greater child PA; 3) whether parent concern for child weight influences the relationship between either parent involvement in child PA, or parent conversations with their child about PA, and child PA.

METHODS: Child participants ($n=98$, 39% female, M-Age=12, M-BMI=23.0) wore an activity monitor for 7 days. A parent of each child completed self-report measures of parent conversations with their child about PA, parent concern for child weight and parent involvement in child PA (i.e. engaging in PA with child or helping child engage in PA). Regression analyses were conducted to examine whether parent conversations with their child about PA or parent involvement in child PA predicted child PA. Moderation analyses were conducted to examine if parent concern for child weight influenced the relationship between parent conversations with their child about PA or parent involvement in child PA and child PA. Analyses included the covariates age, sex, child BMI and whether a sibling participated in the study.

RESULTS: Parent involvement in child PA predicted child PA; greater involvement in child PA predicted greater child PA ($F(5,92)=3.57$, $p=0.01$, $R^2 \Delta=0.09$). Parent conversations with their child about PA did not predict child PA. Parent concern about child weight did not modify the relationship between parent conversations with their child about PA or parent involvement in child PA and child PA.

CONCLUSIONS: Consistent with previous research, parent involvement in child PA supports a child's engagement in PA. Future research should examine factors that

may explain the relationship between parent involvement in child PA and child PA, such as different means of parent engagement or characteristics of the child (e.g., child temperament or parenting style).

2536 Board #59 June 3, 11:00 AM - 12:30 PM
Outcome Expectancy for Various Physical Activity Modalities during Pregnancy

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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 maternal and fetal health 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 exercises. 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 modality participation.

RESULTS: Outcome expectancy for maternal health was significantly greater than for fetal health for all PA modalities ($p < 0.05$). After controlling for prepregnancy PA and self-efficacy beliefs, PA outcome expectancy for maternal health did not affect modality participation. In contrast, PA outcome expectancy for fetal health did positively affect participation in light jogging ($\beta = 1.15$, CI=1.03-1.28), intense jogging ($\beta = 1.26$, CI=1.07-1.49), aerobic dance ($\beta = 1.18$, CI=1.04-1.33), resistance band exercises ($\beta = 1.14$, CI=1.00-1.31), and CrossFit-type exercises ($\beta = 1.57$, CI=1.19-2.06). No interactive effects were found for maternal and fetal PA outcome expectancies on modality 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.

2537 Board #60 June 3, 11:00 AM - 12:30 PM
Controlled and Automatic Motivational Processes Regulate Older Adults' Daily Sedentary Behavior

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PURPOSE: This 14-day daily diary study tested a dual-process model of motivation to determine the between-person (time-invariant) and within-person (time-varying) processes associated with older adults' daily sedentary behavior.

METHODS: Older adults (n=100) used tablet computers to rate their motivation and sedentary behavior at the beginning and end of each day, respectively. Participants also wore ActivPAL3 activity monitors throughout the study to objectively-measure sedentary behavior. A series of multilevel models were estimated to predict daily sedentary behavior, action planning, and intention formation.

RESULTS: Both self-reported and objectively-measured sedentary behavior were (1) negatively associated with planning at the within-person level (self-reported behavior: $\gamma_{10} = -0.79$, $p < .05$; monitored behavior: $\gamma_{10} = -0.51$, $p < .05$), but not the between-person level, and (2) positively associated with habit strength for sedentary behavior (self-reported behavior: $\gamma_{02} = 36.32$, $p < .05$; monitored behavior: $\gamma_{02} = 19.97$, $p < .05$). Daily action plans to limit sedentary behavior were (1) positively associated with task self-efficacy at the within-person level, but negatively associated at the between-person level ($\gamma_{10} = 0.14$, $p < .05$, $\gamma_{01} = -0.59$, $p < .05$, respectively), and (2) positively associated with intentions at the between- and within-person level ($\gamma_{02} = 1.17$, $p < .05$, $\gamma_{20} = 0.20$, $p < .05$, respectively). Intentions to limit sedentary behavior were (1) positively associated with task self-efficacy at the between and within-person level ($\gamma_{01} = 0.96$, $p < .05$, $\gamma_{10} = 0.61$, $p < .05$, respectively), but (2) not associated with light-intensity physical activity outcome expectations, sedentary behavior risk perceptions, or sedentary behavior habit strength.

CONCLUSIONS: This study was the first to systematically identify a set of controlled and automatic processes associated with older adults' daily sedentary behavior. Interventions aiming to reduce sedentary behavior in older adults should interrupt established sedentary habits and promote counterhabitual daily intentions and action plans. This research was supported by the Paffenbarger-Blair Fund for Epidemiological Research on Physical Activity from the American College of Sports Medicine Foundation.

2538 Board #61 June 3, 11:00 AM - 12:30 PM
Physical Activity Intensity And Well-being In Healthy Adults

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It is well documented that habitual physical activity (PA) has a positive effect on mood and well-being. Yet, in a recent study self-reported vigorous intensity PA was found to be associated with lower levels of well-being than moderate intensity PA among middle aged adults. **PURPOSE:** The purpose of our study was to examine the relationship among objectively measured intensity of habitual PA and several dimensions of self-reported well-being and quality of life (QOL) in a subset of healthy adults aged 44.1 ± 16.2yr from the STOMP (Effect of Statins on Skeletal Muscle Performance; Clinical Trials #NCT00609063) study. **METHODS:** Subjects wore an accelerometer for 96hr to assess time spent (min·d⁻¹) in sedentary behavior as well as light (<3.0 METS), moderate (3-6METS), and vigorous (≥6 METS) intensity PA. Subjects also completed the Psychological General Well-Being Index (n=150) for QOL, Beck Depression Inventory (n=99) for depression, and Brief Pain Inventory (n=419) for pain severity and the extent to which pain interferes with daily activities. Multivariable regression was used to examine the relationship among habitual PA and dimensions of well-being while controlling for potential covariates such as gender, age, and body mass index. **RESULTS:** Time spent in light intensity PA was positively correlated with QOL ($r^2 = 0.024$; $P < 0.05$) and inversely correlated with depression ($r^2 = 0.033$; $P < 0.05$). Time spent in moderate intensity PA was inversely correlated with pain severity ($r^2 = 0.014$; $P < 0.05$) and directly correlated with QOL ($r^2 = 0.021$; $P < 0.05$). Time spent in sedentary behavior was inversely correlated with QOL ($r^2 = 0.027$; $P < 0.05$) and directly correlated with depression ($r^2 = 0.041$; $P < 0.05$). There were no significant correlations among QOL, depression, or pain and time spent in vigorous intensity PA (All $P > 0.05$). **CONCLUSION:** Confirming reports in the literature, our findings indicate that lower levels of habitual light to moderate intensity PA and higher levels of sedentary behavior negatively impact mood and well-being. However, our findings do not support an adverse effect of vigorous intensity PA on well-being. Supported by: NHLBI/NIH Grant RO1 HL081893

2539 Board #62 June 3, 11:00 AM - 12:30 PM
The Experimental Effect Of Parent Versus Peer Influence On Children'S Physical Activity Behavior

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Parents and friends have been shown to have a significant influence over a variety of children's behavioral choices including physical activity and sedentary behavior. However, while there are studies assessing the role of parents and peers on youth physical activity there are no studies we are aware of have directly compared the effect of parent versus peer influence upon children's physical activity and sedentary behavior. **PURPOSE:** To assess physical and sedentary activity behavior, enjoyment (i.e., liking), and preference of condition during three separate simulated recess conditions: playing alone, with their parent participating, and with their friend participating. **METHODS:** Twenty children (8.3 ± 1.3 years old) participated in three simulated recess conditions on separate days. During each of the conditions, children had free access to an outdoor playground (e.g., slides, crawl tubes, etc.) and a chair with a table of sedentary activity options (e.g., books, toys, coloring sheets, crayons, etc.) situated within the playground property for 40 minutes. Physical activity was monitored via an accelerometer and time allocated to the sedentary options was monitored via a stopwatch. Children reported their liking of each condition via visual analog scale and identified their preferred condition. **RESULTS:** Children accumulated significantly ($p \leq 0.05$) fewer sitting minutes and greater physical activity counts when playing with their parent (2.7 ± 7 min sitting, 87503 ± 37063 counts · min⁻¹) or friend (0.9 ± 1.4 min sitting, 93363 ± 22608 counts · min⁻¹) versus playing alone (7.8 ± 8.2 min sitting, 70672 ± 35228 counts · min⁻¹). Children reported greater ($p \leq 0.05$) liking of the friend (9.8 ± 0.6 cm) and parent (9.4 ± 1.1 cm) conditions versus playing alone (7.0 ± 3.5 cm). Twelve children reported preferring the friend condition, seven

preferred the parent condition and only one child preferred the alone condition ($\chi^2 = 9.1, p \leq 0.01$). **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 friend 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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Studies addressing 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), $t = 8.113, p < 0.001$) and AA ($\beta = 0.457$ (0.066), $t = 6.903, p < 0.001$). PN was a significant predictor, but not as strong as PBC and AA ($\beta = 0.193$ (0.059), $t = 3.285, p < 0.001$). 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

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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 (FS), and arousal (FAS). The physical activity enjoyment scale (PACES), subjective exercise experience scale (SEES), and three 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 \pm 15.2 and 92.7 \pm 15.2) compared to the No TV condition (77.5 \pm 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 \pm 0.17 vs. 2.7 \pm 0.3, $p = 0.025$). They reported liking the self-selected program more (84.3 \pm 2.1 vs. 67.2 \pm 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 \pm 19.7 and standardized: 79.1 \pm 14.2, $p > 0.05$) and dissociation from walking, (no TV: 72.6 \pm 5.6 vs. self: 38.1 \pm 6.7 and standardized: 33.2 \pm 3.9, $p = 0.002$) compared to the no TV condition. **CONCLUSION:** 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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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 (min/day) 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. NVivo 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 ($M = 7.25 \pm 4, p < .01$) than MS ($M = 13.17 \pm 7.5$) or HS males ($M = 11.23 \pm 5.3$), 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 ($r^2 = .21, p < .0001$). Only school level (high school) predicted increases in participants' SB, but the overall model was not significant ($r^2 = .06, p = 0.4$). 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 playing video games 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

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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 (AERQ), 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 analogue scores regarding degree of readiness to exercise. **CONCLUSIONS:** The multidimensional structure of the AERQ provided acceptable model fit according to confirmatory factor analysis, with evidence for preliminary

construct validity. Further, the four subscales demonstrate adequate convergent validity, discriminate validity, and internal consistency.

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

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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 CLs. **PURPOSE:** To examine the effect of utilizing shorter rather 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⁻¹·min⁻¹) 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⁻¹·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.

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

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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, caffeine) in a counterbalanced order. After preliminary session to characterize the cyclists, experimental TT4 were performed on a speed bike attached to a cycle-simulator, to provide power output data sampled at a 2Hz frequency. In order to compare performance, a one-way Anova was carried out with mean power output values (PO) of each TT4. A custom algorithm for Sample Entropy calculation (sampEn) was applied on windows overlapped by 120 samples over the entire PO signal. Values of sampEn were concatenated to build vectors of entropy results. Wilcoxon signed rank test compared the distribution of these entropy vectors among conditions. **RESULTS:** The mean PO over TT4 was 281.7 ± 25.1 w, 276.1 ± 30.7 w and 277.4 ± 15.7 w for control, placebo and caffeine conditions,

respectively. Although caffeine did not improve performance ($p = 0.88$), it increased the 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.

2546 Board #69 June 3, 9:30 AM - 11:00 AM Cortisol Response During A Bicycling Competition

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Cortisol concentration elevates due to physiological and psychological factors. A cyclist's resting cortisol level will increase in response to endurance training and in response to a bout of high intensity cycling. However, the cortisol response specific to a cycling competition has not been reported. **PURPOSE:** The purpose of this study was to measure the salivary cortisol response in cyclists before and after a 40 kilometer state championship cycling competition and to relate this to pre-race nervousness. **METHODS:** Participants were amateur cyclists ($N = 29$) competing in a state championship time trial cycling competition. Inclusion criteria consisted of cyclists over the age of 30 years with at least 2 years of cycling experience. Cyclists with a history of endocrine disorders were excluded. Pre-race nervousness was measured within 15 minutes of the race start time with three Likert questions taken from the Competitive State Anxiety Inventory 2. The questionnaire was shortened due to time sensitivity immediately prior to the race start. The questions were as follows: I am concerned about this competition; I feel nervous; and my body feels tense. A sum of the three items produced the final score. This version of the inventory demonstrated good reliability in practice (Chronbach's alpha = 0.70). Within 10 minutes of the start of the race, a saliva sample was provided. The cyclists' placed a small cylindrical polymer swab under the tongue for 2 minutes. Saliva samples were stored on dry ice and were assayed in duplicate by radioimmunoassay with a 3% intra-assay coefficient of variation. The same procedure was followed to measure post-race cortisol within 5 minutes of race finish. **RESULTS:** 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- ($\rho = -0.11, p = .47$) nor post-competition cortisol ($\rho = 0.13, p = .42$). **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

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(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 (Dmax 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 VT. 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, $p < 0.0001$; Dmax mean difference = 6.0 bpm, $p < 0.001$). Power during the last 20-minutes of the 30CTT did

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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 (No relationships reported)

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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 (No relationships reported)

People with functional limitations due to arthritis and/or musculoskeletal conditions, often cannot achieve a minimum level of effort that allows them to take advantage of the benefits of aerobic exercise. On the other hand, there is a considerable interest to identify the external work efficiency by the close relationship with endurance performance. The arrival of immersible ergocycle (IE) opens new perspectives for the practice of exercise in these populations and could be interesting to use in rehabilitation programs and performance training. Water immersion affect hemodynamic and cardiorespiratory responses during rest and exercise relative to exercise on dry land at same external power output (P_{ext}). Since VO_2 response is lower for a same P_{ext} on IE, this could increase external work efficiency, but this has not been study yet.

PURPOSE: To compare the gross external work efficiency ($G \eta_w$) and net external work efficiency ($N \eta_w$) on IE vs dryland ergocycle (DE) during a maximal incremental test at the same P_{ext} in healthy young subjects

METHODS: Thirty healthy participants (age: 33 ± 10 years) performed incremental exercise tests on IE and DE at equal P_{ext} . Exercise on IE began at 40 rpm and was increased by 10 rpm until exhaustion. Exercise on DE began with an initial load of 25 watts (W) and increased by 25 W.min⁻¹ until exhaustion. VO_2 and HR were measured with a portable gas analyser (Cosmed, K4b2, Italy) during both incremental tests. The $G \eta_w$ and $N \eta_w$ were calculated according to P_{ext} on IE and DE, and then divided by the respective measured metabolic cost (P_{met}) obtained by gas exchange.

RESULTS: During exercise on IE, VO_2 was lower ($P < 0.0001$) whereas $G \eta_w$ (e.g., 70 rpm: 19.06 ± 2.26 vs 23.86 ± 5.71) and $N \eta_w$ (e.g., 70 rpm: 22.76 ± 3.19 vs 30.26 ± 9.35) were respectively higher on IE at all intensities ($P < 0.001$) when compared to DE exercise of equivalent P_{ext}

CONCLUSIONS:

$G \eta_w$ and $N \eta_w$ were higher during exercise on IE vs DE at the same P_{ext} in healthy young subjects. Exercise water on IE could help people with functional limitations to achieve a minimum level of effort that allows them to take advantage of the benefits of aerobic exercise.

2550 Board #73 June 3, 9:30 AM - 11:00 AM
Impact of Standing up During Sprint Cycling on Power Output in Female Athletes
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 (No relationships reported)

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
 Alexa J. Chandler, Tamara Meuwissen, Jeffery C. Ives, Thomas Swensen. *Ithaca College, Ithaca, NY.*
 (No relationships reported)

Purpose: We determined if abdominal power and endurance were related to anaerobic and aerobic cycling performance and if abdominal fatigue influences cycling parameters. **Methods:** Twenty-three college aged subjects, whose $X \pm SD$ 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 throw 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 trials for the cycling measures; immediately before the performance trials, subjects completed abdominal crunches to fatigue. All tests were preceded and followed by a warm-up and cool-down. Dependent *t*-tests were used to assess differences between 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% ($p = 0.000$) 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 anaerobic power tests or competitions that include anaerobic power elements.

2552 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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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 ($VO_{2max} = 58.1 \pm 11.5 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$) completed three 20km time trials in an environmental chamber; a normoxic trial (CON) in which fraction of inspired oxygen (F_{iO_2}) was 0.21 ± 0.02 , followed by two trials in hypoxia ($F_{iO_2} = 0.18 \pm 0.03$) 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 ($1905.2 \pm 107.3\text{s}$) than CON ($1867.5 \pm 100.3\text{s}$) and FALSE ($1869.8 \pm 83.4\text{s}$). Cycling duration was not different between CON and FALSE. Mean power output was higher ($P < 0.05$) in CON ($271.7 \pm 41.3\text{W}$) and FALSE ($269.4 \pm 34.5\text{W}$) compared to TRUE ($257.6 \pm 40.9\text{W}$). SAO_2 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 20kmTT 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.

2553 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 vs 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 same groomed 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 6 km course. The same FTBs were used throughout testing. Tire pressure and air temperature, respectively, were 55158 Pascal (8 PSI) and $8.4 \pm 2.9 \text{ C}^\circ$ on ET and 27579 Pascal (4 PSI) and $-3.6 \pm 1.2 \text{ C}^\circ$ 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. Blood lactate (BL) and rating of perceived exertion (RPE) were assessed immediately post ride via a portable lactate analyzer and 0-10 categorical ratio scale, respectively. Data were analyzed via paired t tests with $P < 0.05$ set as significance. **RESULTS:** All data are reported mean \pm SD. Participant characteristics for age (yrs), ht (cm), wt (kg), and baseline VO_{2max} ($\text{ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$), respectively, were: 23.6 ± 2.5 , 179.2 ± 8.9 , 74.0 ± 9.1 , and 60.2 ± 7.1 . Time to complete each TT was significantly ($P = 0.000$) shorter for ET vs ST (21.38 ± 2.17 vs 29.18 ± 4.15 min). A significant difference ($P = 0.000$, for both variables) between ET vs ST, respectively, for Speedavg (17.0 ± 1.6 vs $12.5 \pm 1.9 \text{ km} \cdot \text{hr}^{-1}$) and speedmax (40.4 ± 4.6 vs $33.1 \pm 6.3 \text{ km} \cdot \text{hr}^{-1}$) was observed. Post ride [BL] was significantly higher after completion of ET vs ST (12.1 ± 3.5 vs $4.5 \pm 2.0 \text{ mmol} \cdot \text{L}^{-1}$). No significant differences ($P > 0.05$) were noted between ET and ST, respectively, for HRavg (176 ± 9 vs $175 \pm 15 \text{ beats} \cdot \text{min}^{-1}$), HRpeak (186 ± 6 vs $187 \pm 8 \text{ beats} \cdot \text{min}^{-1}$), %HRmax (92.5 ± 4.7 vs 92.2 ± 8.2), and RPE (7.7 ± 1.0 vs 8.1 ± 0.2). **CONCLUSION:** As expected, time to complete the course was significantly faster during ET. However, FTB on ST was completed at a very high intensity (i.e., 92% of HRmax and RPE of 8.1/10), indicating the potential to induce a similar training overload vs ET.

2554 Board #77 June 3, 9:30 AM - 11:00 AM
Effect Of Training Under Hyperoxia On Exercise Performance And Aerobic Capacity In Trained Cyclists

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Some previous studies suggested that trained athletes can perform exercise at high power outputs and long duration during inspiration of a hyperoxic gas mixture, which would inhibit the decrease in arterial oxygen saturation (SpO_2) levels during intense exercise. Training under hyperoxia could increase aerobic capacity, and thus improve exercise performance in trained athletes. **PURPOSE:** This study aimed to determine the effect of training under hyperoxia on exercise performance and aerobic capacity in trained cyclists. **METHODS:** Six male trained cyclists (age: 21.3 ± 1.9 yr, height: 168.6 ± 5.5 cm, weight: 59.7 ± 9.0 kg) performed training under hyperoxia. Before the training periods (pre-training), the subjects performed an incremental exercise test to exhaustion in which the work rate at initiation was 120 W for 3 min. The work rate was then increased as a step function by 40 W every 3 min at a pedal rate of 90 rpm to determine the workload corresponding to the maximal oxygen uptake (VO_{2max}) and work rate max (WR_{max}) by using a bicycle ergometer. VO_{2max} was determined by calculating the average of the breath-by-breath data over 30-s intervals during the incremental test. All the subjects underwent training under hyperoxia on 3 days per week for a 4-weeks period. The training protocol consisted of 5 repetitions of intense exercise at 3-min intervals. The intensity of the intense exercise was 90–100% WR_{max} . The duration of the intense exercise was 3 min in sets of 1–4, and the subjects cycled to voluntary exhaustion in 5 sets. All the subjects completed the training under conditions of hyperoxic gas mixture ($36.1\text{--}37.2\% O_2$). They also performed the incremental exercise test 3–6 days after the training periods (post-training).

RESULTS: The time required by the subjects to perform the incremental exercise test in the post-training period was significantly longer than that required in the pre-training period (16.69 ± 1.64 min vs. 15.81 ± 2.22 min; $p = 0.022$). There were no statistically significant differences in VO_{2max} between the post-training period and the pre-training period ($57.2 \pm 6.0 \text{ ml} \cdot \text{min}^{-1}$ vs. $56.2 \pm 6.6 \text{ ml} \cdot \text{min}^{-1}$). **CONCLUSION:** Our results showed that submaximal training with inspiration of a hyperoxic gas mixture for 4 weeks improves exercise performance in trained cyclists.

2555 Board #78 June 3, 9:30 AM - 11:00 AM
Differences in Fatigue During Maximal Arm-Cycling Sprints Interspersed with 30s and 180s of Rest

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PURPOSE: To investigate: 1) the time course of upper body fatigue during 10, 10s maximal arm-cycling sprints and 2) whether or not the extent of fatigue was dependent of the rest duration between sprints.

METHODS: On two separate days, participants ($N = 10$) completed 10 trials of 10s maximal arm-cycling sprints interspersed with either 30s or 180s of recovery. Each session was separated by 48 hours. Peak power was recorded during all sprints. Participants performed a maximum voluntary contraction (MVC) of the elbow flexors prior to the first sprint and immediately post-sprints 5 and 10. Heart rate and rate of perceived exertion (RPE) were also recorded.

RESULTS: Peak power decreased 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 ($p < 0.050$). When the sprints were interspersed with 30s and 180s rest, MVC force 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: Independent of rest time between sprints; there was a decrease in peak power during the sprints and elbow flexor MVC force. Interestingly, there was a greater reduction in MVC force of the elbow flexors when the sprints were interspersed with 180s compared to 30s of rest, which was opposite to the changes found for the power outputs (i.e. greater reduction in power when sprints were interspersed with 30s rest). Finally, changes in RPE were independent of rest time between sprints despite participants having higher heart rates and less heart rate recovery when performing sprints interspersed with 30s rest.

2556 Board #79 June 3, 9:30 AM - 11:00 AM
Experienced Cyclists Predict The Highest Sustainable Intensity Of Exercise More Effectively Than Critical Power Testing.

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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 always 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_{2peak} (Quark CPET, Cosmed, Rome, Italy) and peak PO (PO_{peak}). PO of CP from 5 TTE trials was derived from a 2-parameter hyperbolic model (PO_{HYP}). Participants also performed two 30-min rides at a self-selected PO (PO_{SELF}) 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] ≤ 1.0 mM·L⁻¹ between the 10th and the 30th min. **RESULTS:** Mean VO_{2PEAK} and PO_{PEAK} were 4.30±0.67 L·min⁻¹ and 383±53 W, respectively. PO_{HYP} , PO_{SELF} and 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_{SELF} and PO_{MLSS} (-22 to 22 W, bias = 0; p > 0.05), PO_{HYP} and MLSS (-8 to 51 W, bias = 21; p > 0.05) and PO_{SELF} and PO_{HYP} (-39 to -4 W, bias = -21 W; p > 0.05). Although PO_{SELF} and PO_{HYP} had similar magnitudes of range when compared to PO_{MLSS} , PO_{HYP} consistently over predicted PO_{SELF} and PO_{MLSS} . **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.

2557 Board #80 June 3, 9:30 AM - 11:00 AM
Impact of Wheel Size (26 vs 29 inch) on Energy Expenditure during Mountain Bike Trail Riding

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Mountain bikes with 26-inch wheels (26ers) were the industry standard for decades. More recently, bikes with 29-inch wheels (29ers) have gained popularity. Anecdotally, bikers have claimed that the 29ers "roll over" obstacles more easily and require less energy to ride. Steyn and Warnich (2014) reported that 29ers had less rolling resistance in sand compared to 26ers, with little difference on rock or asphalt surfaces. However, most trails include a combination of terrain surfaces; therefore, the difference in rolling resistance should translate into a difference in energy expenditure during a trail ride. **PURPOSE:** This study measured energy expenditure during standardized mountain bike trail rides on a 26er compared to a 29er. **METHODS:** Thirteen experienced mountain bikers (n=4 women, n=9 men, age=33.0±10.1 yrs), fitted with a Polar heart rate monitor and a K4B2 portable gas analyzer system, completed a trail ride on a 26er and on a 29er in random order with at least 24 hours between rides. Rocky Mountain Element full suspension bikes, 26er and 29er, were matched as closely as possible for mass, tire pressure, shock pressure, and rider position. GPS was used to measure distance and speed during each segment of the standardized 6.68 km (4.15 mile) trail ride. Heart rates were recorded and energy expenditure of each ride was determined by measuring oxygen consumption. **RESULTS:** Respectively, the 29er rides were completed in less time than the 26er (24.2±3.2 vs 25.5±3.5 minutes, p=.022), faster speeds (4.7±0.6 vs 4.4±0.6 m/s, p=.033), lower average heart rates (155.0±19.2 vs 162.2±16.8 bpm, p=0.034), and lower total calories (263.3±34.3 vs 290.7±36.9 kcal, p=0.002). Work rates represented by the rate of oxygen consumption (ml O₂/min, p=0.076) and rate of caloric expenditure (Kcal/min, p=0.100) were not different. **CONCLUSIONS:** Results indicate that at similar work rates, riders gained a mechanical advantage on the 29er mountain bike. Total time and heart rates were about 5% lower on the 29er, while average speed was 6.8% faster, with a 9.4% reduction in the total caloric expenditure for a standardized trail ride. Mountain bikers debating between a 26er and 29er, or trying to choose a bike appropriate for conditions they most commonly encounter, may benefit from these results.

2558 Board #81 June 3, 9:30 AM - 11:00 AM
Acute Responses Of A 90 K Cycle To Substrate Utilization, Muscle Deoxygenation, GET, And Performance

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 (No relationships reported)

Purpose: To observe the acute responses of a 90 k cycle on VO_{2max} , gas exchange threshold (GET), critical power (CP), substrate use, blood lactate, and muscle deoxygenation during ramp (RAMP) and CP testing. **Methods:** 12 male cyclists (28±6y; VO_{2max} 4.2±0.5 L/min) performed RAMP and CP tests on a cycle ergometer, pre and post 90 k moderate intensity cycle on the open road. The RAMP test (30 W/min) was used to determine VO_{2max} and GET whereas the CP test demonstrated peak power and CP. Breath-by-breath pulmonary VO_2 and muscle deoxygenation (HHb) was measured during both RAMP and CP tests. Blood lactate concentration was collected pre and post, both tests. **Results: RAMP:** Decreased VCO_2/VO_2 (RER) and carbohydrate oxidation at CP (pre 1.08 ± 0.08, post 1.03 ± 0.06; pre 5.8 g/min, post 5.07 g/min; P<0.05; P<0.05) demonstrating increased activation of glycolytic oxidative phosphorylation and reduced substrate glycolytic phosphorylation was observed. VO_2 at GET was unchanged, whereas work rate decreased (pre 2.5 ± 0.43 L/min, post 2.38 ± 0.4 L/min; pre 209 ± 33 W, post 188±29 W; P>0.05; P<0.05) implicating increased oxidative phosphorylation from fat. Post ride, post RAMP test blood lactate, peak work rate and VO_{2max} were lower (pre 12.08 ± 2.28 mmol/L, post 9.16 ± 3.3 mmol/L; pre 392 ± 29 W, post 361 ± 28 W; pre 4.2 ± 0.46 L/min, post 3.85 ± 0.45 L/min; P<0.05). Increased HHb from 175-310 s post cycle, with no change in VO_2 , suggests reduced blood flow distribution (BFD) (P<0.05; P>0.05). **CP:** CP and associated VO_2 were similar pre to post-ride (pre 300 ± 35 W, post 306 ± 39 W; pre 3.92 ± 0.32 L/min, post 3.76 ± 0.43 L/min; P>0.05). Whereas RER decreased pre- to post-ride at CP (pre 1.15 ± 0.07, post 1.08 ± 0.07; P<0.05) suggesting lower substrate glycolytic phosphorylation. Reduced HHb from 10-75 s post cycle, with no change in VO_2 , suggests improved BFD (P<0.05; P>0.05). Decreased power output from 10-95 s (P<0.05) post ride, coupled with the lower blood lactate (pre 15.38 ± 2.75 mmol/L, post 10.62 ± 2.18 mmol/L; P<0.05) suggests lower anaerobic glycolytic phosphorylation. **Conclusion:** The acute response to a long duration cycle enables cyclists to perform at CP and GET with lower glycogen utilization due to up regulation of glycolytic oxidative phosphorylation. Chronic long duration training sessions (90 k) may increase aerobic power from carbohydrates.

2559 Board #82 June 3, 9:30 AM - 11:00 AM
Effects of Beta-Alanine on Power Output and Blood Lactate Concentrations with Repeated Wingate Tests

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Past research supports that Beta-alanine (β-Alanine) delays the onset of blood lactate levels and increases the power output by the muscles. β-Alanine is not synthesized in the human body and has to be obtained through dietary supplementation (i.e., part of a dipeptide called carnosine). β-Alanine acts as an intramuscular buffer during anaerobic exercise, which is used to reduce lactate and keep the pH levels at a safe level so as to preserve the cellular enzyme activity. **PURPOSE:** To determine how a five day loading phase, at two different levels, of β-Alanine supplementation would affect power output and blood lactate concentrations. **METHODS:** Student athletes from a Division II University performed three Wingate protocols on three separate occasions, separated by at least one week. Participants were randomly assigned the three different treatments; placebo, 3.2 or 6.4 grams of β-Alanine. Power output for each 30 second Wingate test was determined by recording pedal revolutions for each 5-second interval for each treatment. **RESULTS:** A 3 x 3 repeated measures ANOVA showed a significant main effect for time [(F(2,36)=16.02, p<0.001) and trial [(F(2,36)=62.95, p<0.001)], but no time x trial interaction, for the total revolutions (i.e., power output) for all Wingate tests. A 2 x 9 repeated measures ANOVA showed a significant main effect for time [(8,72)=71.61, p<0.001], trial [(1,72)=108.6, p<0.001], and time x trial [(8,72)=17.85, p<0.001]. A paired-samples t test showed significance (p=0.02) between control Wingate post-exercise test #1 (10.2±1.3) vs. 6.4 gram β-Alanine Wingate post-exercise #1 (9.5±2.1). **CONCLUSIONS:** In conclusion, a five day loading phase for β-Alanine showed promise for time and trial changes in repeated Wingate tests (i.e., power output) and significant time x trial results for blood lactate. However, this study loaded β-Alanine for five days, while a typical loading phase is 28 days. This may have led to the lack of significance between control and the two β-Alanine treatment quantities for time x trial in the repeated Wingate tests. Moreover, while the blood lactate concentrations showed significance, it was only at one particular time compared to trial. More research needs to be conducted in terms of β-Alanine loading phase time and repeated anaerobic tests.

2560 Board #83 June 3, 9:30 AM - 11:00 AM

Energy Systems and Performance Endurance in Cyclists According to the Type of Course

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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. **PURPOSE:** To determine the contribution of the anaerobic system and other energy systems on a simulated 28 km road cycling flat course compared to a 20 km uphill course. **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 (PMr-20 km) (W' : $r = -0.64$, $p < 0.01$; PP : $r = -0.73$, $p < 0.05$ for flat vs. ascending), but anaerobic work (Wana) during the uphill 20 km was higher than in the flat 28 km (18.53 ± 10.02 vs. 7.91 ± 4.55 kJ, $p < 0.001$). 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, $p < 0.05$). Kinetics of PMr-20 km and of PM-28 km showed a parabolic performance strategy on both courses ($F(1, 9) = 22.08$, $p < 0.01$; $F(1, 9) = 42.03$, $p < 0.01$). **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.

2561 Board #84 June 3, 9:30 AM - 11:00 AM

Changes in Muscular Strength Over a 24-Week Cycle Ergometer Interval Program

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(No relationships reported)

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 = 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 or 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 70%, 80%, 90%, 100%, 90%, 80% of maximum heart rate, respectively with 2 minutes active rest, and (d) short 30 sec. sprint intervals at maximal effort with 20 sec. active rest. Other physical activities outside the lab were tracked and recorded, and participants did not report engaging in any strength training during the study. Isometric knee strength (45deg, 5sec contraction) was measured on the right leg before and after the 6-month training program using the Biodex 3 dynamometer. Peak Torque Flexion (PTF) and Peak Torque Extension (PTE) were measured and compared pre and post the 6-month program. A dependent t-test was used to calculate differences pre to post. **RESULTS:** PTF on average significantly increased from the pre-test to the post-test (92.67 ± 28.53 ft/lbs vs. 102.19 ± 29.02 ft/lbs, $t = 2.37$, $p = 0.03$, Cohen's $d = 0.56$). PTE did not differ statistically from the pre test to the post test (61.59 ± 18.62 ft/lbs vs. 60.34 ± 21.98 ft/lbs, $t = -0.58$, $p = 0.57$, Cohen's $d = 0.14$). **CONCLUSION:** Interval training appears to be a viable option for increasing some measures of muscular strength over a 6-month training period. This finding suggests that healthy, middle aged subjects can achieve muscular strength benefits from very short, high-intensity aerobic intervals.

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2562 Board #85 June 3, 9:30 AM - 11:00 AM

Predicting Physiological Response To Constant Power Cycling Exercise From A Single Incremental Blood Lactate Threshold Test.

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Background: Blood lactate threshold (BLT) testing is at the cornerstone of performance assessment and training prescription for competitive cyclists. Cycling power at the BLT is often determined from a single incremental exercise test and subsequently used as a surrogate measure of the BLT. However, it is not fully understood if cycling at this power over longer exercise durations will elicit similar physiological responses.

Purpose: To determine if the relationship between power output and the physiological responses to a single 3-minute stage incremental exercise protocol would 'carry over' into steady state exercise lasting up to 30-minutes and across multiple exercise intensities.

Methods: 15 trained cyclists completed a 3-min stage incremental BLT test and 3 subsequent 30-minute steady state exercise trials at -5%, +5% and +15% of the power output at breakpoint BLT. The mean heart rate (HR), rating of perceived exertion (RPE) oxygen uptake (VO_2) and blood lactate (bLa) corresponding with each intensity were determined from the BLT test and linear regressions were used to compare the physiological responses expected of these workloads with the actual physiological responses determined during steady state exercise. Accuracy was set a priori at 5% standard error of estimate (S.E.E.).

Results: HR and VO_2 at power outputs corresponding with -5%, +5% and +15% of the BLT measured during 3-minute incremental stages accurately carried over to 30-minute steady state exercise with a S.E.E. (% mean) of 4.29bpm (2.8%) and 129.7ml/min (4.3%), respectively. However, RPE and bLa concentration did not fall within the 5% S.E.E. thresholds [RPE = 0.92 (6.6%) on the Borg 6-20-point scale; bLa = 42 mM (27.4%)]. There was a tendency for bLa concentration to be further underestimated with increasing exercise intensity.

Conclusion: The relationship between HR, VO_2 and power output established during a single 3-minute stage incremental BLT test 'carries over' to steady state exercise lasting up to 30-minutes at intensities of -5% to +15% of the breakpoint BLT. Although RPE and bLa were inaccurate, the S.E.E. for lactate and RPE was within 0.5mM and 1 point on the Borg 6-20 scale, respectively. These results indicate that physiological responses to longer duration exercise can be predicted with some accuracy from a single BLT test.

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

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

2563 Board #86 June 3, 9:30 AM - 11:00 AM

Prediction of Oxygen Uptake during Walking in Persons with Down Syndrome

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Persons with Down syndrome (DS) have increased rate of oxygen uptake (VO_2) during walking likely due to balance problems and reduced fitness. For exercise prescription, a formula for predicting VO_2 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 VO_2 from walking speed for persons with DS and examine its accuracy. **METHODS:** We compiled data from three previous studies. A total of 470 VO_2 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). VO_2 was measured with open-circuit spirometry during either over-ground or treadmill level walking at speeds ranging from slow to fast. The relationship between VO_2 and speed was analyzed with multi-level regression. Predictors were speed (m·s⁻¹), group (DS vs. non-DS), the group by speed interaction, speed squared, and walking mode (treadmill vs. over-ground). Separate models for each group were run upon significant interaction. Prediction accuracy was assessed with the mean absolute percent error and Bland-Altman plots. **RESULTS:** The relationship between VO_2 and speed differed between persons with and without DS.

Significant predictors of VO₂ were speed, speed squared, group, and group by speed interaction ($p < 0.001$; $R^2 = 0.82$). Walking mode (treadmill vs. over-ground) was not a significant predictor. Separate models for each group showed that speed and its square significantly predicted VO₂ ($p \leq 0.001$). For persons with DS, the prediction equation was $VO_2 = 7.713 - 3.477 \times \text{speed} + 7.911 \times \text{speed}^2$ ($R^2 = 0.83$). For persons without DS, the equation was $VO_2 = 6.951 - 0.736 \times \text{speed} + 3.560 \times \text{speed}^2$ ($R^2 = 0.77$). Mean absolute percent error across speeds did not differ between groups (DS: $13.0 \pm 9.3\%$; non-DS: $11.9 \pm 8.2\%$; $p = 0.16$). 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.

2564 Board #87 June 3, 9:30 AM - 11:00 AM
Fatigue Level is Associated with Sleep Quality but not Vector Magnitude in Multiple Sclerosis

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 (No relationships reported)

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 accelerometry. **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.

2565 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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Rheumatoid arthritis (RA) is a chronic inflammatory disease characterized by synovial 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: 80% 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-press (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: -0.9%; 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 (-2.0%).

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 constitute a promising alternative adjunctive therapy for RA management.

2566 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

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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 ($R^2=0.28$, $\beta=-.22$, $p=.01$). This association was slightly attenuated but remained significant when resilience was entered into the model ($R^2=0.29$, $\beta=-.21$, $p=.03$). Sedentary behavior was independently associated with mental QOL after adjusting for MVPA, disease state, age, and sex ($R^2=0.21$, $\beta=-.23$, $p=.01$). This association was no longer significant with the addition of resilience, suggesting it is a mediating variable ($R^2=0.35$, $\beta=-.09$, $p=.29$). **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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2567 Board #90 June 3, 9:30 AM - 11:00 AM
The Oxygen Uptake Efficiency Slope Is Not Influenced By Beta-blockade In End-stage Liver Disease Patients

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Portal hypertension is a typical complication of end-stage liver disease (ESLD). Beta-blockade is used as prophylaxis to minimize the risk of gastroesophageal variceal haemorrhage. The use of beta-blockers may negatively impact peak oxygen uptake ($\dot{V}O_{2peak}$) and ventilatory threshold (VT) by reducing cardiac output. $\dot{V}O_{2peak}$ and VT have shown to predict short- and long-term complications after liver transplantation but may be limited by peripheral fatigue due to beta-blockade. The oxygen uptake efficiency slope (OUES) represents the effectiveness of the body to extract oxygen

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 compared to $\dot{V}O_{2peak}$ and VT in patients with ESLD.

METHODS: Participants completed a symptom-limited cardiopulmonary exercise test (CPX) as part of pre-liver transplant risk stratification. Those who reached a respiratory exchange ratio (RER) ≥ 1.05 were included in the analysis. $\dot{V}O_{2peak}$ was determined as the highest 30-second average values during the test. VT was measured using the V-slope method. OUES [$\dot{V}O_2$ (L/min) = $m(\log_{10} VE) + B$, where $m = OUES$] was calculated at 50% (OUES₅₀), 75% (OUES₇₅) and 100% (OUES₁₀₀) 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 $\dot{V}O_{2peak}$ (3.9 ± 3.7 vs. 16.1 ± 2.6 ml.kg⁻¹.min⁻¹) and VT (10.7 ± 2.6 vs. 12.6 ± 2.1 ml.kg⁻¹.min⁻¹). However, there were no significant differences ($p > 0.05$) at OUES₁₀₀ (1.59 ± 0.48 vs. 1.76 ± 0.51), OUES₇₅ (1.61 ± 0.43 vs. 1.72 ± 0.52) and OUES₅₀ (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.

2568 Board #91 June 3, 9:30 AM - 11:00 AM
Metabolic And Cognitive Effects Of Physical Activity In Patients With Alzheimer's Disease

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Cardiorespiratory fitness ($\dot{V}O_{2max}$) represents the peak rate of metabolic activity in exercising muscle. Previous studies demonstrated a relationship between $\dot{V}O_{2max}$ and brain atrophy at different stages of Alzheimer's disease (AD). Furthermore, in patients with mild cognitive impairment $\dot{V}O_{2max}$ 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 $\dot{V}O_{2max}$, 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. CT included multi-modal stimuli (visual, verbal, auditive). Before (T0) and after (T1) 6-month treatment MMSE and $\dot{V}O_{2max}$ were measured.

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, $p=0.003$). $\dot{V}O_{2max}$ increased significantly in ET group (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.

2569 Board #92 June 3, 9:30 AM - 11:00 AM

Differences in Body Composition Across Levels of Disability Among Ambulatory Patients Living With Multiple Sclerosis

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(No relationships reported)

Few studies have explored body composition differences in relation to disability status in patients with Multiple Sclerosis (MS). **PURPOSE:** Explore differences in total lean mass, percent body fat, and visceral adiposity mass across mild, moderate, and severely disabled individuals living with MS. **METHODS:** One hundred and four (M=23, F=81) community dwelling adults diagnosed with MS (mean age =45.69 ± 9.98 y), BMI= 25.79 ± 9.98 kg/m², participated in this study. All participants were capable of walking 100 meters unassisted and did not regularly participate in physical activity. Regional and whole body composition was assessed using DXA. Self reported disability was quantified according to the Patient Determined Disease Steps (PDDS) self-report questionnaire, whereby participants were categorized as either mild, moderate, or severely disabled. A multivariate analysis of covariance (MANCOVA) was conducted to assess body composition by PDDS, while controlling for age and sex. **RESULTS:** Analysis revealed that disability status did not have an effect on percent body fat ($F(2, 99) = 1.92, p = .15$), total body lean tissue ($F(2, 99) = 1.02, p = .36$), or visceral adiposity mass ($F(2, 99) = .61, p = .55$). Descriptive statistics for body composition by disability status are as follows:

Disability Level	Mild (n=52)	Moderate (n=47)	Severe (n=5)
Percent Body Fat	38.07 ± 9.71	35.77 ± 7.93	35.60 ± 9.13
Total Body Lean (kg)	42.26 ± 7.73	42.51 ± 7.77	45.07 ± 7.49
Visceral Mass (kg)	.730 ± .600	.757 ± .613	1.075 ± 1.246

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.

2570 Board #93 June 3, 9:30 AM - 11:00 AM

Neuromuscular Determinants For Walking Performance In Individuals With Multiple Sclerosis

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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 obtained while participants performed 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 ($P < 0.01$) 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 MUs 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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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 self-report. PA levels were measured by wearing Actigraph GT3X+ accelerometers on the hip of the more-affected leg for one week.

RESULTS: The patients averaged 33 min of MVPA / day (range: 4-107 min). The stepwise procedure converged on a model ($R^2 = 0.34$, $P = 0.002$) that included total leg 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

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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- γ , GM-CSF, e TNF) determined by Multiplex Assay (Luminex), maximum O₂ uptake (VO₂max) consumption determined by gas analysis (MetaLyzor 3B), and peak running speed (V_{peak}) 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, VO₂max and V_{peak} 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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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. We hypothesized that the improvements in motor function would be greater for participants who received wide-pulse NMES.

METHODS: Eleven persons (51.4 ± 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.

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2574 Board #97 June 3, 9:30 AM - 11:00 AM

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

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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 manifest 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.

Methods: Subjects were classified as OSA (N=21) or controls (N=21) based on an overnight, at-home screening device. Cardiovascular hemodynamic variables were assessed using a non-invasive, impedance cardiography device at rest and during a submaximal treadmill exercise trial. Subjects exercised for 5 minutes at 70% of predicted VO₂ Reserve (VO₂R). Hemodynamic variables included cardiac output, stroke volume, ejection fraction, systemic vascular resistance, contractility index (CTi) and end-diastolic volume (EDV).

Results: Control subjects were significantly younger (28.1 ± 11.5 vs. 41.8 ± 12.8) and had a lower BMI (28.5 ± 3.2 vs. 31.6 ± 5.3) than the OSA group. After adjusting for age and BMI, no hemodynamic variables differed at rest between groups. With exercise, however, OSA subjects had a lower CTi (268.9 ± 76.2 vs. 407.5 ± 142.7, P < 0.05) and a higher EDV (156.8 ± 32.9 vs. 122.6 ± 23.8, P = 0.03). No other hemodynamic variables differed with exercise.

Conclusions: Results suggest that the presence of OSA results in alterations in cardiovascular exercise hemodynamics, suggestive of remodeling of the myocardium. The CTi represents the maximal velocity of ejected blood flow, a surrogate for contractility, which was attenuated in the OSA group. This decreased contractility likely contributed to the decreased EDV also observed. These findings suggest that OSA may impact exercise capacity and contribute to the increased risk for CVD and heart failure previously established.

2575 Board #98 June 3, 9:30 AM - 11:00 AM
Self-Reported Physical Activity and Sitting in Adults with Visual Impairments

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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 ± 13.9 yrs, body mass index = 28 ± 6.9 kg/m²) with varying degrees of VI (B1, n=30; B2, n=25; B3, n=34; B4, n=26) 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, 4.9% in MPA, 4.9% 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 ± 46.8 mins/d) when compared to women (42.7 ± 30.9 mins/d). For MVPA greater participation was found with men (120.4 ± 75.3 mins/d) when compared to women (84.2 ± 55.7 mins/d). There was a significant interaction between gender and VI in walking with a significant main effect for VI. Tukey post hoc analysis was conducted, B2 walked 46.8 ± 39.9 mins/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.

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

	Walking	MPA	MVPA	VPA	ST
G	F(1, 107)=0.568, p=0.453	F(1, 73)=9.559, p=0.003*	F(1, 89)=6.239, p=0.014*	F(1, 69)=6.224, p=0.948	F(1, 107)=0.502, p=0.480
VI	F(3, 107)=3.232, p=0.025*	F(3, 73)=0.624, p=0.602	F(3, 89)=0.583, p=0.628	F(3, 69)=0.915, p=0.438	F(3, 107)=0.1096, p=0.354
G x VI	F(3, 107)=6.513, p=0.000*	F(3, 73)=2.109, p=0.106	F(3, 89)=2.835, p=0.043*	F(3, 69)=2.709, p=0.052	F(1, 107)=0.1.118, p=0.354

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<.05

2576 Board #99 June 3, 9:30 AM - 11:00 AM
Cardiopulmonary Exercise Testing Reveals Abnormalities in Chronic Kidney Disease

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Cardiopulmonary exercise testing (CPX) provides a wide range of information related to cardiorespiratory fitness, mechanisms of limitations in exercise capacity and prognosis. Cardiorespiratory 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 investigated.

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 V_E/VCO₂ slope (32 ± 3 vs. 27 ± 4; p < 0.05) in CKD indicates 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 ± 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.

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2577 Board #100 June 3, 9:30 AM - 11:00 AM
Combined and Sequential Physical and Vocal Training for Parkinson's Disease

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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/cool down. Modifications were included for individuals to maintain their own pace while partaking in group activities. Upon program completion, the SFT 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.

2578 Board #101 June 3, 9:30 AM - 11:00 AM
Tai Chi Exercise on Muscle Strength and Physical Function in Peripheral Neuropathy Patients

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An estimated 20 million people in the U.S. suffer from peripheral neuropathy (PN). Patients with PN develop gait abnormalities, and foot pain is one of the factors affecting walking ability. As a result, a large number of individuals with PN suffer from a reduction in daily physical activity and reduced quality of life. Tai Chi appears

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 3 times per week, 60 minutes each time. Before and after training, muscle strength [One repetition maximum (1RM) 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 PN patients. 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.

2579 Board #102 June 3, 9:30 AM - 11:00 AM

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

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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:** Correlations between peak heart rate and age, BMI, ID and DS were observed (r² = 0.032; p < 0.05). For peak oxygen uptake, age, sex, BMI, ID, DS and the interaction term BMIxDS were important (r² = 0.54; p < 0.05). **Conclusions:** These results demonstrated that individuals with ID on average have lower peak heart rates and lower peak oxygen uptake than individuals without ID, controlling for sex, age and BMI, and that the negative influence of BMI on peak oxygen uptake is smaller for people with DS. Although the differences are not as large as between individuals with DS and individuals without ID, our analysis demonstrates that all three groups are significantly different from each other.

Dependent = HRpeak	Unstandardized Coefficients		Sig.
	B	Std. Error	
Constant	211.7	4.210	.00
Age	-.59	.081	.00
Sex	-.89	1.346	.51
BMI	-.22	.087	.01
DS	-23.97	1.987	.00
ID no DS	-10.03	1.546	.00
Constant	54.04	7.203	.00
Dependent=VO2peak			
Age	-.14	.053	.01
Sex	-7.5	.823	.00
BMI	-.84	.056	.00
HRpeak	.11	.032	.00
DS	-20.3	5.271	.00
ID no DS	-3.6	.992	.00
BMIxDS	.37	.183	.04

2580 Board #103 June 3, 9:30 AM - 11:00 AM

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

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(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 hamstring 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 OFF and ON for the following variables (mean ± SD): Quad PT [OFF: 72.2 ± 37.3; ON: 81.1 ± 47.9 (p = .011)], Quad PT/BWT [OFF: 37.0 ± 16.9; ON: 41.3 ± 19.2 (p = .006)]. There was no significant difference for Ham PT [OFF: 57.5 ± 30.8; ON: 60.5 ± 30.4 (p = .200)], and Ham PT/BWT [OFF: 30.0 ± 13.7; ON: 31.3 ± 13.8 (p = .240)], and H:Q ratio [OFF: 0.812 ± 0.189; ON: 0.775 ± 0.178 (p = .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 pharmaceutical ingestion.

2581 Board #104 June 3, 9:30 AM - 11:00 AM

Self-Reported Walking Time in Adults with Blindness or Visual Impairments

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PURPOSE: Walking may be one of the most achievable and convenient forms of physical activity (PA), which elicits substantial health benefits. However, individuals who are blind or have visual impairments (VI) face many barriers that may limit the amount of time spent walking. The purpose of this study was to examine time engaged in walking among individuals with blindness or VI. **METHODS:** One hundred and fifteen individuals (age=36.1±13.9yrs, BMI=28±6.9kg/m²) who were blind, self-reported as B1 (no light perception) (n=30) or had a VI, self reported as B2-B4 (ability to recognize the shape of a hand up to visual acuity of 20/70 and a visual field larger than 20 degrees in the better eye with the best practical eye correction) (n=85) enrolled in a national fitness program through the United States Association of Blind Athletes completed the study. Participants completed the International Physical Activity Questionnaire-Short Form (IPAQ-S), which assesses frequency of participation in walking, moderate PA, vigorous PA, and sitting time for a one-week period. **RESULTS:** Daily walking times for individuals with blindness and those with VI were 46.8±39.9 mins and 75.6±62.6 mins, respectively. Participants with blindness spent significantly less time walking compared to those with VI (t(113)=-2.89, p=0.005). Similarly, individuals who were blind acquired fewer walking MET/min/wk (900.4±909.2 MET/min/wk) compared to those with VI (1582.8±1491.0 MET/min/wk) (t(113)=-2.95, p=0.004). **CONCLUSIONS:** Individuals who are blind spend less time walking and achieve fewer MET/min/wk of walking compared to those with VI. This may be a result of barriers encountered by those who are blind, but not by those with VI and suggest the need for intentional programming to facilitate walking for this population.

2582 Board #105 June 3, 9:30 AM - 11:00 AM
Global Pain Severity is Associated with Lower Extremity Strength in Older Adults with Multisite Pain
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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)

2583 Board #106 June 3, 9:30 AM - 11:00 AM
The Relationship between Global Pain Severity and Gait Speed in Older Adults with Multisite Pain
 Lauren Tierno, Tongjian You, FACSM, Elisa Ogawa, Saurja Thapa, Netsanet Tsegai, Yurun Cai, Suzanne Leveille. *University of Massachusetts Boston, Boston, MA.* (Sponsor: Tongjian You, FACSM)
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 (No relationships reported)

Lower extremity function is affected by the site and severity of chronic musculoskeletal pain in older adults. However, it is unknown if pain severity is associated with walking speed in older adults who have multisite pain and are at risk of falling. **PURPOSE:** To investigate the relationship between global pain severity and gait speed in older adults with multisite pain and having a history of falling. **METHODS:** Thirty six community-dwelling older adults (77±8 years, 29 females and 7 males) with multisite pain (≥ 2 pain sites) who reported at least one fall in the past year or currently used an assistive device were recruited from the Boston area. Global pain severity was measured using the pain severity subscale (0-10) of the Brief Pain Inventory. Gait speed (m/s) was assessed by the better of two trials of a timed 4-m usual-pace walk. Pearson correlation and linear regression were used to assess the association between pain severity and gait speed. **RESULTS:** The average pain severity was 4.89±1.70, and the average gait speed was 0.99±0.31 m/s. Gait speed was negatively associated with pain severity ($r=-0.30$, $p=0.07$). This association was diminished after multivariable adjustment in linear regression. **CONCLUSION:** Gait speed tended to be associated with global pain severity in older adults with multisite pain and having a history of falling. This preliminary finding needs to be further confirmed in an analysis with a larger sample size. (Supported by NIH Grant R21 AG043883)

2584 Board #107 June 3, 9:30 AM - 11:00 AM
Aerobic Fitness and Protection on Atherosclerotic Cardiovascular Risk in Paralympic Athletes with a Locomotor Impairment
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Atherosclerotic cardiovascular disease (ACVD) is a leading cause of morbidity and mortality in individuals with a locomotor impairment (I-LI). ACVD occurs at earlier ages in I-LI than in ambulatory subjects because they, in particular those with a spinal cord injury (SCI), have a higher prevalence of risk factors (RF) mainly due to their increased sedentary habit. While reduced daily energy expenditure has been established as further RF, at our knowledge, the possible role of aerobic fitness as ACVD protective factor has not been fully evaluated in I-LI. **PURPOSE:** The present study, carried out on Paralympic athletes (PA) with a LI, was aimed at both assessing the prevalence of ACVD RF in PA with either a SCI (PA-SCI) or other (different from SCI) LI (PA-OLI) and evaluating the hypothesis that aerobic fitness (oxygen uptake peak - VO₂peak) was inversely related to ACVD RF. **METHODS:** A total of 135 male PA (72 PA-SCI - 28 PA with lower limb amputation, 12 PA with a cerebral palsy/brain injury, 7 PA with poliomyelitis, 9 PA with other neurological disorders and 7 PA with other orthopedic disorders) were screened through anthropometric and blood pressure (BP) measurements, laboratory blood tests and graded maximal exercise test, to estimate both an ACVD-RF score and VO₂peak. The ACVD risk score was assessed summing 1 point for each of the following RF: obesity - OB - (BMI≥30 or waist circumference ≥102 cm), hypertension - HT - (systolic BP ≥ 140 mm Hg and diastolic BP ≥ 90 mm Hg), dyslipidemia - DL - (total Cholesterol - C - ≥200 mg·dl⁻¹ or LDL-C ≥130 mg·dl⁻¹ or HDL-C < 40mg·dl⁻¹), impaired fasting glucose - IG - (fasting plasma glucose ≥100 mg·dl⁻¹) and subtracting 1 point when serum HDL-C was higher than 60 mg·dl⁻¹. **RESULTS:** Prevalence of OB, HT, DL, IG and high HDL-C were equal to 5.9% and 3.2%, 13.9% and 14.3%, 58.3% and 49%, 29.2% and 34.9%, 27.8% and 17.4%, in PA-SCI and PA-OLI, respectively. Based on the ACVD RF, 3 groups were formed: group 1 (RF≤0, N=54), group 2 (RF=1, N=41), group 3 (RF≥2, N=40). VO₂peak was equal to 37.9±14.71 ml·kg⁻¹·min⁻¹, 30.9±9.13 ml·kg⁻¹·min⁻¹ and 24.1±5.50 ml·kg⁻¹·min⁻¹ in the PA of groups 1, 2 and 3, respectively. **CONCLUSIONS:** ACVD RF prevalence resulted similar in PA-SCI and PA-OLI. VO₂peak is inversely related to groups of ACVD RF. High aerobic fitness seems to provide a protective effect on the risk of ACVD morbidity in PA.

2585 Board #108 June 3, 9:30 AM - 11:00 AM
To Window or Not To Window? The Effects of Window Thresholds On Shoulder Isokinetic Testing
 Alexander C. Merritt, Bryan L. Riemann, George J. Davies.
Armstrong State University, Savannah, GA.
 (No relationships reported)

To Window Or Not To Window? The Effects of Window Thresholds On Shoulder Isokinetic Testing.
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 Common practice for isokinetic testing is to window test data within certain percentages of the target velocity. To date, particularly for the shoulder, little objective rationale for the optimal window threshold exists. **PURPOSE:** To examine the effects of differing window thresholds on shoulder internal (IR) and external (ER) rotation average peak torque and range of motion. **METHODS:** Fifteen healthy, young adults (18 to 30 yrs) completed dominant shoulder IR and ER rotation isokinetic testing at 60°/s and 180°/s (Biodex, Shirely, NY). Raw torque, angle and velocity data were exported from the dynamometer software and processed using a custom program that computed peak torque and ROM at seven window thresholds: no window (NW), 70%, 75%, 80%, 85%, 90% and 95% of target velocity. Speed by window analyses of variance with Bonferroni post hoc tests were conducted. Statistical significance was considered at $\alpha=.05$. **RESULTS:** All participants reached 95% of 60°/s for both IR and ER and 180°/s for IR, whereas 20% (n=3) failed to reach 180°/s for ER. With each window threshold increase, ROM ($P\leq.001$, $d=1.35$ to 7.46) and 180°/s IR peak torque were significantly decreased ($P<.001$ to .032, $d=1.01$ to 5.53), whereas 180°/s ER peak torque significantly decreased until 90% ($P<.001$ to .037, $d=.99$ to 2.31). For 60°/s IR peak torque, NW, 70%, and 75% were significantly greater than 85%, 90% and 95% ($P=.004$ to .027, $d=1.04$ to 1.29) and 80% and 85% were significantly greater than 95% ($P=.014$ to .017, $d=1.09$ to 1.12). For 60°/s ER peak torque, 95% was significantly less than all other window thresholds ($P=.039$ to .048, $d=.96$ to .99). **CONCLUSION:** Even with 5% increments, windowing had very potent effects on peak torque and ROM data.

These results suggest when determining peak torque from isokinetic shoulder IR and ER data at 60°/s 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.

E-28 Free Communication/Poster - Exercise Science Pedagogy

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

2586 Board #109 June 3, 11:00 AM - 12:30 PM 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. **METHODS:** 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 lesson 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 Square analysis. A level of p< 0.05 was used as the criteria for statistical significance. **RESULTS:** There were no significant differences between groups with respect to Exam 1 (traditional 81.33 + 9.32%, hybrid 81.14 + 10.89%), Exam 2 (traditional 77.96 + 10.70%, hybrid 78.77 + 10.61%), Exam 3 (traditional 82.54 + 8.18%, hybrid 80.82 + 8.53%), and Semester Average (traditional 83.92 + 6.64%, hybrid 82.55 + 8.63%). Perceptions of content delivery with respect to the learning experience, feedback, clarification of concepts, and level of engagement were also similar between sections ($\chi^2 > 0.05$). **CONCLUSION:** Both traditional and hybrid modes of delivery were equally effective in promoting mastery of exercise physiology content.

2587 Board #110 June 3, 11:00 AM - 12:30 PM Evaluation of Critical Thinking in an Exercise Science Program with a Standardized Critical Thinking Test

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(No relationships reported)

There is consistent agreement amongst educators and employers that critical thinking is important for college students and college graduates entering the work force. The ability to think critically is a trait that is often more highly regarded by employers than specific content knowledge. Critical thinking, or some variant of the terminology, is regularly seen in university, college, department, and programmatic outcomes and mission statements. If critical thinking is as important as it has been portrayed in the literature and media, is it being intentionally taught and/or evaluated at the programmatic level? **PURPOSE:** To evaluate the capacity of freshmen and senior exercise science students to think critically and to determine if there is a relationship between GPA and critical thinking scores. **METHODS:** 302 (179 freshmen, 123 senior) exercise science students completed a standardized critical thinking test (max score = 30) during the spring semester of the 2014-2015 academic year. Cumulative grade point averages were calculated for all 302 students at the end of the spring 2015 semester. Descriptive statistics were calculated and Pearson's correlation was used to determine the relationship between GPA and critical thinking score. **RESULTS:** Critical thinking scores were significantly higher in seniors (23 ± 3.1) than freshmen (20 ± 3.8; p<0.05). Grade point average was higher in seniors (3.55 ± 0.3) than freshmen (3.36 ± 0.5; p<0.05). A weak relationship (r=0.388; p<0.001) was noted in the combined sample between GPA and critical thinking score.

CONCLUSIONS: Seniors in an exercise science program, when compared to exercise science freshmen, demonstrate a higher cumulative GPA and critical thinking score. Grade point average and critical thinking score do not seem to be related.

2588 Board #111 June 3, 11:00 AM - 12:30 PM Final Paper and Exam Scores in Traditional Versus Flipped Classroom in a Special Populations Course

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In the past 3-5 years, there has been increased discussion in STEM-related disciplines regarding the use of the "flipped" classroom where lectures are on video podcast and classroom time is focused on practical application. There are limited data on effectiveness of flipped classrooms on student learning outcomes. **PURPOSE:** To analyze final paper rubric and final exam scores in traditional lecture versus flipped classroom developed to enhance critical thinking skills and exercise programming in a special populations exercise science course. **METHODS:** Final paper rubric scores and domains (introduction, literature review, exercise program, writing clarity, and APA format; 1-3 scale, 15 points) and final exam grades were compared from Fall 2009 through Spring 2015. The flipped classroom was implemented Fall 2013. Students viewed podcasts prior to class and focused on key research studies and exercise programming in class. All sections were taught by the same instructor. Independent t-tests compared scores from traditional (n=84) versus flipped classroom (n=85). **RESULTS:** There were no differences between traditional lecture and flipped classroom in overall final paper rubric, 13.7 vs. 13.6, t(167) = .243, p=.808, and exam scores 80.2 vs. 79.5, t(167) = .511, p=.610. Flipped classroom students performed better on the introduction, 3.0 vs. 2.94, t(167) = -2.306, p<.001, d = .36 and literature review, 2.91 vs. 2.69, t(167) = -2.802, p<.001, d = .41, though they fared worse on writing clarity, 2.91 vs. 2.69, t(167) = -2.802, p<.001, d = .34 and APA format, 2.53 vs. 2.14, t(167) = -2.802, p<.001, d = .60. There were no differences in the exercise program, 2.91 vs. 2.79, t(167) = -1.841, p=.067. **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 courses. Supported by a Research Council Curriculum Enhancement Grant from Winthrop University #CE13008.

2589 Board #112 June 3, 11:00 AM - 12:30 PM Changes in College Students' Perceptions of Required Blogging in an Exercise and Nutritional Sciences Course

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The growth of social media and internet sites for transmission of exercise, nutrition, and health-related information has increased in recent years, and development of on-line communication skills should be included in health-science education. Incorporation of blogging in to the higher education classroom may serve this professional development purpose, while also increasing student engagement with course material and enhancing learning outcomes. **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. **METHODS:** 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=0.001). 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

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(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, 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. Functional linear models ($\alpha=.05$) 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 3° greater eversion compared to copers and normals ($p<.05$). AI subjects also demonstrated up to 0.1 Nm/kg less eversion moment relative to copers, while copers demonstrated up to 0.1 Nm/kg greater eversion moment relative to normals ($p<.05$). PL activation in AI subjects was 13% and 21% less than copers and normals, respectively ($p<.05$).

CONCLUSIONS: Copers show unique neuromechanics relative to AI subjects and normals. AI subjects land with more eversion, but also exhibit less eversion moment along with less PL activation. More data are needed to determine if this strategy is associated with injury risk.

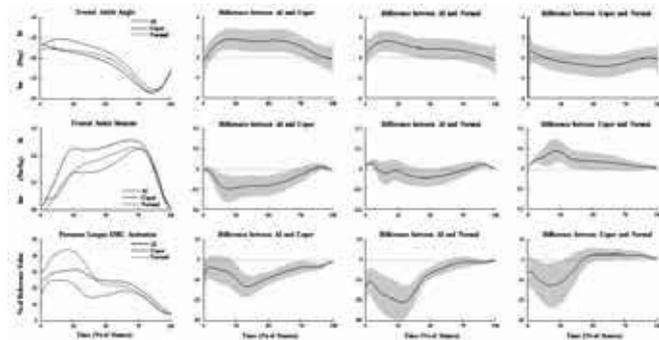


Figure 1. Grand averages for sagittal plane ankle angles, moments, and EMG muscle activation. Pairwise comparison functions with corresponding effect sizes (95% confidence intervals) were plotted to detect mean differences between groups (AI vs Copers, AI vs Normal, Copers vs Normal, respectively) during a max vertical jump and side jump task ($\alpha=.05$). This analysis compares variables as polynomial functions (curves) rather than discrete time points. If functions (black solid line) and corresponding 95% confidence intervals (gray shaded area) did not cross the zero horizontal dashed line, then significant differences existed ($p<.05$). 0-50% of stance indicates the landing phase, 51-100% of stance indicates the push-off phase, and 50% of stance indicates peak knee flexion angle.

2591 Board #114 June 3, 11:00 AM - 12:30 PM

Ankle Sprain Copers Demonstrate Unique Lower Extremity Neuromechanics Compared to Healthy Controls and AI Subjects

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(No relationships reported)

Ankle instability (AI) patients show various sensorimotor deficits, which may be related to the chronic nature of instability. Ultimately, an intervention should focus on deficits which may perpetuate the problem, but an understanding of successful sensorimotor function may best come from those who sprained their ankles with no problematics outcome (copers).

PURPOSE: To examine sagittal ankle angles, moments, tibialis anterior (TA) and medial gastrocnemius (MG) 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 (FAAM ADL = 77.1 ± 15.3%, FAAM Sports = 62.5 ± 20.4%, sprains = 4.1 ± 2.8), 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 ($\alpha=.05$) were used to detect mean difference between groups. If 95% confidence intervals did not overlap zero, significant differences existed ($p<.05$).

RESULTS: Figure 1 shows that copers and AI 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 tibiotalar cartilage surface.

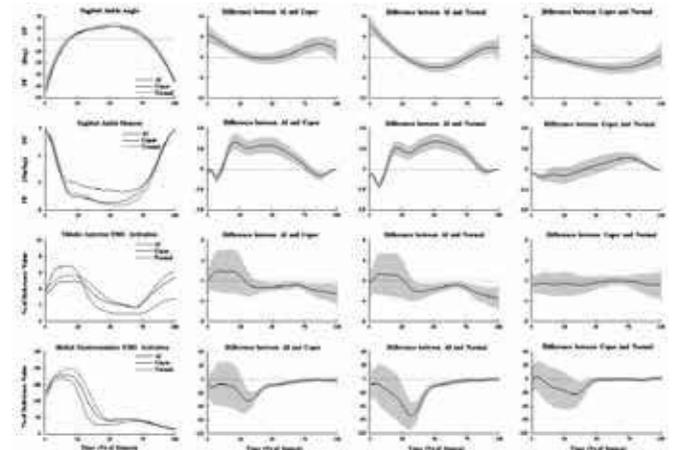


Figure 1. Grand averages for sagittal plane ankle angles, moments, and EMG muscle activation. Pairwise comparison functions with corresponding effect sizes (95% confidence intervals) were plotted to detect mean differences between groups (AI vs Copers, AI vs Normal, Copers vs Normal, respectively) during a max vertical jump and side jump task ($\alpha=.05$). This analysis compares variables as polynomial functions (curves) rather than discrete time points. If functions (black solid line) and corresponding 95% confidence intervals (gray shaded area) did not cross the zero horizontal dashed line, then significant differences existed ($p<.05$). 0-50% of stance indicates the landing phase, 51-100% of stance indicates the push-off phase, and 50% of stance indicates peak knee flexion angle.

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

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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: 24.28±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;

terrain. **METHODS:** Twelve patients with orthopaedic lower limb injuries wore their clinically prescribed, passive-dynamic, carbon fiber ankle-foot orthosis (AFO) during the testing procedures. Twelve able-bodied control subjects also participated. Full body kinematic data were collected for one minute as individuals walked on level and cross-sloped terrain at a speed standardized by leg length. MOS was calculated as the minimum distance between the whole body center of mass and lateral border of the base of support (5th metatarsal head marker) in the mediolateral direction. A 2-way repeated-measures ANOVA with un-paired post-hoc t-tests compared the AFO limb to controls across the three terrain conditions. Effect sizes were also calculated (large effect: $d > 0.8$). **RESULTS:** Individuals with lower limb injuries who wore passive-dynamic AFOs had a 10% greater MOS than controls when their AFO limb was downslope and effect sizes were large (control: 0.097 ± 0.012 m, patient: 0.107 ± 0.009 m, $p = 0.0279$, $d = 0.96$). The patient group achieved MOS values equivalent to controls when the AFO limb was upslope (control: 0.099 ± 0.013 m, patient: 0.103 ± 0.014 m, $p = 0.457$, $d = 0.31$) and on level terrain (control: 0.100 ± 0.012 m, patient: 0.107 ± 0.013 m, $p = 0.203$, $d = 0.54$). There were no differences in MOS across the three terrain conditions (control: $p = 0.404$, patient: $p = 0.172$). **CONCLUSION:** The semi-rigid design features of a passive-dynamic AFO may limit stability when walking on cross slopes, particularly when the AFO limb is downslope. These results are consistent with data from other populations and demonstrate a compensatory increase in MOS under some destabilizing conditions.

2596 Board #119 June 3, 11:00 AM - 12:30 PM
Relationships between Self-Reported Ankle Function and Hoffmann Reflex Latency in Patients with Acute Ankle Sprain
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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-reflex) 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. Hoffman 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 score decreases, 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 spinal reflex responses in the soleus. The preliminary findings support the possibility that delayed response of the soleus H-reflex may be one of the neurophysiological mechanisms underlying ankle dysfunction following AAS.

2597 Board #120 June 3, 11:00 AM - 12:30 PM
Reduced Plantar Cutaneous Sensation Alters Static Postural Control with Chronic Ankle Instability
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 (No relationships reported)

Compensatory mechanisms that utilize plantar cutaneous sensations to maintain good postural control among those with chronic ankle instability (CAI) has not yet been reported. **PURPOSE:** To determine if individuals with CAI demonstrate altered postural control after a diminished plantar cutaneous sensation 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 45 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 2 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: $F_{3,176} = 13.96$; $P = .00$), mediolateral CoP range (RangeX: $F_{3,176} = 15.44$; $P = .00$), and mean anteroposterior TTB (meanTTBy: $F_{3,176} = 5.93$; $P = .01$). 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 stable 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.

2598 Board #121 June 3, 11:00 AM - 12:30 PM
Different Lower Extremity Joint Energetic Pattern between Subjects with Copers and Ankle Instability
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 (No relationships reported)

Lateral ankle sprains are common sport-related injuries, which often lead to ankle instability (AI) or may not develop into AI (coper). Identification of copers energetic patterns may clarify underlying injury pathomechanics of AI. **PURPOSE:** To examine if AI and copers subjects demonstrate different joint power patterns during a forward-side jump when compared to controls. **METHODS:** 19 AI (22.9 ± 2.0 yrs, 175.3 ± 10.7 cm, 73.7 ± 12.2 kg; 4.1 ± 2.8 sprains), 19 Coper (22.1 ± 2.2 yrs, 173.9 ± 8.2 cm, 72.9 ± 12.9 kg; 2.0 ± 1.1 sprains) and 19 control subjects (21.6 ± 2.5 yrs, 172.9 ± 7.7 cm, 68.4 ± 10.8 kg) were categorized according to the FAAM and the MAII. They performed 5 forward-side jumps on the force plate. Joint power (W/kg) was measured during the landing (eccentric power: 0-50% of stance) and take-off (concentric power: 50-100% of stance) phases of a forward-side jump. Functional linear models ($\alpha = 0.05$) were used to evaluate difference in joint power between groups. Functions of each group as well as 95% confidence interval (CI) were plotted to determine significant differences. **RESULTS:** Figure 1. The AI group had less ankle eccentric power during landing phase while greater knee and hip eccentric power in the initial phase of landing compared to copers and control groups ($p < .05$). During take-off phase, AI demonstrated less ankle and knee concentric power whereas copers and controls demonstrated increased hip joint power ($p < .05$). **CONCLUSIONS:** The AI group increased proximal joint energy absorption to compensate for decreased distal joint power during landing compared to the copers and control groups. AI subjects also generated greater energy with the hip joint to compensate for less concentric ankle and knee joint power during the take-off phase.

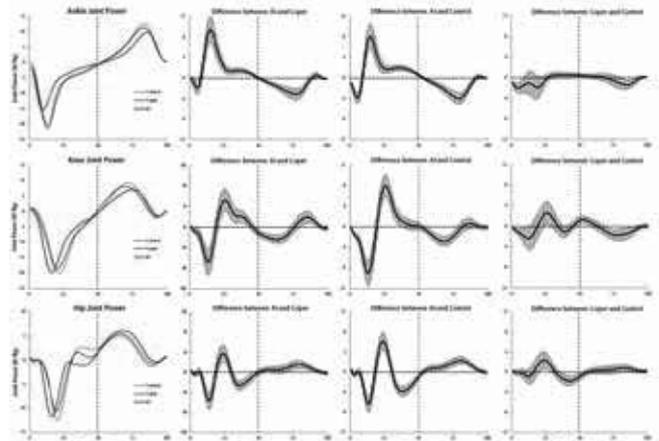


Figure 1. Ankle, knee and hip joint power during stance phase of a forward-side jump between groups (AI vs Coper, AI vs Control, Coper vs Control). Mean difference (dotted line) and corresponding 95% CI (shaded area) are plotted as a function of time. When the shaded area does not overlap with the zero line (horizontal dotted line) a significant difference ($p < 0.05$) is indicated between groups. The solid line indicates joint knee flexion angle.

2599 Board #122 June 3, 11:00 AM - 12:30 PM
Frontal Hip Neuromechanic Alterations During a Jump Task between Ankle Instability, Copers, and Healthy Controls

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Lateral ankle sprains often develop into ankle instability (AI), but some individuals (copers) who have sprained their ankles demonstrate no residual symptoms. Identifying neuromechanic patterns between AI and copers may help identify risks that underlie AI.

PURPOSE: To examine frontal-plane hip angles, moments, gluteus medius (GM), and adductor longus (AL) 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 (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 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<.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.

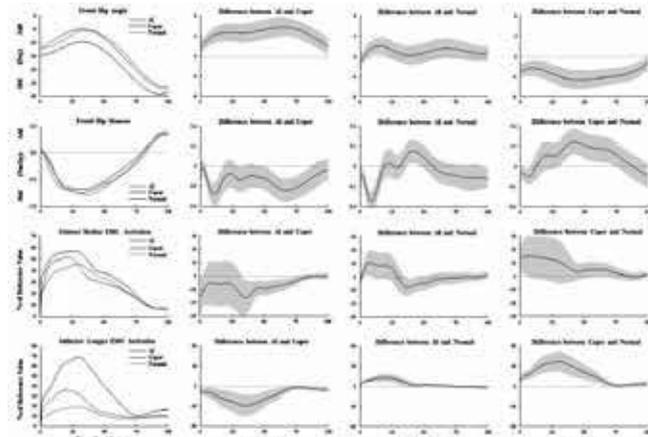


Figure 1. Kinematic variables for frontal plane hip angles, moments, and EMG muscle activation. Pairwise comparisons between groups with its corresponding effect sizes (95% confidence intervals) were plotted to detect mean difference between groups (AI vs Copers, AI vs Normal, Copers vs Normal), respectively during a max vertical front-side jump task (toe-off). The analysis compares variables as polynomial functions (curves) rather than discrete time points. If functions (black solid lines) and 95% confidence intervals (gray shaded area) do not cross the zero (horizontal dotted line), then significant differences exist (p<.05). 0% of values indicate the landing phase, 25% of values indicate the peak off phase, and 75% of values indicate the peak force before toe-off.

2600 Board #123 June 3, 11:00 AM - 12:30 PM
Ankle Health Regulates Lower Extremity Muscle Behavior and Coordination in Freely Walking Rats

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Mechanism(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 affect periarticular and proximal muscle activity. Yet, the retrospective nature of these studies does not allow for a causal link. PURPOSE: To assess temporal alterations in 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)

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 (VL), and biceps femoris (BF) muscles. Baseline EMG were recorded while rats walked on a motor driven treadmill (16m/min) 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 using two-tailed dependent t-tests. Minimum detectable change (MDC) was also 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 were found to exhibit delayed onset time (ms; BF: baseline: -16.7±54.0; day0: 5.23±64.1; TA: baseline: 307.0±64.2; day3: 362.5±55.9; day6: 357.3±39.6, P<0.05) and longer phase durations were observed for the VL and TA (ms; VL: baseline: 321.9±92.6; day3: 401.3±101.2; day4: 404.1±93.0; day5: 364.6±105.2, TA: baseline: 105.3±14.5; day4: 154.9±7.8; 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; day6: 0.93±0.4; day7: 0.85±0.3; TA: baseline: 0.62±0.4; day4: 0.90±0.5, P<0.05). MDC analysis revealed increased sample entropy values for the VL and TA. 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.

2601 Board #124 June 3, 11:00 AM - 12:30 PM
Comparative Effectiveness of Plantar Massage Techniques on Postural Control in those with Chronic Ankle Instability

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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±8.7cm, 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. A repeated measures multivariate ANOVA with a significance level of p<.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 1.65), p=0.001); BRUSH (-0.52±0.63, ES: 0.92 (0.27 to 1.57), p=0.002)), and 95% COP ellipse (MANUAL: (-1.64±0.272, ES: 0.69 (0.05 to 1.33), p=0.014); BALL (-1.64±2.68, 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.

2602 Board #125 June 3, 11:00 AM - 12:30 PM
Prolonged Recovery Time Improves Long Term Postural Control Outcomes For Mice With Surgically Sprained Ankles.

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Recent evidence suggests that increased periods of rest and/or immobilization may improve both acute and long-term outcomes following an ankle sprain. A novel mouse model demonstrates significant acute and chronic balance deficits following a lateral ankle sprain. However, the interventions best able to treat these deficits remains unknown.

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 19cm round beam 1m in length. A liberal alpha level of ≤ 0.10 was used to assess Group \times Time differences in this preliminary investigation.

RESULTS: Foot slips significantly increased at 4-weeks post injury (0.56 ± 0.56) and remained increased at 54 weeks post injury (4.41 ± 1.32) relative to the baseline assessment (0.17 ± 0.26). A Group main effect was also observed as the 3-day group (2.79 ± 0.64) had significantly more slips than the 1-week group (1.88 ± 0.64). A Group \times Time interaction ($p=0.10$) was also observed for foot slips as the 3-day group had significantly more slips at 54-weeks (5.33 ± 0.75) than the 1-week (3.66 ± 1.75) and 2-week (4.23 ± 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

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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) who scored below 90% (82.5 ± 9.0) on the FAAM ADL, below 75% (61.7 ± 12.7) on the FAAM Sport, reported at least 2 "yes" responses (3.6 ± 1.2) on the MAII, and had not suffered a sprain in the previous 6 months; were prepared with a full marker set 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 Dirichlet 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 ($P < 0.05$).

RESULTS: Figure 1 shows the stance curves of clusters 1-5 and a curve of the control group for 8 lower extremity muscles. Some muscles demonstrated distinct differences between clusters and healthy controls at various points during stance. **CONCLUSIONS:** 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.

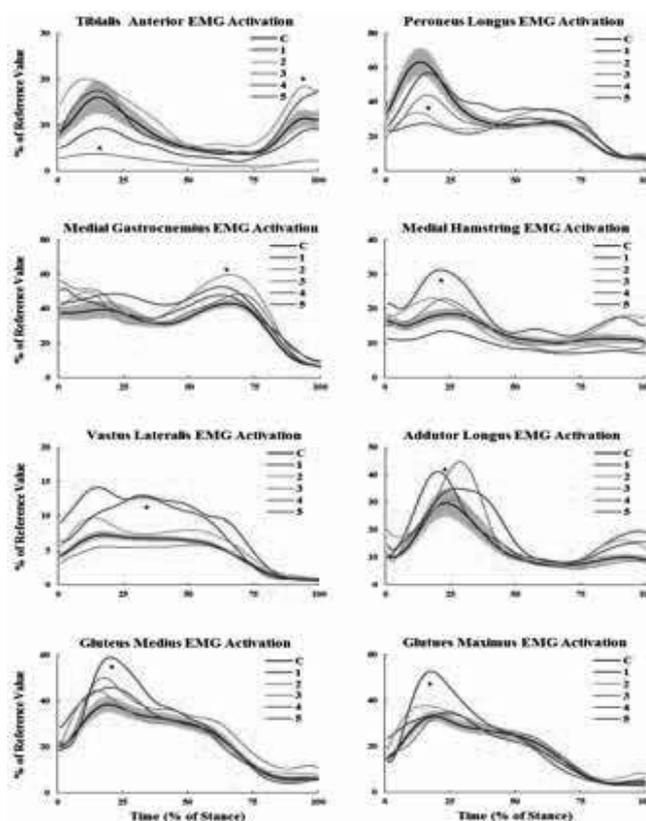


Figure 1. Six curves for each subplot represent normalized EMG amplitudes during the stance phase of a jump task. The control group (C) is surrounded by a 95% confidence interval band. Functional linear models were used to detect differences between each cluster and the control. * Different from control ($P < 0.05$).

2604 Board #127 June 3, 11:00 AM - 12:30 PM

Analysis of Postural Stability During Bipedal Stance Following Acute Lateral Ankle Sprain

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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= 66.7 ± 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 (PREF) 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 ($t(34) = -0.585, p = .563$), condition 2 ES ($t(34) = -0.436, p = .665$), condition 3 ES ($t(34) = -1.594, p = .120$), condition 4 ES ($t(34) = -0.486, p = .630$), condition 5 ES ($t(34) = -0.685, p = .498$), and condition 6 ES ($t(34) = -1.239, p = .224$); 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 PREF ($t(34) = -1.485, p = .147$). 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.

2605 Board #128 June 3, 11:00 AM - 12:30 PM
Lower-extremity Biomechanics During A Drop-vertical Jump In Chronic Ankle Instability And Healthy Controls

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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 jump landing. These measures are often collected independently and there is limited research collecting these measures simultaneously during a movement task. Purpose: To assess the kinematics and kinetics of the lower extremity and EMG of 4 shank muscles (anterior tibialis, medial gastrocnemius, peroneus longus, peroneus brevis) during a drop-vertical jump task (DVJ). Methods: Forty-eight young, active adults participated (CAI: n=24, Control: n=24). Three dimensional motion capture was performed using an electromagnetic motion capture system. Lower extremity kinematics, kinetics in the frontal and sagittal plane and EMG of the shank musculature above resting activity were collected while performing 10 DVJ off a 30cm box onto an instrumented forceplate 50% of the participant's height away. Means and 90% confidence intervals were calculated for all measures from 200ms prior to forceplate contact to 100% post contact with the forceplate. Results: CAI patients had greater inversion (107ms to 200ms post contact, MD)=4.01±2.55°) and dorsiflexion kinematics (11ms to 71ms post contact, MD=5.33±2.02°), increased sagittal ankle kinetics (11ms to 77ms post, MD=0.17±0.09, 107ms to 200ms post, MD=0.23±0.03) and decreased knee sagittal kinetics (95ms to 200ms post, MD=8.23±0.97Nm/kg) compared to controls after landing. CAI patients also had greater peroneal activity following forceplate 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 inversion positioning and peroneus 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.

2606 Board #129 June 3, 11:00 AM - 12:30 PM
Ankle Instability And Rest Intervals Impact Muscle Activation And Lower Extremity Kinematics During The Sebt

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Shorter rest intervals between trials during functional tests negatively affects 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, medial; M, and posteromedial; PM) 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. 74.5±7.4, M: 88.6±5.7 vs. 83.3±8.4, PM: 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, PM: 50.6±24 vs. 28.7±12.3), MA of PL in only AM direction (AM: 65.1±37.4 vs. 45.4±25.7), and MG in all directions than CAI (AM: 49.1±40.2 vs. 31.6±19.3, M: 47.1±34.2 vs. 28.8±19.7, PM: 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, PM: 12.8±5.4 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 multiplanar motion of the lower extremity were able to discriminate between individuals with and without CAI.

2607 Board #130 June 3, 11:00 AM - 12:30 PM
Unique Center of Pressure Profiles in Unilateral Compared to Bilateral End-Stage Ankle Arthritis Patients

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 (No relationships reported)

ankle arthritis is a debilitating condition that alters the mobility and stability of the ankle joint during both static and dynamic tasks. Symmetrical contribution to balance performance has been posited to improve balance performance. However, few studies have examined the impact of unilateral compared to bilateral joint involvement on balance in individuals with ankle arthritis. PURPOSE: To quantify balance performance in patients with unilateral (UA) compared to bilateral (BA) end-stage ankle arthritis. METHODS: Twenty-three UA and 21 BA patients performed three 10-second quiet standing trials with their feet placed together. Ground reaction forces were recorded using two force platforms, one under each foot (1200 Hz, BP600-900, AMTI). Center of pressure (CoP) measures were calculated using custom software (Matlab, Mathworks). CoP excursions in the anteroposterior (AP), mediolateral (ML) and resultant directions (RES) were calculated as described by Prieto et al. (1996). Independent samples t-tests were used to compare the involved (INV) and uninvolved limbs (UN) in the UA to the average of the left and right limbs in BA. Significance was set at p < 0.05. RESULTS: No demographic differences existed between the UA and BA patients. No differences existed between the INV and BA group for the RES (p=0.499; INV: 16.96±7.11 mm; BA: 16.08±4.48 mm), AP (p=0.190; INV: 6.05±1.41 mm; BA: 6.16±1.29 mm) or ML excursions (p=0.431; INV: 14.39±7.26 mm; BA: 13.38±4.83 mm). When comparing the UN limb to the BA group, the UN limb had significantly greater RES (p=0.040; UN: 20.25±8.57 mm) and ML excursions (p=0.029; UN: 17.97±8.51) compared to the BA group. No differences were observed in AP excursions between the UN (p=0.255; UN: 5.83±1.67) and BA groups. CONCLUSIONS: These data indicate that the contribution of each limb to postural stability is unique in individuals with unilateral end-stage ankle arthritis. Interestingly, no differences were observed in AP CoP excursions between the two groups. Further, it should be noted that CoP excursions were significantly greater in the UN limb compared to the BA group. This is contrary to the notion of "better balance" which would generally be associated with healthy limb, but may be an effect of compensating for the INV limb.

2608 Board #131 June 3, 11:00 AM - 12:30 PM
Therapeutic Exercise Effects on Function of the Medial Longitudinal Arch During Running: A Preliminary Study

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 (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 ± 3.58 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 decrease in arch drop from baseline to

week 8 in the TX group for subjects with an initial arch drop of 3.80 mm or greater (p=.0045).

CONCLUSIONS: These preliminary data suggest that the exercise intervention was most effective at decreasing arch drop in those with the most planus feet. Data will be reanalyzed when recruitment is complete.

Static and Dynamic Arch Height Values in Millimeters (mm)

	Week 0 Averages (mm)			Week 8 Averages (mm)			Δ Drop (mm)
	Static	Dynamic	Drop	Static	Dynamic	Drop	
Controls	14.43	10.27	4.12	13.17	9.06	4.11	0.00
Exercise (all)	14.69	11.52	3.21	15.27	13.35	2.50	-0.71
Ex (>3.8 mm initial drop)	14.68	9.50	5.18	13.71	11.69	2.57	-2.61

2609 Board #132 June 3, 11:00 AM - 12:30 PM

The Effect Of An 8-week Strengthening Protocol On Intrinsic Foot Muscle Size And Strength

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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 68.3±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

Group	Size				Strength		
	ABDH (cm ²)	QP (cm ²)	FDB (cm ²)	FHB (cm)	Great Toe (kg)	Lateral Toes (kg)	Doming (kg)
C	0.06 ± 0.15	-0.02 ± 0.16*	0.03 ± 0.15	0.02 ± 0.07	0.43 ± 2.38	0.02 ± 2.38	3.51 ± 4.28*
MSW	0.05 ± 0.25	0.04 ± 0.22	0.03 ± 0.06*	0.01 ± 0.11	1.80 ± 2.19*	1.66 ± 2.78*	5.20 ± 3.12*
FS	0.16 ± 0.15*	0.17 ± 0.32*	0.18 ± 0.19*	0.17 ± 0.17*	1.89 ± 2.13*	1.91 ± 2.02*	4.11 ± 3.56*

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

2610 Board #133 June 3, 11:00 AM - 12:30 PM

Injury Simulation in Wearing High Heel Footwear-An In Vivo Study

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PURPOSE: To simulate injury in high heel footwear. **METHODS:** A 3-D Foot Print Device was used to analyze gait of ten young female (mean age 24±2.36 years, mean height 172±0.31 cm and mean weight 61.15±6.03 kg) subjects wore high heeled shoes of 7.5 cm and diameter of 1cm at the point of contact with the ground. Their plantar foot pressure data were 2781.69±948.11 kPa peak pressure. These data were used in model to simulate micro-fracture in high heeled foot bone. The number of cycles to

cause the failure of bone due to repetitive daily loadings of the foot was obtained using special crack predicting equations. Crack growth model is taken as $a_i + \sum_{j=1}^i \Delta a_{i-j}$ where a_0 is initial plan size and a_i is the crack growth increment associated with the i^{th} applied load while process continues until a terminal flaw size was obtained. Numerical model provided a functional relationship between the crack growth rate da/dN and stress intensity factor range ΔK , i.e., $da/dN = C(\Delta K)^m$ (2) Where a was crack length, N was the number of cycles and C and m were material constants that characterize the crack propagation rate. From Equation # 2 obtained number of cycles of repetitious landings to cause failure (N_f) of bone as follows:

$$N_f = \frac{a_i}{C \Delta K^m} \quad (3)$$

where, a_i and a_0 are initial and final crack length. Using

$a_i = 10.0 \times 10^{-8}$, $C = 1.0 \times 10^{-8}$, $m = 1.25$, and $\Delta K = 1.12 (\Delta \delta)$, where $\Delta \delta$ was the measured stress, Equation (3) was integrated numerically with an increment of 10×10^{-6} m to the final value of the crack length (a_f) 10×10^{-6} m. Then rate of change of crack length with number of cycles (da/dN). **RESULTS:** Crack growth rate for plantar pressure of 3728.8 N.cm-2 and m being 1.25, reveals that 6 loadings of ball of foot were sufficient to initiate micro-fracture of bone in foot. When m is 1.5 cracks start at 2 loadings. Plantar pressure of 1834 N.cm-2 and m being 1.25, revealed that 9 loadings of ball of foot were sufficient to initiate micro-fracture of bone in foot. **CONCLUSION:** It is concluded that data predicted development of an in vivo micro-fracture in high heeled foot even before it occurred. It revealed that micro-fracture due to repetitive loading of foot was sensitive to number of loadings. Magnitude of m was inversely proportional to strength of bone. Model was of significance in computational aspect of bone remodeling, and fracture fixation of bone.

2611 Board #134 June 3, 11:00 AM - 12:30 PM

Plantar Loading During Gait Significantly Correlates To Metatarsal Bone Density

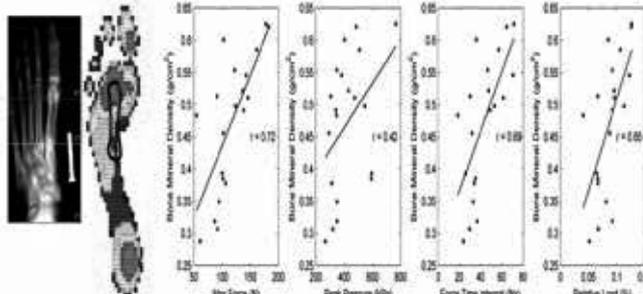
Rolonda Kelly¹, Nicholas S. Pritchard¹, Anh-Dung Nguyen¹, James M. Smoliga¹, Jeffrey B. Taylor¹, David R. Sinacore², Kevin R. Ford, FACSM¹. ¹High Point University, High Point, NC. ²Washington University School of Medicine, St.Louis, MO. (Sponsor: Kevin R. Ford, FACSM)
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An 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.



2612 Board #135 June 3, 11:00 AM - 12:30 PM
The Effect of an 8-week Arch Muscle Strengthening Protocol on Arch Height Index
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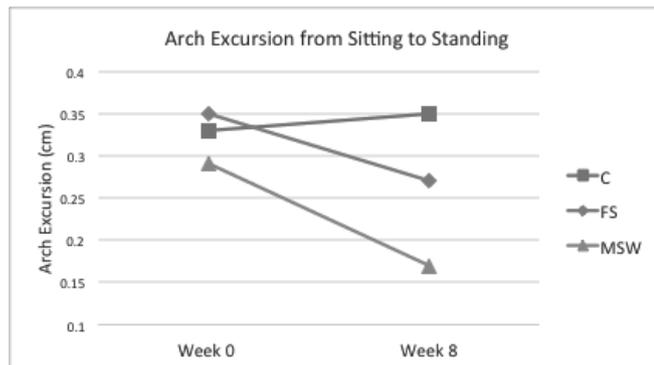
The arch of the foot is comprised of 4 layers of muscles, which help to control its downward motion with every step. Strengthening of these muscles of the arch may increase overall arch control.

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 1 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. The pictures were analyzed using imageJ. Arch Excursion (AE) was measured as the difference in dorsum height between sitting and standing. Data were analyzed using a repeated measures ANCOVA with the baseline measurement as the covariate.

Results: No differences in static AHI were found 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 for AE with the FS and MSW groups showing reductions at the post-training, while the CON did not (Figure 1).

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



2613 Board #136 June 3, 11:00 AM - 12:30 PM
Absolute And Relative Joint Contributions To Landing In High- Compared To Low-Arched Athletes
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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:** Therefore, 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, ViconPEAK) 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: 0.59±0.16; LA: 0.55±0.12). When comparing relative joint work, HA athletes exhibited greater relative 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%).

CONCLUSIONS: 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.

2614 Board #137 June 3, 11:00 AM - 12:30 PM
Sex Differences in Metatarsal Bone Density and In-Shoe Load Distribution in Recreational Runners
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Runners are at an increased risk of stress fractures compared to other athletes; with female runners sustaining greater metatarsal stress fractures compared to male runners.

PURPOSE: To examine sex differences between the bone mineral density (BMD) of the second and fifth metatarsal and in-shoe loading of the foot during running.

METHODS: Fifteen recreational runners (7 males, 8 females: height 168.3±9.3 cm, 68.2±11.8 kg, age 20.7±0.8 years), who run at least 10 miles per week, volunteered to participate. A dual x-ray absorptiometry (DXA) method was used to scan the second and fifth metatarsals. BMD was calculated for the total area of each metatarsal.

Pressure distribution measurement insoles were used to calculate relative load (force-time integral of medial, central, lateral forefoot divided by total force time integral) while participants ran on a treadmill at a self-selected speed with three different step rate conditions in a randomized order. Subjects were instructed to adjust their cadence using feedback from an audible metronome set to preferred step rate, as well as ten percent higher and ten percent lower step rates. One-way ANCOVAs were used to examine sex differences between BMD controlling for height and mass. Repeated measures ANCOVAs were used to examine sex differences in forefoot loading across step rates while controlling for treadmill velocity.

RESULTS: Total fifth metatarsal BMD was greater in males (0.466 g/cm² [95% CI: 0.43, 0.50]) compared to females (0.409 g/cm² [95% CI: 0.37, 0.44], p=0.04). Sex differences were not found in second metatarsal BMD (p=0.8). After controlling for treadmill velocity, a main effect (p=0.04) of sex on central forefoot relative loading was found, such that females (16.0% [95% CI: 14.4, 17.7]) exhibited greater loading compared to males (13.2% [95% CI: 11.4, 14.9]). Relative loading of the lateral and medial forefoot was not statistically different between sexes (p>0.05).

CONCLUSIONS: A difference in BMD of the fifth metatarsals was found between males and females. Interestingly, sex differences did not exist in second metatarsal BMD but females had greater relative loading under the central forefoot compared to males. The relationship between biomechanical loading, BMD and stress fracture risk should be examined longitudinally.

E-30 Free Communication/Poster - Genetics

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

2615 Board #138 June 3, 11:00 AM - 12:30 PM
Elevated Nerve Growth Factor/p75NTR Co-localization In Smokers After Eccentric Exercise
 Nina Moore Aronstein¹, Stuart R. Chipkin¹, Priscilla M. Clarkson, FACSM¹, Lawrence M. Schwartz¹, Monica J. Hubal, FACSM². ¹University of Massachusetts, Amherst, MA. ²George Washington University School of Medicine and Health Sciences, Washington, DC. (Sponsor: Monica J. Hubal, FACSM)
 (No relationships reported)

PURPOSE: Smoking increases musculoskeletal injury risk and protracts healing. While the underlying mechanisms are poorly understood, altered inflammatory responses may contribute. We previously found at 48h post-eccentric contractions (ECC) that smokers (SM) experienced: 1) 15% greater delayed onset muscle

soresness (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- to anti-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 only 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 ($-23.2 \pm 2\%$). 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: $39.6 \pm 8.1\%$; exercise: $31.3 \pm 11.4\%$) but increased in SM (control: $59.2 \pm 8.4\%$; exercise: $72.4 \pm 13.7\%$).

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 inflammatory findings, p75NTR/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.

2616 Board #139 June 3, 9:30 AM - 11:00 AM

Association of Mitochondrial Haplogroup J with Elite Athletic Performance in Iranian Male Population

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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 and related phenotypic expression could be considered beneficial for sprint power performance.

2617 Board #140 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.

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Homozygosity for a common null polymorphism (R577X) in the ACTN3 gene results in the absence of the fast fibre-specific protein, α -actinin-3 in ~16% of humans worldwide. α -Actinin-3 deficiency is detrimental to sprint and power performance in elite athletes and is associated with decreased force generation and increased susceptibility to eccentric damage.

PURPOSE: The aim of this study was to investigate the association between R577X polymorphism in the ACTN3 gene and indirect muscle injuries in elite

football players. One hundred and seventy-three male elite Italian football players (age = 19.2 ± 5.3 years) were recruited from a first-league football club participating at the Official National Italian Football Championship (Serie A, Primavera, Allievi, Giovanissimi). The cohort was genotyped for the ACTN3 R577X polymorphism, and muscle injuries data were collected during the period of 2009-2014 (five football seasons). **METHODS:** Genomic DNA was extracted using a buccal swab, and genotyping was performed using PCR method. Structural-mechanical injuries and functional muscle disorder were included in the acute indirect muscle injury group. **RESULTS:** Participants with the ACTN3 XX ($XX=2.60 \pm 3.70$, $n=22$) genotype exhibit significantly higher injury incidents compared to participants with the RR genotype ($RR=1.21 \pm 2.73$, $n=62$, $P=0.02$). **CONCLUSIONS:** The ACTN3 R577X polymorphism is associated with the incidence of muscle injuries in elite football players. We anticipate that the knowledge of athletes' genetic predisposition to sports-related injuries might aid in individualizing training programs.

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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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-1 α , ACE, CKMM, and PPAR γ) 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-hip ratio (WHR), body fat percentage (%BF) has 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 ($P \leq 0.05$). We have shown that ACTN3 ($P=0.027$), ACE ($P=0.001$), 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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PURPOSE: The aim of this study 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).

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 and 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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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, athlete 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, 10 national level, 55 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 ($I^2=0\%$), 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 replicate 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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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 respect 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; VO_{2max} : 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 100 lymphocytes), in comparison of modes immediately post exercise ($\Delta -11.5 \pm 8.9$; $p = 0.04$). 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, VO_2 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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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 in two cohorts 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 and 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 (36.1 ± 0.9 cm) was significantly lower than those in the RX and XX genotypes in women (38.9 ± 0.4 cm) even after adjusting for age and exercise habit 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 habit 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.

2623 Board #146 June 3, 9:30 AM - 11:00 AM

Global DNA Methylation is Stable Across Time and Following Acute ExerciseJames W. Navalta¹, Mihaela A. Ciulei², Debra K. Tacad¹, Ashley P. Tovar¹, John C. Young, FACSM¹. ¹University of Nevada, Las Vegas, Las Vegas, NV. ²Pennsylvania State University, University Park, PA. (Sponsor: John C. Young, FACSM)

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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 yrs, ht = 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; wk 1 = 1.3±1.1%, wk 2 = 1.0±1.7%, wk 3 = 1.3±0.8%, wk 4 = 2.2±1.3%, mo 2 = 1.4±0.9%, mo 3 = 2.0±1.9%). Additionally, acute aerobic exercise to maximal exertion did not alter GDM (p = 0.71; pre 1.9±1.0%, post = 1.5±0.8%), 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 measure 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.

2624 Board #147 June 3, 11:00 AM - 12:30 PM

Insulin Resistance-Related Epigenetic Modifications in Visceral Adipose Tissue of Obese AdolescentsMatthew D. Barberio¹, Evan P. Nadler¹, Samantha Sevilla², Brennan Harmon¹, Monica J. Hubal, FACSM¹. ¹Children's National Medical Center, Washington, DC. ²National Institutes of Health, Bethesda, MD. (Sponsor: Monica J. Hubal, FACSM)

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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 in obese adipose tissue are poorly understood, especially during the emergence of cardiometabolic risk in obese adolescents. The purpose of this study was to identify obesity-induced methylation modifications in VAT in obese adolescent females as compared to age-matched lean controls. **Methods:** Omental adipose samples were collected during abdominal surgery from lean (L; n = 10; age = 15 ± 3 yrs; body mass index (BMI) = 21.9 ± 3.0 kg/m²) and extremely obese (Ob; n = 10; age = 16 ± 2; BMI = 45.8 ± 9.8) African American (L = 4; Ob = 4), Caucasian (2; 4), and Hispanic (4; 2) adolescent females. VAT DNA was extracted (QIAamp DNeasy Tissue Kit) and 500ng was used for bisulfite conversion (EZ DNA Methylation Kit). Global methylation profiles were generated (Illumina Infinium Human Methylation 450 BeadChip Array), processed (Illumina Genome Studio), and imported into Partek Genomics Suite. Beta-values generated using SWAN were converted to M-values. Differential methylation was assessed via 3-way ANCOVA (ethnicity*group*ID with age and BMI covariates) of M-values, filtering out any known polymorphisms. **Results:** ANCOVA detected 1017 differentially methylated probes (p<0.01; group difference > 0.01) in VAT from obese as compared to lean patients, with 643 probes mapping to known genes. Biological pathway analysis identified AMPK signaling (1.62 x 10⁻²) and p70s6k signaling (1.42 x 10⁻²) as having differential methylation patterns in VAT from Ob as compared to L subjects. Furthermore, differential methylation was found at multiple sites in the circadian clock gene PER3 (beta values 2.1 - 3.9% higher in Ob vs L) and the cadherin superfamily gene PCDHA7 (beta values 1.1 - 2.7% lower in Ob compared to L VAT). **Conclusion:** VAT from obese adolescent females have methylation differences in key insulin- and diabetes-related pathways as compared to lean counterparts. Furthermore, multi-dimensional regulation of methylation in PER3

and PCDHA7 genes suggests potential epigenetic regulation of circadian and cell-adhesion pathways in obesity.

2625 Board #148 June 3, 9:30 AM - 11:00 AM

The Angiotensin Converting Enzyme Insertion/Deletion Polymorphism Associates with Habitual Physical Activity among European-American AdultsMichael L. Bruneau, Jr¹, Theodore Angelopoulos², Paul Gordon³, Niall Moyna⁴, Paul Visich⁵, Robert Zoeller⁶, Rick Seip⁷, Stephen Bilbie⁷, Paul Thompson, FACSM⁷, Joseph Devaney⁸, Heather Gordish-Dressman⁸, Eric Hoffman⁸, Linda Pescatello, FACSM⁹. ¹Springfield College, Springfield, MA. ²University of Central Florida, Orlando, FL. ³University of Michigan, Ann Arbor, MI. ⁴Dublin City University, Dublin, Ireland. ⁵University of New England, Biddeford, ME. ⁶Florida Atlantic University, Boca Raton, FL. ⁷Hartford Hospital, Hartford, CT. ⁸Children's National Medical Center, Rockville, MD. ⁹University of Connecticut, Storrs, CT. (Sponsor: Dr. Linda S. Pescatello, FACSM)

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PURPOSE: The angiotensin converting enzyme (ACE) insertion (I) deletion (D) polymorphism (ACE DIP) (rs4340) is a 287 base pair sequence within intron 16 of chromosome 17q23 that accounts for half of the variation in plasma ACE levels. Due to its influence on cardiovascular and renal function, the ACE DIP has been examined for its association with sport performance. The literature regarding associations with habitual physical activity is limited and inconsistent. We examined associations of the ACE DIP and physical activity among 461 European-American adults.

METHODS: 203 men and 258 women with a body mass index (BMI) of 24.3±4.8 kg·m⁻² 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 DIPxBMI 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<.05.

RESULTS: For NW (BMI=21.7±1.8 kg·m⁻²), participants with the ACE II reported walking 1.4±1.0 mi/wk, ID 1.2±0.9 mi/wk, and DD 1.6±1.2 mi/wk, with ID walking less than II and DD (p<0.05). For OW (BMI=29.6±4.4 kg·m⁻²), participants with the ACE II reported walking 1.5±1.1 mi/wk, ID 1.2±1.0 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.

2626 Board #149 June 3, 9:30 AM - 11:00 AM

Circulating MicroRNAs Are Upregulated In Response To Acute Aerobic Exercise In Obesity

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PURPOSE: MicroRNAs (miRNAs), a class of non-coding RNAs, are involved in the regulation of gene expression and numerous biological processes, including inflammation and metabolism in obese populations. Emerging research indicates that physical activity provides health-related benefits in obesity-associated inflammatory diseases. This study attempted to understand how acute aerobic exercise would mediate the changes of inflammation-associated miRNA expression (miR-21, miR-126, miR-130b, miR-221, and miR-222) in plasma between obese and normal-weight individuals.

METHODS: Twenty-three subjects (12 obese and 11 normal-weight) were recruited to participate in a 30-minute aerobic exercise (75% VO₂max). Blood samples were collected prior to, immediately post-exercise, and recovery 1 and 2 hours for analyses of miRNAs. All data were log transformed.

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-curves “with respect to increase” (AUCi) were higher in obese subjects ($P < 0.020$) and also positively correlated ($P < 0.001$), even after controlling for cardiorespiratory fitness (VO₂max).

CONCLUSIONS: These 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

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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: Twelve spontaneously hypertensive rats were kept sedentary or subjected to low or high intensity treadmill running (60 and 80% of the V_{max}). 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 muscle 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

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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/2J, 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 estimations 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 $47.7 \pm 1.1\%$ for duration, $61.8 \pm 6.8\%$ for average speed, and $35.1 \pm 4.5\%$ 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

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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 acclimatize 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 (G_{Ma}) and rectus femoris (RF). Final EMG data for the G_{Ma} 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 G_{Ma}, between the TRX and traditional split squat. Significantly ($p < 0.001$) higher EMG activity was displayed for the G_{Ma} 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 G_{Ma} or RF were observed. **CONCLUSIONS:** The results were significant for the EMG activity of the G_{Ma} 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.

2630 Board #153 June 3, 11:00 AM - 12:30 PM

Biomechanical Analysis Of A Single-leg Squat With Isokinetic Resistive Force By A Novel Exercise Equipment

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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 (RSL) exercise using a novel isokinetic exercise machine (ERIK). RSL 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 RSL compared with those of a common single-leg squat (SLS). **METHODS:** Six asymptomatic female college students participated in this study. Participants performed RSL and SLS. In RSL, 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 RSL, hip adduction angle was significantly smaller ($3.2 \pm 2.3^\circ$ vs. $12.2 \pm 3.7^\circ$, $p < 0.05$) and hip abduction angle was significantly larger ($11.9 \pm 2.9^\circ$ vs. $1.3 \pm 4.1^\circ$, $p < 0.05$) than those in SLS. Motion patterns of the hip joint differed between RSL and SLS. As descent motion progressed, hip abduction angle increased in RSL, while hip adduction 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 RSL. EMG activity of the gluteus medius was significantly higher in RSL than in SLS ($85 \pm 17\%$ vs. $60 \pm 17\%$, $p < 0.05$), as was that of the adductor longus muscle ($35 \pm 18\%$ vs. $23 \pm 13\%$, $p < 0.05$). **CONCLUSION:** RSL 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 support leg.

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2631 Board #154 June 3, 11:00 AM - 12:30 PM

Muscle Activity of the Lower Limb During Single-Legged Hopping

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Running can be described as a series of bilateral single-legged jumps and landings; however, single-legged locomotion (SLL) is anecdotally more difficult than bi-lateral locomotion (BLL). Muscle activity may play a role in this increased difficulty; it is not known how active different muscles are during SLL vs. BLL, or whether providing body weight support during SLL would elicit more similar activity levels compared with BLL. **PURPOSE:** To compare muscle activity during single-legged locomotion at different levels of effective body weight (BW).

METHODS: Subjects ($n=12$; 25.00 ± 7.74 years, 1.67 ± 0.09 m, 63.28 ± 11.42 kg) performed running at 100% BW in addition to single-legged hopping at 80%, 70%, 60%, 50%, and 40% BW. Muscle activity of the Rectus Femoris, Semitendinosus, Tibialis Anterior, and Medial Gastrocnemius was measured. Average muscle activity was calculated over 15 seconds (zero offset removed, full-wave rectified). Activity from each muscle was analyzed using a one-way repeated measures analysis of variance ($\alpha=0.05$).

RESULTS: Muscle activity of the Semitendinosus and Tibialis Anterior was not affected by varying levels of effective BW ($p > 0.05$). Muscle activity of the Rectus Femoris and Medial Gastrocnemius was influenced by varying levels of effective BW ($p < 0.05$). For the Rectus Femoris, hopping at 80% BW and 70% BW elicited higher average muscle activity than running (92.4%; 70.8% increase, respectively), hopping at 60% BW (24.2%; 10.2%), hopping at 50% BW (39.9%; 24.2%), and hopping at 40% BW (62.5%; 44.3%). For the Gastrocnemius, hopping at 80% BW and 70%

BW elicited higher average muscle activity than running (70.3%; 50.8% increase, respectively) and hopping at 40% BW (57.2%; 39.2%).

CONCLUSIONS: It appears that increased knee flexor muscle activity is the primary mechanism that is responsible for why SLL is more difficult than BLL. Muscle activity between BLL and SLL at 50% BW were shown to be similar, which suggests the occurrence of a bilateral deficit. However, it is still unclear whether these increases are the result of the existence of a bilateral deficit, or a result of a change in the movement pattern.

2632 Board #155 June 3, 11:00 AM - 12:30 PM

Comparing Performance And Side-to-side Asymmetry Of The Forward, Medial And Lateral Triple Hop Tests

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(No relationships reported)

The forward triple hop for distance test (FTH) is commonly used to assess functional 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-1 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 = 5.00 ± 0.44 m) were significantly larger than MTH (distance = 4.03 ± 0.40 m, $p < 0.001$) and LTH (distance = 3.70 ± 0.41 m, $p < 0.001$) distances and MTH were larger than LTH distances ($p < 0.001$). Spearman's rank correlations indicated strong relationships between FTH and MTH ($\rho = 0.78 - 0.80$, $p < 0.001$) and the FTH and LTH ($\rho = 0.62 - 0.61$, $p < 0.05$) performances, and FTH LSI and LTH LSI ($\rho = 0.74$, $p < 0.001$). There was no significant relationship identified between LSI observed during the FTH and MTH ($\rho = 0.32$, $p = 0.17$).

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.

2633 Board #156 June 3, 11:00 AM - 12:30 PM

Relationship between Vertical Jump Height and Force-Time Derived Variables

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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-shorten activity. A recent study sampling 273 athletes found a relationship between both temporal and force components to jump height. **PURPOSE:** The purpose of the study was to examine if this relationship between kinetic factors and jump height also exists in a population of college students.

METHODS: Forty five (21 male, 24 female, age 21.3 ± 1.1 years, height 172 ± 9 cm, mass 73.3 ± 19.2 kg) college students performed countermovement jumps with bilateral arm-swings on a force plate (AMTI, Inc., Watertown, MA, USA) sampling at 1200Hz. After verbal instructions, participants warmed up and performed testing trials in order to become accustomed to the required task. Once standing reach height was determined, participants performed three maximal jumps while reaching for the highest vane on a Vertec VJ tester (Sports Imports, Columbus, OH). Jump height (JH) was also subsequently calculated through the Momentum-Impulse relationship from the force-time curve. A LabVIEW program calculated the following variables: eccentric rate of force development (ECC-RFD), peak concentric force (CONC-F) and peak eccentric velocity (ECC-V).

RESULTS: JH (49.8±15.7 cm) was significantly ($p < .05$) correlated to CONC-F (1785±489 N)($r=0.589$) and ECC-V (-1.00±.22 m/s)($r=-0.515$) but not significantly correlated to ECC-RFD (4.95 ± 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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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 lower 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 ($r=0.55$; $p=0.001$), 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 lower extremity kinematics of VJ can accurately screen for ACL injuries.

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), Contralateral: 2.1 BW, Control: 2.1 BW; $p<0.01$) along with lower average external knee flexion moments (ACLR: 0.7 Nm/kg, Contralateral: 0.9 Nm/kg, Control: 1.1 Nm/kg; $p<0.05$) and reduced power absorption at the knee (ACLR: 0.9Nm/kg, Contralateral: 1.5Nm/kg, Control: 1.2Nm/kg; $p<0.01$). Operative limbs had lower peak knee flexion (ACLR: 96.8°; Contralateral: 100.7°; $p=0.001$) and knee flexion excursion (ACLR: 75.0°, Contralateral: 82.5°; $p=0.003$) than contralateral limbs but did not differ from controls in these measures.

Operative and non-operative limbs had greater peak hip flexion (ACLR: 98.9°, Contralateral: 99.8°, Control: 83.5°; $p<0.006$), hip flexion excursion (ACLR: 60.8°, Contralateral: 65.6°, Control: 49.6°; $p=0.02$), and power absorption at the hip (ACLR: 1.0Nm/kg, Contralateral: 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, Contralateral: 0.4Nm/kg, Control: 0.2Nm/kg; $p<0.02$) and utilized less hip ab/adduction range (ACLR: 1.7°, Contralateral: 1.9°, Control: 6.1°; $p<0.003$) though no differences were seen in knee valgus angles or excursion ($p>0.52$).

CONCLUSIONS: Lower GRF 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

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 (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 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 ± 5yrs; mass = 71.0 ± 12.5kg; height = 1.74 ± 0.10m) performed 5 unilateral and 7 bilateral jumps with each foot on an independent force plate. Two sacral markers were tracked with an 8-camera 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 $p<.05$ and variables were extracted if the model increased to $p=.10$.

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 = .94+/- .02). Rate of force reduction was the only significant predictor of single leg jump height on the left leg (r -squared = .76+/- .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 = .89+/- .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.

2637 Board #160 June 3, 11:00 AM - 12:30 PM
Convergent Validity of the Flight Time and Impulse-Momentum Methods of Calculating Countermovement Jump Height

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The countermovement jump test is considered to be one of the best assessments of lower body power in athletic populations. Impairments in jump height have been previously shown to be indicative of acute and chronic exercise-induced fatigue. There are a number of different methods to calculate vertical jump height utilizing a force platform including the flight time and impulse-momentum methods. However, there has been limited research comparing vertical jump heights derived from either method in elite-level athletes.

PURPOSE: To examine the convergent validity between flight time and impulse-momentum methods of calculating countermovement jump height in elite male soccer players. **METHODS:** Thirty-four collegiate Division-1 men's soccer players (age 20.4 ± 1.5 years; height 181.7 ± 6.1 cm; body mass, 80.2 ± 8.1 kg) were assessed for vertical jump height using a force plate (Bertec AM 651x Force Plate, Bertec Corporation, Columbus, OH). Each subject completed three attempts of the countermovement jump test with 1-min rest intervals. **RESULTS:** No significant bias was detected between methods (mean, 0.25 cm; 95% CI, -0.11 to 0.61 cm; $p > 0.05$). Furthermore, there was a very strong correlation observed between methods ($r = 0.93$; $p < 0.01$). **CONCLUSION:** The flight time and impulse-momentum methods possess convergent validity and each provide an accurate measurement of vertical jump height in elite-level athletes. However, the flight time method may be more preferable for practical applications due to its relative simplicity.

2638 Board #161 June 3, 11:00 AM - 12:30 PM
Vertical Jump and Standing Long Jump Power to Determine Lower Extremity Imbalance and Injury Risk
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 (No relationships reported)

Suzanne M. Konz
 Marshall University, Huntington WV
 The individual responsible for the health care of athletes need practical means to determine lower extremity injury risk in athletes. Comparing the relationship of these two commonly used field tests could enhance this practical ability. **PURPOSE:** to determine the relationship between a calculated ratio between VJ power and SLJ power ratio is sensitive in determining injury risk. **METHODS:** Participants included 26 female NCAA-I athletes. The study examined data from testing conducted on the athletes prior to an off-season training cycle. Isokinetic testing at 60°/sec and 180°/sec, VJ height and SLJ distance results were examined. Average power ratios and the peak power ratios were calculated. Correlation and linear regressions analyzed relationships. Significance was set at the .01 level. **RESULTS:** Hamstring % BW at 60°/sec ($p=.000$, $r=.788$) correlated with success in the VJ height and SLJ distance ($p=.000$, $r=.757$). Hamstring % BW at 180°/sec ($p=.000$, $r=.765$) correlated with success in the VJ height. At 180°/sec, hamstring % BW ($p=.000$, $r=.742$) correlated with success in the SLJ distance. The predictors ($p=.009$, $r=.920$) for peak power in the VJ were peak force, average velocity, athlete mass, and peak velocity. Stepwise linear regression indicated average velocity was the most important factor ($p=.001$, $r=.825$). Success in VJ height for power factors was average velocity ($p=.000$, $r=.840$). The predictors ($p=.029$, $r=.919$) for average power in the SLJ were peak force, average velocity, athlete mass, and peak velocity. Stepwise linear regression indicated average velocity ($p=.000$, $r=.840$) was the most important component to SLJ distance. Regression for the average ratio z-score was significant ($p=.001$, $r=.738$). The sport that athletes participated provided significance for average z-score ($p=.004$, $r=.741$) and peak z-score ($p=.004$, $r=.747$). **CONCLUSIONS:** Strength imbalance could affect an athlete's performance by limiting their ability to lower than optimal levels. An imbalance could also increase the risk of injury in an athlete. Using the performance tests of the VJ and the SLJ to determine the tendency in muscle dominance would allow sports medicine and strength staff to develop appropriate interventions tailored to the athlete to decrease the imbalance.

2639 Board #162 June 3, 11:00 AM - 12:30 PM
Can We Improve The Bosco Test? A Biomechanical Analysis
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Power output (PO) testing of athletes has been a central topic for the sports community, with common debates about the "Gold Standard" to predict sports performance. Despite its technical and conceptual constraints, the Bosco Test—using repeated vertical jumping—has outlasted many others due to its practicality and reliability. The test results, however, do not reflect expected PO differences from widely different athletes. **PURPOSE:** To compare average power output (APO) results as calculated directly from instantaneous vertical ground reaction forces (IVGRFs), with the Bosco Test APO. **METHODS:** 18 sedentary adult males (21.6±2.4 years, 67.2±11.3 kg, 1.77±0.05 m), 6 volleyball players (22.0±3.4 years, 72.3±12.5 kg, 1.84±0.10 m), 6 marathon runners (30.8±7.7 years, 73.2±11.0 kg, 1.75±0.05 m), and 6 swimmers (32.2±6.91 years, 78.8±4.6 kg, 1.77±0.06 m) performed a 60-s Bosco Test on a Force Plate. Total time in the air, total number of jumps, and IVGRFs were recorded from the force plate signal. APO (Watts/kg) was calculated from 'efficient' IVGRF using both the conventional Bosco methodology and PotevAA, our proposed method, for the same trials. Two-way ANOVAs with repeated measures were used to compare APO for the different groups and between methods. **RESULTS:** APO was greater for Bosco (15.8±1.9 Watts/kg) than for PotevAA (8.0±1.8 Watts/kg) over the full 60s of the protocol ($p<.0001$), as well as for each 15 s interval ($p<.0001$). Both methods detected differences among sport groups ($p<.0001$), but no differences were found between athletes (Bosco: 16.02±1.97 Watts/kg, PotevAA: 8.38±1.85 Watts/kg) and sedentary participants (Bosco: 15.58±1.88 Watts/kg, PotevAA: 7.56±1.63 Watts/kg, main effect $p = 0.15$; interaction $p = 0.65$). **CONCLUSIONS:** Contrary to our expectations, APO differences detected by PotevAA were even smaller than those detected by Bosco; neither test discriminated satisfactorily among groups. We failed to show that PotevAA, a theoretically sound method to calculate APO directly from IVGRF during the positive vertical impulse of a 60-s jump series, could improve the conventional Bosco calculation.

2640 Board #163 June 3, 11:00 AM - 12:30 PM
Reliability of the Myotest® Height Displacement Measure among Hispanic Collegiate Athletes
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 (No relationships reported)

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 Myotest® 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 Myotest® 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 Myotest® 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 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 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 Myotest® showed good reliability for the SQJ (ICC= 0.84, SEM= 2.9 cm, CV= 8.6%) and CMJ (ICC= 0.95, 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, there were differences between the first and second jump and between the first and third CMJ (37.8 ± 9.2 , 39.3 ± 9.2 , and 39.6 ± 9.0 cm, $P<0.05$). **CONCLUSION:** These results suggest that the Myotest® 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.

2641 Board #164 June 3, 11:00 AM - 12:30 PM
Effects Of Reduced Relative Implicit And Explicit Feedback On Lower Extremity Jump-landing Mechanics: A Preliminary Analysis
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 (No relationships reported)

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±0.1m, 67.7±11.5kg) 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 cued to focus their attention in overall jump, while EF was cued to focus on knocked knees, bowleg 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), 33% and 16.6% feedback frequency phases (viewed recordings of their most recently performed best jump-landings). 3D Lower extremity biomechanics were tested before (pre) and after (post) 6 weeks of intervention. Multivariate ANOVAs compared differences between groups and time for max hip abduction (HA, °), knee abduction moment (KAM, Nm/kgm), and knee flexion (KF, °) ($p<.05$). **RESULTS:** No statistically significant differences ($p>0.05$) were found for: HA (CG:pre=-9.85±5.3, post=-7.36±8.65; IF:pre=-4.17±2.67, post=-7.52±5.27; EF:pre=-5.68±6.12, post=-5.98±5.43), KAM (CG:pre=-0.5±0.3, post=-0.34±0.13; IF:pre=-0.5±0.21, post=-0.48±0.13; EF:pre=-0.48±0.12, post=-0.46±0.26), and KF (CG:pre=-92.26±9.12, post=-100.33±15.2; IF:pre=-106.37±16.34, post=-103.45±19.97; EF:pre=-100.32±11.4, post=-112.4±18.22). **CONCLUSION:** While we did not note any differences in HA, KAM, and KF among the 3 groups from pre to post-test, IF & HA trended to decrease from pre to post-test whereas it increased for CG. For KAM, CG was lower on post-test comparing to IF and EF. EF and CG trended to decrease from pre to post-test, while IF slightly

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: 12.57-46.97); Healthy: median= 24.52 (range: 9.8-61.62), P=.04, ES=-0.21) When stratified by gender, HxLBP males landed less stiff than healthy males (HxLBP: median=20.50 (range: 14.54-46.97); Healthy: median=29.65 (range: 15.98-61.62), P=.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 9.28-39.99), P=.45). No differences were observed between all, male or female HxLBP and healthy participants for any joint stiffness measures (P>.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
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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 (p = 0.013; 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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Evaluation of stance time, time-to-peak loading, and flight time are commonly used to objectively 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 yr; height=166.3±9.3 cm; weight=59.3±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: 511.96±143.46 msec, vGRF: 497.79±145.69 msec; r=0.868, p<0.05, error=14.18±74.37 msec) and flight time (TMA: 521.61±40.092 msec, vGRF: 500.30±42.42 msec; r=0.792, p<0.05, error=21.30±26.70 msec). There was no association between TMA-derived and vGRF-derived time-to-peak loading (TMA: 115.09±77.83, vGRF: 35.47±13.47; 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=9.54±15.11%; flight=5.77±3.85%) 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
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 (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:** Examine 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 (K@IC), peak knee flexion (pkKF), 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 K@IC and pkKF correlated to decreased VGRF during the DLDL (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 K@IC, pkKF, or VGRF during either the FJSL (p=0.825, p=0.097, p=0.998 respectively) or DLDL (p=0.703, p=0.246, p=0.380 respectively). **CONCLUSION:** During DLDL, 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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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 during the vertical drop and jump task 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 Wilcoxon 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, $Z = -4.168$, $p = .0001$, (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.

Figure 1. Comparison of the LESS values for Landing 1 and Landing 2 during Drop Jump task among female athletes.

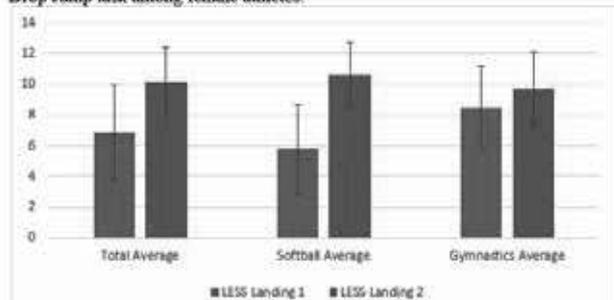


Figure 1. Average LESS Scores for the first and second landings.

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

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 (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 data 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 ($p < 0.05$).

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).

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 ($44.9 \pm 6.4^\circ$ and $50.4 \pm 5.5^\circ$), increased ankle inversion ($10.6 \pm 4.0^\circ$ and $6.0 \pm 5.2^\circ$), and significant difference hip abduction-adduction ($0.7 \pm 3.1^\circ$ and $-3.2 \pm 3.4^\circ$) displacements; and greater maximum ankle inversion ($13.6 \pm 5.6^\circ$ and $6.3 \pm 7.9^\circ$) 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.

2649 Board #172 June 3, 11:00 AM - 12:30 PM
Handheld Tablets Are a Valid Measure for Analyzing Vertical Drop Jump Landing Tasks
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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.

PURPOSE: 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 MaxTraQ software on a desktop computer. A paired t-test and Pearson Product Moment Correlation were used to compare tablet and video data. $\alpha = 0.05$.

RESULTS: The effect size was small (.374) and the significance of the difference was due to a high correlation ($r=.71$) between angle measures from the stationary camera and the tablets. The average FPPA from the tablets was $162.5 \pm 7.6^\circ$, and the average FPPA from the stationary camera was $165.8 \pm 11.2^\circ$. The difference of approximately three degrees was statistically significant ($t=3.34$, $p < .001$). **CONCLUSION:** 3.34 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.

2650 Board #173 June 3, 11:00 AM - 12:30 PM
Developmental And Inter-limb Differences In ACL-relevant Biomechanics During Single Leg Landing
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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 knee 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. Purpose: 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-test, 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, $d = 0.74$, $p < 0.05$) in the post-pubertal group compared to the pre-pubertals (-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 for ACL injury, as previous studies suggest greater asymmetry is linked to higher ACL injury.

2651 Board #174 June 3, 11:00 AM - 12:30 PM
Correlation Between Running-reach Height And Agility K-test In Volleyball Players
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Measurement of vertical jumping evaluates anaerobic power and has been a good predictor of performance in volleyball (Sawyer, at al., 2002). Vertical jump performance has been shown to be related to other performance factors such as speed, agility, and power (Barnes, at al., 2007). The correlation between a new Agility K-test (Cabell, at al., 2014) needed to be tested with an established vertical test.

PURPOSE: To assess the relationship between running jump reach test and the Agility K-test. **METHODS:** Young male competitive volleyball players ($n = 273$, age 16.63 ± 1.51 years, height 185.53 ± 8.09 cm, mass 72.72 ± 8.41 kg) volunteered in the study. The subject stood about 5 meters from the base of the Vertec apparatus, and took 3 steps before leaping off both feet as high as possible, using the arms and legs to assist in projecting the body upwards. The subject attempted to take off at a point so that at the peak of the jump he was directly under the Vertec apparatus with his arm fully extended. The Agility K-test consisted of the subjects running at an indoor gym on hard wooden flooring between cones positioned in a "K" pattern at maximum speed. A contact switch for time measurement was placed on the top of each cone which subjects touched with the right or left hand. Pearson correlation coefficient test was used to correlate two dependent variables at $\alpha = .05$. **RESULTS:** The young athletes achieved a time of 15.93 ± 0.48 s in the Agility K-test, and difference = reach - height = 126.67 ± 10.24 cm. A significant Pearson correlation coefficient for the difference and time was $-.22$ ($p < .001$). **CONCLUSION:** The results indicated a negative significant correlation between Agility K-test and running jump reach test with young-aged volleyball players. Other physiological factors relating to this correlation might include muscular strength, flexibility, and speed of the athletes. The nature of anaerobic power and agility is based on fast and explosive movements and varies in the studied age of the athletes.

2652 Board #175 June 3, 11:00 AM - 12:30 PM
The acute Effect of Static Stretching on Static Balance and Vertical Jump in Volleyball Players
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 (No relationships reported)

Static stretching (SS) negatively affects static balance (SB) and vertical jump (VJ) following stretching protocols lasting ≥ 30 -s. Research has shown that stretching times ≤ 30 -s may prevent injuries in this population.

PURPOSE: To determine the acute effect of 20-s SS on SB and VJ in professional Costa Rican volleyball players.

METHODS: Participants were 10 female (21 ± 2.40 yr.) and 10 male (20.60 ± 3.06 yr.) volleyball players. Participants were randomly assigned a control (CON) and experimental (EXP) conditions. SB and VJ were measured before (pre-test) and after (post-test) each condition using the Modified Clinical Test of Sensory Interaction on Balance (mCTSIB) on a Wii Balance Board for SB (displacement of the center of pressure, CoP) and the countermovement jump test for VJ. The EXP consisted of 7 lower-body muscles SS exercises performed during 20-s. The CON condition consisted on quiet sitting. Three-way ANOVA (gender x treatments x measurements) and follow-up analysis were used for the SB and VJ variables.

RESULTS: A significant two-way interaction was found on the mCTSIB open eyes test on the board (OEB) ($p < 0.05$). Post hoc analysis showed a higher displacement of the center of pressure (CoP) in the EXP (45.2 ± 7.8 cm) than in the CON (44.0 ± 6.4 cm) condition. A significant three-way interaction was found on the mCTSIB closed eyes test performed over a flexible surface on the board (CEFB) ($p < 0.05$). A higher displacement of the CoP was found in the EXP (68.4 ± 13.6 cm) compared to the CON (67.3 ± 12.8 cm) condition. Males showed more displacement of the CoP than females in the EXP condition (71.1 ± 14.0 cm vs. 65.7 ± 13.0 cm; $p < 0.05$), and females showed more displacement of the CoP before than after treatment (68.1 ± 13.9 cm vs. 65.7 ± 13.0 cm; $p < 0.05$). Males in the EXP condition showed higher displacement of the CoP (71.1 ± 14.0 cm) than males in the CON condition (72.6 ± 11.9 cm; $p < 0.05$). No significant interactions or main effects were obtained on the mCTSIB closed eyes test performed on the board (CEB), open eyes with flexible surface on the board (OEFB), and VJ.

CONCLUSIONS: A 20-s SS exercises on lower-body muscles negatively affects SB on the OEB and OEFB conditions, without any gender distinction. The SS exercises did not affect SB in the CEB condition and VJ. Males are more unbalanced than females in the CEFB after SS exercises.

Abstracts were prepared by the authors and printed as submitted.

- 2653 Board #176 June 3, 11:00 AM - 12:30 PM
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)

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.

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

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 ± 1.84 yrs). 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) shoe had greater relative loading in the central forefoot (control: $15.2 \pm 4.2\%$, stiff: $13.9 \pm 4\%$, $p = 0.04$) and lesser toes (control: $12.6 \pm 4.1\%$, stiff: $10.8 \pm 3.5\%$, $p = 0.01$) regions during the landing phase. However, the stiff footwear had greater relative load in the lateral midfoot compared to the control shoe (control: $10.3 \pm 5.7\%$, stiff: $11.7 \pm 6.6\%$, $p = 0.01$).

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.

- 2654 Board #177 June 3, 11:00 AM - 12:30 PM
Identifying Limb Dominance in Adolescent Female Basketball Players: Implications for Biomechanical Research
 Colleen Mulrey¹, Kevin R. Ford, FACSM¹, Sandra J. Shultz, FACSM², Anh-Dung Nguyen¹, Jeffrey B. Taylor¹. ¹*High Point University, High Point, NC.* ²*University of North Carolina at Greensboro, Greensboro, NC.* (Sponsor: Kevin R. Ford, FACSM)
(No relationships reported)

The methodology used to determine limb dominance in basketball players is inconsistent, with some studies using self-reported measures and others using results from basketball-specific performance tests. Both the triple hop for distance test (TH) and single-leg countermovement jump (SLCJ) have been reported to elicit side-to-side asymmetries; however, their ability to determine limb dominance in basketball players has not yet been established. Identifying the relationship between limb dominance and these performance measures may be valuable during injury risk screening in basketball athletes. **PURPOSE:** To identify relationships between different methods of determining limb dominance in adolescent female basketball players.

METHODS: Forty adolescent female basketball players (age: 15.5 ± 1.17 yrs; height: 168.0 ± 7.31 cm, weight: 63.27 ± 10.97 kg) were asked to self-identify their preferred kicking and jumping limb. Athletes then completed three trials of a SLCJ and TH on each limb. Each test was then used to independently define limb dominance by the limb that produced the largest maximum vertical height and horizontal distance, respectively. Chi square tests for independence were performed to compare self-report and performance measures of limb dominance ($p < 0.05$).

RESULTS: A significant relationship was identified between self-reported preferred kicking ($R = 36$, $L = 4$) and jumping legs ($R = 25$, $L = 15$) ($p = 0.006$). However, no significant relationships were found when comparing self-reported measures to performance measures during the TH ($R = 21$, $L = 19$; $p = 0.57$) or SLCJ ($R = 23$, $L = 17$; $p = 0.80$). Additionally, performance measures did not consistently produce the same definition of limb dominance amongst individuals ($p = 0.22$).

CONCLUSIONS: These findings indicate that while various methods of defining limb dominance by self-reported measures provide consistent results, self-selection of the dominant limb is unrelated to actual performance. Furthermore, limb dominance, as defined by vertical jump height, is unrelated to limb dominance defined by horizontal

jump distance. The results of this study may call in to question the validity of defining limb dominance by self-report or performance measures in adolescent female basketball players during biomechanical studies.

- 2655 Board #178 June 3, 11:00 AM - 12:30 PM
Team-Specific Needs-Based Injury Prevention Program Improves Landing Technique in Youth Female Athletes
 Hayley J. Root¹, Eleanor M. Beltz¹, Jessica C. Martinez², Samantha E. Scarneo¹, Lindsay J. DiStefano¹. ¹*University of Connecticut, Storrs, CT.* ²*Northern Illinois University, DeKalb, IL.* (Sponsor: Douglas J. Casa, Ph.D, ATC, FACSM, FNATA, FACSM)
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(No relationships reported)

Injury prevention programs (IPPs) have been shown to reduce injury risk in female youth basketball athletes, but these programs are not widely used. One way to increase IPP adoption may be to tailor programs to meet team needs in terms of injury risk or movement impairments. **PURPOSE:** To determine if a team-specific needs-based IPP can reduce injury risk in female youth basketball athletes after a single season. **METHODS:** Sixty-eight youth female basketball players (Age = 12 ± 5 yr) in one basketball league (9 teams) completed an injury risk assessment before (PRE) and after (POST) one season. The injury risk assessment was a jump-landing task videotaped from the front/side of the participant and evaluated using the Landing Error Scoring System (LESS) at a later date. The LESS is a valid and reliable scoring tool that quantifies quality of landing technique, where a higher score indicates a higher number of errors. LESS total score is predictive of injury risk in youth athletes. A single rater graded all videos. After PRE, movement errors for all athletes were itemized and the percent of the team demonstrating each individual item on the LESS was calculated. An athletic trainer with experience in exercise prescription and neuromuscular training designed 10-minute IPP warm-ups that specifically addressed movement errors relevant for each team. A paired t-test was performed to evaluate changes in LESS from PRE to POST ($\alpha = 0.05$). Based on LESS score at PRE we also stratified participants into high (LESS ≥ 5 , $n = 25$) and low (LESS < 5 , $n = 21$) injury risk groups and performed an independent t-test (Group x LESS Change Score (PRE-POST)). **RESULTS:** LESS score significantly improved from PRE to POST (mean difference [PRE-POST] \pm SD = 1.31 ± 1.97 , 95% CI [0.74, 1.90] $P < 0.001$). Participants in the high injury risk group improved movement technique by over 2 errors (2.32 ± 1.68) compared to the low injury risk group (-0.05 ± 1.28), $t(44) = -5.30$, $p < 0.001$. **CONCLUSION:** A team-specific needs-based IPP can effectively improve landing technique and reduce injury risk over one season. Athletes at a higher risk of injury at PRE saw greater improvements at POST and may represent a key population to target for interventions. Future research should evaluate the impact of team-specific approaches on long-term injury prevention compliance and adherence.

- 2656 Board #179 June 3, 11:00 AM - 12:30 PM
Common Jump Force Profiles of College Athletes Differ by Sport, Gender, and Performance
 Jennifer L. Sanfilippo¹, Jacob A. Siedlik², Joseph P. Weir, FACSM², Bryan C. Heiderscheit¹. ¹*UW-Madison, Madison, WI.* ²*University of Kansas, Lawrence, KS.*
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(No relationships reported)

Attempts have been made to characterize force profiles during a countermovement jump (CMJ) among athletes to explain performance differences due to gender, sport and experience. While useful, these approaches have emphasized discrete force variables thereby ignoring potentially valuable information contained in the remainder of the force-time signature. Applying methods such as principal component analysis (PCA) may better differentiate force profiles and provide additional insights into jump performance.

PURPOSE: To define common force profiles among collegiate athletes, and determine if differences exist between gender, sport and resulting jump height.

METHODS: Division 1 collegiate athletes ($n = 152$ females, 334 males) from eight sports (basketball, football, golf, ice hockey, soccer, softball, volleyball, and wrestling) participated. Vertical ground reaction forces were recorded (800 Hz) for each athlete's maximal effort CMJ, and analyzed over the entire push-off phase. Force-time plots were normalized to peak force and jump duration prior to the statistical analyses. PCA was paired with a k-means clustering algorithm to determine relevant force-time plot groupings. Force profile distribution across gender and sports were explored using Chi-square.

RESULTS: The first four principal components accounted for 85.7% of the variance in the data set. Thus, a four cluster solution was calculated defining four force profile clusters. Cluster 2 jumps ($n = 120$; shape = extended force plateau) were associated with higher jump heights than the other clusters ($p < 0.001$, mean differences = 10.6 to 15.5%). Females most commonly exhibited cluster 3 (bimodal with even peaks) and cluster 4 (bimodal with larger second peak) force profiles ($p < 0.001$), while males were

evenly distributed between clusters 2-4 with fewer cluster 1 profiles (distinct peak near take off). Specific clusters were more common among certain sports [all $p < .047$: basketball (cluster 3), football (cluster 2), ice hockey (clusters 3 and 4)].
CONCLUSIONS: Using a CMJ data set involving a variety of collegiate athletes, four distinct force profiles emerged with different profiles preferred by different sports and genders. One profile showed a marked advantage in jump height. The advantage of this force-time profile requires further study.

E-32 Free Communication/Poster - Immunology I

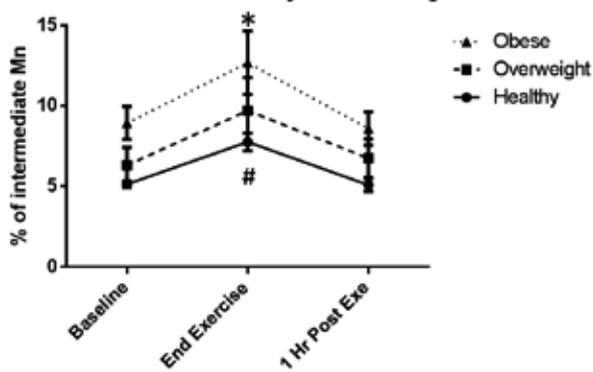
Friday, June 3, 2016, 7:30 AM - 12:30 PM
 Room: Exhibit Hall A/B

**2657 Board #180 June 3, 9:30 AM - 11:00 AM
 Altered Monocyte Subtype Profiles Following High Intensity Exercise in Obese Children**

Abraham Chiu, Goutham Ganesan, Peter Horvath, Pietro R. Galassetti. *University of California, Irvine, Irvine, CA.*
(No relationships reported)

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 cycling.
METHODS: 11 Ob (BMI $\geq 95\%$), 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 (38-50%) increase in the iMn %. Values returned to baseline by 1 hr post exercise. The abundance of iMn was 1.6-1.8x greater in the ob vs. Nw children throughout the study (end exe: $13 \pm 2\%$ vs $8 \pm 1\%$, $p < 0.05$).
CONCLUSION: Ob children have a higher % of pro-inflammatory iMn proportional to the severity of obesity. This systematically greater inflammation could contribute to obesity-related CV problems later in life. Investigating iMn responses across different exercise paradigms and few hours following exercise may help identify how inflammation is modulated in pediatric obesity and other dysmetabolic conditions.
 Support: NIH NICHD P01HD048721 & UL1 TR000153

CD14⁺⁺CD16⁺ Monocyte Percentage



Relative abundance of intermediate monocytes at baseline, end-exercise, and 1 hour following exercise. # $p < 0.001$ vs. baseline, 2-way ANOVA; * $p < 0.05$ obese vs healthy, Dunnett's

**2658 Board #181 June 3, 9:30 AM - 11:00 AM
 Voluntary Exercise Attenuates Obesity and Systemic Inflammation by Alteration of Gut Microbiota in TLR5-Deficient Mice**

Hiromi YANO¹, Masataka UCHIDA¹, Eri OYANAGI², Motoyuki IEMITSU³, Sho ONODERA¹, Michael J. KREMENIK¹, Motohiko MIYACHI². ¹Kawasaki Univ.Med. Welfare, Kurashiki, Japan. ²National Institute of Health and Nutrition, Tokyo, Japan. ³Ritsumeikan University, Kusatsu, Japan.
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(No relationships reported)

PURPOSE: Although voluntary exercise attenuates obesity-associated inflammation, it is unclear whether or not its benefit relates with the changes of gut microbiota. The purpose of this study was to investigate the effect of voluntary exercise on prevention of obesity-associated inflammation in Toll-like receptor 5 (TLR5) deficient mice which occurred in obesity and systemic inflammation along with alteration of gut microbiota.
METHODS: Male C57BL/6 mice (wild type: WT, n=24) and TLR5 gene knock out mice (KO5, n=24) were treated with voluntary exercise (wheel running: WR) or sedentary condition (control: Ctrl) for 20 weeks (n=12 in each condition group). TNF-alpha in plasma, liver, and adipose tissue were evaluated. Fecal bacterial population was also analyzed. In addition, each cecal content of mice was transplanted in recipient mice (male 4-week-old C57BL/6 (n=48) once per week for three weeks, then it was carried out for nine weeks of breeding with a high-fat-diet (HFD).
RESULTS: Body weight and epididymal fat were attenuated by WR in both WT and KO5 mice ($p < 0.01$). The high concentration of TNF-alpha in plasma, liver and adipose tissue were occurred in KO5-Ctrl ($p < 0.01$ vs. KO5-WR). In the fecal bacterial population, Firmicutes/Bacteroidetes ratio in KO5-WR was significantly lower than that in KO5-Ctrl ($p < 0.01$). The transplantation of cecal content from KO5-WR reduced weight gain and plasma TNF-alpha in the HFD mice compared with that from KO5-Ctrl ($p < 0.05$ and $p < 0.01$, respectively).
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.

**2659 Board #182 June 3, 9:30 AM - 11:00 AM
 Changes in Total Antioxidant Status and 8-OXO-Guanosine After Exercise in Smokers Following Two Hour Cessation**

Carlos E. Garza¹, David A. Martinez², Kyung-Shin Park¹, Leslie Solis¹, Buong Jin Kang³. ¹Texas A&M International University, Laredo, TX. ²University of Texas at San Antonio, San Antonio, TX. ³Elizabeth City State University, Elizabeth City, NC.
(No relationships reported)

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 \pm 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 (55%, 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 were quite different to those previously presented (Experimental Biology, Boston, 2015) where smokers ceased smoking only for 30 minutes before each exercise. SM showed higher levels of 8-OXO ($P = .031$) and lower level of antioxidant ($P = .001$) as compared to non-smokers (NS) (group effect). 8-OXO elevated at POST following 65% (SM: 2439 ± 172 pg/mL $\rightarrow 2951 \pm 224$, $P = .012$; NS: $2132 \pm 192 \rightarrow 2581 \pm 315$, $P = .021$) and 75% (SM: $2352 \pm 191 \rightarrow 3369 \pm 259$, $P = .0001$; NS: $2104 \pm 253 \rightarrow 2872 \pm 392$, $P = .005$) VO₂max runs. 8-OXO elevated up to 1h Post following 75% run (2744 ± 239 , $P = .028$) in SM only. Total antioxidant decreased immediately after 65% run (Pre: 4.8 ± 4 mM \rightarrow Post: 4.2 ± 5 , Mean \pm SD, $P = .028$) and up to 1h post following 75% run (Pre: $4.9 \pm 4 \rightarrow$ Post: 3.7 ± 6 , $P = .011 \rightarrow$ 1h Post: 3.9 ± 4 , $P = .019$) in SM; however it was significantly lower than Pre immediately after 75% run (Pre: $5.9 \pm 5 \rightarrow$ Post: 4.6 ± 8 , $P = .013$) 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.

2660 Board #183 June 3, 9:30 AM - 11:00 AM
Exercise-mediated Pentraxin 3 Expression From In Vitro Stimulation Of Human PBMCs With LPS In Obese Individuals

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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, 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.

2661 Board #184 June 3, 9:30 AM - 11:00 AM
The Impact of Obesity on Calprotectin Response to Acute Aerobic Exercise

Brandon G. Fico, Aaron L. Slusher, Michael Whitehurst, FACSM, Arun Maharaj, Chun-Jung Huang, FACSM. Florida Atlantic University, Boca Raton, FL. (Sponsor: Chun-Jung Huang, FACSM)
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 (No relationships reported)

PURPOSE: The secular issue of obesity has been linked to increased inflammatory mediators, such as calprotectin (S100A8/A9), which is primarily derived from neutrophils and monocytes/macrophages. Elevated pro-inflammatory cytokines, such as interleukin-6 (IL-6) have been shown to mediate activation of these leukocytes, thereby resulting in the expression of calprotectin. This study examined the effect of acute aerobic exercise on plasma calprotectin response in obese and normal-weight subjects and its relationship with IL-6.

METHODS: Twenty-one subjects (11 obese and 10 normal-weight) were recruited to participate in a 30-minute aerobic exercise (75% VO₂max). Blood samples were collected prior to, immediately post-exercise, and recovery 1 hour for analyses of plasma calprotectin and IL-6.

RESULTS: Higher baseline levels of calprotectin was found in obese subjects than normal-weight subjects ($P < 0.001$). While acute aerobic exercise increased an elevation in calprotectin ($P < 0.001$) and IL-6 ($P < 0.001$), no difference was found between two groups. Furthermore, a positive relationship was observed between calprotectin area-under-the curve "with respect to increase" (AUCi) and IL-6 AUCi ($r = 0.665$), even after controlling for cardiorespiratory fitness (VO₂max).

CONCLUSIONS: Our results support previous finding that IL-6 may potentially mediate calprotectin expression in skeletal muscle during exercise.

2662 Board #185 June 3, 9:30 AM - 11:00 AM
Habitual Cigarette Smoking and a Single Bout of Exercise on Soluble Cell Adhesion Molecules

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 (No relationships reported)

PURPOSE: The current study examined the acute changes in soluble vascular cell adhesion molecule-1 (sVCAM-1), soluble intercellular adhesion molecule-1 (sICAM-1), and soluble E-selectin (sE-selectin) following a single bout of exercise at low- and high-intensity in habitual cigarette smokers and non-smokers.

METHODS: Sedentary (physical activity < 2 days per week) male smokers (N=8, carbon monoxide ≥ 16 ppm, smoking history > 2 years, and cigarette smoking > 10 cigarettes per day) and their counterpart non-smokers (N=10), the ages between 20 and 30, participated in the study. Participants performed a single bout of treadmill exercise (distance – 3 miles) at two different intensities in random order (low: 55% and high: 75% of VO₂max) on a separate occasion. Overnight fasting blood samples were collected before (PRE), immediately post-exercise (IPE), and 1-hr PE to analyze sVCAM-1, sICAM-1, and sE-selectin. All data were analyzed using a 3-way factorial ANOVA with repeated measure. If necessary, the Sidak's pairwise multiple comparisons and a follow-up simple effects test were employed as post-hoc tests ($p < 0.05$).

RESULTS: sE-selectin did not change following exercise, while sVCAM-1 at IPE (160.09 \pm 3.88 ng/mL) significantly increased by 21.5% from PRE (145.87 \pm 3.19 ng/mL, $p=0.001$) and returned to baseline value at 1-hr PE (145.09 \pm 4.39, $p=0.006$). Similarly, sICAM-1 at IPE (131.73 \pm 4.47 ng/mL) was significantly elevated by 9.7% from PRE (120.06 \pm 3.86 ng/mL, $p=0.001$) but returned to baseline value at 1-hr PE (119.31 \pm 4.27, $p=0.001$). Additionally, smokers had significantly higher sICAM-1 (137.37 \pm 5.78 ng/mL, $p=0.001$) as compared with non-smokers (110.45 \pm 5.17 ng/mL).

CONCLUSION: Exercise may temporarily increase both sICAM-1 and sVCAM-1, but not sE-selectin, which then return to baseline values at 1 hour post exercise. Smokers had significantly higher sICAM-1 as compared with their counterparts, indicating that smokers are more susceptible to inflammatory or cardiovascular diseases.

2663 Board #186 June 3, 9:30 AM - 11:00 AM
Effect of AVP V1a Gene Polymorphisms and Different Exercise Modes on Blood Lipid in Older Adults

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 (No relationships reported)

Purpose: This study was to investigate if and how arginine vasopressin (AVP) V1a receptor rs1042615 polymorphism and different modes of chronic exercise training, including table tennis, square dance, Tai Chi, and swimming would influence low density lipoprotein (LDL) in older adults.

Method: The study was approved by the University Review Committee. Subjects at age of 60-69 years old were recruited from several communities of Shanghai City. After their health status screened by questionnaires and informed consents signed, 372 subjects were included as an exercise group (n=314) and control group (n=58) with no regular exercise. The exercise modes were Tai Chi (n=89), swimming (n=79), square dancing (n=59), table tennis (n=87), with training no less than five times a week for frequency and no less than 60 min for duration. The rs1042615 polymorphism (genotypes of TT, CT, and CC) was analyzed using the matrix assisted laser desorption ionisation-time of flight mass spectrometry method. The LDL was measured by homogeneous methods. For analyses and comparisons, subjects were divided into normal and abnormal LDL groups (>3.1mmol/L as abnormal). Data were analyzed using SPSS 20.0 and SHEsis online software. Descriptive data were expressed as Mean \pm SD and statistical significance was set at $P < 0.05$.

Results: In the abnormal LDL group, the CC genotype individuals had highest mean LDL value (3.86 \pm 0.59 mmol/L) than those of the TT and CT genotypes (3.77 \pm 0.50 mmol/L and 3.79 \pm 0.56 mmol/L). In the normal LDL group, the subjects with table tennis training had lowest mean LDL value (2.56 \pm 0.40 mmol/L) than those in other exercise groups (square dancing 2.61 \pm 0.28 mmol/L, Tai Chi 2.60 \pm 0.35 mmol/L, and swimming 2.71 \pm 0.36mmol/L). The above mean differences were not statistically significant. However, the results showed that for the TT genotype older individuals, compared to those of the CT and CC genotypes, the risk of LDL abnormal in the exercisers with Tai Chi training was lowest (OR = 0.144, 95%CI = 0.034 - 0.603, $P < 0.05$) than those who trained in other exercise modalities of swimming, square dancing, and table tennis.

Conclusion: Our study indicated that Tai Chi practice could benefit improving LDL level in the TT genotype older adults. The mechanisms for this remain to be elucidated.

2664 Board #187 June 3, 9:30 AM - 11:00 AM

Antigen-specific CD8+ T-cells Are Mobilized With Exercise Via β 2-adrenergic Receptor Signaling Pathways: Implications For Immunotherapy?Rachel M. Graftl¹, Hawley Kunz¹, Nadia H. Agha¹, Forrest L. Baker¹, Rod Azadan¹, Bridgette V. Rooney¹, Preteesh Leo M¹, Richard A. Bond¹, Catherine M. Bollard², Emily C. LaVoy¹, Richard J. Simpson, FACSM¹. ¹The University of Houston, Houston, TX. ²The Children's Research Institute, Washington, DC. (Sponsor: Richard Simpson, FACSM)

(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 adjuvant 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.

PURPOSE:

To determine if antigen-specific CD8+ T-cells are redeployed by exercise via β 2-adrenergic receptor signaling pathways independently of shear stress.

METHODS:

Five healthy male subjects (mean \pm SD; age 32 \pm 6 yrs; height 174.2 \pm 3.9 cm; weight 74.4 \pm 4.7 kg) underwent 30 minutes 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 β 1+ β 2-antagonist (80 mg nadolol), and (3) β 1-preferential antagonist (10 mg bisoprolol) administered 3h prior to exercise in a randomized double-blind design. Blood samples were taken at baseline, at rest 3h 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 shear stress between the two drug conditions was identical. Exercise on placebo increased CD8+/CD28-/CD27- T-cell numbers 2.5-fold from baseline (mean \pm std error: +183 \pm 27 cells/ μ l). Nadolol and bisoprolol blunted 79.8% and 25.7% of this mobilization, respectively (p = 0.008). The number of antigen-specific T-cells mobilized during the bisoprolol trial was 3.7-fold greater than the nadolol trial.

CONCLUSIONS:

The mobilization of antigen-specific CD8+ T-cells with exercise is largely driven by β 2-adrenergic receptor signaling pathways. In patients for whom exercise is not possible or desirable, clinicians may consider using preferential β 2-agonists to mobilize antigen specific CD8+ T-cells from the tissues to the bloodstream where they can be easily accessed for immunotherapy.

E-33 Free Communication/Poster - Micronutrients and FluidsFriday, June 3, 2016, 7:30 AM - 12:30 PM
Room: Exhibit Hall A/B

2665 Board #188 June 3, 9:30 AM - 11:00 AM

Calcitriol Favorably Alters Lipid Partitioning Within Skeletal Muscle CellsGrace Jefferson. University of Kentucky, Lexington, KY.
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(No relationships reported)

Grace E. Jefferson¹, D. Travis Thomas², and Lance M. Bollinger¹
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Vitamin D status is correlated with skeletal muscle mass, strength, and intramyocellular lipid (IMCL) content. Ceramides, intramyocellular diglycerides (IMDG), and intramyocellular triglycerides (IMTG) are closely associated with skeletal muscle and whole-body insulin resistance. However, it is unknown how vitamin D metabolism directly alters myocellular protein balance and IMCL partitioning. Purpose: To understand how calcitriol (1,25(OH)₂D) affects myocellular protein synthesis and IMCL partitioning. Methods: C2C12 myotubes were cultured in media containing 100 nM calcitriol or vehicle control. Ceramide, IMDG, and IMTG content was measured by liquid chromatography-mass spectrometry (LC-MS). Gene expression (RT-PCR) of the vitamin D receptor (VDR) and IMCL packaging proteins (PLIN2, PLIN3, and OXPAT) was measured. Results: Calcitriol had no effect on total ceramide content, but significantly decreased abundance of 14:0, 16:0, and 20:0 ceramides. Additionally, calcitriol increased total IMDG content (1.2 fold) which was

largely due to increased 16:0-18:1 and 18:1 containing DG. There was a trend for calcitriol to decrease IMTG content (0.37 fold, p=0.09). Lastly, calcitriol increased expression of VDR (4.8 fold), PLIN2 (2.1 fold), PLIN3 (1.6 fold) and there was a trend towards increased expression of OXPAT (1.5 fold, p = 0.15). Conclusions: Calcitriol does not affect myocellular protein synthesis, but favorably alters IMCL partitioning within skeletal muscle cells. Furthermore, calcitriol increases expression of genes involved in IMCL packaging and mobilization which may explain some of the muscle-specific benefits of vitamin D supplementation.

2666 Board #189 June 3, 9:30 AM - 11:00 AM

25(OH) Vitamin D Is Associated With Cardiorespiratory Fitness In Preschool- Aged Boys, But Not In Girls

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(No relationships reported)

Vitamin D deficiency has been associated with poor cardiorespiratory 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 cardiorespiratory 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 \pm 4.9 cm; weight: 20.5 \pm 3.4kg) 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, season, and physical activity).

RESULTS: The mean 25(OH)D concentration was 58.1 \pm 14.3 nmol/L, 29.9% of children were 25(OH)D deficient (<50 nmol/L), and 56.2% of children had insufficient 25(OH)D (50-75 nmol/L). Multiple linear regression analysis revealed that Serum 25(OH)D concentration was positively associated with VO₂max independently of BMI, season, 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 cardiorespiratory 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 cardiorespiratory fitness in preschool-aged boys.

2667 Board #190 June 3, 9:30 AM - 11:00 AM

The Effect of Hydration Status on Glycemic Control: A Pilot StudyHarriet A. Carroll¹, Laura Johnson², James Betts, FACSM¹.
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(No relationships reported)

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 \pm 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 based on urine osmolality, before commencing an oral glucose tolerance test (75 g glucose solution in 89 mL water). Venous blood samples were drawn at baseline and every 15 minutes for 120 minutes. Trials were separated by seven days, with diet and physical activities replicated for 24 h prior to each. Data were analysed via visual checking of trends and calculating the incremental area under the curve (iAUC). **RESULTS:** Body mass was reduced by 1.2 \pm 0.8 kg. The following week, participants matched this weight loss or remained in the sauna for 45 minutes (whichever came first). Urine osmolality was significantly higher when dehydrated than rehydrated (1069 \pm 67 and 606 \pm 292 mOsm). The iAUC for blood glucose was higher in the dehydrated trial than the rehydrated trial (72.9 \pm 45.5 vs. 66.6 \pm 49.1 mmol*120min/L. This was reflective of a similar time-course of initial response but then an attenuated concentration in the hydrated trial from 45 minutes onwards. Blood lactate concentrations were also lower in the rehydrated group, although the differences in the time-course of the initial response were only apparent from 75 minutes. **CONCLUSIONS:** Hydration status may be an important factor to consider when measuring glycaemic response. The trend in the lactate data suggest the effect

is beyond that of hemodilution alone. This pilot will inform future research design to further explore the effects of hydration on glycemic control and the mechanisms involved.

- 2668 Board #191 June 3, 9:30 AM - 11:00 AM
Effect of Fluid Intake on Changing Blood Volume in Healthy Males
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 (No relationships reported)

Given that euhydration should represent an optimal total body water (TBW) volume and there is a clear relationship between TBW and blood volume (BV), it is important to understand how fluid intake may change BV. Fluid intake can alter urinary and circulatory markers of hydration status; however, the degree to which changes in traditional indices of hydration status are simultaneously reflected in measurements of BV is unknown. **PURPOSE:** To investigate changes in hydration status and BV in response to 24 h of controlled fluid intake. **METHODS:** Blood volume (via CO rebreathing) along with serum and urine osmolality (S_{osm} and U_{osm} , respectively) were measured before and after a 24 h standardized food and fluid intake in 17 healthy males. Based on BV responses to the intervention, subjects were *post-hoc* assigned to groups in which BV had either increased (BV_{inc} : $n = 6$, age 23 ± 3 y, mass 83.4 ± 13.3 kg) or decreased (BV_{dec} : $n = 6$, age 25 ± 3 y, mass 86.1 ± 3.5 kg, $p < 0.05$ between groups). Subjects with no change in BV ($n = 5$) were excluded from the analysis. **RESULTS:** Total fluid intake during the intervention was not different between groups (3930 ± 322 vs. 3883 ± 468 ml; $p = 0.813$, for BV_{inc} and BV_{dec} , respectively). The BV_{inc} and BV_{dec} groups started the protocol with similar S_{osm} (288 ± 3 vs. 289 ± 3 mOsm/kg), U_{osm} (787 ± 214 vs. 692 ± 375 mOsm/kg), and BV (6445 ± 596 vs. 7012 ± 746 ml), respectively (all $p < 0.05$). Despite starting at similar traditional markers of hydration status, the BV_{inc} group increased BV 387 ± 147 ml whereas the BV_{dec} group decreased 410 ± 205 ml ($p < 0.001$). Post-intervention measures of S_{osm} (287 ± 3 vs. 287 ± 2 mOsm/kg) and U_{osm} (628 ± 272 vs. 704 ± 117 mOsm/kg) were not different between groups ($p > 0.05$). However, a trend for a main effect of treatment was observed with S_{osm} across groups (Pre: 289 ± 3 vs. Post: 287 ± 3 mOsm/kg; $p = 0.08$). While changes in BV were significant between groups, post-intervention measures of BV were not different between BV_{inc} and BV_{dec} groups (6831 ± 633 vs. 6602 ± 775 ml, respectively; $p > 0.05$). **CONCLUSION:** Interestingly, changes in BV were not reflected in changes in traditional hydration biomarkers. This may suggest that, while they appeared to begin and end similarly hydrated, the BV_{inc} group retained fluid (and subsequently had an increase in BV) during a period of prescribed fluid intake.

- 2669 Board #192 June 3, 9:30 AM - 11:00 AM
Hydration Status of Elite Young Sailors during World Championship Laser 4.7.
 Panagiotis Verginadis¹, Giannis Arnaoutis¹, Stavros Kavouras, FACSM², Ioannis Bogiatzis³, Labros Sidossis¹. ¹Harokopio University, Athens, Greece. ²University of Arkansas, Arkansas, AR. ³University of Athens, Athens, Greece. (Sponsor: Stavros A. Kavouras, FACSM)
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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 no data concerning hydration levels during sailing events. **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 ± 1.5 kg, body fat: $12.5 \pm 3.1\%$, training age: 7.0 ± 1.2 y). Hydration status was assessed via pre- and post-race urine samples, based on urine specific gravity (USG), and urine color. Measurements and data collection took place at the same time each day, with mean environmental temperature, humidity and wind speed at 23.0 ± 0.80 C, $64\text{--}70\%$ and 9 ± 1 knots, respectively. All athletes competed for 130±9 min. **RESULTS:** Although all sailors were euhydrated after the end of the 1st semifinal race (day 1) ($USG = 1.017 \pm 0.001$), 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 6) 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.

- 2670 Board #193 June 3, 9:30 AM - 11:00 AM
Vitamin D Status and Bone Mineral Density in Female Collegiate Dancers and Cheerleaders
 Tara Kenny, Damon McCune, Laura Kruskall, FACSM, James Navalta, Robbin Hickman, John Young, FACSM. University of Nevada, Las Vegas, Las Vegas, NV. (Sponsor: John C. Young, PhD, FACSM, FACSM)
 (No relationships reported)

INTRODUCTION: An athlete's bone mineral density reflects their cumulative history of energy availability, physical activity, genetic predisposition for bone health, and menstrual status, as well as nutritional, behavioral, and environmental factors. **PURPOSE:** To determine if bone mineral density (BMD) and nutritional factors in bone health are different in two groups of female athletes who have comparable body size/weight requirements, but who engage in qualitatively different training regimens. **METHODS:** Participants were female collegiate athletes who were members of the UNLV Dance team ($n=10$) or Cheer team ($n=9$), ages 18-22. Participants vitamin D status was assessed by obtaining a finger prick sample of blood (< 1 ml). BMD for full body, spine and dual femur was assessed by dual energy X-ray absorptiometry (DXA). A calcium and vitamin D intake questionnaire was also completed. **RESULTS:** There was no significant difference between the groups for total body BMD (1.23 g/cm² dance vs 1.22 g/cm² cheer, $p=0.70$), spine BMD (1.39 g/cm² dance vs 1.36 g/cm² cheer, $p=0.72$) or dual femur BMD (1.20 g/cm² dance vs 1.11 g/cm², $p=0.23$). Age matched z-scores for total body BMD were also not significantly different (1.46 ± 1.23 dance vs 0.83 ± 0.52 cheer, $p=0.19$). However there was a significant difference between age-matched z-scores of the dance team vs. non-athlete female controls (1.46 ± 1.23 dance vs 0.19 ± 1.22 control, $p=0.033$). Serum vitamin D status was found to be insufficient ($10\text{--}29$ ng/mL) in 74% of the athletes (27 ± 4 ng/mL dance and 25 ± 8 ng/mL cheer). Daily calcium intake was 504 ± 723 mg for dance and 531 ± 236 mg for cheer versus the RDA of $1,000$ mg/day. Daily vitamin D intake was 256 ± 335 IU for dance and 228 ± 145 IU for cheer versus the RDA of 600 IU/day. **CONCLUSION:** BMD was not significantly different between the low impact dance team and high impact cheer team. These results suggest that the type of activity (low impact dance vs. high impact cheerleading) was not as important for BMD as participating in 20+ hours a week of physical activity. Although the low levels of calcium and serum vitamin D are of concern, the amount of physical activity in these athletes could have counteracted the negative effects of these nutrient insufficiencies on their bone health.

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

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

- 2671 Board #194 June 3, 9:30 AM - 11:00 AM
Skeletal Muscle Endurance And Mitochondrial Capacity In Mitochondrial-Associated Disorders
 Hannah Bossie¹, Thomas B. Willingham¹, Fran Kendall², Kevin McCully, FACSM¹. ¹University of Georgia, Athens, GA. ²Virtual Medical Practice, Roswell, GA. (Sponsor: Dr. Kevin McCully, FACSM)
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 (No relationships reported)

Friedreich'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 ($n=1$), MITO ($n=1$), and controls ($n=5$) were tested. Muscle twitch accelerometry 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 appeared to be associated 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.

2672 Board #195 June 3, 9:30 AM - 11:00 AM
Oxygen Utilization During The Contraction-Relaxation Cycle Of Intermittent Forearm Exercise

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 (No relationships reported)

Previous work from our laboratory showed that microvascular RBC volume was preserved and extraction of O₂ continued to occur during the contraction phase of intermittent leg extension exercise. Limitations of these measures in the quadriceps include adipose tissue thickness and an inability to observe more than the most superficial portions of the muscle. The smaller muscle mass of the forearm is advantageous in that it possesses a smaller adipose pad and allows for a more comprehensive interrogation of the entire muscle. **PURPOSE:** The purpose of the current study was to characterize muscle oxygenation during the contraction/relaxation phases of intermittent forearm exercise. We hypothesized that O₂ extraction by the muscle would not be limited to the relaxation phase of exercise. **METHODS:** Six healthy men (24 ± 2 yrs) completed two constant-power handgrip exercise tests at moderate (M: 40% peak power) and severe (S: 85% peak power) intensities for 10 minutes or until exhaustion. Using near-infrared spectroscopy (NIRS), measurements of total hemoglobin and myoglobin (total [Hb+Mb]), deoxygenated hemoglobin and myoglobin (deoxy [Hb+Mb]) and tissue O₂ saturation (S_tO₂) of the flexor digitorum superficialis were taken to determine changes in microvascular hematocrit, estimated microvascular O₂ extraction and tissue oxygenation, respectively. Mean values for the relaxation phase and peak values during the contraction phase were calculated at both intensities. **RESULTS:** Total [Hb+Mb] (M: 103 ± 18.2 μM; S: 119 ± 26.9 μM) and deoxy [Hb+Mb] (M: 44.4 ± 17.9 μM; S: 53.7 ± 13.5 μM) were higher (P < 0.05) during severe intensity exercise compared to moderate intensity exercise. Regardless of intensity, the contraction phase elicited an increase (P < 0.05) in total [Hb+Mb] (M: 6.33 ± 3.88 μM; S: 7.59 ± 6.64 μM) as well as in S_tO₂ (M: 3.69 ± 1.49%; S: 5.31 ± 4.52%; P = 0.01). In addition, deoxy [Hb+Mb] (M: 5.79 ± 8.75 μM; S: 7.99 ± 7.81 μM) tended to be greater (P = 0.08) during the contraction phase for both intensities. **CONCLUSION:** The increases in total [Hb+Mb] and S_tO₂ during contraction suggest that arterial oxygenated blood may be shifted from larger NIRS-invisible vessels to smaller NIRS-visible ones by the contraction process, which may mask O₂ extraction during contraction.

2673 Board #196 June 3, 9:30 AM - 11:00 AM
Mitochondrial Adaptation To Training: Superior Effect Of Interval Versus Continuous Exercise When Work Is Matched

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Skeletal muscle mitochondria are important for health and performance; however, the optimal exercise stimulus to increase mitochondrial content and function is equivocal. Counter-weighted 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 potential 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 respiration in permeabilized muscle fibres were measured before and after training to assess mitochondrial content and function, respectively. **RESULTS:** Mean work performed per session was 144±27 kJ, with no difference between legs (p=0.91). There was a time x group interaction (p≤0.05) for both CS maximal activity and mass-specific OXPHOS capacity, such that both were higher after HIIT vs. MICT (p ≤ 0.05). CS increased from 7.4±1.4 to 10.2±2.2 and 7.6±2.2 to 8.5±2.6 mmol•kg protein⁻¹•hour⁻¹ (n=10) after HIIT and MICT, respectively. Mass-specific OXPHOS increased from 48±15 to 58±21 and decreased from 47±17 to 42±15 pmol•s⁻¹•mg ww⁻¹ (n=8) after HIIT and MICT, respectively. Mitochondrial-specific 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

2674 Board #197 June 3, 9:30 AM - 11:00 AM
In Vivo Ca²⁺ Buffering Capacity Following Muscle Contractions In Skeletal Muscle Of Pgc-1α Overexpressing Mice

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 (No relationships reported)

In skeletal muscle, the resting intracellular Ca²⁺ concentration ([Ca²⁺]_i) homeostasis regulated by cellular membrane, mitochondria and sarcoplasmic reticulum (SR). However, the importance of the mitochondria on [Ca²⁺]_i remains poorly understood at resting and contraction recovery phase in vivo. **PURPOSE:** We tested the hypothesis that the capacity for Ca²⁺ uptake by mitochondria is primary factor to determine the Ca²⁺ buffering potential at resting and recovery phase after muscle contractions. **METHODS:** Tibialis anterior muscle of PGC-1α overexpressing (mitochondrial increment model) and wild-type littermates (WT) mice were exteriorized and loaded with the fluorescent probe Fura-2 AM under anesthesia. We examined in vivo Ca²⁺ buffering capacity under recovery phase of tetanic contractions by the electrical stimulation (120 s, 100 Hz) and the resting condition of pharmacological inhibition SR function (Ca²⁺ leak and uptake inhibition by thapsigargin treatment). **RESULTS:** In recovery phase after contractions, [Ca²⁺]_i in PGC-1α returned to resting baseline within 150 s. In marked contrast, [Ca²⁺]_i in WT remained elevated for the entire recovery period (1.06 ± 0.01% at 450 s). Resting condition, [Ca²⁺]_i in WT immediately increased by thapsigargin, whereas PGC-1α increased 15 minutes later. (WT; 1.12 ± 0.03, PGC-1α; 1.01 ± 0.02 at 900 s after thapsigargin treatment, P < 0.05). The increment of the Ca²⁺ buffering potential observed in PGC-1α disappeared by the pharmacologic inhibition (carbonyl cyanide 4-(trifluoromethoxy) phenylhydrazone; FCCP) of the mitochondrial Ca²⁺ uptake system. **CONCLUSION:** Mitochondria play a crucial role in buffering of [Ca²⁺]_i for maintaining in vivo physiological Ca²⁺ regulation.

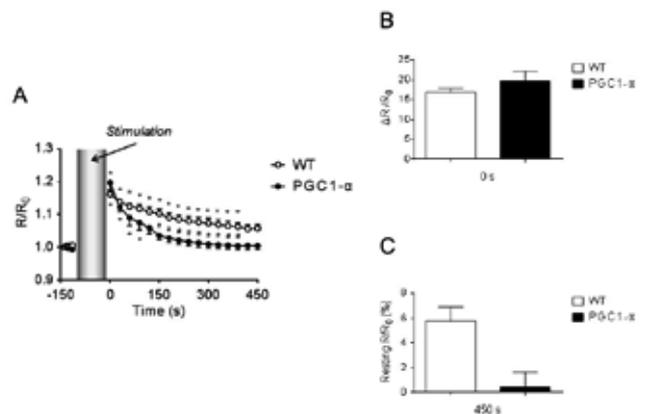


Fig. 1

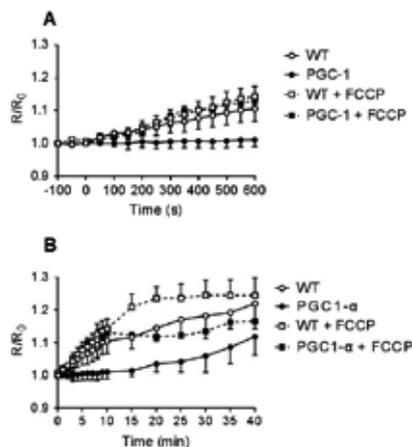


Fig. 2

2675 Board #198 June 3, 9:30 AM - 11:00 AM
**Skeletal Muscle-TLR4 Deficient Mice Lack Exercise-
 induced Cytokine Up-regulation and Mitochondrial
 Adaptation to Exercise Training**

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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 citrate synthase activity in skeletal muscle of WT mice (370.7 ± 21.59 nm/mg/min in sedentary vs. 462.7 ± 17.89 nm/mg/min in exercise trained, P<0.05) but no changes were detected in muscle of mTLR4^{-/-} mice. Conclusion: These data are the first to provide a novel link between skeletal muscle TLR4 and systemic elevations in IL6 in response to exercise. Furthermore, these data suggest a role for TLR4 in exercise-induced metabolic adaptation in skeletal muscle. Supported by National Institutes of Health-NIDDK (2R01DK078765, M.W.H)

2676 Board #199 June 3, 9:30 AM - 11:00 AM

**Physical Exercise Increases Glucose Uptake in
 Skeletal Muscle of Obese Mice Through Rho-Kinase
 Metabolism**

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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 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 RhoE, molecule that inhibits Rock activity and decrease of RhoA, molecule that increases Rock activity, 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. FAPESP: 2013/00554-6 and 2013/21491-2)

2677 Board #200 June 3, 9:30 AM - 11:00 AM

**Maternal Obesity Programs Offspring Muscle
 Mitochondrial Function: Response to Postweaning Diet**

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(No relationships reported)

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 bundles (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, 52±2, 60±2, 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 with saturating ADP, oxidative phosphorylation (OXPHOS) and electron transport system capacity (ETS) 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).

OXPHOS capacity tended to be lower in offspring of obese dams (64 ± 16 , 82 ± 21 vs. 56 ± 16 , 72 ± 12 pmol/s/mg, effect of maternal obesity $p=0.2$) and was accompanied by a greater LEAK respiration (5.7 ± 3.1 , 7.5 ± 2.1 vs. 8.0 ± 2.3 , 8.7 ± 3.8 pmol/s/mg, effect of maternal obesity $p=0.06$).

CONCLUSIONS: Greater LEAK in offspring of obese dams indicates pathologically 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.

2678 Board #201 June 3, 9:30 AM - 11:00 AM
Influence of Dietary Omega-3 Fatty Acids on Mitochondrial Biology in Skeletal Muscle of Older Humans

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(No relationships reported)

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 (n3-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 n3-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-PUFA supplementation (4g/day). 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 measured by spectrofluorometry. 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/ug, old: 4.67 ± 0.47 pmol/s/ug, $p=0.032$) and lipid oxidation (young: 1.42 ± 0.14 pmol/s/ug, old: 0.94 ± 0.12 pmol/s/ug, $p=0.016$). Oxidative capacity was unchanged following n3-PUFA supplementation for carbohydrate substrates (3.99 ± 0.38 pmol/s/ug) or lipid substrates (0.89 ± 0.11 pmol/s/ug). However, mitochondrial ROS emission was significantly reduced following n3-PUFA supplementation in older adults (baseline: 671 ± 78 pmoles/s, follow-up: 530 ± 62 pmoles/s, $p<0.001$). None of the 764 mitochondrial-related genes measured by RNA sequencing were induced by n3-PUFAs in older adults. **CONCLUSIONS:** Unlike aged mice, older humans do 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.

2679 Board #202 June 3, 9:30 AM - 11:00 AM
Mitochondrial Creatine Kinase Is Not Required For Adp Transport Efficiency During Exercise

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(No relationships reported)

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.

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

METHODS: 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/min, 5% grade). Resting RER and Western blotting of proteins involved in ADP/ATP transport (ANT1, ANT2), as well as cytosolic CK, Mi-CK, OXPHOS, COXIV, and PDHE1 were determined. All mice completed a run test to exhaustion. Muscle metabolites (ATP, phosphocreatine (PCR), creatine (Cr), glycogen, lactate) were determined in SED and EX mice. Permeabilized muscle fibres (PMFs) were used to examine Mi-CK contributions to ADP sensitivity in the presence and absence of Cr (20mM) in both SED and EX mice.

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

in vivo assessments of metabolism to determine the biological relevance of Mi-CK.

There were no differences in SED VO₂, RER, muscle metabolites, or any protein measured between WT and KO mice. Run time to exhaustion was similar between groups. Muscle PCR and glycogen decreased similarly in EX mice (WT and KO) relative to SED mice, along with an increase in Cr and lactate. In PMFs the apparent ADP sensitivity (Km) was not altered by exercise in WT mice, however, exercise decreased the apparent Km to ADP in KO mice.

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.

2680 Board #203 June 3, 9:30 AM - 11:00 AM
Human Skeletal Muscle Mitochondrial Related Gene Expression After Exposure to Different Environmental Temperatures.

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(No relationships reported)

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 , 33°C , respectively). **Results:** Core temperature was significantly higher in H and C compared to RT ($37.2\pm 0.1^{\circ}\text{C}$, $p=0.001$; $37.1\pm 0.1^{\circ}\text{C}$, $p=0.013$; $36.9\pm 0.1^{\circ}\text{C}$, respectively). Whole body oxygen consumption was significantly higher in H and C compared to RT (0.38 ± 0.01 L \cdot min $^{-1}$, $p<0.001$; 0.52 ± 0.03 L \cdot min $^{-1}$, $p=0.001$; 0.35 ± 0.01 L \cdot min $^{-1}$, respectively). There was no difference in the gene expression of ERR α ($p=0.665$), GABPA ($p=0.080$), MEF2A ($p=0.630$), NRF1 ($p=0.651$), PGC1 α ($p=0.612$), SIRT1 ($p=0.080$), TFAM ($p=0.890$), or VEGF ($p=0.080$) 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).

2681 Board #204 June 3, 9:30 AM - 11:00 AM
Relationship Between Intramyocellular Lipid Content And Physical Activity Level In Young And Elderly Human Adults

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Intramyocellular lipid (IMCL) is known as depot lipid in skeletal muscle cell for energy substrate, which is strongly influenced by physical activity level. Increases in physical activity level, such as resistance and endurance trainings, decrease IMCL content in young adults. IMCL content in elderly adults is usually higher than that of young individuals. Muscle lipid oxidative capacity decreases with aging. Our previous studies have reported that IMCL content is inversely correlated with muscle strength in young, while it is not in the elderly adults. We postulate that the relationship between IMCL content and physical activity level also differs between young and elderly adults.

PURPOSE: The purpose of this study is to determine the relationship between IMCL content and physical activity level in the young and elderly adults.

METHODS: Physically active adults (15 young, mean age 21 years; 15 elderly, mean age 71 years) participated in this study. ¹H-magnetic resonance spectroscopy (MRS) spectra of the vastus lateralis at the mid-thigh were acquired using a 3.0 tesla whole-body magnetic resonance system. ¹H-MRS spectra with and without water suppression were taken, and calculation of IMCL contents was performed by LCModel

software (v.6.2-2B). Mean physical activity level was estimated with an ambulatory accelerometer (Lifecorder, Suzuken Co. Ltd. Nagoya, Japan) for ten days.

RESULTS: No significant differences were found in IMCL contents (young 8.5 ± 6.1 ; elderly 10.4 ± 2.7 mmol/kg wet weight) and physical activity level (young 266.7 ± 103.0 ; elderly 220.5 ± 76.4 kcal/day) between young and elderly groups. IMCL content was inversely correlated with physical activity level in the young ($r = -0.66$, $P < 0.01$) group, while it was not in the elderly ($r = -0.21$, $p = 0.51$) group.

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.

2682 Board #205 June 3, 9:30 AM - 11:00 AM
Effect Of 30 Or 11.5 Volts Of Pulse Stimulation On Mitochondrial Density In Vitro

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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 immunoblotting of mitochondrial density measured by total OXPHOS, and insulin action measured by Akt phosphorylation. **RESULTS:** 24 hours of EPS at 30V resulted in ~ 1.7 fold greater OXPHOS 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 11.5V stimulation, suggesting electrical pulse stimulation of continuous single bipolar pulses of 2ms at 30V and 1Hz, is a more effective exercise mimetic model for in vitro human myotubes than 11.5V.

2683 Board #206 June 3, 9:30 AM - 11:00 AM
Sedentary Behavior Inversely Relates to Insulin Sensitivity and Mitochondrial Oxidative Capacity in Inactive Obese Adults

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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 oxidative capacity in obese, physically inactive adults. **METHODS:** We studied 19 inactive, obese (35 ± 1 kg/m²), middle aged (54 ± 1 y) adults. We measured insulin sensitivity using a standardized two-stage hyperinsulinemic-euglycemic clamp. In isolated vastus lateralis muscle mitochondria, we measured *state-3* oxygen flux rates (JO_2) by high-resolution respirometry using substrates for complex I, I+II, and II. Finally, we measured ST (<100 counts per min) and time spent in moderate to vigorous physical activity (MVPA, ≥ 2020 counts per min) using accelerometry. We used multivariate regression analysis to test for associations between ST and insulin sensitivity and muscle oxidative capacity adjusted for age and MVPA. **RESULTS:** Data are presented as mean \pm SEM. The average steady-state glucose infusion rate to maintain euglycemia during the high-dose insulin infusion was 8.4 ± 1 mg/kgFEM/min. The average JO_2 were 232 ± 16 pmols/s/ml (complex I) and 307 ± 16 pmols/s/ml (complex II). The average wear-time adjusted times spent in ST and MVPA were 570 ± 30 min/d (9.5 ± 0.5 h/d) and 20.4 ± 0.5 min/d.

The partial correlations between ST and the average glucose infusion rate and JO_2 rates adjusted for age and MVPA were -0.62 ($p = 0.007$), -0.51 ($p = 0.027$, for complex I), and -0.32 ($p = 0.21$, for complex II). **CONCLUSION:** ST inversely correlates with insulin sensitivity and complex I mediated muscle oxidative capacity in inactive, middle-aged, obese adults when adjusted for age and MVPA. We propose that reducing ST will improve insulin sensitivity and muscle oxidative capacity.

E-35 Free Communication/Poster - Nutrition and Supplements

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

2684 Board #207 June 3, 9:30 AM - 11:00 AM
Relative Validation of a Semiquantitative Food Frequency Questionnaire for Portuguese Adolescents

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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.

2685 Board #208 June 3, 9:30 AM - 11:00 AM
Effects Of A High Protein, High Fiber, Or High Sugar Breakfast On Satiety, Lunchtime Caloric Intake, And Academic Metrics In Pre Adolescents

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It is known that the consistent daily ingestion of nutrients meeting recommendations are necessary for growth and development of children with breakfast being reported as a key factor in overall diet quality. While the general recommendation to habitually consume breakfast is sound, the optimal macronutrient composition of this meal with regard to academic performance and satiety has yet to be fully elucidated, especially in children.

PURPOSE: The purpose of this study was to investigate whether a calorie matched high protein, high sugar, or high fiber breakfast is effective for academic metrics (arithmetic, memory, focus) and/or satiety (satiety, hunger-fullness, lunchtime caloric intake, and total caloric intake) in children. **METHODS:** Twenty healthy children (age 5-11) volunteered for this study. After familiarization to testing protocol (sample academic tests, satiety story and instrument), children were split into the treatment

groups using a randomized, counterbalanced design. Breakfast meals consisted of 320 calories by design (PROT [P 30g/F 6g/C 27g/Fib 3g] / FIB [P 11g/F 5g/C 59g/Fib 8g] / SUG [P 8g/F 6g/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] / FIB [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 PROT 610±42 / 870±248, FIB 613±53 / 888±273, and SUG 618±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

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(No relationships reported)

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

PURPOSE: Quantify the prevalence and type of dietary supplements used among NCAA Division I student-athletes.

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: Among 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= 36.0, 44.5% vs. 20.5%, p = 0.001). More athletes in sports using the phosphocreatine energy system (PCr) compared to the phosphocreatine system and anaerobic glycolysis (PCr/AG) 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/AG 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

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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 in 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 #211 June 3, 9:30 AM - 11:00 AM

ACSM Certified Non-Degreed and Degreed Fitness Professionals' 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, CPRPD, CHFID; 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.20.0; alpha >.05). **Results:** Almost 80% of all completed surveys were from the Certified 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 healthful eating topics, NDR were less likely to 1) 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 Dietitians (RDN's) 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<0.001, 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 (76%). Reported 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

vs 44). 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:

1. Krumbach et al. *Int. J. Sport Nutr* 1999
2. Dascombe et al. *J. Sci Med Sport* 2010

2690 Board #213 June 3, 9:30 AM - 11:00 AM
The Discrepancy In Nutrition Between Underclassmen And Upperclassman In Relation To The Residential Environment

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As students enter college, many are making personal food choices for the first time. Data on food typically available on university campuses indicates that dining plans expose students to food that is low in nutrient density (Kolodinsky et al., 2007), suggesting that these food choices are easiest for students with meal plans. Observations imply that as students move off campus dietary choices improve. **PURPOSE:** The purpose of this study was to ascertain differences in dietary habits and quality in undergraduates at Elon University based on their residential environment. **METHODS:** Participants (n=84; male: 40; with equal representation from gender and year) were recruited via fliers and social media to attend a 20-minute evaluation session. Information on residential environment and diet was collected via surveys. The Diet Pattern Review (DPR) was used to evaluate the quality of diet. The DPR was developed at Wake Forest University for use in the cardiac rehabilitation program and has been shown to be an effective and simple tool. The DPR is a food frequency questionnaire that indicates adequacy of nutrient intake based on the following food groups: meats, dairy products, breads and cereals, and fruits and vegetables. This score, out of 100 (DPRtotal), is adjusted to reflect the negative impact of non-nutritious foods consumed (DPRneg) resulting in a net score (DPRnet = DPRtotal - DPRneg) that offers a rough estimate of dietary quality. **RESULTS:** No significant differences were found between on and off campus dwellers for the DPR. In addition there were no significant differences between males and females based on residential environment. However among off campus dwellers, females tended to report a smaller impact of non-nutritious foods compared to males (DPRneg F = 17.42 + 1.96; DPRneg M = 26.76 + 4.13; p = 0.071). DPRnet (DPRnet = 32.69 + 15.35) was low for all undergraduates, suggesting poor dietary quality regardless of gender, year or living environment. **CONCLUSIONS:** Off campus dwellers were twice as likely to eat out as those living on campus, offering a potential explanation for the failure to observe the expected improvement in dietary quality among off campus residents.

2691 Board #214 June 3, 9:30 AM - 11:00 AM
Nutritional Supplements Use and Physical Work Capacity Test in Different Areas of Field Firefighter

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Having the physical capabilities to fight fires and protect lives is very important to all firefighters. They often use nutritional supplements for disease prevention and health promotion. In different areas of field firefighters, their workloads and the choice to use nutritional supplements maybe different. **PURPOSE:** This study was to investigate the nutritional supplements use, nutrition knowledge and physical work capacity tests in different areas of field firefighters of Kaohsiung City Fire Department, Taiwan. **METHODS:** The final sample of 356 field firefighters were obtained from 25 branches in urban, suburban, and exurban areas. All participants completed a self-administered questionnaire in which they were asked about the types of nutritional supplements use (vitamins/minerals, carbohydrate/protein supplements, energy regulatory products, and Health food), the resources of nutrition information, the reasons for use, and nutrition knowledge test. The physical work capacity test score (includes 3000-meter run,

shuttle run, heavy load and run, horizontal bar, weight lifting, push-up, and sit-up) was offered by Training and Education Division in Kaohsiung City Fire Department. **RESULTS:** 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 eliminated 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.

2692 Board #215 June 3, 9:30 AM - 11:00 AM
Use Of Dietary Supplements, Energy and Protein Bars, Gels and Drinks Among Elite Collegiate Endurance Runners

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Elite endurance runners represent a population at risk of developing low energy availability, which may alter hormone function, bone metabolism and increase injury risk. Few studies profile the dietary and supplement intake of elite endurance runners during the competitive season. **PURPOSE:** Outline the intake of vitamin & mineral, amino acid, herb & botanical, fatty acid dietary supplements as well as the intake of other food and beverages taken to supplement the diet. **METHODS:** A sample of 90 elite collegiate endurance runners completed a web-based survey evaluating food patterns, dietary intake, dietary supplement use, and intake of performance bars, gels and drinks. **RESULTS:** Among the sample of 90 endurance runners, 81.1% reporting currently taking a vitamin or mineral, herb or botanical, fatty acid, amino acid, caffeine or other dietary supplements on ≥4 days per week. While 33.3% noted taking only 1-2 supplements, 47.8% reported current use of 3 or more supplements. On average, the runners reported current use of 2.2 +/- 1.8 supplements on ≥4 days per week. Among the runners, 37.8% were taking only vitamin or mineral supplements, while 40.0% reported use of a vitamin or mineral supplement and either an herb or botanical, amino acid, fatty acid, caffeine, or other supplement. The most common vitamin or mineral supplements used by runners included multivitamin/minerals (50.0%), iron (42.2%), calcium (34.4%), and vitamin D (35.6%). The most common non-vitamin or mineral supplement used by runners included caffeine (7.8%) and beta alanine (4.4%). No runner reported use of creatine. In addition, 86.7% of runners reported consuming a performance bar, gel, or beverage on at least a weekly basis (67.8% reported consuming an energy bar, 48.9% reported weekly intake of a carbohydrate or electrolyte beverage, 33.3% consumed a protein drink, and 15.6% used energy gels or chews). **CONCLUSIONS:** A majority of collegiate runners consume dietary supplements, energy bars, drinks, gels and chews, protein bars and drinks on most days of the week. Future research can evaluate the relationship between use of these supplement products and the nutritional adequacy of runners' diets. Runners may also benefit from education on strategies for optimizing energy and nutrient intake with whole foods.

E-36 Free Communication/Poster - Physical Activity in Adults

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

2693 Board #216 June 3, 11:00 AM - 12:30 PM

Assessing Adult And Child Correlates Of Physical Activity In The Healthy Children, Strong Families Intervention

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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-Shepard Leisure-Time PA Questionnaire; children, Netherlands PA Questionnaire), stress (adults only), 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 video game use), site, age (years), weekday and weekend sleep (hours), stress (total units; adults only), adult moderate-to-vigorous physical activity (MVPA; children only), and 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 = 0.398, 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.

2694 Board #217 June 3, 11:00 AM - 12:30 PM

Physical Activity Assessment and Counseling: Quebec Primary Health Care Providers' Current Practice

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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 (36±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)], PHCPs experience [0.97 (0.94-0.99)], patient's annual family income 55 000 \$ [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 level and provide PAC should be favor in FMGs.

2695 Board #218 June 3, 11:00 AM - 12:30 PM

Comparative Validity of Physical Activity Assessment Methods for Individuals with Schizophrenia

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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 $\rho = .47$, $p < .001$ for total minutes of moderate to vigorous PA. Correlation between the final IPAQ assessment and objectively measured PA was $\rho = .31$, $p = .002$. MVPA reported in the 24-hour recall correlated significantly with MVPA on the previous day $\rho = .24$, $p = .041$.

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.

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2696 Board #219 June 3, 11:00 AM - 12:30 PM

Mapping the Contexts of Prolonged Sedentary Behavior in Working Adults: An Ecological Momentary Assessment Study

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Evidence suggests that prolonged, uninterrupted sedentary bouts may be the most harmful manner in which to accumulate sedentary behavior. Currently, little is known regarding the context (e.g. where does it occur? what task is a person doing?) in which prolonged, uninterrupted sedentary bouts most often occur. **PURPOSE:** Using ecological momentary assessment, the purpose of this study was to map the context of prolonged, uninterrupted sedentary bouts among working adults.

METHODS: We studied 605 participants from the Masked Hypertension Study, a worksite-based study of employed adults (mean age 45.4 ±10.6 years; 37.4% 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, home chores, meal-time, commuting, relaxing, other) every 30 min. Sedentary bouts were defined as consecutive minutes wherein the accelerometer registered <100 counts/min.

RESULTS: After adjustment for age and gender, the number of sedentary bouts 30-59, 60-89, and ≥90 min was significantly different by location and task (all p<0.001). For location, bouts 30-59 and 60-89 min occurred more frequently at work (30-59 min: 78.3% [59.3-99.4%] more often at work vs. home; 60-89 min: 40.6% [13.9-73.5%] more often at work vs. home); while conversely bouts ≥90 min occurred more frequently at home (50.1% [14.1-98.4%] more often at home vs. work). For task, bouts 30-59 and 60-89 min occurred more frequently when participants were working (30-59 min: 62.5% [45.2-81.9%] more often while working vs. relaxing; 60-89 min: 53.1% [23.2-90.1%] more often while working vs. relaxing), while bouts ≥90 minutes occurred more frequently when relaxing (37.8% [4.0-82.4%] more often while relaxing vs. working).

CONCLUSIONS: In a cohort of working adults, prolonged, uninterrupted sedentary bouts of moderate duration occurred more frequently during work while conversely longer sedentary bouts (≥90 min) occurred more often at home when participants reported relaxing. These findings implicate the work place as an important target for reducing prolonged sedentary behavior, but suggest that targeting leisure-time at home may be most warranted to reduce extremely long sedentary bouts.

2697 Board #220 June 3, 11:00 AM - 12:30 PM
An Assessment of Participation and Initiatives in an Established Corporate Wellness Program
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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 to be 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 participant if

they worked ≥ 20 hours/week and were at least 18 years of age. Assessments measures included a Qualtrics survey (quantitative) and focus groups (qualitative).

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 focus on mindfulness, nutrition, 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' worksite wellness perceptions and programmatic needs. Practitioners should conduct needs assessments prior to developing interventions to ensure programs meet participant desires.

2699 Board #222 June 3, 11:00 AM - 12:30 PM
A Formative Assessment Of Exercise Resources, Programs And Personnel In U.S. Residential Treatment Programs
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Background: There is emerging evidence for the efficacy of exercise as a treatment strategy for Substance Use Disorders (SUDs) and that this population desires exercise programming during their treatment. However, little is known about whether or not Residential Treatment Programs (RTPs) are equipped with resources to support exercise implementation. Our goal was to identify resources and barriers within U.S. RTPs to inform exercise program implementation within this setting.

Methods: A listing of short- and long-term U.S. RTPs, meeting the American Society of Addiction Medicine's level of care standards from 3.5 to 3.7, was downloaded from the SAMHSA Find a Treatment Center search tool. For each state, RTPs were organized into three lists (short-term, long-term, or both). These lists were randomized using a random sequence generator. Individuals in supervisory level positions from the first 25% of each list were contacted for an interview. The interview assessed the RTPs resources (support, space, time equipment, and personnel) and barriers.

Results: Of the 50 program supervisors that responded, 84% reported that their RTPs were "somewhat" or "very" supportive of exercise programming at their facility. Nearly all (98%) reported having either mandatory or optional daily exercise time in their schedules, 96% had either indoor or outdoor space for exercise, and 94% reported having some form of exercise equipment. The most common equipment was: sport accessories (82% of RTPs), other fitness equipment, such as medicine balls or bands (70%), followed by aerobic (58%) and strength training (56%) equipment. Only 20 programs (40%) employed staff, full or part-time, to provide exercise programming. The most common barriers in offering exercise programming were money and/or budget constraints (54% of RTPs) and space (26%).

Conclusions: These findings suggest that a majority of RTPs provide support, as well as adequate time, space, and equipment, for exercise programming for clients seeking SUD treatment. One potential area of improvement is a greater need for trained staff devoted to implementing these exercise programs and utilizing existing resources. Given the association between exercise and improvements in mental health and substance use, RTPs may serve as an ideal location to implement exercise programming.

2700 Board #223 June 3, 11:00 AM - 12:30 PM
Secular And Longitudinal Trends In Accelerometer-measured Physical Activity And Sedentary Time In Norwegian Adults

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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 PA 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 3178 (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 4 min (95% CI: 2.2, 4.6, $P<0.001$) 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.

2701 Board #224 June 3, 11:00 AM - 12:30 PM
Stability Of Self-reported And Objectively Assessed Physical Activity Over A 3 Year Period In Comparison To Bmi

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PURPOSE: The association of physical activity and BMI with 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 stable over time; measures that vary randomly can introduce regression dilution and limit conclusions from epidemiological research. We aimed to test these assumptions in a cohort of participants recruited from primary care and followed-up for three years. **METHODS:** 514 males and 294 females with an elevated risk of type 2 diabetes were recruited from primary care (family practice). Participants were followed-up with annual measures over three years, including: self-reported moderate-to-vigorous intensity physical activity (MVPA; international physical activity questionnaire), objectively measured MVPA (Actigraph accelerometer - 7 days) and BMI. Regression modelling was undertaken to quantify the degree to which the variance in outcomes at 36 months were explained by measures at previous time points. Tertiles were used to assess Cohen's kappa (reliability) between baseline and 36-month data. **RESULTS:** For self-reported physical activity, 27% of the variance at 36 months was explained by levels at baseline. This increased to 37% when levels at 12 and 24 months were also considered. The same values for objectively assessed MVPA were 47% and 66% respectively and for BMI were 85% and 93% respectively. Kappa coefficients comparing tertiles at baseline to tertiles at 36 months were: self-reported MVPA = 0.25, $p<0.01$ (fair agreement); objectively assessed MVPA = 0.43, $P<0.01$ (moderate agreement); BMI = 0.69, $p<0.01$ (good agreement). **CONCLUSIONS:** Self-reported MVPA at baseline explained little of the variance in self-reported MVPA after 36 months in this clinical population. Objectively assessed MVPA was more predictive over time. However, a single measure of BMI explained over 80% of the variance in BMI 36 months later. Measures of reliability followed the same pattern. Associations of self-reported MVPA with health outcomes should not

be compared to those of BMI; the former is likely to be limited by strong regression dilution. Although objectively assessed MVPA may make such comparisons more valid, they should still be treated with caution.

2702 Board #225 June 3, 11:00 AM - 12:30 PM
Are Physical Activity Patterns Interdependent Between 24-35 Month-olds And Their Parents?

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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 [44.1(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)] ($\beta_1*\beta_2=11.797$, $t=2.73$). Children also spent fewer minutes in MVPA [39.5(21.7)] than their parents [59.6(31.1)] ($\beta=-19.34$, $t=-4.47$). Total time spent in PA (TPA) during a given hour had a significant effect on TPA time in the following hour for children [$\gamma_{11}=0.49(0.02)$, $Z=21.7$] and for parents [$\gamma_{22}=0.73(0.02)$, $Z=37.6$]. After adjusting for respective time spent in TPA during the prior hour, parents showed a stronger effect on children's minutes in TPA [$\gamma_{21}=0.13(0.01)$, $Z=10.3$] than children did on the amount of time their parents spent in TPA [$\gamma_{12}=0.12(0.03)$, $Z=3.4$]. **Conclusion:** Time spent in PA is temporally 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.

2703 Board #226 June 3, 11:00 AM - 12:30 PM
A Comparison of Work-related Physical Activity Levels Between Inpatient and Outpatient Physical Therapists

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PURPOSE: Physical therapists (PTs) work in a variety of healthcare settings with varied levels of physical demands placed on them. The purpose of this study is to compare the physical activity (PA) levels between PTs in inpatient versus outpatient environments for one week using a cross-sectional design. **METHODS:** Sixty-one PTs (30 inpatient, 31 outpatient) wore a tri-axial accelerometer and inclinometer for one work-week. The number steps-per-day, PA intensities, energy expenditures and postural positions adopted during the work day were recorded. **RESULTS:** Significantly longer amounts of time spent sitting was found for inpatient PTs regardless of the significantly higher number of steps-per-day. Outpatient PTs had a higher number of breaks from sedentary activity with those breaks being longer than the inpatient PTs. The percentage of time spent performing moderate-vigorous PA approached significance implying more time was spent performing these types of activities for outpatient PTs. The energy expenditures between the two groups of PTs were not different. **CONCLUSIONS:** Inpatient PTs spent a larger percentage of their time performing sedentary physical activities despite more steps taken per day which may be due to a slower walking speed. The energy expended by both groups was the same despite the higher step count for the inpatient PTs. This may be reflective of the larger body mass of the outpatient PTs which allowed them to expend more energy with less physical activity than the inpatient PTs.

2704 Board #227 June 3, 11:00 AM - 12:30 PM

Accelerometer and GPS Analysis of Trail Use and Associations with Physical Activity and Sedentary Time

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(No relationships reported)

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 (LPA=100-759 counts), moderate (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 determined by GPS coordinates. Mixed linear 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 ($\beta=7.7$ min·d⁻¹, $p=0.04$), MPA ($\beta=28.3$ min·d⁻¹, $p<.0001$), and total PA ($\beta=522$ counts·min⁻¹, $p<.0001$). Trail use was not associated with VPA or SB. Minutes of activity on trails classified as VPA increased by 346% when counts and GPS speed were used to define intensity, 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.

2705 Board #228 June 3, 11:00 AM - 12:30 PM

Examination of Sedentary Time and Physical Activity in University Office Workers

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(No relationships reported)

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 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 activPAL3 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 8.5 hour work 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 count tertiles ($p<.001$). 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.

2706 Board #229 June 3, 11:00 AM - 12:30 PM

Associations of Individual and Neighborhood Level Characteristics with Leisure-Time Physical Activity: The Houston TRAIN Study

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Although access to transit may affect transport-related physical activity (PA), built environment features such as green space, may differentially influence PA in other domains. The Houston TRAIN Study is a natural experiment assessing the impact of light-rail infrastructure on transit behaviors and PA. **PURPOSE:** Assess the relations of individual and neighborhood level characteristics with leisure-time PA (LTPA) among TRAIN participants.

METHODS: Participants were adults (≥18 years) residing within 3 miles of new light-rail corridors in Houston, TX. LTPA was assessed with the self-administered Modifiable Activity Questionnaire (past week), and weekly met-minutes of LTPA were derived. Individual level sociodemographic characteristics (age, gender, race/ethnicity, education) were also reported. Participant addresses were geocoded and matched to census block groups (neighborhood unit). Neighborhood level sociodemographic (median income, racial distribution) and built environment (park access and tree canopy coverage) variables were constructed using public georeferenced data. Generalized mixed effect regression models were used to estimate the relation of individual and neighborhood factors on meeting PA guidelines with LTPA (≥500 weekly met-minutes).

RESULTS: Among 618 participants at baseline, 60% reported meeting PA guidelines with LTPA. At the individual level, Black race was inversely related to meeting guidelines with LTPA (vs. white, OR: 0.4, CI: 0.3-0.7) and having at least some college education was directly related to meeting PA guidelines with LTPA (vs. no college, OR: 1.5, CI: 1.0-2.1). Age and gender were not significantly associated with LTPA. At the neighborhood level, being in the top tertile of neighborhood income (vs. tertile 1, OR: 2.3, CI: 1.4-3.8) was directly associated with meeting guidelines with LTPA. Neighborhood racial distribution, park access and tree canopy coverage were not related to LTPA.

CONCLUSIONS: Among TRAIN participants, individual level education and neighborhood level income are independently related to LTPA, suggesting that socioeconomic status is an important multilevel predictor of LTPA for Houston residents. Other factors were not related to LTPA, contrasting with findings from other studies in different settings.
Funded by NIH R01 DK101593

2707 Board #230 June 3, 11:00 AM - 12:30 PM

A Health Behavior Index for the Hawaiian Islands

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Although an American Fitness Index® (AFI) has recently been created to help generate sustainable and healthy communities, the AFI only evaluates the 50 most populous metropolitan areas in the U.S. leaving many areas unevaluated. **PURPOSE:** To generate a Health Behavior Index (HBI) for the Hawaiian Islands based on health behavior statistics. **METHODS:** Data were collected by modifying The My AFI Community Application Tool. This tool was created to help report communities outside of the 50 most populous metropolitan areas. Population characteristics and health behavior statistics of Hawaiian Islands were collected through rigorous searching of various websites (e.g., U.S. Census, U.S. County Health Rankings, Centers for Disease Control's WONDER system, etc...). Data for the following variables were collected: 1) Percentage engaged in leisure time physical activity, 2) Percentage who do not smoke, 3) Percentage not obese, 4) Percentage in excellent or very good health, 5) Percentage with health insurance, 6) Percentage with access to health foods, 7) Number of recreation facilities/100,000 people, and 8) Percentage of Medicare patients ages 65-75 years not receiving diabetic fee-for-service. Data were collected for the state of Hawaii and individual Hawaiian Islands of Kona, Oahu, Maui, and Kauai.

RESULTS: Population statistics were composed for each location. Health Behavior Index was determined by summing Z-scores. Using state statistics, Hawaii State had a HBI of 2.13. Maui ranked the healthiest with HBI 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.

2708 Board #231 June 3, 11:00 AM - 12:30 PM
Movement Patterns Of Canadian Nurses: A Multi-centre Study

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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 wore an Actigraph GTX3 accelerometer (Actigraph, Pensacola, FL) for ≥ 10 hours/day for a 9-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 \pm SD = age: 44 \pm 12 years; height: 164 \pm 6 cm; BMI: 27.1 \pm 5.4 kg/m²; waist circumference: 81.1 \pm 12.0 cm; resting blood pressure: 113 \pm 13/73 \pm 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 \pm 114.3 minutes/day sedentary, and 408.2 \pm 81.0 minutes/day in light intensity, 122.1 \pm 18.3 minutes/day in moderate intensity and 37.7 \pm 5.4 minutes/day in vigorous intensity PA. The nurses accumulated 14.1 \pm 14.4 minutes/week in MVPA (in bouts of ≥ 10 minutes), and walked 8268 \pm 2392 steps/day. Few (25%) nurses met the recommended ≥ 150 minutes of MVPA/week and even fewer (21%) achieved the 10,000 steps/day guidelines. **CONCLUSIONS:** Even in the busiest of workplaces, nurses do not appear to be meeting PA guidelines. Most of their time was spent being sedentary or engaging in low intensity PA. Interventions are needed to target the low PA levels of Canadian nurses; worksites may be an opportune place to target PA behaviour. Supported by ORACLE grant.

2709 Board #232 June 3, 11:00 AM - 12:30 PM
Associations between Walk Score and Physical Activity in Overweight and Obese Women

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PURPOSE:

To examine the associations between the neighborhood Walk Score (WSc) and physical activity (PA) outcomes in a group of young, overweight/obese suburban and urban women.

METHODS:

Project Health included 48 overweight/obese black or white young women (BMI, 31.2 \pm 3.7 kg/m²; age, 26.7 \pm 4.6 years; 60% black) living in the metropolitan Boston area. An ActiGraph GT3X+ accelerometer (valid day and time defined as ≥ 8 hrs wear time on ≥ 3 days) was used to estimate mean steps/day and time (mins/day) in light PA (LPA; 100-2019 cpm) and moderate-to-vigorous PA (MVPA; ≥ 760 cpm). WSc measured the walkability of a participant's home street address by analyzing walking routes to nearby amenities. Points were based on the distance to amenities; where amenities within a 5-min walk (0.25 miles) were given maximum points (range for WSc = 0-100 points). A decay function is used to assign fewer points to more distant amenities. Multiple linear regression was used to examine associations between WSc and physical activity outcomes (LPA, MVPA, and steps), adjusting for BMI, age, and race.

RESULTS:

Participants had a mean WSc of 62.9 \pm 26.0, wore the accelerometers, on average, 831.3 \pm 102.6 min/day for 7.0 \pm 1.9 days, took 14,424 \pm 4121 steps/day, spent 141.0 \pm 43.4 mins/day in LPA and 118.6 \pm 39.0 mins/day in MVPA. WSc was significantly and positively associated with steps/day ($\beta=0.05$ 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 ($\beta=0.06$, $p=0.009$), shopping ($\beta=0.05$, $p=0.03$), and dining/drinking ($\beta=0.05$, $p=0.02$). 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.

Funding: This research was supported by a University of Massachusetts Boston Proposal Development Grant.

2710 Board #233 June 3, 11:00 AM - 12:30 PM
Differences in Movement Competency In Professional Baseball Players From The United States And Dominican Republic.

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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 $p<.05$.

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.

E-37 Free Communication/Poster - Physical Activity Promotion Programming/ Intervention Strategies in Older Adults

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

2711 Board #234 June 3, 9:30 AM - 11:00 AM
Developing Physical Activity Behavior Change Strategies among Older Adults with Disability employing TTM and ICF

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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 reconstitute items of ICF which focused on older 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 disability.

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2712 Board #235 June 3, 9:30 AM - 11:00 AM
Effects Of Self-efficacy On Physical Activity In Older Adults

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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 dietary intervention 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 ($r=-.27, p=.03$), light PA ($r=.26, p=.03$), but not moderate to vigorous

PA ($r=.14, p=.26$). Results from the regression models showed borderline significant relationships for sedentary time ($p=.05$) and light PA ($p=.06$) but not moderate to vigorous PA ($p=0.35$). 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.

2713 Board #236 June 3, 9:30 AM - 11:00 AM
Neuromuscular Electrical Stimulation Can Improve Walking Endurance In Old Adults

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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 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 to 0.58 m/s, $P = 0.02$). Plantarflexor strength increased between weeks 0 and 7 ($P = 0.001$), but no significant changes were observed for the dorsiflexors, hip flexors, knee extensors, 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.

E-38 Free Communication/Poster - Physical Activity Promotion Programming/ Intervention Strategies in Youth

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

2714 Board #237 June 3, 9:30 AM - 11:00 AM
Physical Activity of Parents and Parental Support as Predictors of Physical Activity of Chinese Children

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(No relationships reported)

Purposes

The primary purposes were to examine the differences in the moderate-to-vigorous physical activity (MVPA) of children, parental support, and parental MVPA between boys and girls and explore the association among parental MVPA, parental support, and the MVPA of boys and girls.

Methods

Participants comprised 172 boys and 151 girls aged 7 to 11 who enrolled in three primary schools in Shanghai and their parents. An accelerometer was utilized to measure MVPA duration among the children. Questionnaires that focused on parental support and PA were completed by the parents. Multivariate analysis of variance (MANOVA) was performed to test the differences in the MVPA duration of children,

MVPA energy expenditure of parents, and parental support by gender. Hierarchical regression analysis was performed to specify the variable that contributed to the MVPA of boys and girls by controlling the age of parents.

Results

Results indicated that only 4% of the children met the recommended MVPA duration of 60 min per day based on the objective data. Parental support consisted of two constructs, namely, logistic support and explicit modeling. Boys ($M = 15.95$, $SD = 9.94$) engaged in more MVPA than girls ($M = 12.52$, $SD = 8.69$), [$F(1, 323) = 10.419$, $p = .001$, $\eta^2 = .07$]. However, no gender differences were noted in terms of the logistic support and explicit modeling of parents and their MVPA. Regression analysis revealed that 23.3% of the variance in the MVPA for boys was explained by explicit modeling and MVPA of fathers [$F(3, 172) = 4.655$, $p < .001$]. In addition, 10.5% of the variance for girls was explained by the explicit modeling of mothers [$F(3, 151) = 2.119$, $p = .022$].

Conclusion

It is concluded that parents should be highly encouraged to support the PA of their children by acting as role models and parents must enhance the PA of their children by different methods based on gender.

Supported by National Social Science Foundation of China [No. 13CTY028].

2715 Board #238 June 3, 9:30 AM - 11:00 AM
Trajectory Changes of Children's Energy Expenditure and Physical Activity: The Effect of Physical Activity Regimen

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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; $M_{age} = 7.81$; 73% White) who took pre-test in Fall 2012 (Time 1). They were assigned to one of two conditions with school as the experimental unit for 3 years: (1) exergaming intervention group (alternating 25-minute PE and 25-minute exergaming daily); and (2) Control group (25-minute daily PE). All children underwent identical assessments in Spring of 2013, 2014 and 2015 (Time 2-4). The outcome variables were children's METs, average minutes in MVPA and SB determined by ActiGraph accelerometers for in-school segment (8:00am-3:19pm), after-school segment (3:20-10:00pm) for the weekdays, and weekend segment (8:00am-10:00pm).

RESULTS: Two-level Mixed Models yielded a significant main effect for Time for EE ($F(3, 48) = 5.52$, $p < 0.01$), MVPA ($F(3, 48) = 6.18$, $p < 0.01$) and SB ($F(3, 48) = 3.51$, $p = 0.02$); and Time \times Condition interaction effect for EE ($F(3, 48) = 5.47$, $p < 0.01$), MVPA ($F(3, 48) = 7.18$, $p < 0.01$) and SB ($F(3, 48) = 4.39$, $p < 0.01$) during in-school segment. There was also a significant main Condition effect for MVPA ($F(1, 48) = 5.11$, $p < 0.01$). In light of after-school segment, main effects for Time and Condition as well as interaction effect were identified for EE (decrease) and SB (increase). But only 2 main effects emerged for MVPA (decrease). With regard to weekend segment, there was only a main Time effect for EE and MVPA (decrease), while 2 main effects emerged for SB (increase).

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.

2716 Board #239 June 3, 9:30 AM - 11:00 AM
Comparison of Physical Activity Levels Between Children Living in Puerto Rico and Continental U.S.

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(No relationships reported)

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 \pm SD; age, 8.9 \pm 1.3 yrs; BMI, 33.1 \pm 10.4 kg \cdot m⁻²), 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 mins/d on 10.6 \pm 5.9 days. In general, Puerto Rican children spent 82.9% of their day in SB and 8.9% of their day 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 639.9 \pm 325.8 min/d and 983.6 \pm 374.7 min/d in SB, respectively, and 77.7 \pm 23.7 min/d and 64.5 \pm 29.4 min/d 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 decrease SB time and increase MVPA time among children living in Puerto Rico.

Funded by The Dudley Allen Sargent Research Fund from the College of Health and Rehabilitation Sciences at Boston University

2717 Board #240 June 3, 9:30 AM - 11:00 AM
The Association Between Perceived Peer and Teacher Social Support and Physical Activity In Schoolchildren

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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 (sMVPA).

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 accelerometry (Actigraph GT3X+) was used to measure sMVPA. 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 sMVPA 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, 8.8 \pm 0.8 years), 88% did not meet the 30-min school-time MVPA recommendation (18.6 \pm 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 sMVPA compared to children in the low-PSS group ($\beta=4.0$ 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 ($\beta=3.3$ mins/school day, 95% CI: 0.52, 5.99, $p<0.05$) compared to students who indicated no TSS.

CONCLUSION: Self-reported high PSS and having TSS were positively associated with amount of sMVPA 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.

2718 Board #241 June 3, 9:30 AM - 11:00 AM
Dynamic Relationship among Elementary School Children's Psychosocial Beliefs, Outside School Physical Activity and Screen Time
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 (No relationships reported)

PURPOSE: Few studies have examined the dynamic relationships among elementary school children's psychosocial beliefs, PA and screen time. This study was designed to examine the longitudinal relationships among children's 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. Children in this school had 125-minute structured PA at school. To assess psychosocial beliefs, children's self-efficacy, outcome expectancy and social support were measured through a battery of established questionnaires. Children's 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 children's psychosocial variables, PA, and screen time at two time points. Results indicated that there was no significant difference in PA, $F(1,65) = .10, p = .75$ 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, $F(1, 66) = 4.7, p = .034$. Specifically, girls reported less PA and screen time than boys. Regression results indicated PA self-efficacy significantly predicted PA at Time 1, $R^2 = .15, F(3, 84) = 4.95, p = .003$. However, outcome expectancy was found to be the only significant predictor of PA at Time 2, $R^2 = .13, F(3,76) = 3.76, p = .014$. No significant relationships between the beliefs and screen time were seen at both time points.

CONCLUSIONS: Findings indicate that children's 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.

2719 Board #242 June 3, 9:30 AM - 11:00 AM
Balanced Energy Physical Activity (BEPA) Toolkit Implementation and Children's Physical Activity at School.
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 (No relationships reported)

PURPOSE: To evaluate the association of Balanced Energy Physical Activity (BEPA) Toolkit use by elementary teachers to children's 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 by classroom and regression was run to examine the relationship between survey responses and PA data.

RESULTS: Regression was used to associate time spent in moderate to vigorous physical activity (MVPA) with three categories of self-reported BEPA-Toolkit use (never, rarely/sometimes, regular). Adjusting for children's sex, grade, BMI categories, pedometer wear time, school, and attendance ($n = 1103, 53\%$ males), children attending classrooms of regular BEPA-Toolkit users spent 2.3 more minutes per day at school in MVPA ($p < 0.05$). Being male, younger, and of healthy weight were associated with more MVPA ($p < 0.05$). No other teacher-specific measured covariates were related to MVPA.

CONCLUSIONS: Consistent with the literature around PA behaviors and children - boys are more active than girls, activity declines as children progress through the grades from 1st through 6th, and heavier children are less active than children of a healthy weight. However when we adjust for these factors results show that kids in the classrooms of Regular USERS are the most active. Using the BEPA-Toolkit to promote PA at schools in rural communities has promising potential and a more rigorous evaluation is warranted.

Abstract is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2011-68001-30020.

2720 Board #243 June 3, 9:30 AM - 11:00 AM
Parental Influences on Outdoor Physical Activity in Chinese Children
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 (No relationships reported)

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 children's 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 Children's Activity and Nutrition (UCAN) cohort study between 2009 and 2011 were used in this study. Children's 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 children's outdoor PA adjusting for children's 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 ($\beta = 0.12, P < 0.05$) is positively associated with outdoor PA on weekdays, whereas family support ($\beta = 0.12, P < 0.05$), parental encouragement ($\beta = 0.14, P < 0.05$), and parental belief ($\beta = 0.12, P < 0.05$) 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 ($\beta = 0.13, 0.17, 0.10$, respectively; all $P < 0.05$) and weekend days ($\beta = 0.21, 0.18, 0.17$, 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.

2721 Board #244 June 3, 9:30 AM - 11:00 AM
The Influence of Time Segments on Moderate-to-Vigorous Physical Activity During Youth Sport Practices
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 (No relationships reported)

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 children's 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 task context and participant demand. Mutually exclusive 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 demanding 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 Evenson's 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 ($P < 0.001$) %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 (35.5 ± 2.2%) compared to elimination (28.9 ± 2.7%).

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.

2722 Board #245 June 3, 9:30 AM - 11:00 AM
Youth who are Obese Sustain Moderate to Vigorous Physical Activity Intensity during Active Video Games

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(No relationships reported)

Nearly one third of American youth are overweight or obese. Many (75%) do not meet the recommended levels for daily physical activity (PA). Based on previous active video game (AVG) research, it is unclear if youth who are obese can achieve moderate to vigorous physical activity (MVPA) for an extended period of time while playing AVG. **Purpose:** To determine if youth who are obese can reach and sustain MVPA during an AVG protocol. **Methods:** Six youth (mean (SD) = 11.3 (0.4) years old; 83% male; 100% African-American) participated in the study, however data analysis was performed on 5 subjects due to missing rest data. Anthropometric measurements (height, weight) were collected. The AVG protocol included a 5-minute warm-up phase (40-60% of heart rate maximum (HRmax)), a 25-minute conditioning phase (60-80% HRmax), and a 5-minute cool down phase. During the AVG protocol, youth wore a portable indirect calorimetry unit (chest harness, heart rate monitor, data unit, face mask) to measure oxygen consumption (VO_2) and HR. Descriptive statistics were generated to determine if participants were in the target HR zone. One-way repeated measures ANOVAs were performed to determine differences in HR and VO_2 across protocol phases, (rest, warm-up, conditioning, and cool-down). **Results:** Results suggest that participants reached and sustained 25 minutes of MVPA during the conditioning phase (mean(SD) HR (bpm) = 148(15); mean(SD) VO_2 (ml/kg/min) = 13.6 (4.1)). Findings on the repeated measures ANOVA for HR indicate a significant main effect ($F(3,12) = 15.45, p < 0.001$). Post hoc pairwise comparisons indicate that HR is significantly lower in the resting phase compared to conditioning ($p = 0.036$) and cool-down ($p = 0.003$) phases. Findings from the repeated measures ANOVA for VO_2 indicate a significant main effect ($F(3,12) = 16.140, p < 0.001$). Post hoc pairwise comparisons indicate that VO_2 during the resting phase is significantly lower than conditioning ($p = 0.005$) and cool-down ($p = 0.046$) phases. **Conclusion:** Youth sustained MVPA during conditioning exhibiting significant differences in HR and VO_2 across phases. AVG may be a promising exercise intervention to increase PA in youth who are obese. Future protocol revision includes a longer conditioning and cool-down phase to increase time in MVPA and allow time to re-establish baseline HR.

2723 Board #246 June 3, 9:30 AM - 11:00 AM
The Role of Nutrition Education in the Implementation of the Presidential Youth Fitness Program

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Purpose: The purpose of this study was to examine the association between the provision of nutrition education in schools and the degree of implementation of the Presidential Youth Fitness Program (PYFP). Secondly, the influence of free and reduced priced lunch was considered.

Methods: Year two implementation data extracted from schools' PYFP funding application and PYFP Index of 284 schools were used for analysis. PYFP implementation was operationalized as a categorical variable (non-implementer, partial implementer, full implementer) based on: 1) mean knowledge score from teachers' virtual professional development, 2) a summed score of organizational supports at the school, 3) administration of the FitnessGram®, and 3) distribution of PYFP student awards. Teachers within each school answered two questions regarding whether the school provided nutrition education to students (range of 0=not in place to 3=fully in place). A multinomial logistic regression model in SPSS was fit to determine the association between the provision of nutrition education and PYFP implementation, controlling for school enrollment and proportion of students receiving free or reduced priced lunch.

Results: The multinomial regression model had a good fit to the data [$\chi^2(6, n = 284) = 121.36, P < 0.001$]. The provision of nutrition education was significantly associated with the level of PYFP implementation. The relative probability of being considered a partial implementer school compared with a non-implementer school was three times higher for every one-unit increase in the provision of nutrition education [$\text{Exp}(B)=3.187, SE=0.228, P<0.001$]. The relative probability of being considered a full implementer school compared with a non-implementer school was thirteen times higher for every one-unit increase in the provision of nutrition education [$\text{Exp}(B)=13.326, SE=0.30, P<0.001$].

Discussion: Nutrition education is significantly associated with an increased probability of achieving a higher degree of PYFP implementation. These findings suggest, schools that provide nutrition education such as having students assess nutritional intake and set corresponding goals are better positioned to implement the PYFP.

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2724 Board #247 June 3, 9:30 AM - 11:00 AM
Nutritional Practices Of Athletic And Non-athletic Youth From Low-income Schools.

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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 athlete 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 "no sports" (NS), "one sport" (OS) and "multiple sports" (MS). Kruskal-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 30.8% (NS), 29.4% (OS), and 39.8% (MS). Significant group differences were found for whole grain breads (WGB; $\chi^2 = 8.209, p = 0.016$), total V ($\chi^2 = 17.072, p < 0.001$), and total F ($\chi^2 = 10.603, p = 0.005$). Post hoc tests showed MS > NS for WGB ($\chi^2 = -24.128, p = 0.022$), OS > NS and MS > NS for V ($\chi^2 = -27.933, p = 0.020$; $\chi^2 = -38.934, p < 0.000$) and MS > NS for F ($\chi^2 = -29.990, p = 0.007$). Significant group differences were also found for beliefs toward F/V consumption increasing strength ($\chi^2 = 10.937, p = 0.004$) and providing more energy ($\chi^2 = 7.456, p = 0.024$). Post hoc test showed MS > NS and MS > OS ($\chi^2 = -23.860, p = 0.018, \chi^2 = 25.061, p = 0.013$) for strength and MS > NS ($\chi^2 = -20.223, p = 0.024$) for more energy, respectively. No significant differences were found for other nutrition variables.

CONCLUSIONS: Low-income MS youth reported better nutrition behaviors than OS and 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.

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2725 Board #248 June 3, 9:30 AM - 11:00 AM
The Relationship Between Xbox Gaming Performance and Physical Function in Young Adults

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(No relationships reported)

As videogames become more interactive, it has been a growing curiosity if they could be used to improve physical function. However, it remains unclear if game performance is related to aspects of physical function. In particular, the Xbox 360 Kinect utilizes human movement commonly used in activities of daily living to control games and could potentially be used to assess or improve physical function.

PURPOSE: To examine the relationship between game performance on the Xbox 360 Kinect and physical function in young adults.

METHODS: There were 14 participants: 8 females and 6 males (mean \pm s.d. age: 20.4 \pm 1.1 years; height: 168.9 \pm 9.1 cm; mass: 69.4 \pm 12.8 kg). Each subject played Xbox Kinect Adventures¹, which included Reflex Ridge, Space Pop, and 20,000 Leaks. Physical function measures included measures of lower limb strength, balance, and reaction time. Knee extensor, knee flexor, hip extensor, and hip flexor strength of the dominant limb was assessed with a handheld dynamometer on the dominant limb. Reaction time (motor, visual, physical) was assessed by a DynaVision D2TM on the dominant upper limb. Balance was quantified by the center of pressure (COP) range and mean COP speed in the AP and ML directions while standing with eyes closed for 30 seconds.

RESULTS: Knee flexor, knee extensor, and hip extensor strength were all positively correlated with the scores in Reflex Ridge ($r = -0.7746, 0.6573, 0.6234$ and $p = 0.0011, 0.0106, 0.0172$, respectively). Motor ($r = -0.698, p = 0.006$) and physical ($r = -0.662, p = 0.010$) reaction times were both negatively correlated with the scores in Space Pop. Motor ($r = -0.679, p = 0.008$) and physical ($r = -0.626, p = 0.017$) reaction times were also negatively correlated with the scores in 20,000 Leaks. Balance measures were not correlated with game performance.

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, health individuals, future research should focus on applying this technology to improving physical function in older adults.

2726 Board #249 June 3, 9:30 AM - 11:00 AM
Effects Of Using Elastic Bands On Strength And Muscle Mass In Well-trained Young Men

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 (No relationships reported)

There is a lack of information regarding the efficacy of using elastic bands (EB) to increase strength and fat free mass (FFM) in the upper extremities of young well-trained men. **PURPOSE:** To assess strength and muscle adaptations in the upper extremities of young well-trained men after a short-term resistance program using EB versus traditional weight devices. **METHODS:** 14 well-trained men were randomly 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 6.46%. 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.

2727 Board #250 June 3, 9:30 AM - 11:00 AM
Barriers to and Enablers of Physical Activity in Indian Adolescents: A Qualitative Study

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 (No relationships reported)

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) from 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. **CONCLUSIONS:** Lack of opportunities to be active at school was the most consistently cited barrier. Schools should be incentivized to increase children's physical activity levels. Additionally, social barriers were markedly different for boys and girls. Policies to increase PA participation must be gender-sensitive.

2728 Board #251 June 3, 9:30 AM - 11:00 AM
Effects Of Exergaming On College Students' Energy Expenditure, Physical Activity, And Enjoyment

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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), 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; Xage=23.6 years, SDage= 4.1; 39 non-Hispanic white) completed 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 highly 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 three 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. More study on eliciting greater physiological stimulation during exergaming among college students is needed.

2729 Board #252 June 3, 9:30 AM - 11:00 AM
Implementation of Self-Determination Theory in College Physical Activity Classes

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Physical activity declines markedly during the college years. Theory-based interventions implemented within basic physical activity courses offer a promising approach for increasing physical activity in this population. **PURPOSE:** To examine the effect of a need-supportive physical activity class environment on college students' self-determined physical activity motivation, self-reported physical activity, enjoyment, and stage of change. **METHODS:** A need-supportive teaching intervention was developed based on Self-Determination Theory and implemented by a group of randomly selected graduate student instructors (n = 7) of a basic instruction college physical activity class (n = 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

questionnaire. Intervention effectiveness was evaluated with a series of mixed model analyses of variance and effect size estimates via Cohen's delta (d).

RESULTS: Results indicated no meaningful differences in students' perception of need support between the need-supportive and conventional teaching conditions (d range 0.13 to 0.19). Changes in self-determined physical activity motivation, self-reported physical activity, enjoyment, and stage of change across time points did not differ by teaching condition ($p > .05$, all d s < 0.15).

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.

2730 Board #253 June 3, 9:30 AM - 11:00 AM

Assessing Usability of Active Infrastructure on a College Campus

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Background: Pedestrian, bicycle, and recreational infrastructure may play a role in improving levels of physical activity and quality of life among college students. Previous research has demonstrated that walkable, compact communities promote the use of various forms of active transportation such as walking, running, and cycling. **Purpose:** 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 in 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 Kruskal-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:** Kruskal-Wallis H test demonstrated a significant difference in walking frequency among the campus clusters, $\chi^2(2) = 20.180$, $p < 0.001$. Walking frequency was highest near center of campus. Post-hoc Mann-Whitney analyses concluded that walking frequency was higher for midway than on the perimeter ($U = 16.5$, $p = 0.005$), higher for inner campus than on the perimeter ($U = 0.00$, $p < 0.001$), and higher for inner campus than midway ($U = 3.5$, $p = 0.007$). Kruskal-Wallis H test revealed a significant difference in cycling frequency among the campus clusters, $\chi^2(2) = 12.581$, $p = 0.002$. Cycling frequency was the highest near the center of campus. Post-hoc Mann-Whitney analyses concluded that cycling frequency was higher for inner campus than on the perimeter ($U = 6$, $p < 0.001$), higher for inner campus than for midway ($U = 5.5$, $p = 0.014$), but not higher on the perimeter than for midway ($U = 63$, $p = 1.0$). There was no significant difference in running frequency among the three campus clusters, $\chi^2(2) = 1.577$, $p = 0.455$. **Conclusions:** Results demonstrate that proximity to center of campus is related to higher frequency rates of walkers and cyclists, but not runners.

2731 Board #254 June 3, 9:30 AM - 11:00 AM

Increased Energy Expenditure in a Modified Versus Traditional College Classroom Setting

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Purpose: 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. The conditions implemented included sitting on a physioball, standing, and an unaltered conditions where students sat in the given chair. 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 kcals) and physioball (2.10 ± 2.60 kcals) conditions ($p = .001$), and between the sitting and standing (1.17 ± 1.74 kcals) conditions ($p = .002$). No significant differences were found between the physioball and standing conditions

($p = .12$). **Conclusions:** Standing and sitting on a physioball are both superior to sitting in terms of energy expenditure. This could have a significant impact on energy expenditure throughout a student's day being that they spend a majority of the day in a sitting position. This in turn can improve one's metabolic and cardiovascular risk profile, while also promoting weight loss.

2732 Board #255 June 3, 9:30 AM - 11:00 AM

Physical Activity Prevalence And Awareness After An Exercise Is Medicine On Campus Campaign, 2011-2014.

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Exercise is Medicine (EIM) is a global health initiative to establish physical activity (PA) as a tool for the prevention and treatment of disease. Exercise is Medicine with Altitude (EIMA) was a campaign implemented to promote PA on a university campus. **PURPOSE:** To evaluate awareness of the EIMA campaign and PA of students.

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 BRFS 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 and 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.

2733 Board #256 June 3, 9:30 AM - 11:00 AM

Inclusion of High Fitness Students Helps Encourage Increased Movement in Low Fitness Students

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Most individuals are 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 ($p=0.31$) when they played on a mixed team (steps = 1820 ± 471) compared with 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.

2734 Board #257 June 3, 9:30 AM - 11:00 AM
What Drives Undergraduate'S To Declare A Health-related Major?

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Health-related majors are popular and growing career paths. However, little research explores interest in health-related majors. **PURPOSE:** To investigate factors influencing undergraduate students to major in a health-related field, and determine whether such influences differ by classification. A second purpose was to investigate plans after graduation. **METHODS:** Qualtrics was used to develop a self-administered, paper and online survey distributed to a list serve of students majoring in a health-related field. Positive and negative factors were rated on a Likert scale ranging from 1 (no influence) to 5 (major influence). Descriptives and non-parametric tests were used for statistical analysis. 380 (M=20.9 ± 2.6 yrs) participants were included. **RESULTS:** The most positive influential factor reported was interest (4.63 ± 0.03), and the negative factor was major difficulty (1.77 ± 0.05). Hands on tasks (59.1%) and helping others (56.3%) in classes/work was the primary reason for selecting a health-related major. 82.4% reported plans to pursue a master's (n=164) or doctorate (n=155) degree to enhance knowledge (52.7%) and improve marketability (44.7%). Accumulating debt (23.3%) was the primary reason not to attend graduate school. Kruskal-Wallis tests were used to determine differences between positive influences in freshman (F) (n=66), sophomores (SO) (n=75), juniors (J) (n=99), seniors (S) (n=96), and fifth year seniors (S5) (n=44). Interests ($\chi^2(4)=9.62$, $p=0.05$), friends ($\chi^2(4)=10.98$, $p=0.02$), college advisors ($\chi^2(4)=20.18$, $p=0.01$), introductory courses ($\chi^2(4)=13.72$, $p=0.01$), and pay in the field ($\chi^2(4)=11.32$, $p=0.02$) were significantly different between groups. Post hoc analysis revealed lower influence from friends in F compared to J (2.68 ± 0.15 vs 3.26 ± 0.12). College advisors had lower influence in F compared to J and S (1.82 ± 0.14 vs 2.66 ± 0.15 vs 2.70 ± 0.15). Introductory courses had lower influence in F compared to J and S (2.29 ± 0.15 vs 2.82 ± 0.13 vs 3.14 ± 0.20). Pay scores was greater in F compared to S5 (3.42 ± 0.15 vs 2.61 ± 0.20, $p=0.01$). **CONCLUSION:** The recruitment of students in a health-related major differs from students in students that continue. These findings highlight the importance of length of study, and the impact of advising on retaining students in health-related majors.

2735 Board #258 June 3, 9:30 AM - 11:00 AM
The Use of Activity Trackers with Exercise Prescription in Children with Congenital Heart Disease

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Purpose: Inadequate physical activity has been reported in children with congenital heart disease (CHD). Activity trackers used in conjunction with individualized exercise prescription may help to increase physical activity in these patients. We sought to determine the effect of activity trackers with exercise prescription on moderate-to-vigorous physical activity (MVPA) and fitness in children with CHD. Methods: We approached 54 patients with CHD aged 10-18 yrs. Fifteen were not interested in participating and 15 were excluded based on their baseline fitness (VO₂ >90% predicted). Exercise physiologists assessed physical activity using the FITT principle. Participants were randomized to an intervention group (INT) or control group (CON). INT children were given an exercise prescription and activity tracker (MOVband, Cleveland, OH) for 16 weeks. CON children were given general advice about exercise. Exercise physiologists monitored the INT group's physical activity online and provided support on a bi-weekly basis. Baseline and follow-up (16-week) assessments included cardiopulmonary exercise tests and 7-day waist-worn accelerometry (GT3X+ ActiGraph LLC; 1s epoch). Mean daily MVPA was estimated from vertical acceleration counts (>2296 cpm) for those with valid data (≥2 days with ≥600 minutes wear time/day). Fitness was assessed as VO₂peak (ml/kg/min) and endurance time (sec) during a standardized treadmill exercise test. Between-group differences were assessed via a repeated-measures ANOVA ($p<0.05$). Results: Seventeen children completed the study protocol (CON n=9; INT n=8). There was an interaction effect (time*group) for daily MVPA (F=4.74; $p=0.05$), with the INT group increasing their MVPA (46 to 54 min) and CON declining (40 to 32 min). Treadmill time increased significantly in the INT group (+56 sec) but not in the CON group (-11 sec; F=7.18; $p=0.02$). There was no effect for VO₂peak. Conclusions: The use of activity tracker with exercise prescription is feasible and associated with increases in MVPA in children with CHD.

2736 Board #259 June 3, 9:30 AM - 11:00 AM
Physically Active Academic Lessons in Primary School. Impact on Children's Physical Activity Level

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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).

	Physically active academic lessons	Physical education lessons	Academic lessons
Sedentary activity (min)	16 (6)*	18 (5)	34 (5)**
Light PA (min)	17 (4)	16 (3)	9 (4)**
MVPA (min)	12 (4)	11 (4)	2 (2)**
Vigorous PA (min)	6 (2)	6 (3)	0 (1)**
Counts per minute	1559 (470)	1481 (508)	277 (193)**
Steps (number)	1699 (544)**	1451 (451)	387 (244)**
<i>Mean (standard deviation).</i>			
<i>**Different from the other lessons ($p<0.001$).</i>			
<i>*Different from the other lessons ($p<0.05$).</i>			

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.

2737 Board #260 June 3, 9:30 AM - 11:00 AM
Implementation Of A Home-based Physical Activity Curriculum In Children With And Without Prader-willi Syndrome

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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 per 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

reported as more difficult for PWS than for OB ($p < 0.05$) for warm-up (PWS=2.3, OB=1.6); strength (PWS=2.8, OB=2.1) and games (PWS=2.6, OB=2.0). Barriers included: scheduling (56.1%), child's motivation (31.8%), program structure (23.9%), weather (22.7%), medical issues (13.6%), and space (4.5%); with PWS reporting a higher frequency of medical issues barriers and OB reporting more space and program structure barriers. Facilitators included: staff communication (35%), family support (18.6%), program's flexibility (15.3%), variety of activities (11.9%), incentives (11.9%), parent manual/equipment (11.9%), and others (20%). Activity variety was mentioned only in OB.

CONCLUSIONS: Children liked the activities, with games receiving the highest rating. Youth with PWS found activities more challenging. Barriers to the intervention were similar to previous studies, with medical complications being additional barriers in those with PWS. Support provided by study staff and family members appeared important facilitators.

2738 Board #261 June 3, 9:30 AM - 11:00 AM
Preschoolers Increased their Heart Rate when Music is Played Halfway through a 30 Minute Play-Period

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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 pre-school children showed a significant increase in their intensity of physical activity when age appropriate music was played halfway through a 30 minute play period.

2739 Board #262 June 3, 9:30 AM - 11:00 AM
Impact Analysis of a University Wellness Course of Behavior Regulation to Exercise.

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Impact Analysis of a University Wellness Course on Behavior Regulation to Exercise.

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Purpose: The purpose of this study is to determine if a sixteen-week wellness course offered at a southern university can an effect participant behavioral regulation to exercise.

Methods: A longitudinal study (pre-post study) of 151 participants ($f=100$, $m=51$; $m=19.6$ yrs) was conducted to evaluate the effects the wellness course had on behavioral 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 ($p=.002$) and Intrinsic Regulation ($p=.007$) reflect significant increase.

Conclusion: Identified (personally important) and Intrinsic (inherently enjoyable) regulation are internal motivators associated with higher rates of participation and adherence. This study revealed that course participation had a positive impact of students' intrinsic and identified regulation. This study can assist with the development of programs that focus on increasing student exercise participation and adherence among college aged participants.

2740 Board #263 June 3, 9:30 AM - 11:00 AM
Formative Evaluation of a Web-Based Professional Development Program to Increase Physical Activity in Classrooms

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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 ($nK-5 = 106$, $n6-8 = 27$, $n9-12 = 54$, $n\text{specialists} = 32$) 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 ($t(202) = 1.10$; $p = .274$) (pre: $M = 13.5$, $SD = 1.65$; post: $M = 13.39$, $SD = 1.35$; 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 ($t(192) = -9.13$; $p < .001$) (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.

2741 Board #264 June 3, 9:30 AM - 11:00 AM
Are Teacher Characteristics Associated With Quality Of Implementation Of Physically-active Academic Lessons?

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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 $\alpha=.91$) and PBC ($\alpha=.92$) 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 everything teachers do"), and restrictive (e.g. "Administrative paperwork is burdensome") subscales of the OCDQ-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, teachers rated PA intensity, ease of implementation, overall rating, and duration from 1 (Low/Poor) 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: Directive PB was positively associated with average PA intensity ($\beta=.38$, $p=.003$). Ease of implementation was associated with greater directive PB ($\beta = .28$, $p=.03$) and PBC ($\beta = .38$, $p=.02$). PBC ($\beta = .35$, $p=.03$) and directive PB ($\beta = .35$, $p=.01$) were positively associated with average overall rating. Average duration of lessons was

positively associated with attitudes ($\beta = .29, p = .05$) and supportive PB ($\beta = .32, p = .03$). Average number of lessons per week was positively associated with PBC ($\beta = .42, p = .01$) and restrictive PB ($\beta = .41, p = .01$).

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.
NIHR01HD070741

2742 Board #265 June 3, 9:30 AM - 11:00 AM
Self-Reported Physical Activity in Student Athletes at Pre-participation Physical Evaluations

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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 14.24 ± 1.168 . Mean days of MVPA was 4.31 ± 1.51 . Mean daily minutes of MVPA was 68.33 ± 38.26 . 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 7% 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 Prompt Community-Level Engagement: A GIS Approach

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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.

METHODS: Objective measures of height and weight were gathered from 112 elementary students (age = 9.8 ± 1.85 ; 54 female). Home addresses and familial perceptions of safety while engaged in neighborhood-level physical activities were gathered using a previously-validated questionnaire. Safety factors included perceived police presence in areas supporting physical activity and perceived safety for daytime or nighttime physical activities. Hot spot analysis using the Getis-Ord G_i^* algorithm was used to identify spatial clusters of high and low BMI and safety zones. OLS regression was used to explore associations in high and low spatial clustering between student BMI and familial perceptions of safety.

RESULTS: 55% of students displayed an unhealthy weight profile (BMI-for-age > 85 th percentile). Overall, spatial clusters of BMI hot spots were significantly associated with spatial clusters of perceptions of safety ($F(4,106) = 30.18, p < 0.01; R^2 = 0.53$). Significant negative associations were observed for perceived police presence in areas supporting physical activity ($p < 0.01$) and perceived safety for daytime physical activities ($p < 0.01$); no association was observed for perceived safety for nighttime physical activities ($p = 0.43$).

CONCLUSIONS: Unhealthy weight status in youth was significantly associated with perceptions of safety for engaging in neighborhood-level physical activities. By coupling hot spot analysis with OLS, overlapping spatial patterns of high need for perceived safety and BMI could be examined at the residential level. This approach has the potential to inform decision making among community partners regarding resource allocation to enhance youth health status in neighborhoods displaying utmost need.

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

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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 greatest 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.

2745 Board #268 June 3, 11:00 AM - 12:30 PM
Patterns Of Physical Activity And Sedentary Behavior Among Children And Adolescents In Shanghai, China

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Physical activity (PA) is essential for the development of children and adolescents. It has been documented that regular moderate-to-vigorous physical activity (MVPA) has substantial benefits for young people's health while sedentary behavior (SED) has many negative health effects. However, the prevalence of PA is decreasing and the prevalence of SED is rising globally. The first step of promoting young people's PA is to monitor the current status.

PURPOSE: To investigate the current situation of PA and SED among young people in Shanghai and to explore the patterns of them. **METHODS:** Large scale school survey was conducted from October to December in 2014 with multi-stage stratified and random cluster sampling method. 711 primary, secondary and upper secondary schools, from all 17 districts of Shanghai metropolitan area were selected. In total, 78516 students, aged 6 to 18 years old, participated in the survey and 71404 students (51.0% boys) finished the self-report questionnaire (response rate = 90.9%). Descriptive statistics and MANOVA were used to analyze the pattern of at least one hour MVPA per day and at least two hours SED by age, gender, and school

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 guideline decrease 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 physical 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.

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2746 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

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PURPOSE: To examine the patterns of moderate-to-vigorous physical activity (MVPA) of a youth cohort from 10th grade (Wave 1, W1) 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 $B=0.46$, $p < .001$; quadratic slope of time $B=-0.20$, $p < .001$). Sex ($B=0.46$) and race/ethnicity (Hispanic vs. White $B=0.34$) but not W1 weight status were associated with W1 MVPA ($p < .001$). W4-W1 BMI difference was negatively associated with linear slope of time ($B=-0.02$, $p < .01$) 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: $B=0.10$, $p < .01$; W2: $B=0.06$, $p < .05$; W3: $B=0.08$, $p < .001$). Peer PA and family support were not associated with MVPA in corresponding waves. Additionally, those attending 4-year college vs. not attending school ($B=0.52$, $p < .001$), and college students living on campus vs. at home ($B=0.37$, $p < .001$) 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.

2747 Board #270 June 3, 11:00 AM - 12:30 PM
Physical Activity, Sedentary Behavior, And Obesity In Adolescents With And Without Attention-deficit Hyperactivity Disorder

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Physical activity (PA), sedentary behavior, and obesity are significant indicators of present and future health in adolescents, however, whether these behaviors differ in Attention-Deficit Hyperactivity Disorder (ADHD) is unknown. **PURPOSE:** To compare BMI classification, PA, sport and club participation, and sedentary behavior between adolescents with ADHD and without. **METHODS:** Analyses included 41,572 adolescents (52% male) aged 10 to 17 years (mean 13.6 ± 0.11 years) from the 2011-12 National Survey of Children’s Health. Adolescents were grouped into two categories: those with parent-reported ADHD ($n=4,698$) and those without ($n=36,874$). Outcomes included BMI classification, regular PA (≥ 3 d/wk), and sedentary behaviors

(electronics usage, and TV viewing time ≥ 2 hr/d). Logistic regression models, adjusted for age, sex, gender, household income, and education, assessed the odds of each outcome comparing those with ADHD and without. Associations between ADHD and outcomes were then reanalyzed after stratification by ADHD severity (mild, moderate, and severe). **RESULTS:** Presence of ADHD was not significantly associated with BMI classification. Unadjusted prevalences showed that 73% of those with ADHD were regularly physically active compared to 79% without ADHD ($p < 0.001$). In addition, among those with ADHD and without, 57% vs. 49% spent ≥ 2 hr/d watching TV ($p < 0.001$) and 45% vs. 41% spent ≥ 2 hr/d using electronics ($p < 0.001$). In adjusted models, those with ADHD were less likely to engage in regular PA (OR=0.64; $p < 0.001$), as well as less likely to participate in sports (OR=0.64; $p < 0.001$) and clubs (0.64; $p < 0.001$). Furthermore, those with ADHD were more likely to engage in sedentary behaviors such as TV viewing (OR=1.30; $p < 0.001$) and electronics usage ≥ 2 hr/d (1.23; $p < 0.001$). There was a significant dose-response relationship between ADHD severity and physical activity and sedentary behaviors; as severity increased, PA decreased ($p < 0.001$), and television viewing ($p < 0.001$) time, and electronics usage ($p < 0.001$) increased. **CONCLUSIONS:** Adolescents with ADHD were less likely to engage in regular PA and more likely to engage in sedentary behaviors compared to those without ADHD. These findings suggest the need for programs to promote PA and decrease sedentary behavior tailored to adolescents with ADHD.

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?

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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, where 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).

Study	n	% Male/ female	Age (y)	Obesity (%)	Obesity (national%)	>2Screen hours/day
2005	64	41/59	6.7+0.5	12.5%	17.2%	13%
2014	50	48/52	6.8+0.4	24.0%	25.3%	62%

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.

2753 Board #276 June 3, 11:00 AM - 12:30 PM
Attributable Proportion Of Specific Physical Activities To Total Activity Volume, NHANES 1999-2006

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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 ($p < 0.05$) 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 difference across population subgroups.

2754 Board #277 June 3, 11:00 AM - 12:30 PM
Demographic Factors, Workplace Factors, And Active Commuting In The United States: A Secondary Analysis Of 2009 Nhts Data

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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 ($p < 0.05$) 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 ($p < 0.05$). 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, $p < 0.001$, $p < 0.002$, > 10 miles OR=0.001; biking: $> 1-5$ miles OR=0.58, $> 5-10$ miles OR=0.21, > 10 miles OR=0.03; all $p < 0.001$) or longer time to work compared to 20-30 mins OR=0.10, > 30 mins OR=0.07; biking: $\geq 10-20$ 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 behavioral patterns that can be used to encourage active commuting through changes in workplace policy, multi-use land programming, infrastructure design, and public health.

2755 Board #278 June 3, 11:00 AM - 12:30 PM
NHANES Grip Test Measured Muscular Strength of American Adults

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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 viscerally obese (sagittal abdominal diameter > 22 cm for male, and > 20 cm for female). 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 (H; $p < 0.0024$) and Non-Hispanic Asians (NHA, $p < 0.0001$), and both NHW and H had stronger grip strength than NHA ($p < 0.0001$). There was no difference between grip strength of NHW and H ($p = 0.99$). High income adults had significantly stronger grip strength than those classified as low ($p = 0.01$) or middle income ($p = 0.038$). Adults with less than high school education had weaker grip strength than those with high school ($p = 0.043$) or college education ($p = 0.004$). Obese adults had 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 (MVLTPA) participation had significantly weaker grip strength than those who reported MVLTPA 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.

2756 Board #279 June 3, 11:00 AM - 12:30 PM
Lms Tables For Waist Circumference And Waist-height Ratio In Colombian Adults: Analysis Of Nationwide Data 2010

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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 selected using receiver operating characteristic analysis based on data from the Colombian representative sample.

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 LR (+) value of 7.01, specificity of 87.5% and LR (-) value of 0.14. In women, the cut-off point value of 84.0 cm for the WC provided a sensitivity of 84.0%, a LR (+) value of 7.30, specificity of 88.5% and LR (-) value of 0.18. In obesity category in men, the cut-off point value of 96.6 cm for the WC provided a sensitivity of 92.9%, a LR (+) value of 7.31, specificity of 87.3% and LR (-) value of 0.08. In women, the cut-off point value of 91.0 cm for the WC provided a sensitivity of 89.2%, a LR (+) 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 5.80, specificity 84.7% and LR (-) 0.13. In women the cut-off point

value was 0.536, sensitivity 85.8%, 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 Metrics?

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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 measure 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 64-97 Years: The Women's Health Initiative OPACH Study

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(No relationships reported)

PURPOSE: This study described the patterns of accelerometer-assessed physical activity and sedentary behavior among women ≥64 years with latent class analysis (LCA).

METHODS: Overall, 5660 women 64-97 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 (MVPA; ≥519 VM/15-s). LCA classified women based on daily (Monday-Sunday) patterns of average VM/15-s (an estimate of total volume) and percent of wake time (defined by participant-completed sleep logs) in sedentary behavior and physical activity intensity categories.

RESULTS: When based on average VM/15-s, four latent classes emerged grouping least to most active, with the population prevalence as follows: 29.0% (mean 58.8 VM/15-s), 38.9% (96.5 VM/15-s), 23.7% (137.2 VM/15-s), and 8.4% (182.7 VM/15-s). Across classes, most women spent the majority of wake time in sedentary behavior (range 44.5%-76.1% of day by class), followed by light low (14.3-31.4%), light high (5.8-18.5%), and MVPA (2.6-16.5%). For percent of sedentary behavior out

of total wearing time, 4 classes were identified from most to least sedentary: 16.5% of population (mean 656.8 minutes/day), 36.6% (586.2), 34.3% (503.7), and 12.7% in the highest class (398.9). For percent of light low activity out of total wearing time, 4 classes emerged from least to most activity: 19.3% of population (mean 125.6 minutes/day), 40.5% (177.0), 31.5% (225.1), and 8.8% (280.8). For percent of light high activity out of total wearing time, 4 classes emerged from least to most activity: 16.0% of population (mean 50.4 minutes/day), 42.7% (87.0), 31.9% (122.8), and 9.4% (165.4). For percent of MVPA out of total wearing time, 4 classes emerged from least to most MVPA: 43.9% of population (mean 22.9 minutes/day), 35.8% (56.1), 16.5% (95.0), and 3.9% (149.5). Patterns of sedentary behavior and physical activity did not meaningfully vary by day of week for any derived class.

CONCLUSION: Future studies can determine whether these LCA assignments better detect cross-sectional associations and predict health outcomes than conventional exposures defined by duration.

2759 Board #282 June 3, 11:00 AM - 12:30 PM

Global Participation In Specific Leisure-Time Physical Activities: A Systematic Review And Meta-analysis

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(No relationships reported)

Physical activity surveillance data indicates a large proportion of the global adult population is insufficiently active to accrue associated health benefits. To better understand this lack of activity, it is important to know how choice in specific physical activities change from childhood into adulthood across the globe. **PURPOSE:** To determine the most popular physical activities performed by children, adolescents and adults across six global regions (Africa, Americas, Eastern Mediterranean, Europe, Southeast Asia, Western Pacific). **METHODS:** A two-phase systematic review was conducted. First, geohive.com, a website with access to 211 country's statistics bureau website was searched. Next, databases Scopus, ProQuest, SPORTDiscus, and Science Direct were searched for articles published in the last ten years. **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 the Americas (basketball, soccer), Europe (soccer) and Western Pacific (basketball). **CONCLUSION:** Global participation rates reflect a consistent pattern of participation in lifelong physical activities, such as swimming, running or walking. There appears to be a general shift away from ball sports during childhood and 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

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(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 accelerometry.

METHODS: Participants were from two intervention studies which emphasized increasing physical activity: 1) healthy midlife women in a lifestyle intervention for reducing abdominal fat (n=44), 2) adults with diabetes in a randomized clinical trial for diabetes self-management (n=96 intervention; n=95 standard of care). Included participants completed both the 7-day version of the IPAQ and wore a triaxial accelerometer for 7 days at baseline and 12 months.

IPAQ measures included: total PA (MET-min/week), weekly minutes of moderate-to-vigorous activity (MVPA), and walking minutes. PA from the accelerometer included average min/day of MVPA and light activity, steps/day, and min/week sustained MVPA (≥ 10 minute bouts) and was processed using vector-magnitude cut-points. Change in accelerometer-measured PA was also compared between tertiles of change in total IPAQ score. Associations between measures were compared using correlations and linear regression.

RESULTS: Overall, participants' (n=235; age 53.8 ± 9.8 years, 75.5% female, 89.4% black, BMI 35.4 ± 8.0 kg/m²) objective MVPA did not significantly change, while mean light activity increased (21.8 ± 78.6 more min/day, $p < 0.001$) as did daily steps (217 ± 1709 , $p < 0.01$). Conversely, median IPAQ total PA declined, (-94, IQR: -1634.0 to 362.0, $p < 0.05$) though other IPAQ measures did not significantly change. Change in accelerometer steps/day was weakly correlated with change in IPAQ total score and walking min/week ($r = 0.16$ and 0.14 , respectively, $p < 0.05$). Changes in accelerometer MVPA, light activity, and steps/day did not significantly differ by IPAQ change tertile.

CONCLUSIONS: The IPAQ may be insufficient for capturing PA changes, particularly if changes are of light intensity. Future studies should assess the appropriateness of other PA assessment tools for better detection of intervention-related PA changes.

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2761 Board #284 June 3, 9:30 AM - 11:00 AM

Short Message Service Text System (SMS-track) - A Novel Approach to Assess Intervention Compliance

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(No relationships reported)

Many school-based physical activity interventions have been conducted, but with mixed results on main outcomes. This inconsistency could be caused by different intervention strategies and intensities, but very likely also from differences in compliance with intervention elements.

PURPOSE: To determine the feasibility of a short message service text system (SMS-track) to assess compliance with intervention elements in a school-based physical activity intervention. Also, to demonstrate the application of the SMS-track, results of compliance with different intervention elements is presented.

METHODS: Data was from the study; Learning, Cognition and Motion (LCoMotion), a cluster-randomized trial. Participants were 193 students from the 7 intervention schools (mean age in years (SD); 12.9 (0.6)). The intervention "package" consisted of: 1) physically active academic lessons 2) physically active recesses and 3) physical activity home work. Every second Friday for 4 months an SMS was sent out to all students asking them to quantify the number of times they had participated in/performed the three elements listed above in the past week. The answers were grouped into the categories; 0, 1-2, 3-4, or ≥ 5 times the past week.

RESULTS: Of the 193 participants 177 (91%) accepted to participate in the SMS track system. The bi-weekly response rates were 79% to 94%. Overall 36% (30% - 52%) reported to perform physical activity homework ≥ 5 times, while 25% (8% - 41%) reported no performance. Twenty four % (21% - 40%) reported engagement in physically active academic lessons ≥ 5 times, and 21% (14% - 32%) no engagement at all. Only 7% (5% - 11%) reported engagement in organized physically active recesses ≥ 5 times and 61% (55% - 71%) no engagement at all.

CONCLUSIONS: SMS track system is a promising approach to assess intervention compliance in real time. Compared to other methods e.g. questionnaires, it has a shorter recall period and provides an ongoing high response rates. Furthermore, it was possible to quantify which intervention elements the participants more frequently complied with.

Trial registration: www.clinicaltrials.gov (NCT02012881).

Financed by the Danish Ministry of Education.

2762 Board #285 June 3, 9:30 AM - 11:00 AM

Feasibility of A Digital Health Intervention to Assess and Encourage Physical Activity in Total Hip Arthroplasty Patients

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Reported Relationships: M. Diamond: Salary; Misfit, Inc.. Intellectual Property; Misfit, Inc.. Ownership Interest (Stocks, Bonds); Misfit, Inc..

Value-based medicine invites physicians to objectively measure the outcomes of their interventions, but the cost, complexity and bulkiness of research-grade activity monitors is prohibitive for doing this on a large scale. Moreover, these devices are generally not designed to provide feedback to patients. **PURPOSE:** To investigate the feasibility of using consumer activity monitors to objectively assess physical activity during recovery from total hip arthroplasty (THA) in the early post-operative period and to engage this older population in their rehab.

METHODS: 131 patients electively undergoing a primary anterolateral THA by a single surgeon at a single institution were invited to participate in this study. Patients were asked to wear the Misfit™ Shine physical activity monitor, which has been shown to accurately measure steps compared to a research-grade actigraph, for 1 week pre-operatively and 6 weeks post-operatively. Medical staff and patients were surveyed about their experiences. **RESULTS:** 92% of patients agreed to participate in this study. Complete physical activity data were collected for 76% of participants. 100% of staff endorsed that they were better able to provide personalized care through objective data about their patients' activity; and that the device helped engage participants in their rehabilitation. Factors identified by staff contributing to the study feasibility included device ease of use and cost, and patient eagerness 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: Wirelessly 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.

2763 Board #286 June 3, 9:30 AM - 11:00 AM

Accuracy of Commercial Activity Trackers to Measure Energy Expenditure During a Controlled Exercise Trial

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Commercially available activity trackers are increasingly popular for the general public in measuring physical activity. Daily energy expenditure (EE) is one of the primary measures provided to the public by these devices. Whether these devices can accurately estimate EE is not clear.

PURPOSE: To compare the EE values obtained from two commercially available devices (Fitbit Charge and Fitbit One) to that measured by the Actigraph GT3X and indirect calorimetry (IC).

METHODS: Seventeen men (n = 4) and women (n = 13) (Age: Mean \pm SD = 27.8 ± 9.0 ; BMI = 24.7 ± 4.2 kg/m²) completed a submaximal treadmill exercise trial while wearing a Fitbit Charge, a Fitbit One, and an Actigraph GT3X. Oxygen consumption and EE (in kcals) was measured via breath-by-breath IC system. The exercise trial consisted of four, 5-minute stages (2.0 mph / 0% grade; 2.0 mph / 5%; 3.0 mph / 0%; 3.0 mph / 5%). To approximate the EE reported by the Fitbit devices, an estimated resting metabolic rate was added to the 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 ($P < 0.01$) and stage ($P < 0.01$). 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 , $7.4 \pm 25.4 \pm 8.5$ and 26.4 ± 7.9 ; $P < 0.01$) underestimated EE compared to IC 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 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

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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, balls) and sedentary options (e.g., books, toys). To manipulate physical activity behavior children were given access to a popular internet-connected tablet computer (Apple iPad) 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

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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 9-17.9 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). Smoothed 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 ($X^2 p < .001$) 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

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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: An online survey about physical activity practices and response to AKWYR was completed by English-speaking parents and caregivers of children in 2nd to 5th grades living in Pennsylvania. Flyers containing a link to the online survey were placed in low-income venues (e.g., subsidized housing sites, food banks, libraries, laundromats), or sent home with students in SNAP-Ed eligible schools and USDA Summer Food Program Sites. Surveys included the International Physical Activity Questionnaire, Satter Eating Competence Inventory, USDA Food Security Screener, psychographic and culinographic items to measure behaviors and food practices, and self-reported demographics including height and weight. Program parameters assessed included graphics, format, content, and application. A \$15 Amazon e-gift card was sent to survey completers. Data analyses included measures of central tendency, chi square and ANOVA.

RESULTS: Respondents ($n=173$) were mostly female (67%), and white (93%). Mean age was 44.2 ± 10.2 y and mean BMI was 28.3 ± 6.6 kg/m² (40% were overweight and 29% obese.) Some food insecurity was evident with 30% sometimes, often, or always worrying about money for food. However, SNAP benefits, medical assistance benefits, Medicaid, and food banks were used by 13%, 13%, 5% and 8%, respectively. Nearly 20% were inactive, with 45% considered minimally active and 35% highly active. 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, 86% 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

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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 7244 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. The distance between takeoff and the heel of the closest foot at landing was recorded in centimeters, and participants were allowed one more try if they landed with their hands behind their feet. Smoothed percentile curves and tables for the 3rd, 10th, 25th, 50th, 75th, 90th and 97th percentiles were calculated using Cole's LMS method.

RESULTS: The one-way ANOVA tests showed that maximum SBJ (cm) was higher in boys than in girls ($p < 0.01$). Post hoc analyses within sexes showed yearly increases in SBJ scores in all ages. In boys, the maximum SBJ scores 50th percentile ranged from 110 to 165 cm. In girls, the 50th percentile ranged from SBJ scores was 96 to

120. Both linear and quadratic age terms were statistically significant predictors of SBJ trends across age.

CONCLUSIONS: Our results provide reference standards for sex- and age-specific SBJ scores in Colombian schoolchildren aged 9-17.9 years for the first time.

The proposed reference values can be used to interpret SBJ scores in Colombian schoolchildren.

Funding COLCIENCIAS (Contract N° 671-2014 Code 122265743978).

2768 Board #291 June 3, 9:30 AM - 11:00 AM

Accuracy of the Fitbit for Measuring Preschoolers' Physical Activity

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(No relationships reported)

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 monitors in young children.

PURPOSE: To evaluate the accuracy 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·m⁻²) wore 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 was 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 < .01) and TPA (r = 0.70, P < .01), but moderate for MVPA (r = 0.59, P < .01). MAPEs were 9.2, 70.1, 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 monitoring in larger samples are warranted.

2769 Board #292 June 3, 9:30 AM - 11:00 AM

Inter-method Agreement To Determine The Distance From Home To School

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Given the increasing prevalence of obesity and overweight in children and youth, promoting physical activity behaviors such as active commuting to school becomes a critical issue. Distance from home to school is the first correlate of active commuting to school. Several measurement methods have been used to predict the distance from home to school, however, a deeper research on this topic is necessary. Purpose: To analyze the agreement between two measuring methods (Google Maps™ vs Geographical Information System) for predicting the distance from home to school. Methods: A total of 542 scholars aged 8-11 years old (mean = 9.36 ± 0.6) from the South of Spain participated in the study and reported their home family postal addresses. The distance from home to school was calculated using two different softwares: Google Maps™ and Geographic Information System, in route and straight line. The association between the two methods was analyzed using Spearman correlation, and the agreement through the Intraclass Correlation Coefficient and Bland Altman method. Results: The correlation between the two methods of measurement (Google Maps™ vs Geographic Information System in route vs straight line) was significant (r=0.966; p<0.001; r=0.984; p<0.001, and r=0.954; p<0.001) respectively, and the agreement was excellent (ICC=0.96, p<0.001; ICC=0.92; p<0.001, ICC=0.97; p<0.001). Conclusions: Both measurement methods may be used depending on the research needs, since both showed a high agreement. However, the use of Geographic

Information System in route is recommended, if there is an economical support, because its reliability and validity have been previously evidenced.

2770 Board #293 June 3, 9:30 AM - 11:00 AM

Theoretical Approach To Understand The Influence Of Economic Resources In Physical Activity. A Review

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Physical activity (PA) is defined as a polysomic concept. There are some external context factors which affect the imaginary that the subjects establish around it, implying the adoption of definitions and specific practices.

This qualitative study pretends 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 revised. 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 revision 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.

2771 Board #294 June 3, 9:30 AM - 11:00 AM

Sedentary Behaviour And Physical Activity: A 2-step Hierarchical Cluster Analysis

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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 three cluster solution was identified. There were 27.7% (n=6,254) of participants assigned to cluster 1 (*Ambulatory & Active*), 44.4% (n=10,028) of participants within cluster 2 (*Moderation*) and 27.9% (6,286) of participants allocated to cluster 3 (*Sedentary & Low Active*). The '*Ambulatory & Active*' (n=6,254) cluster sat 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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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 designed to be 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, kcals), active minutes (ActMin), and steps between two popular personal 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 PA 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 (METS >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±19 vs. 258±11 kcals; 12±1 vs. 11±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 kcals, 19±1 vs. 19±1 min, 2394±181 vs. 2341±167 steps, respectively). However, both the FB and JB on both wrists underestimated EE (13-28% p<0.001), ActMin (30-55%, p<0.001), and steps (24-29%, p<0.001) relative to criterion measures.

CONCLUSIONS: Choice of wrist for 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
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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, 50.3±10.6 yrs & BMI 24.9±2.5; 38 females, 53.3±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±.80min), steps (13,28±1.22), and speed (1.43±.20m/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 on hills. On average these activities took 40min to complete. Descriptive statistics, correlation coefficients (r) and paired t-test among the wearable devices and the Omron pedometer were calculated using SPSS 20.

RESULTS: It was unable to examine the accuracy of the JB due to constant synchronizing errors. Walking Time, Steps, and Speed showed moderate correlations with the Omron (r = .39, .55, & .43, respectively); but low correlations with wearable devices r = .11 to .23(Time), -.10 to .37(Steps), and -.08 to -.23(Speed). Step

counts measured by the devices during free-living were as follows: FC=178±238, NF=1595±156, MF=1628±283, BM=1667±191, FO=1735±174, and AT=1778±180. The Omron (reference) recorded 1749±169 steps. The correlation coefficients between the step counts from the wearable devices and the Omron during free-living were AT=.91, FO=.91, NF=.61, FC=.59, BM=.44, and MF=-.15. All wearable devices showed statistically significant differences when compared to the Omron (t = -2.2 to -14.3, p <0.05).

CONCLUSIONS: Of the devices examined, AT and FO were the most valid for measuring walking steps during free-living activities. On the other hand, quality control and measurement error associated with JB and MF suggest they should not be used.

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2774 Board #297 June 3, 9:30 AM - 11:00 AM
Video Analysis Verification of Wearable Sensor-based Head Impacts
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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±1.3years, 1.66±0.05m, 61.2±6.4kg) volunteered for the study during the 2014 and 2015 lacrosse seasons. Participants were instrumented with xPatch 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 x2 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 2803 game day impacts ≥ 20g were recorded (2014 n=1021, 2015 n=1782) with wearable sensors. Of these total recorded impacts, only 203 impacts (2014 n=80, 2015 n=123) were recorded between game start and end times (g=36±25; RA=6573±3517rad/s²). Only 58 (29%; g=39±21; RA=6853±3293rad/s²) 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 quantify head exposure to 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).

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 (12537.7 3936.2) differed significantly ($P = 0.016$). Mean steps per day between the Actigraph and the Fitbit One (11726.7 11726.7) also differed ($P = 0.001$). 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

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 (No relationships reported)

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-sec 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 ($t = -13.2936$, $p < 0.001$). The mean NWT was 262.5 (Choi) and 407.3 (Troiano) min/day with a mean absolute difference of 146.95 min/day, and mean absolute percent error of 46.3%. There was a significant difference between classifying NWT and wear-time between the two algorithms ($\chi^2 = 3.4e^{-5}$, $p < 0.001$). There was a substantial agreement ($K = 0.81$) in NWT classification between Choi and Troiano algorithms. **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 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/d, 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

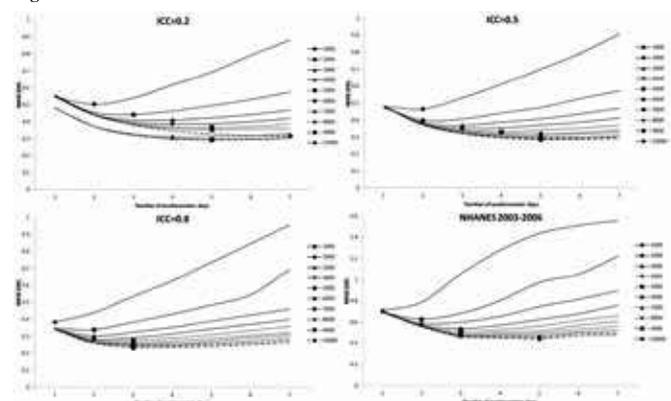
missing values, until participants had data for 17 through 10 hrs of wear time. This technique simulates how sleeping times and non-wear during waking times may be treated in practice. For each participant, sedentary (SED) time was defined as <150 cpm, light physical activity (LPA) was defined as 150-2,689 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 ($p < .01$). As adherence increased to 17 h, estimates for LPA improved (39.7±14.0 min/d; $p < .01$). MVPA was underestimated by 28.4±14.6 min/d ($p < .01$) at 10 h compared to 1.5±2.0 min/d ($p < .01$) at 17 h. The prediction of RAW from the estimates of LPA at 10 h ($\beta = 1.66$, $R^2 = 0.86$) improved as adherence increased to 17 h ($\beta = 1.02$, $R^2 = 0.97$). Prediction of MVPA at 10 h ($\beta = 1.44$, $R^2 = 0.85$) of wear time improved as adherence increased to 17 h ($\beta = 1.01$, $R^2 = 0.99$). SED was significantly underestimated by 609.8±54.4 min/d ($p < .01$) at 10 h of wear time compared to 450.4±48.6 min/d ($p < .01$) with 17 h of time. Prediction of SED did not improve as adherence increased from 10 ($\beta = 1.60$, $R^2 = 0.85$) to 17 h ($\beta = 1.01$, $R^2 = 0.77$). **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.

2778 Board #301 June 3, 9:30 AM - 11:00 AM
Determining The Optimal Number Of Wearing-days Given A Fixed Number Of Accelerometers And Study Duration

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 (No relationships reported)

For studies with a given, fixed number of accelerometers and study duration, there is a lack of guidelines for determining the optimal combination of number of accelerometer wearing days and total sample size that can achieve the highest accuracy in estimating the physical activity level. **PURPOSE:** This simulation study aims to find the optimal number of wearing days given the total number of accelerometer days. **METHODS:** We assumed that the total number of accelerometer days is fixed ($=N$), which equals the sample size (n) times the number of days the participants are instructed to wear an accelerometer (k ; $N = nk$). Two scenarios were simulated, one aiming to estimate the population physical activity level (true mean=320 count/min, SD=220 count/min), and the other aiming to estimate the odds ratio of high physical activity level (using the median as a cutoff) on a particular disease (with OR = 2 and prevalence of 10%). The root mean squared error (RMSE) was used to assess the performance of the estimation. Different settings had been simulated (intra-class correlation (ICC)=0.2, 0.5, 0.8, $k=1-7$, $N=1,000-10,000$). Another similar simulation was conducted by bootstrapping the NHANES 2003-2006 data for those providing 7 valid accelerometer days ($n=4,069$). **RESULTS:** Simulation results of the first scenario showed that, regardless of the sample size, participants should be instructed to wear an accelerometer for one day. Simulation results of the second scenario (Figure 1) showed that the optimal number of wearing days increased with the total number of accelerometer days and decreased with ICC. **CONCLUSION:** We developed a tool for researchers to determine the optimal combination of number of accelerometer wearing days and sample size.

Figure 1.



2779 Board #302 June 3, 9:30 AM - 11:00 AM
Energy Expenditure Estimation During Sedentary, Light, And Moderate Activity: Does Accelerometer Type And Placement Matter?

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 (No relationships reported)

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 9 tasks (3 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. During light activities, AG EE estimation was significantly different for treadmill walking (TM) at .894 m·s⁻¹ at both hip, ankle, and right wrist placements (p values ≤ .02). AC EE estimation was significantly different for TM at .894 m·s⁻¹ at 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.

2780 Board #303 June 3, 9:30 AM - 11:00 AM
Tapping The Potential Presented By The Gravity Component Of An Accelerometer Signal

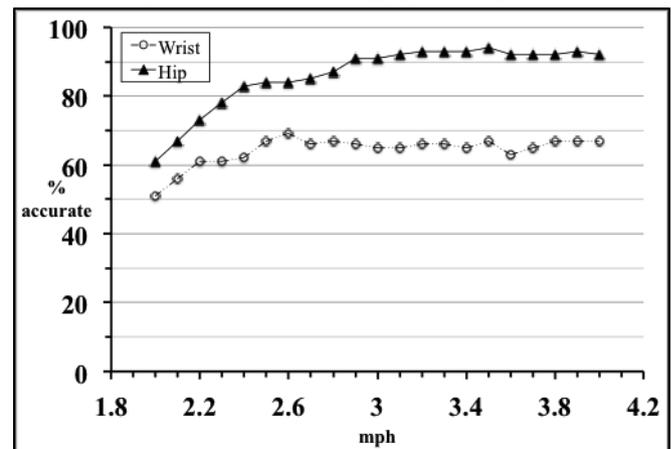
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Reported Relationships: A.V. Rowlands: Consulting Fee; ActivInsights.

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 utilised 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 and between the pelvis and the vertical for the hip-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 >15 min (sensitivity > 92%, specificity > 88%, AUROC > 0.93). 2) Posture: Time estimated sitting/lying was 534±144 min/d (activPAL), 523±143 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 (>0.93, 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.

2781 Board #304 June 3, 9:30 AM - 11:00 AM
Relationship between Walking Speed and Step Detection Accuracy Using Wrist and Hip-Worn Actigraph GT3X+ monitors.

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 (No relationships reported)

Title: Relationship between Walking Speed and Step Detection Accuracy Using Wrist and Hip-Worn Actigraph GT3X+ monitors.
Authors: Alvin Morton¹, Diego Arguello¹, 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 waist and wrist 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.



2782 Board #305 June 3, 9:30 AM - 11:00 AM
Reliability and Validity of Korean Version Ankle Instability Instrument and Foot and Ankle Ability Measure

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 (No relationships reported)

The Ankle Instability Instrument (AII) and Foot and Ankle Ability Measure (FAAM) are commonly used to screen patients with Chronic Ankle Instability (CAI) per International Ankle Consortium (IAC) for research. However, the reliability and validity of the Korean version of these questionnaires have not been examined yet. **PURPOSE:** To examine the reliability and validity of the Korean version of AII (KAII) and FAAM (KFAAM) and set up a cut-off criteria for the CAI. **METHODS:** Fifty four participants with CAI (21M, 33F; 27.4±4.6yrs; 168.0±8.2cm; 63.8±12.8kg) were recruited for this study. A non-CAI group was recruited from two different populations. 29 participants with no history of lower extremity injuries (26M, 3F; 27.0±5.1yrs, 174.1±6.8cm, 70.8±8.5kg) and 25 participants with either lower leg or foot injuries with the exception of ankle joint complex injuries (25M; 26.2±1.9yr, 175.0±4.0cm, 74.1±3.7kg) were also recruited. The KAII and KFAAM scores (ADL and Sports) of the participants were main outcomes of this study. Test-retest

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 AI was at a 99.6% (95% CI: 0.99-1.0), FAAM-ADL was exhibited a percentage of 98.2 (95% CI: 0.96-1.0), and FAAM-Sports was 99.2% (95% CI: 0.97-1.0). The cut-off score, sensitivity, specificity, positive and negative likelihood ratios 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 reliability 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.

2783 Board #306 June 3, 9:30 AM - 11:00 AM

Accuracy Of Wrist-worn Activity Monitors At Three Walking Speeds On The Treadmill

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Wrist-worn activity monitors are becoming increasingly popular with many manufacturers offering such devices. **PURPOSE:** To assess the accuracy of wrist-worn activity monitors at three walking speeds on a treadmill. **METHODS:** Seventy-seven participants (age = 24.9±3.5 yrs, ht = 170.0±8.9 cm, wt = 78.6±19.9 kg) were fitted with a Fitbit Flex (FF) on the right wrist, a Movband Model 2 (MV), Lifetrak C200 (LT), Garmin Vivofit (GV), Polar Loop (PL) on the left wrist, and an Omron HJ-113 (HJ) on the right waist. Each participant walked for two minutes at 53.6 m/min (2.0 mph), 80.5 m/min (3.0 mph), and 107.3 m/min (4.0 mph). At the end of each trial monitor counts and actual step counts from a hand tally (AC) were recorded. A repeated measures ANOVA was used to determine significant differences between the counts. Single measure intraclass correlation (ICC) from a two-way random effects ANOVA was used to assess the agreement between AC and monitor counts. Pedometer error was calculated as [(monitor steps-actual steps)/actual steps] * 100. **RESULTS:** For all speeds, monitor counts were significantly lower than AC ($p < .05$) except for GV and HJ at 53.6 m/min and 80.5 m/min, and for LT and HJ at 107.3 m/min, none of which were significantly different than AC ($p > .05$). Agreement according to ICC was highest with HJ for all speeds (0.68, 0.97, and 0.82 during 53.6 m/min, 80.5 m/min, and 107.3 m/min, respectively). Agreement among the wrist worn monitors was highest with GV (0.71) and lowest with FF (0.18) at the slowest speed, highest with GV (0.67) and lowest with LT (0.03) at 80.7 m/min, and highest with PL (0.28) and lowest with LT (0.0) at the fastest speed. Error was greatest with LT at 40.6% while walking at 53.6 m/min, 19.6% with PL at 80.5 m/min, and 19.0% with PL at 107.3 m/min. Error was least with GV at 3.2% while walking at 53.6 m/min. Although error was least with HJ during 53.6 m/min and 107.3 m/min (1.2% and 1.2%, respectively), GV was 3.2% and LT was 7.7% during 80.5 m/min and 107.3 m/min, respectively. **CONCLUSION:** The hip-worn pedometer (HJ) provides the most accurate step count across all speeds. Among the wrist-worn monitors, GV seems to provide the most accurate measure of step count in this laboratory-controlled study.

2784 Board #307 June 3, 9:30 AM - 11:00 AM

Comparison on Activity Trackers and Subjectively Reported Physical Activity: A Pilot Study

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(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, or average daily idle time measured by the Jawbone UP2 ($p > .05$). Modest, 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 participants. **CONCLUSIONS:** The 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.

2785 Board #308 June 3, 9:30 AM - 11:00 AM

Trends in Kinesiology Research Quality over Three Decades

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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 collated 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 analysed using either oneway ANOVA or KWANOVA 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 effect sizes may be due to increased focus on this area in editorial commentaries. 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.

2786 Board #309 June 3, 9:30 AM - 11:00 AM

The Age-Performance Relationship

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PURPOSE: The physiological traits characterizing human capacities (the ability to move, reproduce or perform tasks) change with age: performance is limited at birth, increases to a maximum, then decrease back to zero at death. Both physical and intellectual skills follow similar ontogenies. The development of sport and chess performances during the lifetime was previously investigated at two different scales: the individual athletes' careers and the world record by age class in 25 Olympic sports and in elite chess players. For all data sets, a biphasic pattern of growth and decline is described by a simple equation and the two processes (growth and decline) are exponential and operate throughout the lifetime, starting at age 0. Here we aim to demonstrate that this biphasic behaviour is probably widespread among biological

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_{2max}). **METHODS:** Data on VO_{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, volume, year, gender, age, physical activity level, and measured VO_{2max} (ml/kg/min) — a total of 120,684 measured individual VO_{2max} observations. Database queries utilize functions, reports, charts, macros, regression analysis and ANOVA. **RESULTS:** One example of a tabular age-division report resulting from a query follows:

AGE DIV	Male - Sedentary			Male - Trained			Female - Sedentary			Female - Trained		
	Re-c"ds	N	VO2	Re-c"ds	N	VO2	Re-c"ds	N	VO2	Re-c"ds	N	VO2
10-14	181	6,921	48.7	86	1,887	53.5	136	5,680	41.7	60	1,150	48.0
15-19	112	3,273	49.5	143	2,874	59.4	79	2,017	39.3	99	1,773	49.8
20-24	374	5,210	46.8	477	7,160	60.5	239	4,019	38.5	245	4,091	48.8
25-29	278	6,322	46.3	462	6,064	62.9	149	3,426	38.1	137	1,557	51.1
30-34	102	1,878	43.0	209	2,918	59.0	71	1,898	36.4	73	1,440	48.6
35-39	60	2,193	40.1	85	1,706	55.3	48	1,715	32.6	34	971	44.7
40-44	48	2,468	38.3	38	699	49.6	43	1,259	30.0	19	376	39.6
45-49	63	2,848	36.0	48	1,557	49.4	36	2,172	29.0	26	949	39.2
50-54	47	1,363	34.3	34	518	48.1	39	985	24.4	24	368	35.7
55-59	48	1,553	33.7	47	1,518	46.7	75	3,736	24.7	37	1,114	34.6
60-64	87	2,406	29.7	66	1,208	41.9	54	1,742	23.7	28	407	30.4
65-69	112	3,186	28.6	59	1,180	38.8	68	2,252	22.8	30	775	28.6
70+	64	1,801	24.9	48	839	34.3	91	2,630	20.0	32	632	23.7
RE-CORDS =	1,576			1,802			1,128			844		
TOTAL =		41,422			30,128			33,531			15,603	
AVER-AGE =			38.5			50.7			30.8			40.2

CONCLUSION: Information resulting from this example query reveals the lifelong profiles including maxima and minima of male and female; sedentary and endurance trained VO_{2max} by age-division. Male and female sedentary VO_{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 #311 June 3, 9:30 AM - 11:00 AM
Development Of Conventions For Probabilistically Determining Differences In VO_2 From Measurement Error
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 (No relationships reported)

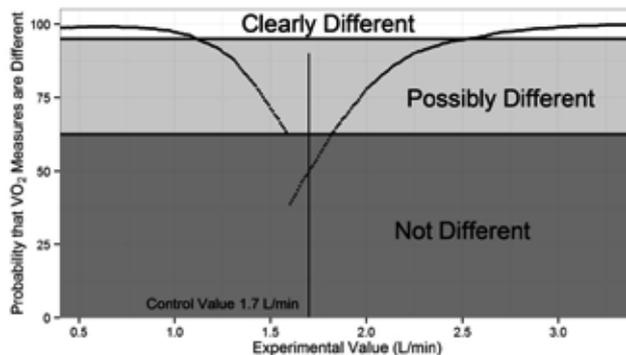
Indirect calorimetry and oxygen consumption (VO_2) is an accepted tool in exercise science. A common study design entails VO_2 testing before and after a training, nutrition or equipment intervention. Small variations in VO_2 are often described as “significant” though they may be within the measurement error of the device.

PURPOSE: Use a custom statistical simulation which probabilistically determines if two day-to-day measurements in VO_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_2 data, one measure remained constant at 1.7 L/min and the second measure was a series of 3000 distributions simulated from VO_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_2 in response to an intervention.



2789 Board #312 June 3, 9:30 AM - 11:00 AM
A Research Methodology for Evaluating the Event Detection Sensitivity of Environmental Sensors Through Video Correlation
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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 athletics 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 this training environment were typically less than 90 minutes and sensors 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
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(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.

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 mean error between the proposed method and ActiLife counts is approximately 0.1% 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 200 days in total of raw acceleration) in free living.

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
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(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 in 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, as a gold standard for comparison purposes. **METHODS:** Six yoga postures were selected for the basis of the training set using Microsoft Visual Gesture Builder (VGB). Programs utilized were included in Kinect version 2 SDK and ran on a PC. **RESULTS:** Three 3D video clips of the six yoga postures were captured from the yoga teacher, two for VGB training and one for validation. We found that adding the second training clip increased performance accuracy for four out of the six postures. The forward bend and arms up postures might improve with additional training clips. Our prior research has shown that the Kinect skeleton algorithms become confused with yoga postures that change the usual orientation of the head. A convenience sample of undergraduate students with various levels of yoga experience, were recorded executing the same 6 postures before, at the mid-point and at the conclusion of a 10-week yoga class series. We assessed the longitudinal correlation points between yoga experience level and VGB posture accuracy. **CONCLUSION:** Gesture analysis for yoga alignment

training may be a useful tool for the development of home and clinical yoga therapy for hard to reach populations. The Kinect sensor provides a tool that could score the performance of yoga therapy and provide quantitative measures of posture adherence and improvement.

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
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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 for 8 hours in a day 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 monitor 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 \pm SD) for PHR, FBHR non-dominant, and FBHR dominant were 75.6 ± 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 $r=.805$ and $r=.793$, respectively. MAPE were $9.17 \pm 10.9\%$ for FBHR non-dominant and $9.71 \pm 12.4\%$ for FBHR HR dominant. ANOVA and post-hoc analyses with Bonferroni revealed significant differences in estimating HR from FBHR non-dominant wrist ($p=.001$) and FBHR dominant wrist ($p=.001$) 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
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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 each day across three domains (work 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 (≥ 25 kg/m²) or non-overweight (<25 kg/m²) using body mass index. Normality assumptions were examined using Anderson-Darling, Cramer-won 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= $-139.61.31$, $p<.001$; Means equal= -120.85 , $p=.04$). The ternary diagram indicated that overweight adults spent more time in non-work related sitting (overweight= 57% ; non-overweight= 52%)

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.

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

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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: Data (388 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 (≥ 30 kg/m²) or non-obese (<30kg/m²) using body mass index. Normality assumptions were examined using Anderson-Darling, Cramer-von 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=336.38, $p<.001$, Means equal=391.70, $p<.001$) and obesity status (likelihood statistic=359.42, $p<.001$, Means equal=390.27, $p=.02$). Males engaged in more SB (male=60.41 \pm 11.03%, female=59.85 \pm 9.39%) and MVPA (male=3.42 \pm 3.54%, female=2.22 \pm 2.71%), but less LPA (male=36.16 \pm 9.94%, female=37.93 \pm 9.16%) compared with females. Obese adults engaged in more SB (obese=62.50 \pm 9.28%, non-obese=59.35 \pm 10.52%), but less LPA (obese=35.07 \pm 9.34%, non-obese=37.67 \pm 9.63%) and MVPA (obese=2.43 \pm 2.95%, non-obese=3.02 \pm 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

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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 \pm 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: (a) 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 \pm 3149.1, 7034.1 \pm 3415.5, 7277.2 \pm 3374.2 steps; and 68.7 \pm 34.4, 74.1 \pm 38.6, 72.0 \pm 38.8 minutes, respectively). However, the estimated step counts and the absolute value (obtained by subtracting estimated step counts from the actual counts) for the first and third experimental periods were found to be significantly different (4961.5 \pm 2951.5 and 5676.0 \pm 2893.9 steps; and 2811.2 \pm 2186.7 and 2055.9 \pm 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

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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 \pm 2.31 years old, height 174.17 \pm 6.26 cm, weight 68.71 \pm 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-cm²), and total fat mass (kg) were assessed by DEXA lunar DPX-L (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 \times 2 with fasting' and 'after lunch \times 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 \pm SD for each trial of muscle mass were 56.41 \pm 4.73 kg, 56.14 \pm 4.80 kg, 56.52 \pm 4.64 kg, and 56.36 \pm 4.69 kg, lean mass were 59.44 \pm 5.07 kg, 59.16 \pm 5.12 kg, 59.54 \pm 4.96 kg, and 59.38 \pm 5.01 kg, BMC were 3.03 \pm 0.42 g-cm², 3.02 \pm 0.41 g-cm², 3.02 \pm 0.41 g-cm², and 3.01 \pm 0.40 g-cm², and fat mass were 9.28 \pm 4.91 kg, 9.24 \pm 4.80 kg, 9.28 \pm 4.89 kg, and 9.30 \pm 4.87 kg, respectively. The ICC for testing the reliability showed strong agreement on muscle mass ($r=0.994$ and $p<0.0001$), 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 ($p=0.041$). **CONCLUSION:** 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?

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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 ± 319917 spectators, 18 ± 3.18 , $70^\circ \pm 13.44$ and $17\% \pm 3.42$, respectively. **Negative correlations were observed 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.

2798 Board #321 June 3, 11:00 AM - 12:30 PM
Prognostic Relevance of Motor Predictors in Early Adolescence for Reaching Professional Soccer Level in Adulthood

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Several talent development programs in soccer have implemented diagnostics measuring motor performance factors. However, there is debate in the field of talent research about the prognostic relevance of such diagnostics in early adolescence for adult performance and about possible biases in diagnostics caused by maturation related characteristics.

PURPOSE:

Focusing on players' speed abilities (SA) and technical skills (TS) with simultaneous consideration for anthropometric and relative age characteristics, this study analyzed the long-term prognostic relevance of a nationwide assessment conducted within the German soccer talent development program.

METHODS:

The prospective cohort study investigated $N=14.178$ talented players from the Under-12 age group born between 1993 and 1995. These players participated in a motor diagnostics (sprinting, agility, dribbling, ball control and shooting) carried out in 2004, 2005, or 2006, respectively. The measurement model comprised the five motor tests as well as three additional covariates (players' height, weight and relative age). As criterion for the adult performance level (APL) in the 2014/15 season, players were categorized as professional ($N=89$), semiprofessional ($N=913$), or amateur league players ($N=13.176$).

The prognostic relevance for each motor predictor was determined using one-way ANOVAs. Additionally, in a logistic regression model, APL was predicted by two latent variable factors (SA, TS) and the maturation related characteristics as covariates.

RESULTS:

Each motor predictor discriminated between the APL with small effect sizes (each $p < .001$; $\eta^2 \leq .02$). In the logistic regression model, TS ($OR=6.72$; $p < .001$) and SA ($OR=4.58$; $p < .05$) predicted the APL after controlling for height, weight and relative age. This multivariate threshold model explained $R^2=24.8\%$ of the APL variance.

CONCLUSIONS:

The study proved prognostic validity of motor predictors over a long-term period (≈ 10 years). However, the effect sizes indicated that the predictors explained only small proportions of the APL variance. Therefore, repeated measurements and further predictors (e.g. personality or cognitive performance factors) in a dynamic and multidimensional approach should supplement the diagnostics.

This study was funded by the German Soccer Association.

2799 Board #322 June 3, 11:00 AM - 12:30 PM
Assessing Assistant Referees' Movement Patterns during the First Half of a Professional Soccer Season

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PURPOSE: To examine North American Professional Soccer assistant referees' (ARs) movement pattern differences between the first and second halves of games during

the first half of a soccer season. **METHODS:** Forty-seven North American ARs were observed during the first half of the 2014 regular season. Movement patterns were analyzed by a 2-D camera system and transferred from raw data to readily usable data. Standing, walking, jogging, and High-intensity Running (HIR) movement patterns (i.e. running and sprinting) were assessed (i.e. total distance covered and distance covered while moving in each speed zone) relative to each individual AR's predetermined maximum running speed. HIR has been reported in prior research as speeds greater than 13 km/h. Because this study utilized relative speed zones, our HIR values corresponded to speeds greater than 50% of the referee's max speed. Paired samples t-tests were utilized to assess all dependent variables. One-Way ANOVAs were conducted to analyze differences between first and second half values. **RESULTS:** ARs covered an average total distance of 6170.72 ± 526.99 m per game. Also, the ARs covered the majority (2854.25 ± 327.56 m, or 46.3%) of their total distance in the 21-50% ("jogging") of max speed range. Standing ($p < .001$) and walking ($p = .001$) increased in the second half, whereas jogging, running, and sprinting ($p = .018$) decreased. HIR accounted for 1212.31 m, or 19.6%, of the total distance covered, yet decreased from 619.17 m in the first half to 592.99 m in the second half. Total distances covered were 3085.10 m and 3086.31 m in the first and second half, respectively. **CONCLUSIONS:** These professional North American Professional Soccer ARs appear to travel similar distances as their international counterparts. Despite the almost identical total distance covered in each half, it appears the referees covered less distances at higher speeds, suggesting the ARs may not have been physically recovered enough (i.e. due to demands of the first half, stress of traveling to the game, daily life stress, etc.) to meet the demands of the second half of the match. Since the primary role of the AR is to observe offside infractions, future research should be conducted in North America to determine where these ARs are specifically located on the sideline when an offside decision is to be decided.

2800 Board #323 June 3, 11:00 AM - 12:30 PM
Comparison Of Repeated Sprint Exercise And Square-wave Endurance Exercise In Young Soccer Players

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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 $3 \times 6 \times (20+20)$ m, with 4.30 min of recovery between series and repetitions respectively and Sweet group trained 1 min at 90% VO_{2peak} , 4 min at 50% VO_{2peak} 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, repeated sprint performances (peak time, total time and fatigue index), the 5-jump performance, repeated sprint test (RST) and peak oxygen uptake (VO_{2peak}). **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 through 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 VO_{2peak} ($p < 0.001$), with SWEET showing larger improvement ($4.9 \pm 1.3\%$) than RSE group ($4.3 \pm 1.5\%$).

Conclusion: The effects of repeated sprints on both aerobic and anaerobic metabolism shown in the present study are in agreement with other studies (Tonnessen et al. 2011, Serpiello et al. 2011). In agreement with the literature, the repeated sprint performances were increased significantly only in RSE group (Tonnessen et al. 2011). The improvement in power of the lower limbs and V_{peak} 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.

2801 Board #324 June 3, 11:00 AM - 12:30 PM
Isokinetic Strength Differences In Elite Youth Soccer Players With Respect To Field Position

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(No relationships reported)

Every player has different physical abilities, technical skills, tactical thinking and psychological characteristics, and therefore has 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 (KF) ratio (H:H), unilateral ratio between H and Q for both legs (H:Q). Mixed model MANOVA, Bonferroni *post hoc* test, and partial eta square (η_p^2) 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_R = 3.24 ± 0.27 N.m.kg⁻¹) and the lowest by CMs (PT_R = 2.96 ± .33 N.m.kg⁻¹). MANOVA showed a significant effect of field position on absolute PT ($\lambda = .37$, $F_{60,411} = 1.60$; $p < .01$, $\eta_p^2 = .18$). Despite differences in absolute values, no significant difference in relative strength regarding the playing position was found ($\lambda = .50$, $F_{60,411} = 1.09$; $p > .01$, $\eta_p^2 = .12$). 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 ($\lambda = .66$, $F_{30,374} = 1.39$; $p > .05$, $\eta_p^2 = .08$) and bilateral strength ratio ($\lambda = .68$, $F_{30,374} = 1.24$; $p > .05$, $\eta_p^2 = .07$) 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 KFs, 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.

2802 Board #325 June 3, 11:00 AM - 12:30 PM
Comparison of Subjective and Objective Measures of Internal Training Load in Female Youth Soccer Players

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Determination of internal training loads (TL) in athletes is important for proper monitoring and prescription of exercise, and self-reported session-rating of perceived exertion (sRPE) has been suggested as a simple, inexpensive means to determine TL. While sRPE and objective measures of TL have been compared among adults and male youth athletes, we are aware of no prior research which has evaluated this relationship in female youth athletes.

PURPOSE: To compare sRPE and heart rate-based measures of internal training load among female youth soccer players.

METHODS: Female soccer athletes (ages 13-18) were monitored over 7 weeks (3 sessions per week) of training using sRPE and heart-rate based measures of internal training load [Edwards TL and Banister's training impulse (TRIMP)]. Spearman rank correlation coefficients were determined between methods using daily average TL for the entire group as well as using individual TL for the entire group and separately for each age group.

RESULTS: For average TL from 21 training sessions, correlations were significant and strong between sRPE and Edwards TL ($r=0.79$, $p<0.001$) and Banister's TRIMP ($r=0.80$, $p<0.001$), as well as between Edwards TL and Banister's TRIMP ($r=0.99$, $p<0.001$). Correlations of TL from 425 individual sessions were significant and moderate between sRPE and Edwards TL ($r=0.40$, $p<0.001$) and Banister's TRIMP ($r=0.41$, $p<0.001$), but strong between Edwards TL and Banister's TRIMP ($r=0.97$, $p<0.001$). Correlations from individual sessions for each age group were moderate and similar between sRPE and Edwards TL ($r=0.26-0.45$, $p<0.001$ for all) and Banister's TRIMP ($r=0.26-0.51$, $p<0.001$ for all).

CONCLUSION: Subjective and objective measures of TL appear similar when using daily averages, and may be interchangeable for monitoring an entire group of youth

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.

2803 Board #326 June 3, 11:00 AM - 12:30 PM
A New Approach To Determining Performance In Vertical Jumps In Professional Soccer Players

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When assessing jumping performance, the most commonly measured parameters include the jump height achieved, maximum force produced at take-off, and rate of force development, as well as force-time curve shape during the jump. Recent studies consider the use of relative net vertical impulse (NTIr) as a kinetic variable which can better predict performance in jumping. However, there is no such study in professional soccer players, whose power is an important component of physical performance.

PURPOSE: To determine the relationship between jump height and NTIr in different vertical jumps in elite soccer players.

METHODS:

A total of 131 professional soccer players (first division, age = 26.7 ± 5.0 yrs, 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 NTIr. The results were processed using ANOVA and Bonferroni *post-hoc* test, effect size (η^2) and Pearson's correlation coefficient (r) as well as coefficient of determination (r^2).

RESULTS:

Analysis of variance showed a significant effect of the type of jump on the JH ($F_{16,776} = 31.75$, $\lambda = .36$; $p < .01$, $\eta^2 = .40$). Players achieved the following values: (CMJFA = 46.34±4.69 cm, CMJ = 40.93±4.37 cm, SJ = 38.49±4.03). 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 NTIr in all types of jumps (CMJF: $r = .49$, $r^2 = .24$; CMJ: $r = .38$, $r^2 = .15$; SJ: $r = .50$, $r^2 = .25$). Correlation coefficient values of Fmax and FI were lower than in NTIr in all types of jumps. The highest value of the NTIr was found in CMJF (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 NTIr 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 NTIr. 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.

2804 Board #327 June 3, 11:00 AM - 12:30 PM
Anthropometric And Physiological Differences Between Goalkeepers And Professional Outfield Soccer Players

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Many scientific studies of soccer player positions (PP) provide an abundance of information on anthropometric, physiological, and game-demand variables in relation to PP. However, most studies ignore goalkeepers (GK), despite the distinctive demands of that position on the soccer team. Goalkeepers determine the final outcomes of most matches, where one mistake by that player can lead to a change on the scoreboard.

PURPOSE: The aim was to observe differences in anthropometric and physiological variables between professional GK and outfield soccer players.

METHODS:

A total of 93 professional Czech players who were divided into GK (n = 14) and outfielders (OF) (n = 79). We investigated differences in the following variables: age, body height (BH), body mass (BM), extracellular to body cellular ratio (ECM/BCM), fat mass (FM), maximal oxygen uptake (VO_{2max}), flamingo postural stability test for preferred (FP) and non-preferred leg (FN) and three vertical jump tests; countermovement jump with arms (CMJFA), countermovement jump (CMJ), squat jump (SJ). The results were processed using t-test for independent samples and Cohen's effect size.

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; BH: 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 = .97; ECM/BCM: GK = .73 ± .06 vs. OF = .62 ± .07, p < .05, d = .49; VO_{2max}: GK = 54.19 ± 2.59 vs. OF = 60.78 ± 4.50 ml/kg/min, p < .05, d = 1.79; CMJFA: 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; SJ: 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 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**

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(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. 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, P0.05) 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.**

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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 repeated sprint ability (RSA).

Results: No significant differences were observed for any of the measures 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

	Starters	Non-starters
BMI	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 ± 329
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**

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(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: Hierarchical 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 (.362 to .557; p<.05), lean body mass (.404 to .425; p<.05), and LBMI (.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 knee 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**

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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-I collegiate female soccer players. **METHODS:** Weekly averages for Smartphone-derived resting logarithm of the root mean square of successive RR

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 = 74/19/7, ES = 0.45) and a likely small increase in lnRMSSD (week 1 = 74.2 ± 11.1, week 2 = 78.1 ± 10.5; 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, -0.06 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 and 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 pre-season 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-1 Male College Soccer Players

Bridget A. McFadden, Alan J. Walker, Morgan L. Hofacker, Meaghan Rabideau, Anthony N. Poysick, 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 1 college soccer players throughout a yearlong training cycle. **METHODS:** Division 1 male college soccer players (N = 20, $M_{\text{weight}} = 76.6 \pm 4.9$ kg, $M_{\text{height}} = 9.37 \pm 3.7\%$) participated in performance testing, which consisted of vertical jump (VJ) to assess power and a maximal graded exercise test (GXT) to assess $VO_{2\text{max}}$ 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 of time on $VO_{2\text{max}}$ ($p = .160$) with an average value of 59.1 ± 3.67 ml O_2 /kg/min at the start of the pre-season. However, there was a significant increase ($p < .001$) in VT from T1 ($70.1 \pm 6.1\% VO_{2\text{max}}$) to T2 ($80.5 \pm 3.6\% VO_{2\text{max}}$), T3 ($78.2 \pm 2.5\% VO_{2\text{max}}$), and T4 ($78.5 \pm 2.9\% VO_{2\text{max}}$). **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 VJ 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?

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(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 1 female (N = 18; $M_{\text{weight}} = 63.5 \pm 3.4$ kg; $M_{\text{age}} = 20 \pm 1.3$ yrs; $M_{\text{height}} = 1.65 \pm 0.01$ m) and male (N = 14; $M_{\text{weight}} = 73.8 \pm 5.6$ kg; $M_{\text{age}} = 19.9 \pm 1.3$ yrs; $M_{\text{height}} = 1.78 \pm 0.01$ 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 algorithm. From this, a work rate was calculated per minute of play and expressed as the rate of point accumulation (RPA). Only players who participated in 2/3 of all games 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 games, the mean TL and RPA were 184.8 ± 12.5 pts and 3.3 ± 0.1 pts/min, respectively ($P < .05$). Compared to women, men had a significantly lower practice TL (97.7 ± 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 $\sim 85\%$ HR_{max} compared to the men in practice ($P < .01$), though men spent more time $\sim 75\%$ HR_{max} ($P < .01$). During games, men again spent more time $\sim 75\%$ of HR_{max} compared to women ($P < .01$). A trend was observed for women spending greater time $\sim 85\%$ and 95% of HR_{max} during game play ($P < .01$). **CONCLUSION:** While women had a higher total TL in practice 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 HR zones by women during games may be due to the greater frequency of substitutions, thus allowing them to sustain higher intensities during gameplay.

2811 Board #334 June 3, 11:00 AM - 12:30 PM
Change of Direction Capacity and Force Production Characteristics of Youth Soccer Players

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The change of direction (COD) capacity of elite athletes has been widely recognized as a vital performance factor, however, little is known about how the different performance related components interact with it. The identification of the key components to maximize the COD capacity at different angles has yet to be identified. **PURPOSE:** To determine the relationship between the COD capacity at different angles and the dominant (D) and non-dominant (ND) leg force production during a countermovement jump (CMJ). **METHODS:** 19 youth soccer players that average 13.6 years of age performed a CMJ on two synchronized force plates (allowing information about D and ND legs) and three 20m COD tests with turns set at 90°, 135° and 180° to the D and ND side respectively. The countermovement phase of the CMJ, which includes an eccentric and concentric phase, was used to calculate the peak eccentric (PEcc) and peak concentric (PCon) force produced during the jump. **RESULTS:** A paired T-test analysis showed that there were no significant differences in PEcc and PCon strength between the D versus ND leg nor COD performance turning to the dominant or non-dominant side ($p > .05$). Although the jump power significantly correlated with PCon force of the D ($r = .49$, $p = .05$). The analysis of the force production during the countermovement phase of the CMJ showed a significant negative correlation between the COD time at 180° degrees ($p = .042$) to the ND side and the PEcc of the ND leg. Interestingly, the 180° COD to the dominant side positively correlated to the COD at 90° ($r = .69$, $p = .01$) and 135° ($r = .72$, $p = .01$) but not to the COD at 180° to the ND side ($p > .05$). **CONCLUSIONS:** The analysis of the force produced during the CMJ elucidates the high eccentric force requirements of the ND legs to perform COD at extreme angles. Further analysis of these relationships is warranted in athletes with different levels of somatic maturation.

2812 Board #335 June 3, 11:00 AM - 12:30 PM
Inconsistencies Found With Anthropometric Equations on Assessing Body Fat Changes Over Time in Soccer Players

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(No relationships reported)

In 2014 our laboratory presented data showing that the anthropometric equations (AE) for % body fat (%BF) estimations that were more in agreement compared with DXA in a cross sectional design were Oliver, Wilmore, Civar, and Durmin & Womersley,

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.

Changes in %BF with DXA	Changes in %BF with AE	Civar	Durnin & Womersley	Oliver	Wilmore
Decrease	Decrease	59.1	56.8	61.4	59.1
	No change	40.9	29.6	34.1	40.9
	Increase	0.0	13.6	4.5	0.0
	Inconsistencies	40.9	43.2	38.6	40.9
No change	Decrease	11.6	17.4	13.0	11.6
	No change	63.8	50.7	60.9	62.3
	Increase	24.6	31.9	26.1	26.1
	Inconsistencies	36.2	49.3	39.1	37.7
Increase	Decrease	0.0	6.9	4.7	9.3
	No change	51.2	32.6	34.8	32.6
	Increase	48.8	60.5	60.5	58.1
	Inconsistencies	51.2	39.5	39.5	41.9
Overall coincidences		58.3	55.1	60.9	60.3

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

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(No relationships reported)

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: 42 soccer players aged 16-34 years, were evaluated in several occasions with DXA and 5 anthropometric equations (Quiterio, Sigurbjom, Kulkarni, Table 1) from 2009 to 2015 with at least a difference of six months (range 2-7 evaluations). For each subject all results of ALST were compared between them. The ALST changes in DXA and AE were classified as: a) increase (>1%); b) decrease (<-1%); c) no change (between ≥ -1% and ≤1%). When both, 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: Table 1 shows the overall results of coincidences and inconsistencies of the equations compared with DXA. When there were an increase in ALST (a), the equations by Quiterio, Kulkarni and Sigurbjom (3 skinfolds) had the same percentage of coincidences and had more coincidences with DXA. With a decrease in ALST (b), the Quiterio's equation had more coincidences with DXA, and when there was no change in ALST (c), the Kulkarni's equation had more coincidences with DXA. In the overall results, Sigurbjom's (3 skinfolds) and Quiterio's equations had the most coincidences with DXA.

CONCLUSION: Sigurbjom'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.

Change in ALST with DXA	Change in ALST with AE	Quiterio	Sigurbjom 7 skinfolds	Sigurbjom 3 skinfolds	Sigurbjom 1 skinfold	Kulkarni
Decrease	Decrease	85.2	76.2	80.2	74.3	74.3
	No change	8.9	17.9	14.8	15.8	16.8
	Increase	5.9	5.9	5.0	9.9	8.9
	Inconsistencies	14.8	23.8	19.8	25.7	25.7
No change	Decrease	66.7	66.7	56.6	70.4	40.7
	No change	7.4	22.2	29.6	22.2	40.7
	Increase	25.9	11.1	14.8	7.4	18.5
	Inconsistencies	92.6	77.8	70.4	77.8	59.2
Increase	Decrease	35.7	35.7	28.6	50.0	35.7
	No change	28.6	39.3	35.7	25.0	28.6
	Increase	35.7	25.0	35.7	25.0	35.7
	Inconsistencies	64.3	75.0	64.3	75.0	64.3
Overall coincidences		62.8	57.7	63.5	56.4	61.5

2814 Board #337 June 3, 11:00 AM - 12:30 PM

Hoff Test Validity In Soccer Players Trained At 2600 Meters Above Sea Level

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(No relationships reported)

Background: Laboratory and field tests are important tools to evaluate the general and specific capabilities for performance from both at the amateur and elite soccer players' levels. Nevertheless, it is necessary to establish levels of reliability and validity that let us apply in the world sports. Objective: the purpose of the study was to examine the relationships between incremental treadmill test and Hoff test to measure the aerobic power of soccer players trained at 2600 meters above sea level. Methods: 20 male soccer players were evaluated (age: 21.5 ± 2.8 years, weight: 70.7 ± 6.7 Kg, height: 174.8 ± 5.8 cm) with an incremental treadmill test (laboratory test), and Hoff test (field test). Regarding to Hoff test, every soccer player runs a maximum distance in 10 minutes with the ball, approximately 290 meters. Maximum oxygen consumption (VO2max), CO2 production (VCO2), maximum heart rate (HRmax) and maximum ventilation (Vmax) were registered with a metamax ergoespirometer 3B®. Results: Positive correlations were found among VO2max (r = 0.854 p < 0.01), HRmax (r = 0.660 p < 0.01) and Vmax (r = 0.545 p < 0.05). Conclusion: the results suggest a relation between both laboratory and field tests and let us measure the aerobic power of soccer players trained at 2600 meters above sea level with the highest levels of reliability.

E-42 Free Communication/Poster - Technology in Biomechanics

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

Room: Exhibit Hall A/B

2815 Board #338 June 3, 11:00 AM - 12:30 PM

Concurrent Validity of Zeno Walkway and APDM Opal Sensors

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(Sponsor: Stephen Bailey, FACSM)

(No relationships reported)

Systems such as 3D motion capture, electronic pressure sensitive walkways, and inertial measurement units (IMUs) are used to measure gait. Electronic walkways

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, S.D. 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 incalculable 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.

Dependent variable	Normal speed condition	Fast speed condition
Cadence	0.998	0.970
Double Support Time %	0.703	0.769
Gait Cycle Duration	0.998	0.952
Gait speed	0.988	0.969
Single Limb Support %	0.681	0.741
Stance %	0.707	0.798
Step Time	0.995	0.966
Stride Length	0.982	0.941
Swing %	0.707	0.798

2816 Board #339 June 3, 11:00 AM - 12:30 PM

Assessing a Wireless Inertia Measurement Unit for Monitoring Complex Strength and Conditioning Movements.

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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 \pm SD: age 23 \pm 1.89y, height 182.15 \pm 8.91cm, body mass 88.12 \pm 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 weightlifting bar and 3 IMUs. The custom made wireless IMUs, containing a tri-axial accelerometer and tri-axial gyroscope sampling at 50Hz, were positioned on the weightlifting 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 \pm 0.021s and the acceleration accuracy \pm 0.309m/s² (standard error in the mean) Hang clean accuracy was \pm 0.023s and \pm 1.618m/s² for timing and acceleration respectively. Finally the power clean showed to be within \pm 0.022s and \pm 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 \pm 1.05 frames, accelerations \pm 8.17%). However the greater degree of bar rotation that occurs during the cleans: 17° for the deadlift compared to 363° and 387° for the hang clean and power clean respectively, causes the increase in acceleration errors (\pm 17.9% and \pm 38.8% for hang clean and power clean respectively) with more complex movements.

2817 Board #340 June 3, 11:00 AM - 12:30 PM

Reliability Of Peak And Average Velocity Measurements During Sit-to-stand Assessments Using A Portable Linear Transducer

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(No relationships reported)

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 \pm SD: age=24 \pm 4yr; height=177 \pm 7cm; mass 86 \pm 19kg) participated in this investigation. Participants visited the laboratory 2 times, separated by 2-7 days at the same time (\pm 2hr). For each visit, participants performed 3 STSs from an adjustable table at 90° (STS90) and 120° (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 (ANOVAs). **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 movement. Future researchers or current practitioners may consider utilizing such devices to assess functional performance in older community-dwelling individuals.

2818 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.

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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 \pm 15.8kg, Height = 172.2 \pm 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) were 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 to traditional 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.

2819 Board #342 June 3, 11:00 AM - 12:30 PM
Using Smartphone Sensors to Accurately Measure Ground Reaction Forces during Physical Activity - A Feasibility Study
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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, GRFs 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 accelerometer 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.

2820 Board #343 June 3, 11:00 AM - 12:30 PM
Reliability Of Mainstream Tablets For 2d Analysis Of A Drop Jump Landing
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(No relationships reported)

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 where the observation and recording may often be done from different locations of by different evaluators. **PURPOSE:** To determine the effect of position and evaluator on the reliability of a mainstream tablet to perform a 2D frontal plane analysis of DVJs. **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 aged volunteers were analyzed. Intraclass correlation coefficients (ICC), standard error of measurement, and minimal detectable change (MDC) were calculated. Alpha = 0.05. **RESULTS:** ICC between the two tablets was 0.83 (p < 0.001) with a 95% confidence interval of 0.76 to 0.88. FPPA standard error of measurement was 1.7 with a MDC of 2.4. **CONCLUSION:** The exact positioning of an observer does not make a significant difference when using a tablet to capture and evaluate a DVJ and different evaluators can assess FPPA. These findings increase the practicality and reliability for using tablets to perform a 2D motion analysis of a drop jump landing.

2821 Board #344 June 3, 11:00 AM - 12:30 PM
Validation Of A Self-monitoring Tool For Use In Post-concussion Syndrome Therapy
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Aerobic exercise at a sub-symptom target heart rate has been recommended as a therapy for Post-Concussion Syndrome. Controlled trials studying the efficacy of such an exercise protocol have yet to be conducted, partly because objectively assessing adherence with an accurate heart rate monitoring instrument is difficult. **PURPOSE:** To evaluate the validity of a commercial wrist-worn, self-monitoring device against electrocardiogram (EKG) to monitor heart rate during exercise. **METHODS:** Heart rate measurements were collected using seven individual self-monitoring devices deployed across 19 healthy participants (9 female; mean age: 22 ± 2 yrs). These heart rate measurements were compared to EKG data concurrently collected while participants completed the Buffalo Concussion Treadmill Test. Additionally, 5- and 10-second centered moving averages of heart rate were compared. Agreement between the commercial self-monitoring device and EKG was assessed by intraclass correlation coefficients (ICC3,1), Bland-Altman limits of agreement, and percent error. Lastly, we employed a linear mixed model to determine if significant differences in measurement error were observed between the individual self-monitoring units deployed during our study. **RESULTS:** We observed a strong single-measure absolute agreement between the commercial self-monitoring device and EKG (ICC3,1=0.872; 95% CI: 0.761 - 0.921). The commercial device underestimated heart rate compared to the EKG (mean difference = -4.96 beats per min (bpm); Bland-Altman 95% limits of agreement = -22.74 to 12.81 bpm). Seventy-four percent of heart rate measurements were within 10% error, and 93.5% of all heart rate measurements were within 20% error. The mean error did not vary significantly by device (F6,12=1.58, P=0.24). **CONCLUSION:** For the purpose of monitoring heart rate, the self-monitoring device we employed demonstrated moderate accuracy with heart rate measures within 10-20% of EKG measurements. The relatively inexpensive cost, easy implementation, and low maintenance make it an attractive and valid option for monitoring heart rate during exercise in nonclinical settings. Supported by NIH Grants (F30NS090816; T35DK007386) and the Matthew Gfeller Sport-Related Traumatic Brain Injury Research Center.

2822 Board #345 June 3, 11:00 AM - 12:30 PM
Development And Clinical Application Of The Body Movement Detection System
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Background: Accurate distinction of the different body movement conditions on bed is an important issue and helpful for fall prevention in elderly adults in long-term care units. However, few studies had developed body movement detection system on bed to provide a real-time feedback to caregivers. **PURPOSE:** The purpose of this study was to develop a system for body movement detection on bed and investigate the accuracy of monitoring different body mobilities on bed. **Methods:** Twenty-three healthy adults (10 female, 13 male; mean±standard deviation age = 26.6±4.4) were participated in this study. Each subject was asked to perform four different body mobilities on bed, including side shifting, rolling, sit up and out of bed. The body movement detection system was established by a clinical bed equipped with four load cell sensors, amplifier, data acquisition system, and a real-time feedback user-interface program written with LabVIEW 2014 edition. Different body movement conditions were distinguished according to the comparisons between the center of pressure on bed, body height and waist width for each individual. Pearson correlation was used to validate the body movement measurements classified with the system. SPSS version 16.0 statistical software was used. The alpha level of statistical significance was set to 0.05. This study was approved by the Institutional Review Board of Tri-Service General Hospital (TSGH). **Results:** This system was demonstrated excellent validity (r=.931, p<.001) and highly accurate in distinguishing shifting (80.4%), rolling (80.4%), sitting (91.3%) and out of bed (100%) movements. **Conclusions:** These results demonstrate that detection of different body movement conditions on bed with this system is valid and accuracy. It will be helpful to caregiver or clinical health manager to prevent accident fall injuries for elderly adults.

2823 Board #346 June 3, 11:00 AM - 12:30 PM
**Transverse Abdominis Thickness Changes via
 Ultrasound Imaging in Functional Positions: A Side-to-
 Side Comparison**

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 (No relationships reported)

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.

2824 Board #347 June 3, 11:00 AM - 12:30 PM
**Predicted Localized Changes in Tissue Stresses and
 Strains due to Massage Using Finite Element Modeling**

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 (No relationships reported)

PURPOSE: Massage therapy is a popular treatment for attenuating muscle soreness and accelerating recovery following eccentric exercise (EEC). 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 (26.6 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 42.8, 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 biological signaling responses.

2825 Board #348 June 3, 11:00 AM - 12:30 PM
**Modeling 3D Ground Reaction Forces During Walking
 Using Nanocomposite Piezo-Responsive Foam
 Sensors**

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3D ground reaction force (GRF) is an important characteristic of physical activity. Direct measurement of 3D GRF currently involves relatively immobile force plates, where only a small number of movement trials are typically recorded in a lab setting. Mobile measurement of 3D GRF would enable researchers to record these measures for more movement trials in an ecologically valid setting (i.e., outside the lab).

PURPOSE: To model 3D GRF during simulated walking from voltage responses of Nanocomposite Piezo-responsive Foam (NCPF) sensors. **METHODS:** NCPF sensors were placed in the heel, arch, ball, and toe of a shoe that was placed on a prosthetic foot. This shoe was then placed in a prosthetic testing apparatus (ISO 22675) and tested by a local manufacturer. 3D GRF, measured using a proprietary inline prosthetic load cell, and NCPF sensor responses were recorded for 111 simulated walking stance phases. 3D GRF and NCPF sensor data were filtered using 35- and 9-coefficient Fourier series, respectively. A MANOVA test evaluated the correlation of the NCPF and 3D GRF coefficients; then, all 35 3D GRF coefficients were modeled using the sensor coefficients that were significantly correlated ($\alpha = 0.005$). Next, prediction curves were constructed using coefficients from this regression model, the fit was analyzed using a cross-validation process, and prediction error for the model was reported and compared against the overall variability of the data. **RESULTS:** The regression model predicted 3D GRF with average error rates (i.e., average error of all predicted GRF data points, across all stance phases) that were significantly below the data variability rate: GRF_x (anterior-posterior), GRF_y (medial-lateral) and GRF_z (vertical) were predicted with 1.15%, 2.25%, and 1.34% average errors, respectively. **CONCLUSION:** Using sensor coefficients to predict 3D GRF for simulated stable walking with a prosthetic foot results in a highly accurate model. NCPF sensors appear to be capable of gathering large amounts of ecologically valid GRF data during stable walking. Supported by NSF Grants CMMI1538447 and CMMI1235365.