

**A-25 Thematic Poster - Advancing Physical Activity Assessment Methods - Part I**

Wednesday, June 1, 2016, 9:30 AM - 11:30 AM  
 Room: 109

76 **Chair:** Scott E. Crouter. *The University of Tennessee Knoxville, Knoxville, TN.*  
*(No relationships reported)*

77 Board #1 June 1, 9:30 AM - 11:30 AM  
**Towards Reducing the Features used in Machine Learning Free-living Physical Activity Recognition Algorithms**

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**PURPOSE:** Machine learning (ML) methods for processing accelerometer data are gaining popularity and have been validated for identifying physical activities from raw data. However, these methods can be complex, requiring the computation of many features. Simpler methods are easier to understand and may be faster to apply. We investigated the extent to which we can reduce the number of features computed while still maintaining high classification accuracy.

**METHODS:** Forty overweight women (55.2 ± 15.3 yrs) wore two ActiGraph GT3X+ accelerometers (right hip, non-dominant wrist) for 7 free-living days. Wearable cameras captured ground truth activity labels. For each accelerometer location, we used a ML classifier based on 41 acceleration features (identified in the literature), to classify 4 activities (sitting, standing, walking/running, riding in a vehicle). We partitioned participants into training (80%) and testing (20%) portions. We trained a classifier on the training set and ranked the features by importance to the random forest component of the classifier. Then we repeated the following procedure until all features were removed: remove the feature with lowest importance score, re-train the classifier on the training set, and evaluate the performance on the test set. We did this separately for the hip and wrist accelerometers, and evaluated performance using balanced accuracy (BA) (mean of sensitivity and specificity).

**RESULTS:** The highest BA obtained with the hip accelerometer was 78.9% (36 features). Using only the most important feature (3 Hz frequency component) reduced BA by 11% (69.9%). Using 17 features BA was within 1% of maximal (78.4%). The highest BA obtained with the wrist accelerometer was 73.6% (37 features). Using only the most important feature (2 Hz frequency component) reduced BA by 12.5% (64.4%). Using 22 features BA was within 1% of maximal (73.3%).

**CONCLUSIONS:** These analyses indicate that a smaller number of features can be used without much loss in accuracy, but using only a single feature reduces accuracy more dramatically. As researchers adopt more complex methods it is important to understand the tradeoff between simplicity and value gained by complexity. Although simpler methods have been shown to work well in the lab, some complexity is still required for free-living classification.

78 Board #2 June 1, 9:30 AM - 11:30 AM  
**Describing The Methodology To Estimate Accelerometer Return Percentage From A Study Utilizing Mail-based Data Collection**

Gregory Knell<sup>1</sup>, Deborah Salvo<sup>1</sup>, Kelley Pettee Gabriel, FACSM<sup>1</sup>, Casey Durand<sup>2</sup>, Abiodun Oluyomi<sup>1</sup>, Michael Robertson<sup>2</sup>, Deanna M. Hoelscher<sup>1</sup>, Harold W. Kohl, III, FACSM<sup>1</sup>. <sup>1</sup>The University of Texas Health Science Center at Houston (UTHealth) School of Public Health, Austin, TX. <sup>2</sup>The University of Texas Health Science Center at Houston (UTHealth) School of Public Health, Houston, TX.  
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Recent advances in accelerometer design and battery life have improved the practicality of mail-based delivery and return for data collection in large epidemiologic studies. Mail-based administration can significantly reduce the cost and logistic challenges associated with in-person delivery/recovery, but requires other resources (e.g. phone calls, direct mailing) to optimize protocol compliance and monitor return. To date, there is no available method to forecast the number of monitors expected to be returned within a certain time-frame. This information is critical to appropriate allocate study staff and resources. **PURPOSE:** To describe a novel methodology to estimate accelerometer return percentage in the Houston TRAIN (Transit-Related Activity In Neighborhoods) Study.

**METHODS:** TRAIN is a prospective natural experiment of diverse, low-resource adults (aged ≥ 18 years), residing within a 3-mile radius of new light rail transit lines in Houston, TX. Continuous enrollment took place from January 2014-October 2015. Accelerometers were delivered via first class U.S. mail and participants were compensated upon return of the monitor. Accelerometer retrieval times were used to calculate percentiles of “days to return”. These percentiles were then used to determine the number of participants falling within each percentile range for “days to return” among those who have not yet returned their monitor. Finally, the expected number of accelerometers to be returned was calculated for participants who have not yet returned their monitor, based on the calculated probability of returning the accelerometer as a function of the total number of days outstanding.

**RESULTS:** Return data from participants in the first 19 months of data collection for the TRAIN study were analyzed (n=553). To date, 426 (77%) were returned. The 95th and 99th percentiles of “days to return” was 60 and 127 days, respectively. Currently, 127 accelerometers have not yet been returned, of which 64 have been outstanding for over 127 days. Among those outstanding, 19.1 accelerometers are expected to be returned.

**CONCLUSIONS:** This empirical-based methodology can be useful for implementing cost-effectiveness strategies in continuous-enrollment studies utilizing mail-based retrieval of data collection materials.  
 Funded by NIH R01 DK101593

79 Board #3 June 1, 9:30 AM - 11:30 AM  
**Differences In Physical Activity Estimates By Wear Time, Body Placement And Data Processing Of Accelerometers**

Jacqueline Kerr<sup>1</sup>, Katherine Ellis<sup>1</sup>, Suneeta Godbole<sup>1</sup>, Catherine Marinac<sup>1</sup>, Jonathan Mitchell<sup>2</sup>, Aaron Hipp<sup>3</sup>, Peter James<sup>4</sup>, David Berrigan<sup>5</sup>. <sup>1</sup>UCSD, San Diego, CA. <sup>2</sup>Children’s Hospital of Philadelphia, Philadelphia, PA. <sup>3</sup>North Carolina State University, Raleigh, NC. <sup>4</sup>Harvard School of Public Health, Boston, MA. <sup>5</sup>National Cancer Institute, Bethesda, DC.  
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**PURPOSE:** As accelerometer methods advance, researchers may employ different body placements and data processing techniques. This may result in different physical activity (PA) estimates that will make study comparisons challenging. We compared three data processing techniques for hip worn accelerometer data; compared wrist and hip locations; and compared wake-time wrist to a 24-hour wrist protocol.

**METHODS:** 2608 days from 333 women (mean age 55) with matched hip and wrist accelerometer data were compared using generalized estimating equations adjusting for days within individuals. Participants were asked to wear hip accelerometers for waking hours and the wrist accelerometer (on the non-dominant hand) for 24 hours over 7 days. Standard wake wear time criteria (5 days, 600 mins/day) were applied to the hip and wrist. Minute level count (CPM) cut points from the vertical axis were applied to the hip data (1952 cpm (MVPA)). A laboratory developed algorithm (GGIR) for wrist and hip vector magnitude (VM) data was employed to identify MVPA. A free living machine learned (ML) behavioral algorithm was applied to classify walking in the hip and wrist. Meeting guidelines was considered as 30 mins PA per day. **RESULTS:** Wear time compliance between the hip and wrist only varied by 2%. 25% of days included 30 minutes of PA with the hip cut points, 35% with the GGIR VM at the hip, and 71% with the ML walking algorithm. 54% of days were classified by the wrist GGIR wake time criteria compared to 58% with the 24 hour protocol. The ML algorithm classified 60% of days on the wrist wake time, compared with 61% with the 24 hour protocol. All differences were statistically significant at p<.05.

**CONCLUSIONS:** Different processing methods and body placements appear to significantly affect estimates of PA. These differences could greatly impact population estimates of PA. Differences between methods could have been affected by the validity of the algorithms for this aged population: the CPM and VM algorithms were developed in younger adults in the laboratory, and the ML algorithm was developed in free-living women the same age as this cohort. These findings will inform consensus development for accelerometer wear and data processing protocols in future studies.

80 Board #4 June 1, 9:30 AM - 11:30 AM  
**Individualized Cutpoint Analyses May Better Estimate Physical Activity Intensity In Older Adults With Type 2 Diabetes Mellitus**

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**PURPOSE:** Determining the intensity of physical activity in older adults with T2DM using individualized, relative cutpoints may be more informative than using standard absolute cutpoints. **METHODS:** Forty seven older adult T2DM (69±6y, 57% male,

33±6 kg·m<sup>-2</sup>, 7.2±0.9% HbA1c) completed a two speed walking protocol (walking between 1-2.5 mph) for four minutes at each speed, followed by a peak exercise test. Participants wore an accelerometer-based physical activity monitor at their waist and oxygen consumption was measured using a portable metabolic system. Afterwards, participants wore the activity monitor for 7 days. A linear equation for each individual was derived from the activity counts and energy expenditure measured during the walking protocol. Relative intensity cutpoints were calculated by using 44% VO<sub>2</sub>peak to determine moderate and 59% VO<sub>2</sub>peak to determine vigorous intensity. Average times spent in intensity categories per day were calculated using relative versus absolute (Troiano, moderate 2020 cpm, vigorous 5999 cpm) cutpoints. Paired samples t-tests correcting for false discovery rate (p≤0.05) were run to compare estimated time spent in intensity category by cutpoint. RESULTS: Mean VO<sub>2</sub>peak was 16±4 ml·kg<sup>-1</sup>·min<sup>-1</sup> and calculated individualized cutpoints were, on average, 1043(SE=121) cpm for moderate and 1632(SE=174) cpm for vigorous activity. Using the individualized cutpoints, participants accumulated an average of 171.7(SE=12.6) min of light, 22.8(SE=2.8) min of moderate, and 27.4(SE=6.5) min of vigorous activity per day. Use of the standardized Troiano cutpoint resulted in significantly different estimations based on intensity category: light 216.5(SE=11.4, p=0.05) min, moderate 6.8(SE=1.3, p=0.03) min, and vigorous 0.006(SE=0.006, p=0.01) min of activity per day. CONCLUSION: These results suggest utilization of absolute cutpoints may underestimate daily relative intensity levels of physical activity in older adults with T2DM. This misclassification may improperly inform true dose-response relationships, and population-based prevalence of physical activity in these and other clinically important populations.

Supported by Veterans Affairs, Rehabilitation Research and Development Merit Review.

81 Board #5 June 1, 9:30 AM - 11:30 AM

### Validity of a 2-Regression Model for Estimating Physical Activity in Youth Using an Ankle Accelerometer

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**PURPOSE:** The purpose of this study was to develop three 2-regression models (2RM) for use with ankle ActiGraph data in youth using the 1) vector magnitude (VM), 2) vertical axis (VA), and 3) all three axes (3ax) as individual predictors. The models were validated using unstructured physical activity (PA). **METHODS:** For development of the 2RM, 84 girls and 97 boys (mean ± SD; age, 12.0 ± 1.5 yrs) completed 30-min of lying rest and two to seven structured activities (from a list of 25) for 8-min each. For cross-validation, 27 boys and 15 girls (age, 12.6 ± 0.8 yrs) completed approximately 2-hrs of unstructured PA. PA data were collected using an ActiGraph GT3X or GT3X+, positioned on the non-dominant ankle and were converted to 5-sec epochs for each axis and the VM. Measured energy expenditure (Cosmed K4b<sup>2</sup>) was converted to youth MET<sub>y</sub> (activity VO<sub>2</sub> divided by resting VO<sub>2</sub>). A coefficient of variation (CV) was calculated for each activity to determine if the activity was continuous walking/running or an intermittent activity and separate regression equations were developed for each activity group using the VA only, VM only, and 3ax as individual predictors. Repeated measures ANOVAs were used to compare measured and predicted MET<sub>y</sub> and time spent in sedentary (SED; <1.5 MET<sub>y</sub>), light (LPA; 1.5-2.99 MET<sub>y</sub>), moderate (MPA; 3.0-5.99 MET<sub>y</sub>), and vigorous (VPA; ≥ 6.0 MET<sub>y</sub>) PA during the unstructured PA. **RESULTS:** For the VA and VM, counts/5-sec ≤ 1 and ≤10, respectively were used to distinguish SED time and a CV of ≤ 15 counts/5-sec was used to distinguish walking/running. For the 3ax 2RM, walking/running was best predicted by using the anterior-posterior and medial-lateral axes and the VA only was the best predictor for intermittent activities. The VA, VM, and 3ax 2RMs were within 0.42 MET<sub>y</sub> of measured MET<sub>y</sub> during the unstructured PA (P>0.05). The VM and 3ax 2RMs were within 5.7 min of measured time spent in SED, LPA, MPA, and VPA (P>0.05). The VA 2RM over- and under-estimated measured SED and LPA time by 9.3 and 8.6 min, respectively (P<0.019), but was not different from measured MPA and VPA time (P>0.05). **CONCLUSION:** Compared to the Cosmed, the VM and 3ax 2RMs have similar errors on a group basis that are lower than published errors for a 2RM developed for the hip location in youth, using the ActiGraph accelerometer.

Study supported by NIH grant R21HL093407

82 Board #6 June 1, 9:30 AM - 11:30 AM

### Vector Magnitude Calibration to Classify Sedentary Behavior Under Free Living Conditions

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(No relationships reported)

Historically, the classification of sedentary behaviors (SB) with accelerometers has used either single axis or 1-minute cut-points developed in laboratory. **PURPOSE:** To develop 3-axis Vector Magnitude cut-points per second (cts/sec) to classify SB based on movement in free-living conditions. **METHODS:** Two researchers recorded on a tablet free-living movement in 20 adults for >6 consecutive hours on two separate days. Movement types were recorded as: sitting, reclining, standing, walking, running, and kneeling. Participants wore 5 accelerometers collecting data at 100Hz (ActiGraph: right- and left wrists, and right hip; GENEActiv: right- and left wrists). Accelerometer data were integrated into 1-sec epochs. Observations in which both researchers had 100% agreement were included in the analyses. Observation data were categorized as sedentary and non-sedentary and randomly divided into training (50%) and testing (50%) datasets. Using the training dataset, receiver operating characteristic curve analyses were conducted using ROCPLLOT macro (SAS v. 9.4) to determine the optimal sensitivity (SE)/specificity (SP) of cts/sec for SB. Kappa (κ) was computed in the testing dataset to compare the time in SB from the accelerometer-determined cts/sec with time spent in SB from direct observation. **RESULTS:** Adults (N=20; 50% female), Mage= 30.25 ± 6.43 years, normal BMI (85%) gave informed consent to participate. SE/SP analyses identified different cts/sec to detect SB for each accelerometer placement: ActiGraph [left wrist 5 cts/sec (SE, .66/SP.64); right wrist 14 cts/sec (SE,.69/ SP,.66); right hip 0 cts/sec (SE, .88/ SP,.44)]; GENEActiv [left wrist 2 cts/sec (SE,.65/ SP,.66); right wrist 3 cts/sec (SE,.71/ SP,.70)]. Kappa's were modest but statistically significant (p<.005) for all devices and placement sites: ActiGraph [left wrist κ=.29 (95% CI, .29, .30); right wrist κ=.32 (95% CI,.32, .33); right hip κ=.35 (95% CI,.34, .35) ]; GENEActiv [left wrist κ=.29 (95% CI,.28, .29); right wrist κ=.31 (95% CI,.30, .31) ]. **CONCLUSION:** Based on SE/SP to detect SB and agreement with direct observations, the best locations for the ActiGraph and GENEActiv accelerometers were the right hip and right wrist, respectively. Machine-learning algorithms may improve SB detection and future studies should confirm these findings.

83 Board #7 June 1, 9:30 AM - 11:30 AM

### The Energy Cost of Work Station Sitting vs Standing

John Wygand, FACSM, Robert M. Otto, FACSM, Ryan Page, Lauren Chandler, Luisa Echeverry, Richard Happel, Kaitlyn Monteith, Joanna Venezia, Jonathan Lester, Joelle Hecht, John Donnelly, John Petrizzo. Adelphi University, Garden City, NY.  
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>A debate regarding the benefits of standing (STA) vs sitting (SIT) is common in the workplace. A reduction in sedentary lifestyle and increased caloric expenditure are touted as prime reasons to abandon a SIT workstation in favor of a STA or treadmill based workstation. Buckley (2013) reported a Caloric expenditure of 2.6 vs 3.3 kcal/min and a heart rate of 79 vs. 89 bpm for sitting vs standing postures, respectively. With the average 8 hour work day requiring 341 minutes of sitting, a change to standing for a comparable amount of time would increase energy expenditure by 239 kcal/work day. These reported values are astounding. **PURPOSE:** The purpose of this study was to investigate the energy cost of workstation sitting and standing. **METHODS:** 15 volunteers (age 22.4 ± 1.7 yr, ht. 1.73 ± .12 m., body mass 73.9 ± 13.4 kg, 8♂) completed a medical screening, informed consent, and reported to the lab in an euhydrated state. Continuous open circuit spirometry and heart rate by telemetry were employed during 30 minutes of SIT activity followed immediately by 30 minutes of STA activity. Activity included typical work related tasks of reading, typing, computer interaction and telephone usage during both trials. **RESULTS:** Statistical analysis by paired sample t test revealed a significant difference (p<.05) between SIT and STA protocols among all variables. Oxygen consumption (L/min) was 0.285 ± 0.076 and 0.336 ± 0.082, VO<sub>2</sub> (mL/kg-min) was 3.9 ± 0.60 and 4.5 ± 0.6, V<sub>E</sub> (L/min) was 7.71 ± 1.6 and 8.83 ± 1.9, RER was 0.81 ± 0.04 and 0.80 ± 0.04, heart rate (b/min) was 73.2 ± 13.7 and 79.9 ± 11.4, and Caloric expenditure (kcal/min) was 1.39 ± 0.09 and 1.57 ± 0.09, for SIT vs STA, respectively. **CONCLUSION:** A limited, but significant difference between SIT vs STA with a benefit of 0.18 kcal/min or a total of ~61.4 kcal over the estimated 341 minutes of an 8 hour workday substituted for sitting was noted. Ancillary concerns from prolonged standing of peripheral edema, leg fatigue, and varicose veins may preclude the use of standing at the workplace other than in small intervals. Whether an individual is standing or sitting they are still sedentary, thus frequent intermittent standing in one minute intervals may counteract the negative effects of maintaining a single posture for prolonged periods. Intermittent walking throughout the workday may be a better alternative.

**A-26 Thematic Poster - Protein Metabolism I**

Wednesday, June 1, 2016, 9:30 AM - 11:30 AM  
Room: 101

84 **Chair:** Craig Sale. *Nottingham Trent University, Nottingham, United Kingdom.*

(No relationships reported)

85 Board #1 June 1, 9:30 AM - 11:30 AM  
**Exercise Enhances The Overnight Muscle Protein Synthetic Response To Pre-sleep Protein Feeding In Older Males**

Andrew M. Holwerda<sup>1</sup>, Imre W. K. Kouw<sup>1</sup>, Jorn Trommelen<sup>1</sup>, Shona L. Halson<sup>2</sup>, Will K. W. H. Wodzig<sup>1</sup>, Lex B. Verdijk<sup>1</sup>, Luc J. C. van Loon<sup>1</sup>. <sup>1</sup>Maastricht University, Maastricht, Netherlands. <sup>2</sup>Australian Institute of Sport, Belconnen, Australia. (Sponsor: Janice Lee Thompson, FACSM)  
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(No relationships reported)

**PURPOSE:** The age-related decline in skeletal muscle mass is, at least partly, attributed to anabolic resistance to food intake. To compensate for anabolic resistance, we recently introduced the ingestion of dietary protein prior to sleep as a nutritional strategy to increase overnight muscle protein synthesis rates. Here we aimed to assess whether resistance-type exercise performed in the evening can further augment the overnight muscle protein synthetic response to pre-sleep protein ingestion in older males.

**METHODS:** In a parallel group design, twenty-three healthy older men (71±1 y) were randomly assigned to ingest 40 g casein protein before going to sleep with (PRO+EX: n=11) or without (PRO: n=12) performing resistance-type exercise earlier that evening. Overnight protein digestion and absorption kinetics, whole body protein metabolism and muscle myofibrillar protein synthesis rates were assessed using primed, continuous infusions of L-[ring-2H5]-phenylalanine and L-[ring-2H2]-tyrosine with the ingestion of intrinsically L-[1-13C]-phenylalanine labeled casein protein.

**RESULTS:** Exogenous phenylalanine appearance rates expressed over time did not differ between treatments. A total of 53±2 vs 55±2% of the ingested protein-derived phenylalanine appeared in the circulation during overnight sleep in the PRO+EX and PRO treatment, respectively (P=0.49). Myofibrillar protein synthesis rates were 31% higher during overnight sleep when exercise was performed earlier that day (0.058±0.002 vs 0.044±0.003 %·h<sup>-1</sup> in PRO+EX and PRO, respectively; P<0.01; L-[ring-2H5]-phenylalanine). In line, 27% more L-[1-13C]-phenylalanine was incorporated into myofibrillar protein in PRO+EX compared with PRO (0.042±0.002 vs 0.033±0.002 MPE, respectively; P<0.05; L-[1-13C]-phenylalanine).

**CONCLUSIONS:** Resistance-type exercise augments the overnight muscle protein synthetic response to pre-sleep protein ingestion and allows more of the ingested protein to be directed towards de novo muscle protein synthesis during overnight sleep in older males.

Funding: Top Institute Food and Nutrition (TIFN)

86 Board #2 June 1, 9:30 AM - 11:30 AM  
**Protein Requirements Are Increased In Active Females As Determined By Indicator Amino Acid Oxidation**

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(No relationships reported)

**PURPOSE:**

Protein requirements in athletes are generally greater than the current recommended daily allowance (RDA) based on nitrogen balance (NBAL), which may underestimate true requirements. Compared to males, less is known about requirements for this important macronutrient in active females. Therefore, the present study utilized the minimally-invasive Indicator Amino Acid Oxidation (IAAO) technique to evaluate the impact of variable intensity exercise on protein requirements of active females. We hypothesized the safe protein requirement would be greater than the RDA determined by both NBAL (0.8g/kg/d) and IAAO (1.2g/kg/d) in non-active adult males.

**METHODS:**

After a 2-d controlled diet, 7 females (~21y, ~63kg, ~23% body fat, ~47 mL O<sub>2</sub>/kg/min) completed 2-7 metabolic trials during the luteal phase that each involved the performance of variable intensity exercise (modified Loughborough Intermittent Shuttle Test) followed by 8 hourly mixed meals providing a variable protein intake (0.2-2.6g/kg/d), 6g/kg/d of carbohydrate, and sufficient energy. Protein was provided as crystalline amino acids modeling the amino acid profile of egg protein with the exception of tyrosine (40mg/kg/d) and the indicator phenylalanine (30.5 mg/kg/d with 5.46 mg/kg over 4h as L-[13C]phenylalanine). Breath<sup>13</sup>C<sub>2</sub> enrichment (isotope ratio

mass spectroscopy) and CO<sub>2</sub> production (indirect calorimetry) were used to calculate <sup>13</sup>C<sub>2</sub> excretion (F<sup>13</sup>C<sub>2</sub>) with bi-phase linear regression analysis used to determine the estimated average requirement (EAR) as the breakpoint and safe intake as the upper 95% CI.

**RESULTS:**

Preliminary analysis (n=33 trials) revealed F<sup>13</sup>C<sub>2</sub> conformed to a bi-phase model (r<sup>2</sup>=0.65; P<0.01) with an EAR for protein determined as 1.41g/kg/d and a safe intake of 1.76 g/kg/d.

**CONCLUSIONS:**

Our results suggest that the safe protein intake for active females during the luteal phase is 47-120% greater than the RDA in non-active individuals and is at the upper range of recommendations for athletes based on NBAL (i.e. 1.2-1.7g/kg/d, ACSM). Importantly, the EAR determined herein is similar to our previous study using the IAAO in active males (i.e. 1.35g/kg/d) suggesting that sex per se does not affect protein requirements after variable intensity exercise.

Funded by the Ajinomoto Innovation Alliance Program.

87 Board #3 June 1, 9:30 AM - 11:30 AM

**The Influence of Nighttime Protein Intake on Overnight Lipolysis and Next Morning Fat Oxidation**

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(No relationships reported)

**Purpose:** Determine in overweight and obese men if casein (CAS, 30 g protein), as compared to a non-caloric placebo (PLA), consumed before bed would alter blood markers but elicit similar changes in overnight subcutaneous abdominal adipose tissue (SCAAT) lipolysis and next morning whole-body fat oxidation. **Methods:** Determine in overweight and obese men if casein (CAS, 30 g protein), as compared to a non-caloric placebo (PLA), consumed before bed would alter blood markers but elicit similar changes in overnight subcutaneous abdominal adipose tissue (SCAAT) lipolysis and next morning whole-body fat oxidation. **Results:** There were no differences between treatments in overnight SCAAT glycerol (CAS, 175.0±26.5; PLA, 184.8±20.7 μmol/L; p=0.77), next morning fat oxidation (CAS, 0.76±0.01; PLA, 0.76±0.01; p=0.75) or metabolic rate (CAS, 2126±111; PLA, 2145±106 kcals/day; p=0.94). Similarly, there were no differences in any blood markers; however, the participants were hyperinsulinemic (fasting insulin > 30 μUL) prior to the study. **Conclusion:** SCAAT lipolysis and next morning fat oxidation, metabolic rate and blood markers were similar between CAS and PLA. CAS before bed did not promote fat storage and may help with long-term weight control. Supported by FSU and Dymatize® Nutrition.

88 Board #4 June 1, 9:30 AM - 11:30 AM

**Protein Ingestion Before Sleep Provides Precursors For Post-exercise Overnight De Novo Muscle Protein Synthesis**

Jorn Trommelen<sup>1</sup>, Andrew M. Holwerda<sup>1</sup>, Imre W.K. Kouw<sup>1</sup>, Shona L. Halson<sup>2</sup>, Lex B. Verdijk<sup>1</sup>, Luc J.C. van Loon<sup>1</sup>. <sup>1</sup>Maastricht University, Maastricht, Netherlands. <sup>2</sup>Australian Institute of Sport, Belconnen, Australia. (Sponsor: Janice Lee Thompson, FACSM)

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(No relationships reported)

Previously, we have demonstrated that ingestion of 40 g protein prior to sleep increases mixed muscle protein synthesis rates during postexercise overnight recovery. It remains to be established whether ingestion of a more moderate amount of protein increases overnight muscle protein synthesis rates and provides precursors for de novo muscle protein synthesis.

**PURPOSE:** To determine the impact of ingesting 30 g casein protein with and without 2 g free leucine prior to sleep on myofibrillar protein synthesis rates during postexercise overnight recovery.

**METHODS:** 36 healthy young males performed a single bout of resistance-type exercise in the evening (19:45 h) after a full day of dietary standardization. All subjects were provided with adequate recovery nutrition (20 g protein + 45 g carbohydrate) immediately after exercise (20:45 h). Thirty min prior to sleep (23:30 h), subjects ingested a beverage containing 30 g intrinsically L-[1-13C]-phenylalanine-labeled protein with (PRO+Leu, n=12) or without (PRO, n=12) 2 g free leucine or a noncaloric placebo (PLA, n=12). Continuous intravenous L-[ring-2H5]-phenylalanine, L-[1-13C]-leucine and L-[ring-2H2]-tyrosine infusions were applied. Blood and muscle tissue samples were collected to assess whole-body protein balance, myofibrillar protein synthesis rates and overnight incorporation of dietary protein-derived amino acids into de novo muscle protein. One-way ANOVA with treatment as factor was used to determine differences between treatments.

**RESULTS:** Protein ingestion prior to sleep improved overnight whole-body net protein balance (PRO:  $53 \pm 7$ , PRO+leu:  $59 \pm 12$ , and PLA:  $-6 \pm 1$  mol·kg<sup>-1</sup> per 7.5 h;  $P < 0.001$ ). Myofibrillar protein synthesis rates did not differ between treatments and averaged  $0.055 \pm 0.008$ ,  $0.055 \pm 0.015$  and  $0.057 \pm 0.003$  %·h<sup>-1</sup>, respectively ( $P = 0.850$ ). Myofibrillar L-[1-13C]-phenylalanine enrichments increased following protein ingestion and did not differ between the PRO and PRO+leu treatments.

**CONCLUSIONS:** Protein ingestion prior to sleep supports overnight recovery by providing precursors for de novo muscle protein synthesis during sleep. However, the ingestion of 30 g of casein protein with or without additional free leucine does not increase muscle protein synthesis rates during postexercise overnight recovery.

**Funding:** TIFN

89 Board #5 June 1, 9:30 AM - 11:30 AM  
**Impact of Post-Exercise Protein Ingestion on Treadmill-Based Endurance Training Adaptation**

Abdullah F. Alghannam<sup>1</sup>, Iain Templeman<sup>1</sup>, Kostas Tsintzas<sup>2</sup>, Susan Reeves<sup>3</sup>, Dylan Thompson<sup>1</sup>, James Bilzon<sup>1</sup>, James A. Betts, FACSM<sup>1</sup>. <sup>1</sup>University of Bath, Bath, United Kingdom. <sup>2</sup>University of Nottingham, Nottingham, United Kingdom. <sup>3</sup>University of Roehampton, London, United Kingdom. (Sponsor: James A. Betts, FACSM)  
 (No relationships reported)

The influence of post-exercise protein ingestion on the adaptive response to running-based endurance training relative to an energy matched carbohydrate supplement has not been determined. **PURPOSE:** To examine the effects of post-exercise protein ingestion on the magnitude of exercise-induced endurance training adaptation. **METHODS:** In a randomized parallel group design, 25 individuals (VO<sub>2</sub>max  $55 \pm 6$  ml·kg<sup>-1</sup>·min<sup>-1</sup>) completed 6 weeks of treadmill running (4 sessions per week; 70-75 % VO<sub>2</sub>max, 30-60 min per day, 4 days per week). Participants were randomly assigned to a group receiving a supplement containing carbohydrate (CHO; 1.6 g sucrose·kg<sup>-1</sup>; n=12) or carbohydrate-protein (CHO-P; 0.8 g sucrose·kg<sup>-1</sup> and 0.8 g whey protein hydrolysate·kg<sup>-1</sup>; n=13) ingested immediately post-exercise and then 1 h later. Baseline and follow-up measurements included expired gas, blood, and muscle biopsy samples to determine markers of cardiovascular and intramuscular training adaptation. Data are mean  $\pm$  SD. **RESULTS:** Absolute and relative improvement in VO<sub>2</sub>max in response to training was not different between groups ( $0.2 \pm 0.2$  L·min<sup>-1</sup> and  $3 \pm 1$  ml·kg<sup>-1</sup>·min in CHO-P and CHO;  $p > 0.05$ ). However, plasma albumin content increased following the intervention in the CHO-P ( $2.09 \pm 0.1$  to  $2.27 \pm 0.2$  g·kg<sup>-1</sup>; time x trial:  $p = 0.01$ ) relative to CHO ( $2.08 \pm 0.1$  to  $2.08 \pm 0.1$  g·kg<sup>-1</sup>). There was no between-group effect on estimated plasma volume change; however, an increase in plasma volume was shown in CHO-P treatment ( $3.88 \pm 0.7$  to  $4.10 \pm 0.8$  L; time:  $p = 0.03$ ) relative to CHO ( $3.68 \pm 0.4$  to  $3.74 \pm 0.6$ ;  $p > 0.05$ ) following the intervention. No differences in the change in expression for several key metabolic genes related to mitochondrial biogenesis (e.g. TFAM, PPAR and PGC-1 $\alpha$ ) and carbohydrate/lipid metabolism (e.g. HK, GLUT4 and FABP) were observed between groups ( $p > 0.05$ ). **CONCLUSION:** The inclusion of protein in a post-exercise recovery supplement increases plasma albumin content when combined with 6 weeks of treadmill-based endurance training. Nevertheless, the magnitude of improvement in VO<sub>2</sub>max was not different between groups. Thus, the present findings suggest that post-exercise protein ingestion may be beneficial in amplifying cardiovascular, but not intramuscular training adaptation. **Funder:** Saudi Arabian Ministry of Higher Education.

90 Board #6 June 1, 9:30 AM - 11:30 AM  
**Amino Acid Transport after Sprint Exercise and Oral Amino Acids**

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 (No relationships reported)

**PURPOSE:** To study if oral ingestion of essential amino acids (oral EAA) increases the amino acid transporter SNAT2, Akt/mTOR signaling and muscle protein synthesis (MPS) after sprint exercise.

**METHODS:** 12 healthy subjects performed three 30-s sprints with 20 minutes rest in between. Subjects consumed EAA + maltodextrin solution or flavoured water (placebo) during the sprint exercise up to 15 min after the last sprint in a randomized order with one month interval. In vivo MPS rate was measured using a stable isotope technique. Subject received a stable isotope of phenylalanine (D5-phenylalanine) to label the precursor pool for protein synthesis. Continuous infusion started before the first sprint and was ended 200 min after the last sprint. Two post exercise biopsies (vastus lateralis) were obtained 80 min and 200 min after last sprint. The amount of labelled phenylalanine incorporated into muscle protein over these 2 hours represents the in vivo MPS rate and was expressed as fractional synthesis rate (FSR %) calculated

by dividing amount of labelled phenylalanine incorporated during these 2 hours by the amount in the free amino acid (precursor) plasma pool. Biopsies were also analyzed for Akt/mTOR signaling and SNAT2 amino acid transporter by Western blot and for SNAT2 gene expression by real-time PCR. Blood samples were analyzed for amino acids, glucose, lactate, and insulin. Four subjects, involuntary vomiting after exercise during EAA condition, showed a minor increase in plasma leucine and were presented separately.

**RESULTS:** Non-vomiting subjects (n=8): The expression of the amino acid transporter SNAT2 was higher both at the protein ( $P < 0.05$ ) and the mRNA ( $P < 0.001$ ) level after EEA than after placebo. Fold increase for phosphorylated Akt, mTOR and p70 was 1.7-3.6 ( $P < 0.01$  -  $P < 0.001$ ) comparing EAA with placebo. FSR % after EEA was increased by 25 % ( $P = 0.02$ ) compared to placebo. None of these variables were significantly increased in the subjects who vomited.

**CONCLUSION:** Oral EAA increased MPS after sprint exercise. Enhanced capacity for amino acid transport and subsequent enhanced Akt/mTOR signaling are suggested to mediate the increased MPS.

91 Board #7 June 1, 9:30 AM - 11:30 AM  
**Diminished Postprandial Muscle Protein Synthetic Response To Protein Ingestion In Obese Adults**

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Excess body fat blunts muscle protein synthesis rates under hyperinsulinemic, hyperaminoacidemic clamp conditions. However, the efficacy of the ingestion of single meal containing ample amounts of protein to augment postprandial muscle protein synthesis rates has not been studied in obese and overweight adults.

**PURPOSE:** We aimed to compare myofibrillar protein synthesis after protein ingestion in healthy weight, overweight, and obese adults.

**METHODS:** 10 healthy-weight ( $24 \pm 1$  y, BMI  $22.7 \pm 0.4$  kg/m<sup>2</sup>, HOMA-IR  $1.4 \pm 0.2$ ), 10 overweight ( $26 \pm 2$  y, BMI  $27.1 \pm 0.5$  kg/m<sup>2</sup>, HOMA-IR  $1.25 \pm 0.11$ ), and 10 obese ( $27 \pm 3$  y, BMI  $35.9 \pm 1.3$  kg/m<sup>2</sup>, HOMA-IR  $5.8 \pm 0.8$ ) men and women underwent a primed continuous L-[ring-13C6]phenylalanine infusion. Blood and muscle biopsy samples were collected at rest and after ingestion of 36 g of protein to assess plasma amino acid and insulin concentrations and myofibrillar protein synthesis rates.

**RESULTS:** Protein ingestion increased plasma essential amino acid concentrations similarly in all participants (time effect:  $P < 0.05$ ) with concentrations peaked at 2 h and returning to baseline values at 5 h. The obese participants had a greater peak postprandial plasma insulin response to protein ingestion than the overweight and healthy-weight participants (obese  $56.7 \pm 8.0$  compared to overweight  $11.9 \pm 1.6$  and healthy-weight  $14.3 \pm 1.7$   $\mu$ U/L,  $P < 0.001$ ). Protein ingestion increased myofibrillar protein synthesis in both the healthy-weight (rest:  $0.057 \pm 0.006$  %/h, fed:  $0.084 \pm 0.014$  %/h) and overweight groups (rest:  $0.061 \pm 0.007$ , fed:  $0.087 \pm 0.019$  %/h) ( $P < 0.05$ ) with no increase in the obese group (rest:  $0.055 \pm 0.005$  %/h, fed:  $0.067 \pm 0.005$  %/h,  $P = 0.45$ ). **CONCLUSIONS:** Increased adiposity led to an impaired postprandial muscle protein synthetic response to protein ingestion in obese adults when compared to healthy-weight and overweight individuals. These data suggest that poor skeletal muscle remodeling may underlie early metabolic impairments in apparently "healthy" obese adults.

Funding provided by the National Pork Board

92 Board #8 June 1, 9:30 AM - 11:30 AM  
**Protein Requirements Are Elevated in Endurance Athletes according to the Indicator Amino Acid Oxidation Method**

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**Reported Relationships:** H. Kato: Salary; Ajinomoto Co., Inc..

Protein requirements have been suggested to be elevated in endurance athletes on the basis of classic nitrogen balance methodology. The minimally-invasive indicator amino acid oxidation (IAAO) method has the advantage of providing insight into whole body protein kinetics and has been used to determine protein requirements in a variety of non-exercised populations; however, this method has never been utilized to determine protein requirements in endurance-trained individuals.

**PURPOSE:** The aim of this study was to re-evaluate protein requirements in endurance athletes after an acute bout of exercise utilizing the novel IAAO methodology.

**METHODS:** Seven male endurance-trained adults ( $27.1 \pm 3.7$  yrs,  $67.4 \pm 4.5$  kg;  $58.8 \pm 2.8$  ml O<sub>2</sub>/kg/min; means  $\pm$  95%CI) completed a 20-km treadmill run (74% HRmax) prior to consuming test diets providing a variable amount of protein (0.2-2.8 g/kg/d) and sufficient energy. Protein was provided as a crystalline amino acid mixture

based on egg protein composition with the exception of phenylalanine and tyrosine (30.5 and 40.0 mg/kg/d, respectively). To determine the metabolic fate of the indicator amino acid (1.20 mg/kg/h of [<sup>1-13</sup>C]phenylalanine), breath enrichment (isotope ratio mass spectrometry) and CO<sub>2</sub> production (indirect calorimetry) were measured to determine <sup>13</sup>CO<sub>2</sub> excretion (F<sup>13</sup>CO<sub>2</sub>) and urinary [<sup>1-13</sup>C]phenylalanine (LC/MS/MS) was measured to determine whole body phenylalanine flux (Q) at isotopic steady state. The estimated average requirement (EAR) was determined as the breakpoint after bi-phase linear regression analysis of F<sup>13</sup>CO<sub>2</sub> with a population safe intake defined by the upper 95% confidence interval.

**RESULTS:** Q (68.3±2.9 μmol/kg/h) was not affected (P=0.99 by protein intake. F<sup>13</sup>CO<sub>2</sub> displayed a robust bi-phase linear relationship (r<sup>2</sup> = 0.86) that resulted in an EAR and population-safe intake of 1.55 and 1.75 g protein/kg/d, respectively.

**CONCLUSIONS:** We report a population safe intake that is greater than previously determined in non-exercised adults by IAAO (~1.24 g/kg/d) and the current recommended daily allowance of 0.8 g/kg/d. Our results suggest that the metabolic demand for protein in endurance-trained adults after a 20-km run is greater than their sedentary peers and potentially the current recommendations for athletes based on nitrogen balance.

**A-27 Thematic Poster - Running Footwear: Less or More?**

Wednesday, June 1, 2016, 9:30 AM - 11:30 AM  
Room: 103

93 **Chair:** Rebecca E. Fellin. *U.S. Army Research Institute of Environmental Medicine, Natick, MA.*  
(No relationships reported)

94 Board #1 June 1, 9:30 AM - 11:30 AM  
**Effects Of Different Footwear On Ankle Range Of Motion And Postural Stability**  
Jeffrey B. Powell, Amanda Strauch, Jung-Hyun Kim, Aitor Coca. *NIOSH/CDC/NPPTL, Pittsburgh, PA.*  
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(No relationships reported)

**PURPOSE:** The purpose of this study was to assess the effects of different footwear on functional ankle ROM and postural stability under a dynamic balance perturbation condition in healthy individuals.

**METHODS:** Eight healthy male subjects (mean: age 23.6 years, height 182cm, weight 81.9kg) completed four experimental conditions: barefoot (BF), athletic shoes (AS), firefighter boots (FB), and industrial rubber boots (RB) in a counterbalanced order. Ankle ROM (in degrees) for dorsiflexion, plantar flexion, inversion, and eversion were measured in a supine position using an isokinetic dynamometer. Postural stability was assessed using a Biodex balance system to determine overall stability index (OSI) under a dynamic balance test (perturbation level 10 - 3). All measurements were triplicated and mean values were analyzed by one-way ANOVA and pairwise comparisons.

**RESULTS:** Ankle ROM for plantar flexion and inversion were significantly decreased with FB and RB (p<0.01) whereas dorsiflexion and eversion showed a decreased trend without a significant main effect. Postural stability, as evidenced by an increase in OSI, was significantly impaired with FB (P<0.05), but no difference was noted with other types of footwear compared to BF.

**CONCLUSION:** In this study, functional ankle ROM was influenced by different footwear characteristics such as shoe material, sole height, and boots shaft to which ankle plantar flexion and inversion were significantly reduced and postural instability was significantly increased with FB and RB. These results suggests that footwear characteristics should be considered for practical assessment of postural stability in a real world scenario.

| Results *: pairwise comparison significantly different from BF (p<0.05) |           |          |           |           |
|---|-----------|----------|-----------|-----------|
|   | BF        | AS       | FB        | RB        |
| Plantar flexion   | 45.5±12.0 | 41.3±6.5 | 20.7±5.0* | 25.1±8.4* |
| Dorsiflexion  | 19.0±3.2  | 17.8±2.8 | 16.4±4.3  | 14.8±3.8* |
| Inversion   | 33.8±9.2  | 32.8±9.7 | 22.9±7.0* | 19.5±8.2* |
| Eversion  | 40.2±11.0 | 40.1±8.3 | 29.7±14.6 | 30.4±13.6 |
| OSI   | 0.7±0.2   | 0.9±0.3  | 1.2±0.5*  | 1.0±0.3   |

95 Board #2 June 1, 9:30 AM - 11:30 AM  
**Better Dynamic Postural Stability While Wearing Minimalist Footwear in Physically-Active Male Adults**  
Paul N. Whitehead<sup>1</sup>, Timothy C. Sell<sup>1</sup>, Mita Lovalekar<sup>1</sup>, Matthew E. Darnell<sup>1</sup>, Nicholas R. Heebner<sup>2</sup>, John P. Abt, FACSM<sup>2</sup>, Scott M. Lephart, FACSM<sup>2</sup>. <sup>1</sup>University of Pittsburgh, Pittsburgh, PA. <sup>2</sup>University of Kentucky, Lexington, KY. (Sponsor: John P. Abt, FACSM)  
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(No relationships reported)

Minimalist footwear (MF) has gained significant popularity over the last five years. The majority of existing research has examined running-related injuries and kinematics, but MF may provide a therapeutic benefit when integrated with strength and conditioning programs. To establish if MF is therapeutic, acute differences in a task of dynamic postural stability was assessed in athletic shoes (AS), MF, and military boots (MB). Postural stability has been shown to be a risk factor for ankle injuries, a common ailment in armed forces. If certain footwear can show advantages toward improved postural stability, there will be the potential for future studies to examine extended use. **PURPOSE:** To examine the role of footwear on dynamic postural stability. **METHODS:** Thirty-one healthy males (23.5±4.9 yrs, 76.3±7 kg, 175.7±6.3 cm) participated in the study, and none had previous experience wearing MF. Subjects jumped with both feet over a 12-inch hurdle from a distance of 40% of their height. Subjects landed on their dominant leg then maintained their balance with hands on hips. Five trials were collected and averaged for each condition. The primary outcome variable was the Dynamic Postural Stability Index (DPSI) and its component scores (APSI, MLSI, and VSI), which were computed using the first three seconds of ground reaction forces following initial contact with force plates recording at 1500 Hz. A higher DPSI or component score indicates worse postural stability. One-way repeated measures ANOVA was used for hypothesis testing at p<0.05. **RESULTS:** DPSI was significantly higher in AS compared to both MB (p<0.001) and MF (p<0.001). The component scores were all significantly lowest (p≤0.001) in MF. **CONCLUSION:** The MF scores indicate better stability compared to AS acutely. This could be due to less material interfering with the ability to respond to perturbations. By training in MF, individuals could have exposure to accelerated proprioception that might otherwise be muted by AS, experience strengthening benefits, and experience postural stability enhancements longitudinally. This could lead to a reduction in ankle injury risk. Lower scores in MB compared to AS were not expected, but it could be due to the cutaneous feedback from the high-top ankles and more rigid body of MB. Supported by the Freddie H. Fu, MD Graduate Research Award

96 Board #3 June 1, 9:30 AM - 11:30 AM  
**Minimalist Running Shoes Increase Intrinsic And Extrinsic Foot Muscle Volume In Habitual Shod Runners**  
Roy TH Cheung<sup>1</sup>, Louis K. Sze<sup>1</sup>, Tony L. Chen<sup>1</sup>, Irene S. Davis, FACSM<sup>2</sup>. <sup>1</sup>Hong Kong Polytechnic University, Hong Kong, Hong Kong. <sup>2</sup>Harvard University, Cambridge, MA. (Sponsor: Prof. Irene S Davis, FACSM)  
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(No relationships reported)

Minimalist footwear (MF) running has gained popularity recently partially because it is claimed to strengthen the intrinsic and extrinsic foot muscles. However, there is limited data on the change in muscle size associated with a transition to MF.

**Purpose:** To examine the effects of a transition to MF on the intrinsic and extrinsic foot muscle volume. The relationship between participants' compliance with MF and changes in muscle volume was also evaluated. **Methods:** 20 habitual shod runners underwent a 6-month, transition program to MF running, including foot and ankle strengthening and a gradual increase in running in the MF. 18 matched shod runners were instructed in the same strengthening program, but they continued their normal mileage in their traditional running shoes. Runners' compliance with MF was monitored using an online survey program. We measured intrinsic and extrinsic foot muscle volumes with MRI before and after the program. **Results:** Weekly mileage between groups was similar at baseline (p=0.216) and after the program (p=0.612). However, runners in the MF group exhibited significantly larger extrinsic (p=0.011) and intrinsic (p=0.001) foot muscles after the program. Intrinsic foot muscle growth was mainly observed at the forefoot (p=0.004) but not the rearfoot region (p=0.104). Muscle volume of runners in the control group remained similar after the program (p=0.333-0.948). A significant positive correlation was found between participants' compliance with MF and changes in the extrinsic muscle volume (r=0.506; p=0.023). **Conclusion:** Transition to MF running was associated greater extrinsic and intrinsic foot muscle volume. Additionally, the extrinsic muscle growth was correlated with the use of MF.

WEDNESDAY, JUNE 1, 2016

| Group        |          | Pre-transition Mean (SD) | Post-transition Mean (SD) | P-value |
|--------------|----------|--------------------------|---------------------------|---------|
| Control      | Leg      | 27634.23 (2532.26)       | 27425.54 (2463.83)        | 0.594   |
|              | Foot     | 4613.94 (723.98)         | 4739.53 (941.34)          | 0.381   |
|              | Rearfoot | 2526.27 (485.81)         | 2647.36 (660.84)          | 0.333   |
|              | Forefoot | 2087.66 (333.13)         | 2092.16 (330.48)          | 0.948   |
| Minimal Shoe | Leg      | 25082.47 (2786.17)       | 27031.84 (3448.16)        | 0.011   |
|              | Foot     | 4566.96 (753.51)         | 4973.51 (766.50)          | 0.001   |
|              | Rearfoot | 2592.21 (630.42)         | 2764.32 (531.33)          | 0.104   |
|              | Forefoot | 1974.27 (303.23)         | 2209.64 (417.21)          | 0.004   |

97 Board #4 June 1, 9:30 AM - 11:30 AM  
**Differences in Running Economy among Experienced Runners Wearing both Minimal and Traditional Running Footwear**

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 (No relationships reported)

Minimal footwear running shows shorter stride lengths (higher stride frequencies) vs. traditionally heel-elevated shoes (Lieberman, 2012). Previous research demonstrates running economy (RE) of barefoot running on a treadmill or over-ground is 2.0-5.7% more economical than shod running (Hanson et al., 2011) and that minimal shoe running is more economical than shod running (2.4-3.3%). **PURPOSE:** To examine differences in running economy between treadmill trials among experienced (EM) and non-experienced minimalist (NM) shoe runners wearing minimalist and traditional footwear.

**METHODS:**

Nineteen experienced runners (running  $\geq 3$  days/wk,  $\geq 30$  min/run,  $\geq 3$  mo) completed the study (age  $22 \pm 4$  y, height  $174.5 \pm 11.3$  cm, weight  $74.8 \pm 15.7$  kg, BMI  $24.3 \pm 2.3$  kg/m<sup>2</sup>). Twelve EM (five withdrew) and 12 NM runners were recruited. A randomized crossover design was employed with each treadmill test occurring a week apart, each participant serving as their own control. The treadmill test consisted of four, ten-minute continuous stages (2, 3, 6mph, and a self-selected speed of at least 6.5mph, all 0% grade). The self-selected speed was kept the same for both trials. The only difference between the two trials was type of footwear (minimal (MF) or traditional (TF)). Treadmill data was recorded during the last two minutes of each stage for expired gases (VO<sub>2</sub>, VCO<sub>2</sub>, and VE) and steps/2min, which were hand-counted by two investigators. A two-tailed, dependent t-test was used to analyze shoe weight, steps/2min, VO<sub>2</sub>, VCO<sub>2</sub>, and VE for each of the four stages.

**RESULTS:**

Step rates for all stages were greater in MF ( $p < 0.05$ ), specifically Stage 4 (MF =  $163.7 \pm 10.1$ , TF =  $161.1 \pm 9.5$  steps/2min,  $p = 0.05$ ). Stage 4 VO<sub>2</sub> differed for both relative (MF =  $38.9 \pm 2.7$ , TF =  $40.0 \pm 2.3$  ml/kg/min,  $p = 0.03$ ) as well as absolute values (MF =  $2.92 \pm 0.68$ , TF =  $2.99 \pm 0.69$  L/min,  $p = 0.04$ ). Additionally, MF were lighter compared to the TF ( $309.2 \pm 48.9$ ,  $630.1 \pm 162.4$  grams,  $p < 0.001$ ). Based on coefficient of determination, the effect of shoe weight on improved running economy was 8% in relative and 13% in absolute VO<sub>2</sub>.

**CONCLUSIONS:**

Footwear had an immediate impact on stride mechanics as all runners ran with a higher step rate in MF. MF improved running economy (2.33-2.75%), based on VO<sub>2</sub> values at a self-selected pace. These results lend credence to claims of MF improving running economy.

98 Board #5 June 1, 9:30 AM - 11:30 AM  
**The Effect Of Minimal Running Shoes On Peak VO<sub>2</sub> And 5 Km Running Performance**

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 (No relationships reported)

**Introduction:** Barefoot running may affect performance in endurance running events, by improving biomechanical parameters and physiological responses compared to shod running. The majority of research efforts during the last 15 years have been centered mainly on the biomechanical differences between shod and unshod running and the influence on a selection of physiological variables i.e. heart rate, submaximal oxygen uptake and blood lactate. Surprisingly data from studies to examine the impact of barefoot running on the race performance are scarce.

**Purpose:** The purpose of this study is to examine the effect of minimal running shoes (MRS) on peak oxygen consumption (peakVO<sub>2</sub>) and 5 km running performance.

**Methods:** Twelve moderately trained subjects (10 male, 2 female), all habitual shod runners, participated in a series of 5 maximal trials 7 days apart. During the first two trials, the subjects completed two exhaustive incremental peakVO<sub>2</sub> efforts on a treadmill, running either with MRS or with their shoes in a random order. On Day 3 they completed a 3 km race on a treadmill running with the MRS, for familiarization with the race performance trial. During the last two laboratory visits, the subjects completed two 5 km race trials on a treadmill, either with the MRS or the shod condition in a random order. Paired T-test for dependent samples was used for the statistical analysis. Results: Mean ( $\pm$ sd) MRS and shod running peakVO<sub>2</sub> values  $54.68 \pm 3.74$  and  $54.04 \pm 4.44$  ml.min<sup>-1</sup>.kg<sup>-1</sup> respectively was not different ( $p = 0.532$ ). Mean ( $\pm$ sd) time for the 5 km race performance also was not different ( $p = 0.225$ ) between MRS and shod conditions ( $1446 \pm 139.22$  v  $1458 \pm 141.05$  s). Conclusions: The results of the present study show no effect of MRS in habitually shod runners on peakVO<sub>2</sub> and 5 km performance time. Despite however, the lack of significance there was a tendency for faster times with MRS condition. Future studies may need to extend the familiarization period with MRS to notice significant running performance benefits.

99 Board #6 June 1, 9:30 AM - 11:30 AM  
**8 Week Exercise Protocol and Minimalist Shoes Walking Effect on Lower Leg Muscle Size**

Aaron W. Johnson<sup>1</sup>, Tiffany D. deVries<sup>1</sup>, Shaun Brewer<sup>1</sup>, Andrew Rich<sup>1</sup>, Joseph W. Myrer<sup>1</sup>, Irene S. Davis, FACSM<sup>2</sup>, Sarah T. Ridge<sup>1</sup>. <sup>1</sup>Brigham Young University, Provo, UT. <sup>2</sup>Harvard Medical School, Boston, MA. (Sponsor: Irene S. Davis, FACSM)  
 (No relationships reported)

Transitioning to minimalist shoes (MS) is desired by many runners. However, there are concerns about transitioning safely. Pre-transition exercises or low intensity training may facilitate this transition.

**Purpose:** The purpose of this preliminary study was to investigate muscle size change after either 8 weeks of walking in MS or 8 weeks of following an exercise protocol. The muscles of interest in the lower leg were the tibialis anterior (TA), tibialis posterior (TP) and flexor digitorum longus (FDL).

**Methods:** 28 runners ( $22.6 \pm 2.6$  yr,  $174.4 \pm 10.3$  cm,  $70.0 \pm 13.0$  kg) continued to run their usual weekly amount and were randomly assigned to a control group ( $n = 7$ ), MS walking group ( $n = 7$ , progressively increase walking from 2500 steps in MS to 7000 steps/day at 8 weeks), or an exercise group ( $n = 14$ , 8 weeks of progressive foot muscle exercises). Videos of the TA, TP and FDL were taken starting from a relaxed state to a contracted state and back to the relaxed state via B-mode ultrasound imaging using a 10 MHz linear probe (GE LogiqP6). Videos for the FDL were taken at a point 50% distal from the medial knee joint line to the inferior tip of the medial malleolus with the probe held perpendicular to the shaft of the leg. For the TP and TA the probe was held at a point 30% from the knee joint line to the inferior tip of the lateral malleolus. To obtain videos of the TA and TP, each participant was instructed to invert their foot. For the videos of the FDL, participants were instructed to flex their toes. Videos of the contraction cycle for the TA, TP, and FDL were recorded. 2 separate still-shots of the muscles at rest were saved from the recorded videos to make size measurements. Repeated measures ANCOVA with the respective baseline muscle size as covariate was run.

**Results:** There was a significant main effect for time for all muscles ( $p < 0.02$ ), and a significant group by time interaction ( $p < 0.05$ ) for the change in muscle size for the FDL and TP. The mean and SD for the muscles were TA:  $2.5 \pm 0.3$  cm, TP:  $1.8 \pm 0.25$  cm, FDL:  $1.7 \pm 0.36$  cm<sup>2</sup>.

**Conclusion:** The data from this preliminary study appear to support the idea that walking in MS or performing foot intrinsic strengthening exercises may increase the size of some lower leg muscles. It is unknown if this increase in muscles size will alter the potential risks associated with a transition to minimalist shoe running.

100 Board #7 June 1, 9:30 AM - 11:30 AM  
**The Effect Of Extreme Cushioning Shoes On Running Economy At Different Speeds And Inclines**

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Running economy is defined as the oxygen cost for running at a given submaximal speed. Several factors related to shoe design can affect running economy such as shoe mass and cushioning. While shoe mass has been shown to increase the metabolic cost of running, the effect of shoe cushioning on running economy is less clear. **PURPOSE:** To determine the effect of wearing extreme cushioning shoes on running economy at different speeds and inclines.

**METHODS:** Subjects ( $n = 10$ , age  $28.7 \pm 6.4$  yr, weight:  $67.8 \pm 10.4$  kg, height:  $1.72 \pm 0.09$  m) were fitted with a pair of neutral running shoes (Addidas Prene) and a pair of extreme cushioning shoes (Hoka Bondi 4). Each subject completed two days of testing. Day 1: Subjects ran on a treadmill at three speeds (preferred speed (PS), PS+1

mph, PS-1 mph) in each shoe condition (6 total conditions). Day 2: Subjects ran on a treadmill at two different inclines (0%, 6%) in each shoe condition (4 total conditions). For all conditions, subjects ran for 8-10 minutes while rate of oxygen consumption (VO<sub>2</sub>) was recorded (Moxus). Average VO<sub>2</sub> during each condition was calculated and compared Day 1 using a 2 (shoe) x 3 (speed) and Day 2 using a 2 (shoe) x 2 (incline) repeated measures ANOVA ( $\alpha=0.05$ ).

**RESULTS:** VO<sub>2</sub> was not influenced by the interaction of speed and shoe ( $p=0.496$ ). VO<sub>2</sub> was different between speeds (increasing on average 30.7% across speeds;  $p<0.001$ ) but not between shoes ( $p=0.191$ ). VO<sub>2</sub> was not influenced by the interaction of incline and shoe ( $p=0.054$ ). VO<sub>2</sub> was greater for incline (increasing on average 40.0% with incline;  $p=0.017$ ) but not different between shoes ( $p=0.059$ ).

**CONCLUSIONS:** It seems that the cushioning of the shoe (extreme vs. regular) play no role in the influence of running economy.

101 Board #8 June 1, 9:30 AM - 11:30 AM  
**Running Shoe With Extra Midsole Thickness Increase Foot Horizontal Instability During Treadmill Running**

Shuqi Zhang<sup>1</sup>, Li Li, FACSM<sup>2</sup>. <sup>1</sup>Northern Illinois University, Dekalb, IL. <sup>2</sup>Georgia Southern University, Statesboro, GA.  
 (No relationships reported)

**PURPOSE:** Opposite to the design concept of the minimum running shoes, maximum running shoe provides extra midsole thickness for additional cushioning. This additional midsole thickness might lead to instability in both medial-lateral (ML) and anterior-posterior (AP) directions. The goal of this study was to compare peak forces and the variability of forces (FVar) in horizontal directions (ML and AP) among maximum, regular, and minimum running shoes. **METHODS:** Eight participants ran on instrumented treadmill at 3.5m/s wearing three different running shoes in a random order. In each trial, ten steps were recorded bilaterally for both left and right. Maximum force (FMax) and Minimum force (FMin) were calculated for each step at the ML and AP directions. Variability (FVar) was calculated with the standard deviation of the ten-trial ensemble curve at every ten percent of the stance phase. Three-way MANOVA (Shoe, each ten percent section and L/R foot as independent variables) was performed to detect the different variability of forces (FVar-ML and FVar-AP) among three running shoes at horizontal directions. Two-way MANOVA (Shoe and left / right foot as independent variables) were performed to determine the different peak forces at ML and AP directions (FMin-ML, FMax-ML, FMin-AP, and FMax-AP). Tukey post hoc employed when needed. Alpha was set at .05. **RESULTS:** Significant different peak forces were observed among different running shoes in the positive directions (anterior and lateral). FMax-ML (lateral) for the regular shoe (89.7±3.1 N) was much greater than that of the minimum shoe (76.3±3.1 N) and the maximum shoe (75.2±3.1 N). Positive AP (anterior), FMax-AP for the maximum shoe (229.1±3.8 N) was much greater than that of the minimum shoe (213.2±3.8 N). There was significant different variability among three types of shoes. FVar-AP showed significant difference, where FVar-AP for the maximum shoe (39.4±1.1 N) was much greater than that of the minimum shoe (35.3±1.1 N). **CONCLUSIONS:** Comparing to regular and minimum running shoes, maximum shoe provides greater horizontal instability, specifically greater medial-lateral peak force and greater variability at the AP direction.

**A-28 Thematic Poster - Sleep**

Wednesday, June 1, 2016, 9:30 AM - 11:30 AM  
 Room: 110

102 Chair: Rebecca Spencer. University of Massachusetts, Amherst, MA.  
 (No relationships reported)

103 Board #1 June 1, 9:30 AM - 11:30 AM  
**Sleep Disorders And Physical Functioning In Us Adults: Results From Nhanes 2005-2006**

Shipra Puri, John P. Collins, Baian Baattaiah, Jeffery E. Herrick. George Mason University, Fairfax, VA. (Sponsor: Dr. Randall E. Keyser, FACSM)  
 (No relationships reported)

Sleep disorders (SDs), such as obstructive sleep apnea, insomnia and restless legs syndrome, affect approximately 35 to 40% of the U.S. adult population annually and yet frequently overlooked. SD hinders daily functioning and has negative impact on health and longevity. It is plausible that SD adversely affect physical functioning (PF) that mediates the ability to perform activities of daily living.

**PURPOSE:** This secondary data analysis using cross-sectional data from the National Health and Nutrition Examination Survey (NHANES) 2005-2006 assessed the relationship between SD and PF in U.S. adult population. **METHODS:** For the

present analysis, NHANES SD and PF questionnaires were used. Participants were classified as having PF limitation (PFL) if they reported difficulty or an inability to do at least one of the 10 tasks selected from the PF questionnaire. The presence of SD was measured by a yes to any of the following SD: sleep apnea, insomnia or restless leg syndrome; or yes to "ever told by doctor have a SD". In addition, a comorbidity score (CS) was generated on the basis of participant's total number of self-reported comorbidities. The impact of age, gender and body mass index (BMI) on PF was also examined. The chi-square test was used to analyze the association between SD and PF. **RESULTS:** The sample population consisted of 1413 adults (54% women) with mean age of 63 ± 16.4 years, and BMI of 29.7 ± 7.6. About 12% (n = 169) of the population reported to have both SD and PFL. SD was significantly related to PFL with a Pearson chi-square of 40.15 ( $p \leq 0.001$ ). Multivariate regression analysis revealed that SD, CS, female gender, and BMI had a large effect on PF ( $r^2 = 0.25$ ,  $p < 0.001$ ) in the model. BMI had a small effect on PFL ( $\beta = 0.017$ ,  $p = 0.02$ ) that appeared to be futile after accounting for the effects of SD, comorbid conditions, and gender. **CONCLUSION:** Sleep disorder was significantly associated with physical functioning limitations. Given the gender effect in our model, inclusion of strategies to minimize sleep disturbance may impact physical performance of women with comorbid conditions. Overall, our results implicate sleep optimization strategies as one important method for attenuating the progression of physical functioning limitations in adults.

104 Board #2 June 1, 9:30 AM - 11:30 AM  
**Evening Exercise Does Not Differentially Influence Sleep Outcomes Compared to Morning Exercise**

James LeCheminant, FACSM, Kaylie Carbine, Katie Slinn, Tyshae Davis, Michael J. Larson. Brigham Young University, Provo, UT.  
 (No relationships reported)

**Purpose:** To determine the influence of morning or evening exercise on accelerometer-determined sleep outcomes. **Methods:** Thirty-seven healthy and young individuals were randomly assigned to a morning (n=18) or evening exercise group (n=19). Within each group there was an exercise and non-exercise condition, counter-balanced and determined randomly. Participants in the morning exercise group reported to the laboratory between 7-10am, completed a 45-minute bout of moderate-intensity exercise, and then wore an accelerometer (at hip and wrist) for 24 hours. Their non-exercise day was identical except there was no morning exercise. Participants in the evening group reported to the laboratory between 7-10pm, completed a 45-minute bout of moderate-intensity exercise and then wore an accelerometer (hip and wrist) for 24 hours. Their non-exercise day was identical except there was no evening exercise. Sleep data were analyzed using ActiLife Data Analysis Software. Bed times and wake times were determined using the auto function in the ActiLife software. The age-appropriate Sadeh equation was utilized to determine total sleep time, sleep efficiency, number of awakenings, and sleep latency. The data below are from the hip-placed accelerometer. **Results:** Total sleep time (TST) in the morning exercise group was 7.38±1.54 hrs during the exercise condition and 7.71±1.63 hrs during the non-exercise condition ( $p=0.44$ ). TST in the evening exercise group was 7.65±1.38 hrs during the exercise condition and 7.25±2.32 hrs during the non-exercise condition ( $p=0.22$ ). The group\*condition interaction was not significant for TST ( $F=0.78$ ;  $p=0.38$ ) or other sleep outcomes ( $p>0.17$ ). There was not a main effect of exercise for any sleep outcome ( $p>0.49$ ). Results were not different using the wrist accelerometer data. **Conclusion:** When examined experimentally, a 45-minute bout of exercise either in the morning or evening did not influence accelerometer-determined sleep outcomes positively or negatively.

105 Board #3 June 1, 9:30 AM - 11:30 AM  
**Physical Activity Mediates the Relationship Between Sleep Quality and Vascular Health in Older Adults**

Kayla M. Nunemacher, Jacqueline A. Augustine, Wesley K. Lefferts, Tiago V. Barreira, Kevin S. Heffernan. Syracuse University, Syracuse, NY. (Sponsor: Bo Fernhall, FACSM)  
 (No relationships reported)

Stiffening of the arterial wall with advancing age increases risk for cardiovascular disease. Optimal sleep quality is correlated with lower arterial stiffness. Sleep quality decreases with age which may negatively impact vascular health. It is unclear if there is a direct relationship between arterial stiffness and sleep quality in older adults, and if the relation is mediated by other lifestyle factors such as physical activity (PA). **PURPOSE:** To evaluate PA as a mediating factor in the relationship between sleep quality and arterial stiffness in older adults. **METHODS:** Seventy-five older adults (mean age 68 ± 6 years, body mass 74.2 ± 15 kg, 40 female) participated in the study. Body fat was assessed using air displacement plethysmography. Central artery stiffness was assessed as carotid-femoral pulse wave velocity (PWV) using applanation tonometry, and brachial systolic and diastolic blood pressure were assessed using an automated oscillometric brachial cuff. Self-reported sleep quality was assessed using the Pittsburgh Sleep Quality Index. PA was measured using an accelerometer worn around the waist and expressed as total activity counts. The accelerometer was

worn for at least 3 days (mean wear  $4.92 \pm 1.5$  days). **RESULTS:** When separating participants into low and high sleep quality index using cluster analysis, those with higher sleep quality index (indicating poor sleep quality) had higher PWV ( $11.0 \pm 2.7$  vs  $9.4 \pm 2.4$  m/s,  $p < 0.05$ ) and lower total activity counts ( $184,129 \pm 95,322$  vs  $275,726 \pm 164,323$  counts/day,  $p < 0.05$ ) compared to participants with lower sleep quality index. After co-varying for sex, body fat, and mean arterial pressure, higher sleep quality index was associated with lower total activity counts ( $\beta = -0.22$ ,  $p < 0.05$ ) and higher PWV ( $\beta = 0.29$ ,  $p < 0.05$ ). The significant association between sleep quality index and PWV was attenuated when the indirect effect of total activity counts on PWV ( $\beta = -0.27$ ,  $p < 0.05$ ) was statistically removed using mediation analysis ( $\beta = 0.23$ ,  $p > 0.05$ ). **CONCLUSION:** PA may have a mediating effect, in part, on the relationship between sleep quality and arterial stiffness in older adults. Whether higher PA contributes to better sleep quality or *vice versa* requires further study.  
Supported by: The Dairy Research Institute Grant 1154 (KSH) and NIH NIA P30 AG0344645 05 (KSH).

106 Board #4 June 1, 9:30 AM - 11:30 AM  
**Validity of Wearable Fitness Trackers on Sleep Measure**

Alyssa K. Keill, Hyun-Sung An, Danae M. Dinkel, Jung-Min Lee. *University of Nebraska at Omaha, Omaha, NE.*  
(No relationships reported)

Sleep and its effect on an individual's health is becoming recognized as an important aspect of preventative care for many chronic diseases. Wearable trackers that detect sleep offer users a way to track their sleep quality and patterns. However, no studies have tested the validity of these trackers on sleep measure. **PURPOSE:** To examine the validity of wearable fitness trackers for estimating total sleep time (TST) with respect to a sleep log as a reference measure. **METHODS:** Nineteen healthy individuals (mean  $\pm$  SD; age =  $29.5 \pm 13.4$  years; body mass index =  $25.87 \pm 5.03$  kg/m<sup>2</sup>) participated in the study. Participants randomly assigned to one of two groups. Group 1 ( $n=10$ ) wore the BodyMedia SenseWear Mini Armband (SWA), Basis Peak (BP), and Fitbit Charge HR (FB). Group 2 ( $n=9$ ) wore the ActiGraph Sleep (AG), Jawbone UP3 (JU), and Garmin Vivosmart (GV). Trackers were worn on the non-dominant wrist for one night and a sleep log was completed. Two existing sleep algorithms for the AG (Sadeh and Cole-Kripke) and Fitbit sleep sensitive algorithm were also included for comparison. Pearson correlation was used to examine the linearity of mean TST minutes (TSTM) from each tracker compared to the log TSTM. Mean absolute percentage errors (MAPE) of TSTM from each tracker were calculated against the log TSTM. Lastly, mean differences in average TST between the trackers were examined by a general linear model for repeated measures. **RESULTS:** Pearson correlation coefficients were .32, .69, .24, and -.26 for the SWA, FB, and FBs with regard to log TSTM, respectively. Group 2 correlations between the log TSTM and Sadeh, Cole-Kripke, JU, and GV were .34, .65, .54, and .92, respectively. MAPE were 17.1%, 16.3%, 40.2%, and 32.9% for SWA, FB, FBs, and BP, respectively. MAPE of 17.0%, 11.5%, 14.9%, and 10% were observed for Sadeh, Cole-Kripke, JU, and GV, respectively. Bland-Altman Plots showed no systematic bias between all variables for TST compared with log TSTM. ANOVA and post-hoc analysis revealed a significant difference in the Fitbit sensitive TST ( $p=.001$ ) in Group 1 ( $F(5, 51) = 8.06$ ,  $p=.00$ ) and no significant difference between Group 2 ( $F(4, 40) = 1.27$ ,  $p=.296$ ). **CONCLUSION:** The FB, Cole-Kripke, JU, and GV display the closest estimation of TST compared with log TST minutes. However, further research is needed to validate these monitors with polysomnography.

107 Board #5 June 1, 9:30 AM - 11:30 AM  
**Associations Between Sleep and Changes in Activity and Barriers to Healthy Eating Following a 12-month Behavioral Weight Loss Intervention**

Christopher E. Kline, Patrick J. Strollo, Eileen R. Chasens, Bonny Rockette-Wagner, Andrea M. Kriska, Christopher C. Imes, Susan M. Sereika, Lora E. Burke. *University of Pittsburgh, Pittsburgh, PA.*  
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(No relationships reported)

Physical activity and eating behaviors are often targeted for modification in behavioral weight loss interventions. However, whether sleep is related to the extent to which these behaviors change in weight loss interventions is unknown.

**Purpose:** To examine whether baseline sleep and changes in sleep are related to changes in physical activity (PA) and barriers to healthy eating in a behavioral weight loss intervention.

**Methods:** A sample of 117 adults ( $51.4 \pm 9.9$  y,  $33.9 \pm 4.5$  kg/m<sup>2</sup>) participated in a 12-month weight loss intervention. Sleep was assessed objectively at baseline and 12 mo with approximately 7 d of actigraphy (Philips Actiwatch 2). Measures included wakefulness after sleep onset (WASO; time spent awake after sleep onset) and total sleep time (TST; total time asleep). Subjective sleep quality was assessed with the Pittsburgh Sleep Quality Index. At baseline and 12 mo, PA was assessed with approximately 7 d of waist accelerometry (ActiGraph GT3x) and perceived barriers to healthy eating

were assessed with the Barriers to Healthy Eating (BHE) questionnaire. Multiple linear regression models assessed the influence of sleep (baseline, 12-mo change) on 12-mo changes in PA and BHE scores after adjusting for age, sex, and race.

**Results:** Baseline WASO and TST were  $37.2 \pm 14.9$  min and  $399.8 \pm 51.7$  min per night, respectively; baseline PSQI score was  $6.4 \pm 3.5$ . At 12 mo relative to baseline, time spent sedentary decreased by  $40.9 \pm 78.0$  min/day, time spent in moderate to vigorous PA (MVPA) increased by  $5.5 \pm 14.3$  min/day, and BHE scores decreased by  $8.9 \pm 14.4$ . Worse baseline WASO and TST were associated with less reduction in sedentary time at 12 mo ( $\beta=.20$  [ $P=.04$ ] and  $\beta=-.25$  [ $P<.01$ ], respectively), whereas greater baseline WASO was associated with a smaller 12-mo increase in MVPA ( $\beta=-.23$ ,  $P=.01$ ). Increased TST from baseline to 12 mo was associated with a greater reduction in sedentary time ( $\beta=-.19$ ,  $P=.04$ ). Greater baseline WASO was associated with lower improvement in BHE scores ( $\beta=.25$ ,  $P<.01$ ), and improved sleep quality from baseline to 12 mo was associated with greater reduction in BHE scores ( $\beta=.18$ ,  $P<.05$ ). **Conclusion:** Baseline sleep and changes in sleep were associated with changes in PA and BHE during a lifestyle intervention. Sleep may be an important determinant of changes in PA and eating behaviors when attempting weight loss.

108 Board #6 June 1, 9:30 AM - 11:30 AM  
**Effects Of An Increased Exercise Program On Sleep In Elderly People**

Yoshinori Kitabatake. *Saitama Prefectural University, Koshigaya, Japan.*  
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(No relationships reported)

Sleep disorders have been reported as a risk factor for mortality, coronary heart disease, hypertension, obesity, diabetes, depression, and dementia. The acquisition of quality sleep is considered useful for the prevention of Non-Communicable Disease as well as the prevention of sleep disorders. It is our hypothesis that sleep can be induced by light fatigue from physical activity during daytime. Previous studies reported that exercise as non-drug therapy is effective as a means of preventing a sleep disorder. But exercise intensity using an exercise program is too strong in gray-zone Japanese people. **PURPOSE:** To examine the effect of an exercise program on sleep in elderly people. **METHODS:** Fifty-one subjects met the inclusion criteria for this study. We recommended that these subjects participate in a sleep seminar. These subjects were assigned to intervention (exercise  $n=26$ ) or control ( $n=25$ ) groups (randomized control trial). The exercise program consisted of an increase in physical activity for 10 minutes more than the activity amount of their former daily life as well as a lecture on sleep. The subjects were encouraged to perform physical activity at home every day. The control group attended a seminar lecture. The seminar was held every week (90 minutes per seminar). The study period was 4-weeks. Sleep condition was examined using the Pittsburgh sleep quality index (PSQI). Two-way analysis of variables was used to examine intervention effects on sleep. **RESULTS:** The rate of compliance with this program was 92% in the intervention group and 84% in the control group. The average attendance rate at the seminars was 94% in the intervention group and 96% in the control group. The PSQI score was 9.7 before and 9.0 after in the intervention group, and 9.2 before and 7.4 after in the control group. The interaction was not significant between the intervention group and the control group. **CONCLUSIONS:** The intervention program had high participation, but there were not so many positive results. In conclusion, our study did not confirm our hypothesis. We expected that satisfying sleep would be obtained in the intervention program, but this was not the case. However, we suggested that our expected result could be achieved with an increase in the exercise program's duration and intensity.

109 Board #7 June 1, 9:30 AM - 11:30 AM  
**Concurrent Associations Of Physical Activity And Screen-based Sedentary Behaviors On Sleep Duration Among Us Adolescents: A Latent Class Analysis Approach**

Youngeok Kim, Masataka Umeda, Marc Lochbaum, Steven Stegemeier. *Texas Tech University, Lubbock, TX.*  
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(No relationships reported)

Adolescence is a vulnerable period for experiencing insufficient sleep due to puberty-related changes in circadian rhythm and increasing sleep deprivation during school days. Physical activity (PA) and sedentary behaviors (SB) are well-documented, modifiable sleep hygiene behaviors independently associated with sleep duration; however, scarce data are available regarding their concurrent associations in adolescents. **PURPOSE:**

This study examined the concurrent associations of PA and screen-based SB on sleep duration in US adolescents using a latent class analysis (LCA) approach.

**METHODS:**

A total of 11,204 adolescents who participated in the 2013 Youth Risk Behavior Survey were analyzed. The outcome variables of interest included self-reported PA regarding 1) moderate and vigorous-intensity PA  $\geq 60$  minutes/day; 2) sport team participation

≥ 1 per year; and 3) muscle-strengthening exercise ≥ 3 days/week; and self-reported screen-based SB regarding 4) watching TV ≥ 3 hours/day; and 5) using a computer/playing video games ≥ 3 hours/day. Self-reported sleep durations on average school nights was obtained to determine the sufficient sleep (≥8 hours). A LCA model was developed 1) to identify the latent subgroups with varying response probabilities of each PA and screen-based SB items; and 2) to examine the associations of latent subgroups with likelihood of having sufficient sleep.

**RESULTS:**

Four latent subgroups with varying levels of PA and screen-based SB were identified. Using the estimated response probability ≥ .50 as a threshold to determine 'High' level of respective PA and screen-based SB items, four latent subgroups were characterized as the High PA/Low SB (26.06%), High PA/High SB (23.23%), Low PA/Low SB (29.41%), and Low PA/High SB (21.29%). The likelihoods of having sufficient sleep was greater for the High PA/Low SB when comparing to the High PA/High SB (OR = 1.51) and Low PA/Low SB (OR = 1.49), whereas no difference was found when comparing to the Low PA/High SB.

**CONCLUSIONS:**

The results demonstrated the complexity of concurrent associations of PA and screen-based SB with sleep duration in adolescents. However, the findings generally implied that increasing PA and reducing screen-based SB would yield greater likelihood of having sufficient sleep in this population.

110 Board #8 June 1, 9:30 AM - 11:30 AM  
**The Relationship between Sleep Quantity and Quality and Cardiovascular Disease Risk Factors in Children**  
 Caroline T. Case. *University of New England, Biddeford, ME.*  
*(No relationships reported)*

Duration of sleep has been declining over the past two decades in both adults and children which has paralleled the rise in obesity in our society along with other negative health outcomes. The threshold in which we observe negative health outcomes based on quantity (total sleep time (TST)) and quality (number of sleep interruptions (NSI) and total sleep interruption time (TSIT)) is not clearly understood in children. **PURPOSE:** The purpose of this study was twofold- 1) determine if children have a greater overall cardiovascular (CV) risk profile with decreased sleep duration and quality, and 2) determine if there is a threshold point where sleep quantity and quality is associated with an increased CV risk profile. **METHODS:** Four hundred and seventy six fourth grade students from the Cardiovascular Health Intervention Program went through a CV risk factor analysis (256 females, 219 males, mean age 9.2(years), height 142(cm) and weight 38(kg)). Participants completed a fasting blood lipid and glucose profile, height, weight, grip strength, resting blood pressure and 20m Pacer test. Sleep data was collected using an Actigraph GT3X accelerometer wrist band that was measured for 5 days and measured TST, NSI, and TSIT. Sleep quantity and sleep quality were compared to each individual CV assessment listed above and total CV risk factors. **RESULTS:** TST was inversely related to BMI (p<.05), percent body fat (p<.01), NSI (p<.001) and TSIT (p<.0001). Number of interruptions was inversely related to total sleep time (p<.007) and TSIT was positively related to BMI (p<.002), waist circumference (p<.0001), percent body fat (p<.003), TSIT (p<.000) and NSI (p<.001). When analyzing the sleep thresholds for CV risk we observed that those who slept 8-9 hours had a lower percent body fat versus sleeping <8 hours (p8 hours (p9 hours also had the greatest TSIT (p<.02) **CONCLUSION:** Based on the sleep data, the best range of TST for children is 8-9 hours per night. Students who slept 8-9 hours had the lowest risk factor values compared to those who slept 9 hours. Funding was provided by the Clark Charitable Foundation

**A-29 Thematic Poster - VO2 Kinetics**

Wednesday, June 1, 2016, 9:30 AM - 11:30 AM  
 Room: 104

111 **Chair:** John M. Kowalchuk. *University of Western Ontario, London, ON, Canada.*  
*(No relationships reported)*

112 Board #1 June 1, 9:30 AM - 11:30 AM  
**Chronic Omega-3 Fatty Acid Supplementation And Oxygen Uptake Kinetics During Heavy Exercise**  
 Chad C. Wiggins, Shane A. Bielko, Allison J. Campbell, Timothy D. Mickleborough, FACSM, Robert F. Chapman, FACSM. *Indiana University, Bloomington, IN.* (Sponsor: Robert F. Chapman, FACSM)  
 Email: chcwigg@indiana.edu  
*(No relationships reported)*

**PURPOSE:** To examine the effects 6 weeks of chronic omega-3 fatty acid (O3FA) supplementation (3 g EPA, 2 g DHA) on oxygen uptake and muscle extraction

kinetics during constant load cycling in normoxic and normobaric hypoxic conditions.

**METHODS:** 13 endurance trained cyclists were divided into two groups, O3FA (n = 6, VO<sub>2,max</sub> = 60.2 ± 4.5 ml·kg<sup>-1</sup>·min<sup>-1</sup>), and placebo (n= 7, VO<sub>2,max</sub> = 66.2 ± 4.1 ml·kg<sup>-1</sup>·min<sup>-1</sup>). Subjects completed an incremental exercise protocol to determine maximal oxygen consumption and maximal power output on a magnetically-braked cycle ergometer. In subsequent sessions, subjects completed three minutes of a constant load cycling test at 75% of normoxic peak power at simulated altitude (F<sub>I</sub>O<sub>2</sub> = 15.0%) and at sea-level (F<sub>I</sub>O<sub>2</sub> = 20.9%), prior to 6 weeks of supplementation (baseline) with either O3FA or placebo. Following supplementation, subjects repeated the normoxic and hypoxic constant-load cycle exercise bouts. Breath-by-breath VO<sub>2</sub> was measured continuously, and skeletal muscle deoxygenation (deoxygenated hemoglobin+myoglobin [HHb] via near-infrared spectroscopy [NIRS]) were measured. Kinetic time constant was calculated as time to 63% of primary component response (HHb-τ<sub>1</sub> and VO<sub>2</sub>-τ<sub>1</sub>). **RESULTS:** Chronic O3FA supplementation improved the VO<sub>2</sub> uptake response time (VO<sub>2</sub>-τ<sub>1</sub> = 21.3 ± 6.4s post-supplementation; 31.6 ± 6.2s pre-supplementation; p < 0.05) during exercise in normoxia, with no changes in the placebo group pre- to post-supplementation. VO<sub>2</sub> primary component amplitude was lower in the O3FA group (3.19 ± 0.60 L/min post-supplementation; 3.44 ± 0.60 L/min pre-supplementation; p < 0.05) in normoxia, following supplementation. There were no significant differences in any of the [HHb] parameters during normoxic exercise in either group. There were no significant differences in any of the [HHb] or VO<sub>2</sub> parameters during hypoxic exercise between pre- and post-supplementation in either group. **CONCLUSION:** 6 weeks of O3FA supplementation is beneficial in improving oxygen uptake kinetics during heavy exercise in normoxic conditions, thus may lead to improvements in exercise tolerance to constant heavy load exercise. However, no improvements were seen in [HHb] or oxygen uptake kinetics in hypoxia following O3FA supplementation.

113 Board #2 June 1, 9:30 AM - 11:30 AM  
**Effects Of Endurance Training On Muscular V'O2 Kinetics In Type 2 Diabetes Patients**  
 Jessica Koschate, Uwe Drescher, Christian Brinkmann, Uwe Hoffmann. *German Sport University, Cologne, Germany.*  
 Email: j.koschate@dshs-koeln.de  
*(No relationships reported)*

**PURPOSE:** Maximal V'O<sub>2</sub> is known to increase with endurance exercise interventions. Recently, a method has been developed to assess muscular V'O<sub>2</sub> (V'O<sub>2,musc</sub>) kinetics from heart rate (HR) and pulmonary V'O<sub>2</sub> responses to work rate changes, which allows a better differentiation between cardiovascular system and muscular metabolism. Cardiorespiratory kinetics were analyzed in type 2 diabetes subjects before and after an endurance exercise intervention. **METHODS:** 9 male subjects (61 ± 9 years, 33 ± 5 kg·m<sup>-2</sup>) were tested for peak V'O<sub>2</sub> (V'O<sub>2,peak</sub>), glycemic parameters and cardiorespiratory kinetics using pseudo randomized binary work rate changes (30/80 W). To estimate V'O<sub>2,musc</sub> and cardiorespiratory kinetics, the method of Hoffmann et al. (2013) was applied. Kinetics were summarized by maximum of cross correlation functions (CCF<sub>max</sub>) and equivalents of time constants. Two pre-tests (Pre I, Pre II) within a 4 week period and a post-test after 12 weeks of endurance training were performed. Differences between the tests were analyzed via a two factorial ANOVA. P<= 0.05 was considered significant. **RESULTS:** Table 1 shows the results of Pre I, Pre II and Post tests (mean ± SD, \* significantly different from Post). **CONCLUSION:** Endurance training improves both, V'O<sub>2,musc</sub> and heart rate kinetics in type 2 diabetes patients. This was in accordance with the increase in V'O<sub>2,peak</sub>. In contrast, no changes in glycemic parameters could be observed. V'O<sub>2,musc</sub> kinetics, assessed via moderate WR changes and independent of motivation, can be seen as an indicator for cardiorespiratory fitness and might be useful to measure increases in cardiorespiratory regulation.

| Time   | V'O <sub>2,peak</sub> [ml·m <sup>-1</sup> ·kg <sup>-1</sup> ] | HbA <sub>1c</sub> [%] | CCF <sub>max</sub> (HR) [a.u.] | Time constant HR [s] | CCF <sub>max</sub> (V'O <sub>2,musc</sub> ) [a.u.] | Time constant V'O <sub>2,musc</sub> [s] |
|--------|---|-----------------------|--------------------------------|----------------------|--|---|
| Pre I  | 23.2 ± 3.4*   | 7.6 ± 1.5             | 0.23 ± 0.03*                   | 74                   | 0.29 ± 0.03*                                       | 50                                      |
| Pre II | 24.2 ± 4.2*   | 7.2 ± 2.2             | 0.25 ± 0.05                    | 70                   | 0.32 ± 0.09  | 49                                      |
| Post   | 28.0 ± 5.6  | 6.9 ± 0.6             | 0.26 ± 0.03                    | 59                   | 0.37 ± 0.10  | 39                                      |

Reference: Hoffmann et al. (2013); EJAP, 113:1745-1754.

114 Board #3 June 1, 9:30 AM - 11:30 AM

**Effect of Blood Flow Restricted Cycle Training on Oxygen uptake kinetics during Exercise**Norio Hotta<sup>1</sup>, Hisayoshi Ogata<sup>1</sup>, Takaharu Kondo<sup>1</sup>, Koji Ishida<sup>2</sup>, Michael R. Kushnick<sup>3</sup>. <sup>1</sup>Chubu university, Kasugai, Japan. <sup>2</sup>Nagoya University, Nagoya, Japan. <sup>3</sup>Ohio University, Athens, OH.

(No relationships reported)

A number of studies have illustrated that blood flow restricted (BFR) resistance training increasing muscle function even when low-intensity training is utilized. Recently BFR has also applied to aerobic training; however less is known about the effect of aerobic training with BFR on the oxygen uptake (VO<sub>2</sub>) kinetic responses during exercise with or without BFR.

**PURPOSE:** To elucidate the effects of 8-weeks cycle training with BFR on VO<sub>2</sub> kinetics at the onset of constant-load cycle exercise with or without BFR. **METHODS:** Eighteen healthy subjects were randomly assigned to BFR (n = 9; 22±5 yrs) or no BFR group serving as the control (CON; n = 9; 21±2 yrs). Both groups trained for 30 minutes, 3 days/week for 8 weeks. BFR was performed for 5 minutes every 10 minutes by applying cuffs to the upper thighs. Breath-by-breath VO<sub>2</sub> was measured during the performance of 5-min moderate intensity (below the lactate threshold) or 6-min heavy intensity exercise (above the lactate threshold) without BFR at Pre-, 4 weeks after (Mid-), and Post-training. At Post, we also measured VO<sub>2</sub> kinetics during exercise with BFR (Post+BFR). Two-way repeated ANOVAs were used (BFR vs CON and Pre vs Mid vs Post vs Post+BFR) with significance accepted as p<0.05; and Tukey's post hoc tests utilized as needed. **RESULTS:** Although time constant ( $\tau$ ) of VO<sub>2</sub> kinetics at the fast component during moderate exercise fitted the exponential model was significantly faster in Mid and Post than that of Pre (26.8 to 16.3 and 15.5 s and 27.5 to 22.1 and 18.5 s in BFR and CON, p<0.05, respectively), significant group-by-time interaction was not detected. The amplitude of the VO<sub>2</sub> slow component during heavy exercise significantly decreased in Mid and Post than that of Pre (281 to 103 and 128 mL/min and 300 to 154 and 160 mL/min in BFR and CON, p<0.05, respectively), while a significant group-by-time interaction was not detected. Both  $\tau$  of VO<sub>2</sub> kinetics during moderate exercise and the amplitude of the VO<sub>2</sub> slow component during heavy exercise significantly increased from Post to Post+BFR (19.1 and 28.0 s, and 266 and 256 mL/min in BFR and CON, p<0.05, respectively); however significant group-by-time interactions were not detected either. **CONCLUSION:** Applying the BFR to eight-weeks cycle training showed no further change in VO<sub>2</sub> kinetics at the onset of exercise.

Supported by KAKENHI (23700788)

115 Board #4 June 1, 9:30 AM - 11:30 AM

**Effects Of Locomotor Training On Vo<sub>2</sub> On-kinetics In Persons With Incomplete Spinal Cord Injury**Jared M. Gollie, Jeffrey E. Herrick, Gino S. Panza, Lisa M.K. Chin, Andrew A. Guccione. *George Mason University, Fairfax, VA.* (Sponsor: Randall Keyser, FACSM)  
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(No relationships reported)

Incomplete spinal cord injury (iSCI) may result in gait abnormalities and prolonged oxygen uptake transitions at the onset of walking (VO<sub>2</sub> on-kinetics). Locomotor training (LT) has been shown to improve gait performance in some individuals with iSCI but the effect of LT on the associated VO<sub>2</sub> on-kinetics is not understood. **PURPOSE:** This pilot study investigated the effects of 15-weeks of LT on VO<sub>2</sub> on-kinetics in adults with iSCI. We hypothesized that LT, when performed solely under volitional control and full-weight bearing, would speed VO<sub>2</sub> on-kinetics.

**METHODS:** Three adult males with iSCI (age: 25.3±8.7 yrs; BMI: 24.0±5.7 kg/m<sup>2</sup>) completed 15-weeks of task-specific LT (two 90 minute sessions per week) which consisted of structured routines and movement drills based on components of the gait cycle. Each participant performed a 6-minute constant work-rate treadmill test at a self-selected walking speed prior to and immediately following the 15-week LT regimen. VO<sub>2</sub> on-kinetics was determined using a mono-exponential model in which a time constant ( $\tau$ ) was calculated during phase 2 of the biphasic kinetic response and amplitude (AMP) was measured at the end of 6 minutes of walking. The transition constant (K $\tau$ ) was calculated as the AMP/ $\tau$  ratio. Heart rate (HR) was monitored using an electrocardiogram and averaged over the last 30-seconds of the exercise bout. Effect size was calculated using Cohen's d (d).

**RESULTS:** After LT, faster VO<sub>2</sub> on-kinetics was observed (pre: 33±7s; post: 25±7s; d=1.14), with smaller AMP (490±32 mL/min; post: 430±52 mL/min; d=1.39) and end-exercise HR response (pre: 113±6 bpm; post: 106±10 bpm; d=0.85). An increase in K $\tau$  (pre: 15.5±4.9 mL/min/sec; post: 18.1±4.3 mL/min/sec; d=0.56) was also noted.

**CONCLUSIONS:** Completion of the LT program appeared to result in an improvement in VO<sub>2</sub> on-kinetics during treadmill walking in these subjects with iSCI. After LT,  $\tau$  appeared to be similar to that typically observed in non-injured individuals during self-selected walking.

116 Board #5 June 1, 9:30 AM - 11:30 AM

**Modeling and Predicting Oxygen Uptake Dynamics in Response to Transient Exercise Intensities During Cycling**Michael J. Mazzoleni<sup>1</sup>, Claudio L. Battaglini, FACSM<sup>2</sup>, Kerry J. Martin<sup>2</sup>, Erin M. Coffman<sup>2</sup>, Brian P. Mann<sup>1</sup>. <sup>1</sup>Duke University, Durham, NC. <sup>2</sup>University of North Carolina at Chapel Hill, Chapel Hill, NC. (Sponsor: Claudio Battaglini, FACSM)  
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(No relationships reported)

Current methods for modeling and predicting oxygen uptake (VO<sub>2</sub>) dynamics often assume a linear relationship between exercise intensity and VO<sub>2</sub> and typically rely on steady state measurements and population-specific equations. However, in reality VO<sub>2</sub> has a nonlinear response to exercise intensity and is also highly dependent on the personal physiology of an individual.

**PURPOSE:** The aim of this study was to develop a nonlinear dynamical systems model for predicting person-specific VO<sub>2</sub> dynamics in response to transient exercise intensities during cycling. **METHODS:** A nonlinear mathematical model for VO<sub>2</sub> dynamics was derived using dynamical systems theory. To validate the model, VO<sub>2</sub> data was collected from four regularly exercising healthy adult males (age: 23.5 ± 3.0 years; height: 184 ± 14 cm; body mass: 86.9 ± 12.3 kg) during a fifty minute bout of cycling on an electric-braked cycle ergometer in the laboratory. The testing protocol for the cycling bout was designed to challenge the predictive capabilities of the model and the participants therefore abruptly changed their power outputs and cadences throughout the tests, which resulted in significant transient fluctuations in their VO<sub>2</sub> responses. The model parameters for each participant were then determined using a heuristic parameter estimation technique, and the model was then used to predict the VO<sub>2</sub> response of each participant over the course of the entire exercise bout to make comparisons with the experimental data. **RESULTS:** The model predictions were able to match the experimental VO<sub>2</sub> data for each of the participants with a high degree of accuracy (R<sup>2</sup> = 0.92 ± 0.04). **CONCLUSION:** These results suggest that person-specific VO<sub>2</sub> dynamics can be accurately modeled and predicted during cycling by utilizing dynamical systems theory.

Supported by the ARO through an NDSEG Fellowship.

117 Board #6 June 1, 9:30 AM - 11:30 AM

**Greater Vo<sub>2peak</sub> Is Associated With Deoxygenation Amplitude, But Not Deoxygenation Kinetics, Across The Active Muscles**Dai Okushima<sup>1</sup>, David C. Poole, FACSM<sup>2</sup>, Thomas J. Barstow, FACSM<sup>2</sup>, Harry B. Rossiter, FACSM<sup>3</sup>, T. Scott Bowen<sup>4</sup>, Tatsuro Amano<sup>5</sup>, Narihiko Kondo<sup>5</sup>, Shunsaku Koga<sup>1</sup>. <sup>1</sup>Kobe Design University, Kobe, Japan. <sup>2</sup>Kansas State University, Manhattan, KS. <sup>3</sup>Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center, Torrance, CA. <sup>4</sup>Leipzig University, Leipzig, Germany. <sup>5</sup>Kobe University, Kobe, Japan.

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(No relationships reported)

It is axiomatic that individuals with a greater peak O<sub>2</sub> uptake (Vo<sub>2peak</sub>) sustain greater perfusive and diffusive O<sub>2</sub> conductance across the active musculature *in toto*. However, it is unclear how these O<sub>2</sub> conductances are regulated among knee extensor muscles that are spatially heterogeneous in blood flow, fiber type, and motor unit recruitment, in individuals whom vary in Vo<sub>2peak</sub>.

**PURPOSE:** Using quantitative near infrared spectroscopy (NIRS) from rest to maximal exercise, we tested the hypotheses that with greater Vo<sub>2peak</sub> the *vastus lateralis* (VL) and *rectus femoris* (RF) muscles would evince: 1) a greater increase in deoxyhemoglobin concentration ([HHb], an index of O<sub>2</sub> extraction) and [hemoglobin] ([tHb], an index of diffusive O<sub>2</sub> potential); and 2) a right-shift in the [HHb] half-time ( $f_{50}$ , an index of relative perfusion); together suggesting that a greater aerobic capacity is associated with improvements in both perfusive and diffusive O<sub>2</sub> transport.

**METHODS:** 22 healthy subjects completed ramp incremental cycling exercise (20 W·min<sup>-1</sup>) to the limit of tolerance. Pulmonary Vo<sub>2</sub> was measured breath-by-breath. [HHb] and [tHb] were quantified in the VL and RF by time-resolved NIRS. Each NIRS profile was modeled with a sigmoid ( $y = B + A / [1 + \exp^{-c(x-d)}]$ ), B is baseline, A is amplitude, c is a constant dependent on d, d is the slope of the sigmoid, and  $f_{50} = c/d$ .

**RESULTS:** Vo<sub>2peak</sub> ranged from 37.7 to 66.4 ml·kg<sup>-1</sup>·min<sup>-1</sup>. Vo<sub>2peak</sub> was associated with the exercise-induced increase in [HHb] for both muscles (VL, r = 0.432; RF, r = 0.529; P < 0.05), and exercise-related increase in [tHb] for RF (r = 0.473, P < 0.05). However, Vo<sub>2peak</sub> did not correlate with  $f_{50}$  for [HHb].

**CONCLUSIONS:** As expected, greater Vo<sub>2peak</sub> during cycling was achieved, in part, via an increased capacity for O<sub>2</sub> extraction in the knee extensors reflected in the greater amplitude for [HHb]. However, a greater capacity for diffusive O<sub>2</sub> conductance (increase in [tHb]) to support increased O<sub>2</sub> exchange, only related to Vo<sub>2peak</sub> in the RF muscle. These results support that a greater Vo<sub>2peak</sub> requires an increase in the maximal

capacity for O<sub>2</sub> conductance across the active musculature, while a regional change in the kinetics of O<sub>2</sub> conductance at a given submaximal relative work rate is not an obligatory adaptation.

Supported by JSPS-15K16476, 24247046, 26560362

118 Board #7 June 1, 9:30 AM - 11:30 AM  
**The Effects of Gait Retraining on Oxygen Consumption and Carbohydrate Metabolism**

Jenevieve L. Roper<sup>1</sup>, Elizabeth M. Harding<sup>2</sup>, Deborah Doerfler<sup>2</sup>, James G. Dexter<sup>2</sup>, Len Kravitz<sup>2</sup>, Janet S. Dufek, FACSM<sup>3</sup>, Christine M. Mermier<sup>2</sup>. <sup>1</sup>California State University San Bernardino, San Bernardino, CA. <sup>2</sup>University of New Mexico, Albuquerque, NM. <sup>3</sup>University of Nevada, Las Vegas, Las Vegas, NV. (Sponsor: Janet S. Dufek, FACSM)  
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(No relationships reported)

Gait retraining is an emerging method of managing running-related injuries, including patellofemoral pain (PFP). However, as a result of an unnatural running pattern, it is possible that gait retraining can affect running economy. **PURPOSE:** The purpose of this study was to determine whether gait retraining by modifying footstrike patterns from rearfoot strike (RFS) to forefoot strike (FFS) increased running economy and heart rate immediately post-retraining and one month post-retraining. **METHODS:** Sixteen subjects (n=16) received clearance to participate by a licensed physical therapist, and were randomly placed in the control (n=8) or experimental (n=8) group. Subsequently, the experimental group (EXP) performed eight gait retraining running sessions where footstrike pattern was switched from RFS to FFS, while the control group (CTL) performed eight running sessions with no intervention. Running economy (VO<sub>2</sub>), respiratory exchange ratio (RER), and heart rate (HR) were recorded during pre-, post-, and one-month post-running trials. **RESULTS:** There were no significant differences for VO<sub>2</sub> (p=0.26), RER (p=0.258), or HR (p=0.248) between the groups as a result of retraining. Specifically, the average changes from pre-training to one-month post-retraining for CTL and EXP, respectively, were 0.03 ml/kg/min and 2.29 ml/kg/min for VO<sub>2</sub>, 0.01 and 0.03 for RER, and -3 bpm and 12 bpm for HR. **CONCLUSION:** Retraining from RFS to FFS did not increase running economy one-month post-retraining.

119 Board #8 June 1, 9:30 AM - 11:30 AM  
**Metabolic Responses to Whole-Body Vibration Varying in Frequency and Amplitude**

Jie Kang, FACSM, Tara Porfido, Craig Ismaili, Soraya Selamie, Jill A. Bush, FACSM, Nicholas A. Ratamess, Avery D. Faigenbaum, FACSM. *The College of New Jersey, Ewing, NJ.*  
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(No relationships reported)

Whole-body vibration (WBV) has been shown to provide neurological potentiation, thereby enhancing muscular activity. To date, how WBV might influence energy metabolism has not been fully elucidated. **PURPOSE:** This study was undertaken to assess the effect of various vibratory loads on metabolic responses during WBV and subsequent aerobic exercise. **METHODS:** Sixteen subjects (21.0±2 yr) including eight men and eight women underwent six WBV sessions that differed in frequency (e.g., 30-Hz, 40-Hz, and 50-Hz) and amplitude (e.g., 1-2 mm and 2-3 mm) in a randomized order. In each WBV session, subjects performed 10 sets of 10 body weight squats with each set lasting 30 sec and 1-min rest period between sets on a vibration platform with a vibration load that represented one of the six frequency-amplitude combinations. Each vibration treatment was immediately followed by 20 min of a constant load cycle exercise at 65% VO<sub>2peak</sub>. Oxygen uptake (VO<sub>2</sub>) and respiratory exchange ratio (RER) were measured throughout WBV and subsequent exercise. The average VO<sub>2</sub> and RER of both WBV and exercise were analyzed using 2-way (frequency × amplitude) repeated measure ANOVA followed by pairwise comparisons involving Bonferroni correction. **RESULTS:** During WBV, VO<sub>2</sub> demonstrated a progressive increase as a function of vibration frequency and amplitude. A significant main effect of amplitude was observed for VO<sub>2</sub> in 1-min-1 (F=6.326, p=0.02) and ml·kg<sup>-1</sup>·min<sup>-1</sup> (F=5.497, p=0.03). The highest VO<sub>2</sub> occurred at 50-Hz and 2-3 mm (e.g., 13.1±2.4 ml·kg<sup>-1</sup>·min<sup>-1</sup>). During subsequent exercise, VO<sub>2</sub> responded similarly to that seen in WBV, and there were trends (p = 0.08-0.10) towards a greater VO<sub>2</sub> at higher frequencies or amplitudes. No effects of vibration frequency or amplitude on RER were found during either WBV or subsequent exercise. **CONCLUSIONS:** WBV can augment metabolic responses in a load-dependent manner when administered concurrently with body-weight squats. Such a stimulating effect seems to persist during aerobic exercise that commences immediately after WBV.

**A-30 Free Communication/Slide - Muscle - Molecular Biology**

Wednesday, June 1, 2016, 9:30 AM - 11:30 AM  
Room: 313

120 **Chair:** Dustin Slivka. *University of Nebraska at Omaha, Omaha, NE.*  
(No relationships reported)

121 June 1, 9:30 AM - 9:45 AM  
**Skeletal Muscle Specific Knock out of Estrogen Receptor Alpha Results in Low Strength**

Tara L. Mader<sup>1</sup>, Brittany C. Collins<sup>1</sup>, Espen E. Spangenburg<sup>2</sup>, Dawn A. Lowe, FACSM<sup>1</sup>. <sup>1</sup>University of Minnesota, Minneapolis, MN. <sup>2</sup>East Carolina University, Greenville, NC.  
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(No relationships reported)

Previous studies from our lab and others have shown that estradiol deficiency in rodents and post-menopausal women results in skeletal muscle strength deficits. There are three known estrogen receptors (ERalpha, ERbeta, and GPER30) and estrogen is known to elicit its effects through estrogen receptors in other tissues. Whole body ERalpha knockout mice exhibit metabolic disorders with little known regarding the specific role of estrogen receptor alpha in skeletal muscle.

**PURPOSE:** To identify the impact of ERalpha on skeletal muscle in vivo contractile function.

**METHODS:** ERalpha flox mice were crossed with Human Skeletal Muscle (HSA) cre mice to create a skeletal muscle specific ERalpha knockout mouse (skmERaKO). Muscle strength of the posterior crural muscles of 4-6 month female skmERaKO mice and wild type (WT) littermates was assessed in isoflurane-anesthetized mice.

**RESULTS:** There was no effect of skeletal muscle ERalpha knockout on body mass. Skeletal muscle knockout of ERalpha results in weaker muscles. Posterior crural muscles of skmERaKO mice exhibit 14% lower peak isometric torque and 16% lower peak concentric torque than skmERaWT mice (p<0.01). Additionally, higher stimulation frequencies are required to generate torque in skmERaKO mice compared to skmERaWT mice with 50% maximal torque being reached at 47 Hz for skmERaKO mice and 43 Hz for WT mice (p=0.042). Finally, power at low velocity was 15% lower in skmERaKO mice compared to skmERaWT mice (p=0.029).

**CONCLUSIONS:** ERalpha plays an important role in skeletal muscle strength. Ablation of ERalpha in skeletal muscle results in muscles that produce less torque and power.

This research was supported by NIH grant R01-AG031743 and American Diabetes Association grant (EES). TLM was supported by University of Minnesota Doctoral Dissertation Fellowship. BCC was supported by T32-AR07612.

122 June 1, 9:45 AM - 10:00 AM  
**TAK1 Is a Key Regulator of Skeletal Muscle Maintenance in Mice**

Shuichi Sato<sup>1</sup>, Sajedah M. Hindi<sup>2</sup>, Marjan M. Tajrishi<sup>2</sup>, Guangyan Xiong<sup>2</sup>, Ashok Kumar<sup>2</sup>. <sup>1</sup>University of Louisiana at Lafayette, Lafayette, LA. <sup>2</sup>University of Louisville SOM, Louisville, KY.  
(No relationships reported)

Shuichi Sato<sup>1,2</sup>, Sajedah M. Hindi<sup>2</sup>, Marjan M. Tajrishi<sup>2</sup>, Guangyan Xiong<sup>2</sup>, and Ashok Kumar<sup>2</sup>

<sup>1</sup>University of Louisiana at Lafayette, Lafayette, LA, <sup>2</sup>University of Louisville School of Medicine, Louisville, KY.

TGFβ-activated kinase 1 (TAK1), a member of the MEK kinase (MAP3K) family, has been demonstrated to be a component of signaling pathways leading to the activation of NF-κB and activator protein-1 (AP-1) in response to cytokines and growth factors. Our previous study has shown that TAK1 is a critical regulator for the proliferation and differentiation of cultured C2C12 myoblasts. However, the role of TAK1 in regulation of skeletal muscle mass has not yet been investigated. **PURPOSE:** To determine if skeletal muscle-specific deletion of TAK1 alters the skeletal muscle mass and function in adult mice. **METHODS:** Skeletal muscle-specific TAK1 knockout (TAK1<sup>md</sup>, n=5) mice were generated by crossing HSA-cre mice with floxed TAK1 (i.e. TAK1<sup>fl</sup>) mice. Tamoxifen was injected intraperitoneally to inactivate TAK1 and the mice were fed with tamoxifen-containing standard chow for the entire duration of the experiment. TAK1<sup>fl</sup> mice (n=6) were used as control. All mice were sacrificed at approximately 3 months of age and the tibialis anterior (TA) and soleus (SOL) muscles were excised for further analysis. **RESULTS:** TAK1<sup>md</sup> mice were found to have reduced body weight (14%) and TA muscle weight (10%) compared to TAK1<sup>fl</sup> mice. Mean fiber-cross sectional area (CSA) was decreased in TAK1<sup>md</sup> mice by 42% and 39% in TA and SOL muscles, respectively. TAK1<sup>md</sup> mice showed lower grip strength compared

to control mice by 39%. Genetic ablation of TAK1 in skeletal muscle significantly reduced the levels of specific muscle proteins whereas the levels of atrogin-1, poly-ubiquitinated proteins, and proteasome activity were increased. **CONCLUSION:** These data demonstrate that TAK1 is essential for maintenance of skeletal muscle in adult animals. Supported by NIH Grant AR059810 and AG029623 to AK.

123 June 1, 10:00 AM - 10:15 AM  
**The Effects of Acute Resistance Exercise on Apoptotic Signaling in Untrained Males**

Jeremy Townsend, Jeffrey R. Stout, FACSM, Adam R. Jajtner, David D. Church, Leopardo P. Oliveira, Kyle B. Beyer, Michael B. Lamonica, Joshua J. Riffe, Tyler W. Muddle, Ran Wang, Kayla B. Baker, Carleigh H. Boone, Alyssa N. Varanoske, Michael J. Redd, David H. Fukuda, Jay R. Hoffman, FACSM. *University of Central Florida, Orlando, FL.* (Sponsor: Jeffrey Stout, FACSM)

(No relationships reported)

Apoptosis, or programmed cell death, is an essential physiological process regulating cellular development and is often associated with advanced stages of inflammation and disease. However, limited research has focused on skeletal muscle apoptosis as result of exercise induced muscular trauma. **PURPOSE:** To observe the effects of an acute lower-body resistance exercise protocol and subsequent recovery on intramuscular apoptotic signaling. **METHODS:** Twenty-eight untrained males ( $22.3 \pm 3.2$  y,  $1.7 \pm 0.1$  m,  $81.1 \pm 15.5$  kg) were assigned to either a control (CON; n=11) or exercise group (EX; n=17) and completed a lower-body resistance exercise protocol consisting of the back squat, leg press, and leg extension exercise. Skeletal muscle microbiopsies were obtained from the vastus lateralis pre-exercise (PRE), 1-hour (1HR), 5-hour (5HR), and 48-hours (48HR) post-resistance exercise. Multiplex signaling assay kits (EMD Millipore, Billerica, MA, USA) were used to quantify the total protein (Caspase-3,-8,-9) or phosphorylation status of proteins (JNK, FADD, p53, BAD, Bcl-2) specific to apoptotic signaling pathways using MAGPIX® (Luminex, Austin, TX, USA). Mann Whitney U analysis was used to determine the effects of the exercise bout on intramuscular signaling. Additionally, change scores were analyzed by magnitude based inferences to determine a mechanistic interpretation. **RESULTS:** Mann-Whitney U analysis revealed that resistance exercise increased JNK phosphorylation at 1H ( $p=0.001$ ) and 5H ( $p=0.022$ ), and FADD phosphorylation at 1H ( $p=0.029$ ). No other differences observed between groups. Magnitude based inferences revealed a "Likely" increase in total Caspase 3 from PRE-5H and from PRE-48H. JNK phosphorylation was "Most Likely" increased from PRE-1H and PRE-5H and FADD was "Likely" increased from PRE-1H. BAD was "Very Likely" increased from PRE-5H and Bcl-2 was "Most Likely" increased from PRE-1H and "Likely" increased" from PRE-5H. **CONCLUSION:** These data show that apoptotic signaling is upregulated in response to a typical resistance exercise protocol, providing additional insight into the physiological mechanisms involved in skeletal muscle remodeling following resistance exercise.

124 June 1, 10:15 AM - 10:30 AM  
**Genetic Variation of The Beta-2 Adrenergic Receptor Influences Power Output in Healthy Subjects**

Eli F. Kelley<sup>1</sup>, Eric M. Snyder<sup>1</sup>, Bruce D. Johnson<sup>2</sup>. <sup>1</sup>University of Minnesota, Minneapolis, MN. <sup>2</sup>Mayo Clinic, Rochester, MN. (Sponsor: Donald Dengel, FACSM)

(No relationships reported)

**Genetic Variation of the Beta-2 Adrenergic Receptor Influences Power Output in Healthy Subjects**

Eli F. Kelley<sup>1</sup>, Bruce D. Johnson<sup>2</sup>, and Eric M. Snyder<sup>1</sup>  
<sup>1</sup>University of Minnesota, Minneapolis, MN; <sup>2</sup>Mayo Clinic, Rochester, MN  
**Background:** Muscular strength and power are important in health, disease, and with aging. With age and disease, a decrease in muscular strength and power are primary contributors to a drop in functional capacity. The beta-2 adrenergic receptors (ADRB2) are important in muscle growth and power output through increased size and gluconeogenesis. In disease models, the ADRB2 have been shown to be important in Ca<sup>2+</sup> homeostasis and cAMP accumulation in cells, both of which are important in attenuating the deterioration of muscle cell function. **Purpose:** The purpose of this study was to determine the effects of ADRB2 genotypes on muscle function (absolute power and relative power) in healthy subjects. **Methods:** To determine this, we performed genotyping of the ADRB2 (amino acid 16) and maximal exercise on 77 healthy subjects (AA = 18, AG = 25, GG = 34). **Results:** There were no differences between genotype groups in age, height, weight, or BMI (age =  $28.9 \pm 5.7$  yrs,  $27.9 \pm 5.7$  yrs,  $29.2 \pm 5.9$  yrs, height =  $170.7 \pm 8.6$  cm,  $174.9 \pm 8.7$  cm,  $173.4 \pm 9.6$  cm, weight =  $68.5 \pm 13.0$  kg,  $75.0 \pm 12.9$  kg,  $74.4 \pm 12.9$  kg, and BMI =  $23.4 \pm 3.9$ ,  $24.4 \pm 2.9$ ,  $24.7 \pm 3.4$ , for AA, AG, and GG, respectively). The genotype groups differed significantly in watts, and watts/VO<sub>2</sub> at peak exercise with a trend towards significance ( $p=0.058$ ) for watts/kg (watts =  $186.3 \pm 54.6$ ,  $237.8 \pm 54.4$ ,  $219.4 \pm 79.5$ , watts/VO<sub>2</sub> =  $0.08 \pm 0.006$ ,  $0.09 \pm 0.005$ ,  $0.08 \pm 0.006$ , and watts/kg =  $2.7 \pm 0.4$ ,  $3.2 \pm 0.5$ ,  $2.9 \pm 0.8$ , for

AA, AG, and GG, respectively). **Conclusion:** These data suggest that genetic variation of the ADRB2 may influence relative strength in healthy subjects and may become an important genetic determinant of muscular strength and functional capacity in patients with diseases that result in a loss of muscle strength.

125 June 1, 10:30 AM - 10:45 AM  
**ACTN3 Genotype Affects Change in Muscle Fiber Cross-Sectional Area from Adolescence to Adulthood**

Barbara Norman<sup>1</sup>, Maria Westerståhl<sup>1</sup>, Birgitta Glenmark<sup>2</sup>, Eva Jansson<sup>1</sup>. <sup>1</sup>Karolinska Institutet, Stockholm, Sweden. <sup>2</sup>Stockholm South General Hospital, Stockholm, Sweden.

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(No relationships reported)

**INTRODUCTION** Alpha-actinin-3 is a Z-disc protein that is expressed only in type II muscle fibers. Common null polymorphism in the ACTN3 gene (R577X) results in lack of this protein in XX-genotypes. In sprint/power oriented elite athletes the prevalence of the X-allele is much lower than in control populations. That implies that lack of alpha-actinin-3 is detrimental for these athletes but a mechanistic link is not fully established. We have previously shown that ACTN3 genotype modulates skeletal muscle hypertrophy signaling in response to sprint exercise in moderately trained subjects. **PURPOSE** To examine the impact of ACTN3 genotype on changes in fiber dimensions from adolescence to adulthood. **METHODS** 63 male and female subjects (13 XX, 29 RX, 21 RR) from the general Swedish population were studied at 16 and 27 years of age. Their physical activity level was estimated by a questionnaire. Muscle samples were obtained from vastus lateralis muscle by needle biopsy technique. The samples were analyzed histochemically for fiber types (I, IIA, IIB). Cross-sectional area (CSA) of the different fiber types was measured from histological sections by planimetry. DNA was extracted from muscle samples and the genotyping was performed by allelic discrimination. Statistical analyses of the effect of ACTN3 and sex on changes in CSA with age were performed by ANOVA and multiple regression analysis. **RESULTS** A significant difference in the relative change of CSA with age, across ACTN3 genotypes was observed in type IIA fibers (ANOVA  $P=0.02$ ) but not in type I fibers and type IIB fibers. The change, expressed as 27-16 years/16-years value, was in type IIA fibers -4.2%, -2.5% and 7.7% in XX, RX and RR respectively and in type IIB -3.0%, -3.4%, and 9.9% in XX, RX and RR respectively. Multiple regression analysis showed that the change in CSA of type IIA fibers was dependent on ACTN3 genotype, while the change in CSA of type IIB was equally dependent on ACTN3 genotype and sex. No ACTN3 genotype effect was observed for the CSA change in type I fibers where alpha-actinin-3 is not expressed. No significant differences in CSA were detected across ACTN3 genotypes either at 16 or 27 years. **CONCLUSION** ACTN3 genotype is strongly suggested to be a determinant of dimensions of type II skeletal muscle fibers in humans which supports the findings in ACNT3 knock out mice.

126 June 1, 10:45 AM - 11:00 AM  
**Aerobic Exercise Augments the Muscle Transcriptome Profile of Subsequent Resistance Exercise**

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(No relationships reported)

**Purpose:** Recent reports suggest that aerobic exercise may boost the hypertrophic response to short-term resistance training. As the molecular mechanisms coordinating this effect are unknown, this study was set out to examine the influence of an acute bout of aerobic exercise on the gene expression response to subsequent resistance exercise. **Methods:** Ten moderately trained men performed 45 min one-legged cycling and 4 x 7 maximal knee extensions for each leg 15 min later. Thus, one limb was subjected to aerobic and resistance exercise (AE+RE), while the opposing leg performed resistance exercise only (RE). Biopsies were obtained from m. vastus lateralis of each leg 3 h after the resistance exercise bout. Using DNA microarray, we analyzed differences ( $\geq 1.5$ -fold,  $FDR \leq 10\%$ ) in the gene expression profile of the two exercise modes (AE+RE vs. RE). **Results:** There were 127 genes up- and 49 down-regulated by AE+RE compared with RE. Among the most significantly differentially expressed genes we found established markers for muscle growth (e.g. down-regulation of myostatin) and oxidative capacity (e.g. up-regulation of AMPK and PGC-1 $\alpha$ ), further supporting their role in regulating muscle adaptations to concurrent exercise. Some cytokines and transcription factors were also among the top differentially expressed genes and, notably, several microRNAs were down-regulated by AE+RE compared with RE. The most activated biological functions were related to carbohydrate metabolism and transcriptional regulation. Although VEGF expression was up-regulated by AE+RE, the functional category 'angiogenesis' was found to be down-regulated by this exercise mode. Upstream analysis revealed that VEGF, CREB, TET2 and mTOR were regulators highly activated by AE+RE, whereas Jnk, Nf $\kappa$ B, MAPK and several miRNAs were inhibited. **Conclusion:** Aerobic exercise modifies

the skeletal muscle transcriptional signature of resistance exercise by augmenting gene programs promoting both myofiber growth and improved oxidative capacity. Our in-depth transcriptional map identified several new candidate genes and putative networks that markedly differed in expression between AE+RE and RE. These signatures represent the first genomic basis for how aerobic exercise may augment rather than compromise muscle growth induced by resistance exercise.

127 June 1, 11:00 AM - 11:15 AM

### MAPK Signaling Following High Volume And High Intensity Resistance Exercise Protocols In Trained Men

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Resistance exercise initiates a multifaceted series of events converting the stimulus of muscle contraction into biochemical responses regulating the rate of protein synthesis. The MAPK pathway appears to be a key signaling pathway involved in the regulation of skeletal muscle mass. While resistance exercise paradigms are often divided into high volume (HV) or high intensity (HI) protocols, it is unknown whether these protocols differentially stimulate MAPK signaling. **PURPOSE:** The purpose of this study was to examine MAPK signaling proteins following a typical HV and HI lower-body resistance exercise protocol. **METHODS:** Ten resistance-trained men (24.7±3.4y; 90.1±11.3kg; 176.0±4.9cm) performed each resistance exercise protocol in a random, counterbalanced order. The HV protocol utilized a load of 70% 1-RM for sets of 10-12 repetitions with a 1-minute rest period length between sets and exercises. The HI protocol utilized a load of 90% 1-RM for sets of 3-5 repetitions with a 3-minute rest period length between sets and exercises. Both protocols included six sets of barbell back squats and four sets of bilateral leg press, bilateral hamstring curls, bilateral leg extensions, and seated calf raises. Fine needle muscle biopsies of the vastus lateralis were completed at baseline (BL) and 1-hour post exercise (1H). **RESULTS:** No significant differences over time were noted for phosphorylation of ATF, ERK/MAPK, p53, p38, MEK1, MSK1, or c-Jun (p>0.05). No significant between trial interactions were noted for phosphorylation of ATF2, JNK, HSP27, ERK/MAPK, p53, p38, MEK1, MSK1, STAT1, or c-Jun (p>0.05). However, significant time effects were observed for phosphorylation of JNK (p=0.0001), HSP27 (p=0.002), and STAT1 (p=0.03). Phosphorylation of JNK, HSP27, and STAT1 were significantly elevated from BL at 1H for both HV and HI. **CONCLUSION:** HV and HI lower-body resistance exercise protocols appear to elicit similar MAPK activation in resistance-trained men.

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### Amino Acid-induced S6K1 Activity In Human Skeletal Muscle Is Mediated By Increased mTor/Rheb Interaction

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(No relationships reported)

Cell culture studies have shown that amino acids activate mTORC1 signaling by increasing the interaction between mTOR and its essential activator Rheb. However, the existence of this mechanism in human skeletal muscle remains to be determined. **PURPOSE:** To determine if increased mTORC1 signaling in response to amino acids in human skeletal muscle is due to an increased interaction between mTOR and Rheb. **METHODS:** Eight well trained men performed resistance exercise on two separate occasions. In connection with the exercise, subjects were supplemented with flavored water (Pla) and essential amino acids (EAA) in a double-blind, randomized cross-over design. Muscle biopsies were taken in the vastus lateralis muscle before, immediately after and 90 and 180 min post exercise. Activity of the mTORC1 pathway was assessed by a radiolabeled in-vitro kinase assay for its immediate downstream target S6K1. Protein-protein interactions were determined by western blot following co-immunoprecipitation of mTOR with Rheb. Co-immunoprecipitation was performed on pooled muscle samples from three of the eight subjects.

**RESULTS:** Activity of S6K1 remained unchanged immediately after exercise in both trials. However, at 90 min post exercise, S6K1 activity increased by approximately 2- and 8-fold (p<0.05) from baseline the Pla and EAA trials, respectively. At the 180 min time point, S6K1 activity remained elevated in both trials being approx. 3-fold higher in the Pla trial and 5-fold higher (p<0.05) in the EAA trial. The fold-change in mTOR and Rheb interaction largely resembled the activity pattern of S6K1 in both

trials; in the Pla trial the fold-change was 0.9, 1.3 and 1.4 while in the EAA trial the fold-change was 1.6, 2.9 and 1.9 immediately after, 90 min after and 180 min after exercise, respectively.

**CONCLUSIONS:** The large increase in S6K1 activity following EAA intake appears to be mediated by an increased interaction between mTOR and its proximal activator Rheb. This is the first time this mechanism has been demonstrated in human skeletal muscle.

### A-31 Free Communication/Slide - Soccer Anyone?

Wednesday, June 1, 2016, 9:30 AM - 11:30 AM

Room: 102

129 **Chair:** Susan M. Sigward. *University of Southern California, Los Angeles, CA.*

(No relationships reported)

130 June 1, 9:30 AM - 9:45 AM

### No Changes in Postural Control Following an Acute Bout of Soccer Heading

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Purposeful heading of the soccer ball is an integral part of the game. However, soccer heading has been scrutinized for safety reasons, and some have even suggested that it should be removed from the game completely.

**PURPOSE:** To determine if an acute bout of heading soccer balls adversely affects postural control.

**METHODS:** Fifteen male collegiate soccer players and seven age-matched, gender-matched controls participated in this study (21.0±1.3years, 180.8±4.9cm, 77.6±6.5kg). Soccer players headed 12 soccer balls at 11.2m/s over the course of 12 minutes. Soccer players had their postural control assessed while standing on a portable force sensor prior to and immediately following the heading drill. This test was repeated for two minutes with both the eyes open (EO) and the eyes closed (EC). Control subjects had their postural control assessed on two occasions, 12-minutes apart. The postural control parameters assessed were the 95% ellipse area, the sway velocity, and the anteroposterior and mediolateral approximate entropy (ApEn) of the center of gravity (COG).

**RESULTS:** There was no significant group-by-time interaction for 95% ellipse area (p=0.161), sway velocity (p=0.342), anteroposterior (p=0.776), or mediolateral (p=0.319) ApEn. The heading group did, however, have a significantly higher sway velocity at baseline (EO=2.1±0.5cm/s, EC=2.8±0.7cm/s) and post-test (EO=2.2±0.6cm/s, EC=2.7±0.6cm/s) than controls at baseline (EO=1.5±0.4cm/s, EC=2.3±0.9cm/s) and post-test (EO=1.5±0.5cm/s, EC=2.1±0.8cm/s) (p=0.039).

**CONCLUSIONS:** An acute bout of soccer heading does not cause quantifiable changes in postural control. Soccer players did show faster sway velocity than the control subjects. Higher sway velocity is usually regarded as poorer postural control. It is unclear what mechanism is causing this deficit. Perhaps, postural control changes occur with repeated heading of the soccer ball over years of soccer participation, rather than after an acute bout of soccer heading. These results were limited to collegiate male soccer players, thus these findings cannot be extrapolated to other ages and genders.

131 June 1, 9:45 AM - 10:00 AM

### On-field Head Impact Exposure in Boys and Girls High School Soccer

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**Purpose:** Impact exposure has been studied in helmeted sports, while impact exposure in un-helmeted sport is relatively understudied. Moreover, for reasons not well understood, female soccer players are more likely to be concussed than their male counterparts at the high school level. The purpose of this study was to use video-analysis in addition to small form factor impact sensors to quantify the frequency, magnitude and context of head impacts during female and male varsity soccer games.

**Methods:** Data from a head impact sensor were synchronized with game video to quantify head impact exposure for 8 male and 15 female high school soccer players who participated in 7 and 9 games, respectively. The sensor measured both linear and angular acceleration. Impacts were categorized based on the context of the contact: player contact with the ball, another player or the ground; no noticeable impact on the

video but substantial player movement (e.g., deceleration, planting, turning). In cases where no noticeable impact or change in movement was observed, the impact was deemed a false positive and excluded from analysis. **Results:** For boys, contact with the ball was the most common mode of head acceleration and accounted for 61.6% of the 125 recorded impacts, and the mode associated with the largest acceleration magnitudes (median: 29.4g; 6,892 rad/s<sup>2</sup>). Contact with another player accounted for 24.4% of impacts, and contact with the ground accounted for 8.1% of impacts. 5.8% of recorded impacts did not have contact with the ball, player or ground, but did have substantial player movement noted on video. Analysis of the data from the first 2 games of the girls season indicates the most common mode of head acceleration was also contact with the ball, accounting for 34.3% of the 67 recorded impacts, and the mode with the largest acceleration magnitudes (median: 22.6 g, 4,663 rad/s<sup>2</sup>), followed by contact with other players (25.4%), motion induced acceleration (22.4%) and ground contact (17.9%). On average, female players experienced 2.23 impacts per player per game, compared to 1.54 for male players. Further analysis of the girl's data is on-going. **Conclusions:** It is important to understand the impact exposure risk for boys and girls in order to developing strategies, techniques or rules for safe play in high school soccer.

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### Relationship Between Stress Distribution And Injury Around The Hip Joint Due To Kicking In Soccer

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(No relationships reported)

**PURPOSE:** In this study, we therefore analyzed the association between kick-induced mechanical stress (stress distribution) and the clinical findings of injuries around the hip joint that are known to be related to kicking actions in soccer.

**METHODS:** We asked 5 healthy, right-footed adults who had some experience in soccer to perform the inside kick, instep kick, and infront kick 3 times each. A three-dimensional motion analysis device was used to record their motion and measure the duration between maximum hip extension (MHE) and ball impact (BI). The motion analysis software, nMotion, was used to calculate stress between hip joints and the angle of the hip joint in each kicking motion. In addition, the bone strength analysis software Mechanical Finder was used to analyze the computed tomography and magnetic resonance imaging data of each subject to develop a finite-element model consisting of the right ilium, sacrum, and femur. Then, stress between hip joints calculated in dynamics analysis was input as a load value into the finite-element model for the stress analysis.

**RESULTS:** At the time of BI, kicking actions produced a high-stress area in the pubic ramus compared with other areas. This value was an equivalent stress value generated in the area of interest (30 mm<sup>3</sup>) in the pubic ramus. Stress generated in the superior and inferior rami of the pubic bone was 3.52 and 2.94 MPa for the inside kick, 7.15 and 5.40 MPa for the instep kick, and 4.47 and 3.33 MPa for the infront kick, respectively.

**CONCLUSIONS:** The high-stress area on BI was the same area where groin pain syndrome (pubic bone marrow edema) occurs in the clinical examination of soccer-related hip joint injury and where fatigue fractures occur in pubic bone rami. Furthermore, in the BI-related area of interest (pubic rami), the values of equivalent stress generated by the inside kick, instep kick, and infront kick in the superior and inferior rami were approximately 3 times, 5 and 4 times, and 3 and 2 times the stress created in the same area by standing by one leg (1.53 and 1.47 MPa in the superior and inferior rami), respectively. The analysis system that integrates motion dynamics into the body structure revealed the relationship between the clinical symptoms of the hip joint and previously reported kick-related injuries around the hip joint.

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### Hip Abductor Strength Predicts Lateral Non-contact Ankle Sprains in Male Soccer Players: A Prospective Study

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(No relationships reported)

**PURPOSE:** Deficits in hip abductor strength have been linked to increased risk of lower-extremity injury. We aimed to prospectively determine whether preseason hip abductor strength predicts future lateral non-contact ankle sprains in competitive athletes.

**METHODS:** Prior to the start of the sports season, isometric hip abductor strength was assessed bilaterally in competitive soccer players (210 males) using a hand-held dynamometer. During the sport seasons, lateral ankle sprain status was recorded, and injured athletes were further classified based on the mechanism of injury (non-contact

vs. contact). Postseason, a logistic model was constructed to determine whether baseline hip abductor strength predicted future lateral non-contact ankle sprains. A receiver operating characteristic (ROC) curve was constructed for hip abductor strength to determine the clinical cut-off value that distinguished between a high-risk and low-risk outcome.

**RESULTS:** A total of 25 lateral non-contact ankle sprains were confirmed for an overall annual incidence of 11.9%. Baseline hip abductor strength was significantly lower in injured athletes compared to non-injured athletes (35.7 ± 5.6 vs. 39.5 ± 6.6 %BW, p = 0.008). Logistic regression indicated impaired hip abductor strength increased future injury risk [OR = 1.10 (95% CI: 1.02, 1.18), p = 0.010]. The clinical cutoff to define high risk was established as hip abductor strength ≤ 33.8 %BW. Using this cutoff, athletes classified as high risk have their probability of injury increase from 11.9% to 26.7%; whereas, athletes classified as low risk have their probability of injury decrease from 11.9% to 8.0%.

**CONCLUSIONS:** Impaired isometric hip abductor strength predisposes competitive male soccer players to lateral non-contact ankle sprains. Screening procedures should consider evaluating isometric hip abductor strength (specifically for high-level male athletes participating in soccer) as preseason hip abductor predicts future lateral non-contact ankle sprains.

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### Effect of Sports Specialization on Lower Extremity Strength between Female Figure Skaters and Soccer Players

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Sport specialization can be defined as intensive, year round training in a single sport at the exclusion of other sports. Recent evidence indicated sport specialization as a risk factor for overuse injuries in young athletes. However, the effect of sport specialization on neuromuscular parameters such as hamstring and quadriceps strength, and strength ratios between the two have not been reported. **PURPOSE:** To examine the effect of specialization in sports on the strength of hamstrings and quadriceps, with hamstrings:quadriceps strength ratio (H:Q ratio) in young female figure skating and soccer athletes. **METHODS:** A cross-sectional study design was employed. Isometric hamstring and quadriceps strength and H:Q ratio were measured in young female figure skaters (N=73, age=13.8±3.3) and soccer players (N=115, age=13.8±1.9). Normalized strength of the hamstrings and quadriceps, and H:Q ratio were compared between figure skaters and soccer players by an independent t-test. Subsequently, H:Q ratio was compared by age groups: < 12 years old, 13-16 years old, and >17 years old to evaluate strength development over time between the two cohorts. This was analyzed by a two-way analysis of variance (ANOVA). **RESULTS:** Hamstring strength was significantly greater in figure skaters compared to soccer players (p=0.001). Also, H:Q ratio was statistically greater in figure skaters compared to soccer players (p=0.004). There were no significant differences in quadriceps strength or the H:Q ratio < 12 years old. However, the two-way ANOVA indicated significantly increased H:Q ratio of figure skaters compared to soccer players in 13-16 years old category (p=0.023 in right limb and p=0.036 in left limb) and left limb of > 17 years old. (p=0.044).

**CONCLUSIONS:** Musculoskeletal development depends on specific demands of movement patterns of particular sports in young female athletes, which may potentially assist understanding increased overuse injury incidences in pediatric and young athletes.

**Character Count:** 1999/2000

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### Comparison of Dominant and Non-Dominant Limb Biomechanics in Female Soccer Players

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The high incidence of anterior cruciate ligament (ACL) rupture in sports, particularly noncontact injuries, warrants determination of risk factors associated with these injuries. The role that leg dominance plays in injury risk during soccer has not been elucidated. One group has suggested injuries differ between the sexes, with women more likely to injure their non-dominant, support leg, but men more likely to injure their dominant, kicking leg (1). Others have reported that leg dominance is not a risk factor (2-3). **PURPOSE:** The purpose of this study was to compare biomechanical variables between the dominant and non-dominant limbs of female soccer players.

**METHODS:** Thirty-two women from two NCAA Division I soccer teams ( $20.1 \pm 1.2$  yrs;  $1.7 \pm .1$  m;  $64.3 \pm 6.1$  kg) underwent biomechanical analyses of two tasks; a triple hop landing (TH) and a single-leg squat (SQ). Knee joint angles and external moments (normalized to mass X height) in the sagittal and frontal planes were assessed at peak knee flexion. Peak knee extension power during the TH landing was also assessed. Paired t-tests were performed to detect differences between biomechanical variables from the self-reported dominant (D) and non-dominant limbs (ND).

**RESULTS:** No between limb differences were observed for the knee angles during the TH (sagittal plane  $D = 66 \pm 9$  and  $ND = 67 \pm 10$  deg,  $p = .767$ ; frontal plane  $D = 7 \pm 5$  and  $ND = 6 \pm 6$  deg,  $p = .360$ ) or the SQ (sagittal plane  $D = 71 \pm 12$  and  $ND = 73 \pm 13$  deg,  $p = .333$ ; frontal  $D = 8 \pm 4$  and  $ND = 10 \pm 6$  deg,  $p = .175$ ). Additionally, no between limb differences in knee flexion moments for either the TH ( $D = 1.1 \pm .3$  and  $ND = 1.1 \pm .3$  Nm/kgm,  $p = .137$ ) or the SQ ( $D = 1.1 \pm .2$  and  $ND = 1.1 \pm .3$  Nm/kgm,  $p = .997$ ) were observed. However, knee adduction moments were smaller in the dominant limb during both the TH ( $D = .35 \pm .19$  Nm/kgm;  $ND = .46 \pm .22$  Nm/kgm;  $p = .011$ ) and the SQ ( $D = .24 \pm .15$  and  $ND = .31 \pm .17$  Nm/kgm,  $p = .030$ ). No between limb differences were present for the TH landing power ( $p = .767$ ).

**CONCLUSIONS:** The greater knee adduction moments observed on the non-dominant stance limb for both the TH and SD would deter the knee from a deleterious risk knee abduction position, commonly associated with noncontact ACL injury. It is therefore plausible that the between limb differences contribute to women soccer players being more likely to sustain injury to their dominant preferred kicking limb.

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**Footedness, Lateral Dominance and Symmetry in Collegiate Male Soccer Players**

Matthew D. DeLang<sup>1</sup>, Jamie Monterosso<sup>2</sup>, David Chasney<sup>2</sup>, Kortney Smith<sup>2</sup>, Kyle Medley<sup>2</sup>, Melodie Kondratek<sup>2</sup>, Tamara Hew-Butler, FACSM<sup>2</sup>. <sup>1</sup>Duke University, Durham, NC. <sup>2</sup>Oakland University, Rochester, MI. (Sponsor: Dr. Tamara Hew-Butler, FACSM)  
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(No relationships reported)

Functional and structural asymmetries from lateral dominance previously verified in volleyball, tennis and baseball players but equivocal in soccer players. PURPOSE: To: 1) assess the accuracy of Self-Reported (SR) versus Waterloo Footedness Questionnaire - Revised (WFQ-R) in defining footedness and 2) determine if footedness is accompanied by corresponding asymmetries in strength, flexibility and body composition in collegiate male soccer players. METHODS: SR vs. WFQ-R classifications of footedness compared with assessments of ball velocity (right minus left foot; R-L) obtained from maximal full-instep kicks (Simi Aktisys 2D). Lower limb muscle strength measured using a handheld dynamometer; flexibility via goniometer; and body composition via dual energy x-ray absorptiometry. RESULTS: 17 male collegiate soccer players participated (age  $19.6 \pm 1.5$  years; BMI  $23.9 \pm 1.4$  kg/m<sup>2</sup>). SR identified 2 left-footed players (lefties) and 15 right-footed (righties), while WFQ-R identified 7 righties plus 10 mixed-footed players (no lefties identified). Ball velocity (R-L) correctly matched 16/17 (94%) right- vs. left-footed players via SR. Remarkable overall symmetry documented. Only differences categorized via SR: lefties had greater maximum (-6.0±6.4 vs. -4.1±5.9 kg;  $p < 0.04$ ) supination strength (R-L difference); greater left ankle plantarflexion ( $58.0 \pm 8.5$  vs.  $47.9 \pm 5.4$ °;  $p < 0.03$ ); and greater right lean arm mass ( $5.2 \pm 3.6$  vs.  $4.5 \pm 3.9$  kg;  $p < 0.03$ ) when compared with righties. Via WFQ-R, mixed players demonstrated: greater maximum (-1.8±7.1 vs.  $5.7 \pm 6.3$  kg;  $p < 0.04$ ) left foot plantarflexion strength (R-L difference); left ( $51.7 \pm 5.2$  vs.  $45.4 \pm 6.5$ °;  $p < 0.04$ ) and right ( $50 \pm 4.5$  vs.  $40.6 \pm 5.9$ °;  $p < 0.002$ ) ankle joint plantarflexion; and increased pelvic bone mineral content ( $461.7 \pm 33.6$  vs.  $419.1 \pm 36.1$  g;  $p < 0.02$ ) compared with righties. CONCLUSIONS: 1) SR footedness closely approximated maximal ball velocity results (lefties kick harder with left foot and vice versa); 2) Collegiate male soccer players largely demonstrated symmetry despite lateral dominance, with minimal asymmetries noted (mostly in the foot and ankle). We speculate the prevalence of running versus kicking in soccer or functional compensation up the kinetic chain may dismiss expected dominance-induced asymmetries.

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**Fatigue And Sex-based Effects On Postural Motion In NCAA Division III Soccer Athletes**

Kathleen S. Thomas<sup>1</sup>, Nicole Liette<sup>2</sup>, Shannon K. Crowley<sup>2</sup>, Abigail J. Leonard<sup>2</sup>, Meir Magal, FACSM<sup>2</sup>. <sup>1</sup>Norfolk State University, Norfolk, VA. <sup>2</sup>North Carolina Wesleyan College, Rocky Mount, NC.  
(No relationships reported)

The cumulative impact of successive high intensity anaerobic bouts on postural motion in soccer athletes and differences between the sexes has not been investigated.

**Purpose:** Examine the effects of fatigue and sex following 6 repeated Wingate Anaerobic Cycle Tests (WAnT) on postural sway immediately following successive

trials during quiet stance. **Methods:** Ten soccer athletes, five males (M: age =  $21.60 \pm 3.05$  yr, ht =  $1.75 \pm 0.03$  m, wt =  $65.81 \pm 5.12$  kg, BMI =  $21.42 \pm 1.17$  kg-m<sup>2</sup>) and five females (F: age =  $19.60 \pm 0.55$  yr, ht =  $1.59 \pm 0.04$  m, wt =  $64.30 \pm 5.15$  kg, BMI =  $25.42 \pm 2.65$  kg-m<sup>2</sup>) completed two identical lab sessions, 7 to 14 days apart. Session one was a familiarization, "dry run", trial in which data was collected but not reported. In both sessions, participants warmed-up by pedaling on a stationary bike for 5 min, at 50 revolutions per min (RPM) with no resistance, before performing 6 repeated WAnT against resistance equal to 7.5% of their body weight. An active recovery between tests consisted of three minutes of pedaling at 50 RPM with no resistance followed by 1-min of bilateral stance with self-selected natural foot width on a force plate. Center of pressure (COP) motion was recorded for 30s prior to and immediately following each successive WAnT under eyes open (EO) and eyes closed (EC) conditions (total of 7 COP trials). Mean velocity, path length, 95% elliptical sway area (ESA) and mean sway in anteroposterior/mediolateral directions were derived from the COP data. **Results:** Significant vision effect was seen for all of the variables with the EC condition producing greater sway measures than the EO condition ( $p < 0.05$ ). A significant sex effect was seen for mean velocity ( $p = 0.01$ ) and path length ( $p = 0.01$ ) where M produced greater mean velocity (M:  $28.98 \pm 5.83$ ; F:  $21.24 \pm 4.94$ ) and path length (M:  $1739.1 \pm 349.51$ ; F:  $1274.39 \pm 296.58$ ) than F. A significant main effect for trial occurred in 95% ESA ( $p < 0.0001$ ) and mean COP values in both anteroposterior and mediolateral directions ( $p < 0.05$ ) compared to baseline values from trial 3 with cumulative increases seen after each trial. **Conclusion:** Multiple high intensity anaerobic bouts has a cumulative negative impact on standing postural sway as a result of fatigue related factors. Females appear able to better attenuate sway velocity and amount of sway under fatigue conditions than males.

**A-32 Clinical Case Slide - Knee I**

Wednesday, June 1, 2016, 9:30 AM - 11:30 AM  
Room: 206

138 **Chair:** Mary Lloyd Ireland, FACSM. *UK Healthcare Sports Medicine, Lexington, KY.*  
(No relationships reported)

139 **Discussant:** Mark E. Lavallee, FACSM. *WellsSpan York Hospital, York, PA.*  
(No relationships reported)

140 **Discussant:** Angela D. Smith, FACSM. *Nemours Children's Health System, Bryn Mawr, PA.*  
(No relationships reported)

141 June 1, 9:30 AM - 9:50 AM  
**Left Knee Pain And Swelling - Adolescent Softball And Soccer Player**  
Ryan Woods, *Mayo Clinic, Rochester, MN.* (Sponsor: Edward R. Laskowski, FACSM)  
(No relationships reported)

**HISTORY:** 13-year-old female softball and soccer player presented for evaluation of left knee pain following repeated squatting while playing catcher during softball. No specific injury or previous knee pain or problems. Pain increased with knee flexion and improved with ice and compression. No locking, catching, radicular pain, muscle weakness or sensory symptoms. Radiographs demonstrated knee joint effusion, otherwise negative. Physical exam unremarkable except for patellar facet pain. Physical therapy was initiated to optimize patellofemoral tracking. Patient returned two months later following a new injury to left knee resulting in pain, swelling and instability. MRI showed a large knee joint effusion and an area suggestive of a cartilaginous body. No evidence of ligament or menisci involvement. Physical therapy was continued, and symptoms improved. Patient returned in five months due to sudden onset of left knee pain, swelling and locking. Repeat MRI demonstrated multiple osteocartilaginous loose bodies and adjacent synovitis in joint space with intact ligaments, menisci and articular cartilage. **PHYSICAL EXAMINATION:** Healthy-appearing individual, no distress. Normal gait cadence and stride. 2+ left knee effusion. Left knee held in 10 degrees short of full extension and flexion to 110 degrees. Left lateral patellar facet tenderness. Tenderness posterior to the left patellar tendon. No joint line tenderness. Ligament stress test is negative. Meniscal provocative tests well tolerated. Neurovascularly intact.

**DIFFERENTIAL DIAGNOSIS:**

1. Loose body
2. Patellofemoral pain
3. Patellar subluxation
4. Chondral defect
5. Meniscal tear

## 6. Synovial osteochondromatosis

## TESTS AND RESULTS:

Initial knee radiographs: no osseous pathology

Initial left knee MRI: Cartilaginous body anterior medial joint space. Signal abnormality in Hoffa's fat pad.

Repeat Left knee MRI: Multiple osteocartilaginous intra-articular loose bodies in posterior joint space.

Repeat left knee radiographs: Multiple periarticular calcified bodies as seen on MRI.

## FINAL/WORKING DIAGNOSIS:

Synovial osteochondromatosis of the left knee with multiple loose bodies

## TREATMENT AND OUTCOMES:

Orthopedic referral. Pending arthroscopic loose body removal with possible synovial debridement.

142 June 1, 9:50 AM - 10:10 AM

**Multiple Acl Injuries In A Collegiate Football Player**

Joshua "Shane" Maxwell. *University of Minnesota, Robbinsdale, MN.* (Sponsor: Rob Johnson, MD, FACSM)

Email: Maxwe184@umn.edu

(No relationships reported)

**HISTORY:** A 21 year-old senior NCAA Division III college football linebacker presents with a painful and swollen right knee. He felt a pop when he was changing directions to make a tackle during a game. States it felt similar to his 2 previous right knee injuries, both of which were later diagnosed as full thickness ACL tears. He currently complains of swelling and pain with full extension.

Surgical history consistent with 2 previous ACL reconstructions on his right knee. All injuries occurred while playing football. His first reconstruction was 6 years ago and was a bone-patellar tendon-bone graft. He tore this graft 1 year ago and had a second reconstruction using a cadaver graft.

**PHYSICAL EXAMINATION:** Vitals - height 5'10", weight 190, General - well developed, well nourished.

Observation - Moderate right knee effusion, no obvious deformities, antalgic gait. Palpation - normal patellar tracking with no apprehension, mild medial joint line tenderness.

ROM / Functional testing- extension limited to 25 degrees due to effusion. Lachman and anterior drawer positive. Posterior drawer negative. Varus and valgus stress normal. McMurray negative.

Strength - muscle strength 5/5 globally.

Neurovascular - Light touch and sensation intact, pulses equal and normal.

**DIFFERENTIAL DIAGNOSIS:** ACL tear

Tibial plateau fracture

Patellar subluxation

Meniscal injury

**TEST AND RESULTS:** MRI results:

-failed ACL graft

-progressive chondromalacia of

femoral condyle

-partial lateral meniscectomy with peripheral meniscal degeneration

**FINAL WORKING DIAGNOSIS:** ACL deficient knee with progressive chondromalacia

**TREATMENT AND OUTCOMES:** Compression, ICE, ROM exercises, NSAIDs

Consultation with Orthopedics, Fitted for ACL brace.

Successful reduction in pain, swelling, and instability within 10 days.

Long discussion with athlete, parents, ATC, orthopedic surgeon and MSK radiologist.

Athlete educated on immediate and long term risks of playing and decided to return to play. He states he feels 100% and is currently leading his team in tackles this season.

Orthopedic surgeon recommends a multi-stage repair including ACL reconstruction, osteotomy and meniscal transplant after the season is over.



143 June 1, 10:10 AM - 10:30 AM

**Disruptive Knee Pain in a Cross Country Runner**

Casey Wagner<sup>1</sup>, Anthony Scillia<sup>2</sup>. <sup>1</sup>*Atlantic Health Systems, Morristown, NJ.* <sup>2</sup>*New Jersey Orthopaedic Institute, Morristown, NJ.*

Email: cjlwagnermd@gmail.com

(No relationships reported)

**HISTORY:**

An 18 year old male cross country runner presented to the office for non-radiating sharp lateral right knee pain. He was running approximately 20 miles per week. His pain progressively worsened over the past 10 months and he could no longer run. He had no pain at rest or while walking, and no locking, clicking, snapping, or buckling. His knee did swell mildly the last time he ran. There was no trauma and he never experienced any back or hip pain.

He was initially seen by his PMD who diagnosed him with a knee sprain and prescribed physical therapy (PT), rest, ice, naproxen, and ordered an MRI. The MRI showed a trace knee effusion, but was otherwise negative. After completing PT with no relief, he was referred to a sports medicine orthopedist who diagnosed him with IT band friction syndrome and continued PT with rest. He did not improve and had a landmark based cortisone injection into the distal IT band with no relief.

**PHYSICAL EXAMINATION:**

Right knee exam: normal alignment and gait, no effusion, and tender lateral joint line.

Quadriceps and hamstring strength was 4/5 with 10° loss of flexion. Positive Noble's and McMurray test. All other provocative tests were negative, including Ober.

Hip exam normal

**DIFFERENTIAL DIAGNOSIS:**

IT band syndrome

Occult lateral meniscus tear

Patellofemoral pain syndrome

Loose body

**TEST AND RESULTS:**

MRI T2 STIR images showed a subtle signal abnormality between the IT band and the lateral femoral condyle consistent with IT band friction syndrome and a minimal linear signal abnormality posterior of the lateral meniscus junction within the distal strut in the popliteus hiatus of indeterminate significance. The posterolateral corner structures were normal.

A dynamic study of an ultrasound guided cortisone injection into the distal IT band insertion and then running directly afterward and at one week produced no relief.

An intra-articular lidocaine injection and running directly afterward produced complete resolution of symptoms.

**FINAL WORKING DIAGNOSIS:**

Meniscal capsular disruption

**TREATMENT AND OUTCOMES:**

He had a knee arthroscopy that repaired the meniscal capsular junction tear and a hypermobile lateral meniscus. After repair, bone marrow aspirate concentrate was injected into the posterior lateral capsule. He completed post-operative PT and is now long distance running pain-free.

144 June 1, 10:30 AM - 10:50 AM

**Knee Injury - Soccer**

Yogen Patel<sup>1</sup>, Alex Behar<sup>1</sup>, Anupam Basu<sup>2</sup>. <sup>1</sup>Rush University Medical Center, Chicago, IL. <sup>2</sup>John H. Stroger Jr. Hospital, Chicago, IL.

Email: yogen\_patel@rush.edu

(No relationships reported)

**HISTORY:** A 17-year-old female high school soccer player presented a few hours after sustaining a right knee injury during a game. At minute 80, she suffered a varus blow to the anteromedial aspect of the knee from a sliding tackle on her planted, fully extended leg. She heard an audible pop and had immediate anterolateral knee pain and swelling with significant instability.

**PHYSICAL EXAMINATION:** Antalgic gait with large knee effusion noted on inspection. Focal tenderness over lateral joint line and fibular head. Range of motion (ROM) at the knee limited by pain to 0-100 degrees. Strength testing 4/5 with knee flexion and extension, 0/5 with ankle dorsiflexion and extensor hallucis longus, 5/5 with plantar flexion. Sensation to light touch decreased in lateral lower leg and dorsum of the foot. 2+ Dorsalis pedis and popliteal pulses and <2s capillary refill in toes. Provocative testing significant for positive Lachman's, posterior drawer, varus stress and dial test. Valgus stress and McMurray's were negative.

**DIFFERENTIAL DIAGNOSIS:**

1. Combined ligamentous tear
2. Acute Fracture
3. Meniscal injury

**TEST AND RESULTS:**

Anterior-posterior and lateral knee X-ray:

---Fibular head avulsion fracture.

MRI without contrast of the knee:

---Arcuate complex avulsion fracture with complete disruption of the posterior cruciate ligament (PCL), anterior cruciate ligament (ACL) and concomitant posterolateral corner (PLC) injury.

**FINAL WORKING DIAGNOSIS:**

1. Grade III sprain of ACL and PCL
2. Arcuate complex avulsion fracture with PLC injury.
3. Common Peroneal Nerve Mononeuropathy

**TREATMENT AND OUTCOMES:**

1. Immediate cessation of physical activity with non-weight bearing status of right lower extremity. The patient was provided with crutches and placed in a knee immobilizer brace.
2. Isometric quad strengthening initiated for the first 9 days to help reduce swelling and prevent muscle atrophy.
3. On day 10, the patient had simultaneous reconstruction of her ACL and PCL followed by surgical repair of the fibular head.
4. Electrodiagnostics at week 4 confirmed right common peroneal nerve mononeuropathy below the fibular head and the patient was provided with an ankle foot orthosis.
5. Returned to sports after 14 months of challenging rehab when she regained full, painless ROM and strength in her knee and ankle dorsiflexors.

145 June 1, 10:50 AM - 11:10 AM

**Knee Swelling - Football**

Andrew H. Gordon, Arthur J. Deluigi. *MedStar National Rehabilitation Network, Washington, DC.* (Sponsor: Francis O'Connor, FACSM)

Email: Andrew.Gordon@medstar.net

(No relationships reported)

**HISTORY:** A 14-year old male high school football player presented with right knee swelling and pain lasting three weeks. He did not recall any injury or trauma. A trial of over-the-counter ibuprofen did not help. He rated his pain 4/10 in our office. On ultrasound, a suprapatellar effusion was seen, from which 35 mL of serosanguinous fluid was aspirated. A traumatic etiology was suspected. We then medicated the region with 40 mg of triamcinolone. For over two weeks after that aspiration, the knee swelling persisted, and ultimately he went to the ER. At follow-up with us, about 3 weeks after initial aspiration, a suprapatellar effusion still persisted.

**PHYSICAL EXAMINATION:** Afebrile with normal blood pressure and pulse at both initial and follow-up presentation. On initial as well as follow-up examination of the knee (approximately three weeks after initial aspiration and steroid injection), the right knee demonstrated a supramedial effusion, equivocal McMurray's test, negative anterior and posterior drawer tests, and negative Lachman's test.

**DIFFERENTIAL DIAGNOSIS:** 1. Medial meniscal tear. 2. Ligamentous Injury. 3. Septic arthritis. 4. Abscess/Hematoma.

**TESTS AND RESULTS:** Ultrasound of the right knee showed persistent evidence of suprapatellar effusion. 75 mL of cloudy dark serosanguinous fluid was obtained after a second suprapatellar aspiration under ultrasound guidance. Magnetic Resonance Imaging (MRI) of the right knee after the second aspiration showed a large hematoma/seroma between the skin, patella and medial patellofemoral retinaculum, as well as a

tiny joint effusion. The subcutaneous fluid collection extended 12 cm craniocaudally, 8 cm transversely, and 5.5 cm from anterior to posterior. MRI also showed normal cruciate and collateral ligaments with no evidence of meniscal tear. Culture of the second suprapatellar aspiration revealed heavy methicillin-sensitive staphylococcus aureus (MSSA) bacteria.

**FINAL WORKING DIAGNOSIS:** Atraumatic abscess and hematoma of the right distal quadriceps muscle.

**TREATMENT AND OUTCOMES:** We empirically started oral cephalexin after the second suprapatellar aspiration and after confirming the infection, he finished a one-week course of the cephalexin. On follow up about three weeks later, he had no swelling or pain on exam and was cleared to return to play.

146 June 1, 11:10 AM - 11:30 AM

**Knee Swelling In A 10-year-old, Traumatic Or Atraumatic?**

Cortie J. Rolison. *University of Kentucky, Lexington, KY.*

(Sponsor: Mary Lloyd Ireland, MD, FACSM)

Email: cj.rolison.iv@gmail.com

(No relationships reported)

**HISTORY:** 10-year-old Hispanic female presented with a 2-week history of a right knee effusion. She had fallen onto her anterior knee while playing basketball, swelling began the next day. At her visit, pain had improved but swelling persisted. No prior knee injuries. Also had several swollen joints when she was much younger which resolved without treatment.

**PHYSICAL EXAM:** Severe effusion to right knee, no ecchymosis. ROM: 20-90. No varus or valgus laxity. Negative lachman's. 5/5 strength, distal extremity was neurovascularly intact.

**DIFFERENTIAL:** Juvenile Rheumatoid Arthritis (JRA), Pigmented Villonodular Synovitis (PVNS), Septic Arthritis, Osteochondral fracture, OCD lesion

**RESULTS:** ANA: <1:80, ESR: 22. CBC, CMP, TSH, CRP, RF and anti-CCP levels were all normal. Knee radiographs: no fracture, open growth plates, suprapatellar effusion. MRI: Very large joint effusion with synovial perforation. Synovial hypertrophy from intraarticular hemorrhage. No bony findings.

**TREATMENT:** Initially sent to pediatric rheumatology over concern for JRA. Then referred to pediatric ortho-oncology after grossly bloody arthrocentesis. Based on MRI, joint aspirate and clinical picture (5+ months of persistent effusion), surgical treatment was recommended. She was taken to the operating room for arthroscopic evaluation, synovial biopsy and synovectomy.

**OPERATIVE FINDINGS:** Marked amount of synovitis in suprapatellar pouch, medial and lateral gutters, and intercondylar notch, brownish-red in appearance

**BIOPSY:** Papillary architecture, giant cells and foam cells consistent with pigmented villonodular synovitis

**FINAL DIAGNOSIS:** Pigmented Villonodular Synovitis

**OUTCOMES AND DISCUSSION:** Seen in clinic after surgery to review pathology.

Compression and cryotherapy utilized for swelling which subsided after 7 weeks. Regained full ROM and quadriceps strength at 4 months. Most recent follow-up was at 2 years postoperatively, no complaints, normal knee exam, normal radiographs, and no evidence of recurrent PVNS.

Despite her trauma, her persistent effusion was from PVNS, a benign condition who's onset is usually later in life and is important to treat as it can be locally aggressive.

Acute hemarthroses are more common with ACL tears, and patellar dislocations.

Persistent effusions are not common and should be evaluated.

**A-33 Clinical Case Slide - Medical Issues I**

Wednesday, June 1, 2016, 9:30 AM - 11:10 AM  
Room: 202

147 **Chair:** Lauren M. Simon, FACSM. *Loma Linda University Medical Center, Loma Linda, CA.*

(No relationships reported)

148 **Discussant:** John Mark MacKnight, FACSM. *University of Virginia, Charlottesville, VA.*

(No relationships reported)

149 **Discussant:** Sherrie L. Ballantine-Talmadge. *Boulder Center for Sports Medicine, Boulder, CO.*

(No relationships reported)

150 June 1, 9:30 AM - 9:50 AM

**Influenza Encephalitis in a Collegiate Baseball Player**

Alyssa Otto, Brainard Cooper, Christopher Varacallo, Jeffery Guy, Matthew Pollack. *University of South Carolina, Columbia, SC.*

(No relationships reported)

Alyssa Otto  
Case Study Abstract  
ACSM Format

**Title: Influenza Encephalitis in a Collegiate Baseball Player**

**Authors:** Alyssa Otto, Brainard Cooper, Christopher Varacallo, Jeffery Guy, Matthew Pollack

**HISTORY:** A 20 year old male, NCAA Division I baseball player presents to athletic trainer with a chief complaint of a severe headache. Associated symptoms included numbness in bilateral fingertips and lips, disoriented and look tired and fatigued. Athlete could answer questions asked but could not recall details of the morning prior to presenting to the athletic trainer. He had a previous history of headaches, coughing and congestion over past few months. Previous headaches were treated with over the counter medications and sleep. Athlete also had a medical history of ADHD and surgical history of tonsillectomy and adenoidectomy 2013.

**PHYSICAL EXAM:** No obvious deformity and no visible sites of trauma. Full strength in upper extremities bilaterally; normal sensation bilaterally except for fingertips and lips. Deterioration of mental status over the following hour and was unable to understand simple commands or reply verbally. Athlete was transported to the Emergency Department. Upon arrival, athlete became combative due to disorientation and was intubated for his safety.

**DIFFERENTIAL DIAGNOSIS:**

1. Migraine Headache
2. Intracranial Hemorrhage
3. Meningitis

**TESTS & RESULTS:**

Complete Blood Count Test- mild elevated white blood cell count (13.4)  
Comprehensive Metabolic Panel- within normal limits  
Urine Toxicology- within normal limits  
CT Scan- normal  
MRI- normal

Lumbar Puncture- elevated with white blood cell count  
Influenza Test- positive for influenza b

**FINAL/ WORKING DIAGNOSIS:** Influenza Encephalitis

**TREATMENT & OUTCOMES:**

- Intubated and admitted to the ICU
- Hospital day #2 was extubated
- Treated with Tamiflu for influenza b
- Discharged to go home and follow up with athletic training staff
- No residual symptoms, feeling well
- Athlete successfully participated in 2015 baseball season

151 June 1, 9:50 AM - 10:10 AM

**Abdominal Pain-basketball**

Brett Keller. *Atlantic Sports Health, Morristown, NJ.*

(No relationships reported)

**HISTORY**

A 17 year old Hispanic male basketball player presents to the office complaining of left lower quadrant pain for one week. The pain began following a high school basketball practice. He denies any specific injury or trauma during practice. The pain is sharp in nature and rated 3/10 at rest and 8/10 with any activity. The pain does radiate into the

groin on the left side, but he denies any testicular discomfort. He reports mild swelling in the left lower quadrant and feels that the area may be bulging. He denies any change in bowel habits or any recent change in appetite. He denies nausea, vomiting, hematuria, or dysuria.

No significant medical or surgical history. He denies sexual activity.

All other review of systems are negative.

**PHYSICAL EXAMINATION**

Height 6'7" Weight 216 lbs

**Abdomen:** Inspection of the abdomen and groin reveals no visible bulge or discoloration. There are positive bowel sounds in all quadrants. Palpation reveals significant tenderness in the periumbilical region and left lower quadrant. There is also tenderness in the groin along the inguinal canal. No rebound or guarding is present.

**Genitourinary:** No palpable bulge in the groin. No tenderness in the testicle. Bilateral hernia exam reveals no abnormality.

**Musculoskeletal:** Negative straight leg raise. Pain in left lower quadrant with resisted sit-up

**DIFFERENTIAL DIAGNOSIS**

Hernia

Abdominal muscle strain

Nephrolithiasis

Ilioinguinal entrapment neuropathy

Diverticulosis

**TESTS AND RESULTS**

Abdominal ultrasound: Inferior rectus sheath hematoma. No abdominal wall hernia

**FINAL WORKING DIAGNOSIS**

Rectus Sheath Hematoma

**TREATMENT AND OUTCOMES**

1. A repeat ultrasound after two weeks showed a decrease in size of rectus sheath hematoma.
2. Screening for bleeding disorder revealed no abnormality.
3. Patient was limited in physical activity for one month.
4. Athlete was able to return to full activity and resume playing basketball.
5. Patient currently plays basketball at the collegiate level.

152 June 1, 10:10 AM - 10:30 AM

**5 Year-old Male with Leg Pain and Abnormal Gait**

Adam Liegner. *Maine Medical Center Sports Medicine Fellowship, Portland, ME.* (Sponsor: William Dexter, FACSM)  
Email: adam.liegner@gmail.com

(No relationships reported)

**HISTORY:**

A 5 year-old boy presents with leg pain, unable to walk normally. The pain started 1 day ago and is located in his posterior lower legs BL. No injury. Parents note that he has been ambulating with his legs held straight and slightly out to the sides. They are using a wheelchair to get around.

The patient had a fever and URI symptoms last week, treated with azithromycin (on day 3). No fever today. Other than the leg pain and difficulty with walking seems well and happy. No rash, insect bites, or other joint complaints. Comprehensive ROS otherwise neg.

**PMH/PSH:**

Obesity - weight > 95th %ile

Sickle cell trait

Seasonal allergies

(Born in US - fully vaccinated)

**Meds:**

Azithromycin

APAP PRN

Allergies:

NKDA

SHx:

Lives with parents and younger brother. Has two brothers living with grandmother in Congo. Parents emigrated from Congo in 2007. No smokers.

**FHx:**

Sickle cell anemia (mother)

**PHYSICAL EXAM:**

BP 117/54, HR 59, T 36.6 (oral), Wt 32.2kg

GEN: Alert, well appearing. Sitting on exam table, moving legs freely without pain or limitation.

SKIN: No rash, redness, bruising.

**MSK:**

Gait - Wide-based stance with knees straight, primarily on his arches, slides feet across the ground. Unwilling to stand on toes due to pain.

BL Hips - Log roll neg, nl ROM, FABER and FADIR neg for pain.

BL Knees - Inspection nl. No warmth, tenderness. Active ROM nl. MMT strength 5/5 on flex and exten, no pain. Varus, valgus stress nl.

BL Ankles - Inspection nl. Mild tenderness of lower calf. No warmth or effusion.

Active ROM nl. MMT 4/5 dorsiflexion, 4/5 plantarflexion, both cause pain in the distal calf.

Lower extremities neurovascularly intact.

**DIFFERENTIAL DIAGNOSIS:**

- 1) Myositis
- 2) Bilateral DVT
- 3) Tenosynovitis
- 4) Sickle cell pain crisis
- 5) Guillain Barre
- 6) Lyme
- 7) JRA
- 8) Abuse

**TESTS AND RESULTS:**

BL ankle XR (AP, lat): No fracture/dislocation. No effusion. Mild soft tissue swelling posterior to the talus possibly representing inflammation.

CRP: 0.10 (<1.00 mg/dL)

ESR: 11 (0-15 mm/hr)

CBC with diff: WBC 2.9 (5.3-11.5), Reactive Lymphocytes Percent 6 (<1)

CK: 7136 (24-195)

Influenza A + B PCR: Influenza B detected

**FINAL WORKING DIAGNOSIS:**

Influenza B myopathy

**TREATMENT AND OUTCOMES:**

Seen in the clinic 1 day later for planned follow-up, ambulating without pain. Walking normally, including on his toes, without pain. Parents advised to hydrate to prevent nephropathy.

153 June 1, 10:30 AM - 10:50 AM

**An Unusual Cause Of Sore Throat And Thigh Pain In A Football Player.**

Calvin Wong, MD<sup>1</sup>, Damon Mitchell, AT-C<sup>2</sup>, James Collins, AT-C<sup>2</sup>, Marco Zucconi, AT-C<sup>2</sup>, Alvin Cabrera, AT-C<sup>2</sup>, Allison Miner, AT-C<sup>2</sup>, Tal David, MD<sup>3</sup>, Catherine Robertson, MD<sup>4</sup>. <sup>1</sup>*Metro Comprehensive Medical Center, San Diego, CA.* <sup>2</sup>*San Diego Chargers, San Diego, CA.* <sup>3</sup>*Synergy Orthopaedic Surgery, San Diego, CA.* <sup>4</sup>*University of California, San Diego, San Diego, CA.*  
 Email: calvinwongmd@gmail.com  
 (No relationships reported)

**HISTORY:**

A 21 year-old male professional football athlete presented with several days of sore throat and fever. He was initially treated conservatively, but when he worsened, his throat was cultured and he was started on antibiotics (azithromycin). His sore throat and fevers resolved, but two days later, he developed new, atraumatic pain over the left greater trochanter. He received an injection of kenalog to his left trochanteric bursa for a presumptive diagnosis of bursitis. The following day his hip pain worsened and spread down the thigh toward the knee. He developed fevers and malaise. Upon presentation to the training room, he had difficulty ambulating and complained of swelling along the lateral thigh.

**PHYSICAL EXAMINATION:**

Training room evaluation revealed an ill appearing young male with difficulty ambulating. The left thigh was diffusely swollen and exquisitely tender but with normal appearing skin. There was no skin break, erythema, or fluctuance. He could tolerate limited range of motion at the hip and knee. Temperature was 103.5. Heart rate was 110.

**DIFFERENTIAL DIAGNOSIS:**

1. Cellulitis
2. Soft tissue abscess
3. Myositis/fasciitis
4. Sickle cell crisis

**TEST AND RESULTS:**

- Throat Culture: Beta-hemolytic Streptococcus, non-Group A
- Training Room Ultrasound showed a thin layer of fluid tracking along the fascia without abscess. Air was also seen along the fascia.
- WBC 26, CRP 29
- MRI of thigh showed fasciitis with air tracking along the fascia along the entire lateral thigh.
- Intra-operative Culture from thigh: Fusobacterium necrophorum

**FINAL WORKING DIAGNOSIS:**

Lemiere's Syndrome presenting as Necrotizing Fasciitis

**TREATMENT AND OUTCOMES:**

1. Aggressive surgical debridement of Left thigh (4 surgeries)
2. IV Antibiotics (4 weeks)
3. Chest tube placement for drainage of Left infected pleural effusion secondary to septic emboli to the left lung (developed during hospitalization)

154 June 1, 10:50 AM - 11:10 AM

**Undernutrition - Bariatric Athlete**

Benedict Ifedi, Randolph Taylor. *Memorial Family Medicine Residency Program, Sugar Land, TX.*

Email: Benedict.Ifedi@memorialhermann.org

(No relationships reported)

**HISTORY:** A 38 year old female with past medical history of hypertension, hyperlipidemia, and obesity presented to the major medical tent by wheelchair with complaints of profound weakness and dizziness after having just completed a marathon. She described having run the majority of the marathon and had not sustained any injuries along the course. She described weakness and dizziness as mentioned in addition to "being dehydrated." Review of systems was otherwise negative. Of note the patient also had a history of gastric bypass surgery 2 years prior to date of presentation. **Physical Exam:** Examination of the patient revealed a pale appearing woman in no acute distress with dry mucous membranes. The patient was fully alert and oriented and had normal cardiac and respiratory exam.

**Differential Diagnosis:**

1. Dehydration
2. Exertional Hyponatremia
3. Heat Related Illness

**Test and Results:**

Vital Signs: Temperature 98.5F, Heart Rate 82, Blood Pressure 123/62

Labs: pH 7.45, pCO2 35.2, pO2 98, Na 141, K 4.6, HC03 24.7, BG 83, iCa 1.15 Hemoglobin/Hematocrit - 13.3/39

**Final/Working Diagnosis:**

Dehydration and Undernutrition

**Treatment and Outcomes**

1. 1 liter bolus of normal saline administered intravenously through left AC IV line in addition to PO hydration with low calorie sports drink
2. Patient provided warming blankets for comfort in setting of cool outside temperature
3. The patient's symptoms resolved and she felt significantly better within approximately 20 minutes of receiving normal saline bolus
4. The recommendation was provided to the patient to be evaluated by sports nutritionist with experience in caring for endurance athletes who have undergone bypass or weight loss surgery to assist with maintaining balanced nutrition and hydration while exercising.

**A-34 Clinical Case Slide - Upper Extremity- Hand/ Wrist**

Wednesday, June 1, 2016, 9:30 AM - 11:30 AM

Room: 203

155 **Chair:** John Hatzenbuehler, FACSM. *Intermed, PA, South Portland, ME.*

(No relationships reported)

156 **Discussant:** Jason L. Zaremski. *University of Florida, Gainesville, FL.*

(No relationships reported)

157 **Discussant:** Kenneth Vitale. *University of California San Diego, San Diego, CA.*

(No relationships reported)

158 June 1, 9:30 AM - 9:50 AM

**Persistent Wrist Pain in an Adolescent Soccer Player**

Celeste Quitiquit. *University of Washington/Seattle Children's Hospital, Seattle, WA.*

Email: celeste.quitiquit@seattlechildrens.org

(No relationships reported)

**HISTORY:** A 15-year-old right hand dominant male soccer player presented with two months of left wrist pain. He denied trauma but noticed it first while bench pressing. He has some pain at rest but it is worse with activity. The pain is deep and throbbing along radial side of wrist. He denies numbness, tingling, weakness, fevers, rash, pain in other joints, or difficulty with sleep. No medications. He was seen initially one month prior at an outside facility and had normal xrays. No treatment. No prior upper extremity injuries.

**PHYSICAL EXAM:** Left upper extremity showed no deformity, bruising, swelling, or skin changes. He had tenderness at snuffbox, scaphoid tubercle and distal radius. Wrist

flexion and extension were painful. He had less pain with circumduction, axial loading, Watson test. Full grip strength. Sensation and motor intact in radial, median, and ulnar distributions. Brisk capillary refill. Strong radial pulse.

**DIFFERENTIAL DIAGNOSIS**

1. Distal radial fracture
2. Scaphoid fracture
3. Scapholunate tear
4. Carpometacarpal dislocation
5. Old trauma (avascular necrosis, non-union)
6. Systemic (rheumatoid arthritis, amyloidosis, gout)
7. Tendinopathy
8. Bone infection

**TEST AND RESULTS**

1. Left wrist PA, lateral, and scaphoid radiograph: abnormal lucency at dorsal aspect of distal radial metaphysis with a sclerotic border and small periosteal reaction

2. ESR, CRP, WBC, Platelets, and Hct : normal. Blood cultures: negative.

QUANTIFERON GOLD and HLA B-27: pending

3. MRI of left wrist with/ without contrast: Hypointense signal on T1, hyperintense signal on T2 STIR images at left metaphyseal distal radius. No fluid at radioulnar joint. No abscess.

4. Bone biopsy: Trabecular bone with hypocellular marrow spaces. Rare neutrophils.

Focal marrow necrosis areas.

5. Total body bone scan: pending

**FINAL WORKING DIAGNOSIS**

Chronic nonbacterial osteomyelitis

**TREATMENT AND OUTCOMES**

1. Chronic recurrent multifocal osteomyelitis (CRMO) follows a relapsing course over years and may eventually remit with resolution of hyperostosis without permanent bony deformity.

2. Initially patient was immobilized with Thumb Spica wrist brace with some relief.

3. Started Naproxen 500mg BID. Most patients respond to NSAIDs and/or intermittent corticosteroids for transient relief, but recurrences are common and some require DMARDs.

159 June 1, 9:50 AM - 10:10 AM

**Right Hand Dystonia in a Professional Musician**

Adam Lewno, Michael Munin, Eric Helm. *University of Pittsburgh Medical Center, Pittsburgh, PA.*

Email: lewnoa2@upmc.edu

(No relationships reported)

**HISTORY:**

53 year old right handed female professional oboist with past medical history of anxiety presented with a 3 year history of progressive 2<sup>nd</sup> digit extension as well as 3<sup>rd</sup> digit flexion and extension difficulty during coordinated targeting of her musical instrument's keys. She admits to practicing five days a week, averaging two hours a session without any practice schedule changes. After failing pharmacological treatment, including Baclofen and Artane, she underwent EMG guided botulinum toxin injections to the right extensor indicis proprius and second lumbrical muscles with minimal improvement. Due to continued pain and coordination difficulties she has retired from professional symphony play.

**PHYSICAL EXAM:**

SKIN: No rash, lesions, or discoloration.

NEUROMUSCLAR: Limited active flexion of the right 2<sup>nd</sup> digit at the proximal interphalangeal joint with loss of distal interphalangeal joint motion. Bradykinetic extension at the right 3<sup>rd</sup> digit metacarpophalangeal joint and proximal interphalangeal joint. Normal strength, deep tendon reflexes, and sensation throughout the upper extremity. No palpatory tenderness, crepitus, snapping, muscle atrophy, or deformity throughout the right hand. Grasp, lateral pinch, and nine hole peg test were within 90<sup>th</sup> percentile for age.

**TESTS and RESULTS:**

Outside facility right wrist and hand radiographs indicated carpometacarpal osteoarthritis

**DIFFERENTIAL DIAGNOSIS:**

1. Musicians focal dystonia
2. Osteoarthritis
3. Tendonitis: extensor indicis proprius, flexor digitorum profundus, flexor digitorum superficialis, lumbricals
4. Median nerve mononeuropathy
5. Posterior Interosseous mononeuropathy
6. Trigger finger
7. Flexion tendon rupture
8. Ganglion cyst impingement
9. Dupuytren's contracture
10. Rheumatoid arthritis
11. Psoriatic arthritis
12. Scleroderma

**FINAL DIAGNOSIS:**

Musician's Focal Dystonia of the Right 2<sup>nd</sup> and 3<sup>rd</sup> digits

**TREATMENT AND OUTCOMES:**

1. Occupational hand therapy with performing art specialist focusing on sensory re-education and constrain induce movement therapy
2. Kinesio tape on the dorsum of the hand along the 2<sup>nd</sup> and 3<sup>rd</sup> extensor tendons
3. Dynamic hand warm up stretching with integrated rest breaks during practice sessions
4. Within 2 months progressed to a home exercise program and returned to professional symphony play

160 June 1, 10:10 AM - 10:30 AM

**Finger Pain In A Female Football Player**

Michael C. Yonz, Scott Riley, Mary Ireland, FACS. *University of Kentucky, Lexington, KY.* (Sponsor: Mary Lloyd Ireland, FACS)

Email: michael.yonz@uky.edu

(No relationships reported)

**HISTORY:** 14 year old right hand dominant female cornerback presented to orthopedic clinic with 2 months of right index finger (IF) pain after falling onto her hand during a middle school football game. She had immediate pain both with rest and with range of motion of the finger. She was treated by a different orthopedist with casting and bracing for 2 months which did not relieve her symptoms. She complains of swelling over her second metacarpophalangeal joint (MCPJ) and well as pain with flexion of her IF.

**PHYSICAL EXAMINATION:** Examination in clinic revealed edema over the second MCPJ. She has pain with full flexion of the MCPJ along with radial deviation of the MCPJ. She has full motion in her distal and proximal interphalangeal joints (DIPJ and PIPJ) of the IF. She has a normal sensory and vascular exam in the IF. She has a normal exam in her other fingers.

**DIFFERENTIAL DIAGNOSIS:**

1. Fracture of the proximal phalanx or metacarpal of the IF
2. Dislocation of the second MCP joint
3. Ligament injury to MCP joint

**TEST AND RESULTS:**

Posterior-anterior, oblique, and lateral radiographs of the right hand

-No fracture or dislocation/subluxation noted.

Magnetic resonance imaging of the right hand

-Complete tear of the ulnar collateral ligament (UCL) of the second MCPJ

**FINAL/WOKING DIAGNOSIS:**

Ulnar collateral ligament tear of the second MCPJ of the right hand

**TREATMENT AND OUTCOMES:**

1. Operative exploration of the UCL of the second MCPJ. The patient was found to have a tear of the dorsal 2/3 of the UCL with significant laxity to radial deviation
2. Reconstruction of the UCL with a tendon junction graft. Splinted in 10 degrees of MCP flexion
3. Placed in outrigger splint for 7 weeks post-op and then allowed active and passive range of motion as tolerated
4. Released for sporting activities at 3 months with initial use of buddy taping during activities
5. At 6 months post-op, complained of pain and stiffness in the IF. 1cm of tip to palm distance on the index finger when making a fist. Received a corticosteroid injection to the DIPJ, PIPJ, and MCPJ. Recovered full motion of the fingers. Returned to football activities.

161 June 1, 10:30 AM - 10:50 AM

**Chronic Thumb Pain in a Volleyball Player**

Matthew B. Heller, Andrew T. Martin. *Campbell University School of Osteopathic Medicine, Lillington, NC.* (Sponsor: Patrick Leary, FACS)

(No relationships reported)

**HISTORY:**

24 year old female presents to the Sports Medicine Clinic complaining of Right Thumb pain x 2 years. She stated she was an avid volleyball player when she began to develop a chronic pain persisting in her right thumb. She noted that there was associated stiffness in her thumb that was worst in the morning and would get better as the day went on. She could not recall any specific trauma to the area, other than the pain gradually increased while she was playing volleyball.

**PHYSICAL EXAMINATION:**

+ Laxity on stress testing at the radial aspect of the first MCP joint of right hand.

**DIFFERENTIAL DIAGNOSIS:** Early arthritis, Capsulitis, chronic sprain, ligamentous instability

**TEST AND RESULTS:** X ray revealing negative fracture, no bony or joint abnormalities

**FINAL WORKING DIAGNOSIS:** Rupture of Radial collateral ligament on right thumb

**TREATMENT AND OUTCOMES:** Referral to Orthopedics for surgical repair.

162 June 1, 10:50 AM - 11:10 AM

**Wrist Pain in a Collegiate Golfer**

Joseph Mitchell, Robert Hosey, FACSM. *University of Kentucky, Lexington, KY.* (Sponsor: Robert Hosey, FACSM)  
 Email: jlmitch3@uky.edu  
 (No relationships reported)

Title: Wrist Pain in a Collegiate Golfer  
Authors: Joseph Mitchell, Robert Hosey  
History:

year-old right-handed senior male golfer presented with right wrist pain. History was significant for 4 months of pain that worsened after striking a tree root while playing golf in the spring. He was evaluated and radiographs were negative at that time. His pain subsided with 3 weeks of rest. He returned to his home in Europe for summer vacation, and had increasing pain with golfing activity over 6-8 weeks. An MRI in Europe was reported to show edema in scaphoid, and a CT scan reportedly showed a non-displaced healing scaphoid fracture. He was treated with relative rest and physiotherapy for 6 weeks. At his follow-up visit upon returning to school for the fall, he reported improvement in symptoms. He was able to do normal daily activities without pain, but still had some pain with weight-bearing activities.

Physical Examination:

Examination of his right wrist revealed normal alignment without deformity, ecchymosis, erythema or swelling. He had no pain to palpation over the anatomic snuffbox. He had full range of motion and normal strength of his right wrist to flexion, extension, ulnar deviation, radial deviation, pronation, and supination without pain. He had normal grip strength. He had mild discomfort on the radial side of his right wrist with weight-bearing on his right hand. Neurovascularly intact in his right upper extremity.

Differential Diagnoses:

- Scapholunate ligament injury
- Kienbock's disease
- Scaphoid impaction syndrome
- Scaphoid fracture
- De Quervain's tenosynovitis

Tests and Results:

- X-ray of right wrist:
- Scaphoid waist fracture with evidence of healing
- CT of right wrist:
- Scaphoid waist fracture with evidence of partial non-union along the volar margin

Final Working Diagnosis

Partial union of mid waist scaphoid fracture

Treatment and Outcome:

Initially, immobilization in an Exos thumb spica splint. Bone stimulator twice daily for 20 minutes. Gradually progressed him back to golfing activity starting with chipping and putting. He was still healing as of last set of X-rays at 8 week follow-up. He progressed through putting and chipping without pain. We cleared him to start full golf activity.

163 June 1, 11:10 AM - 11:30 AM

**Peculiar Hand Injury-Indoor Collegiate Soccer Goalie**

Berkin O. Ulgen<sup>1</sup>, Jason Stacy<sup>2</sup>, Tenley E. Murphy<sup>1</sup>. <sup>1</sup>*University of South Carolina School of Medicine, Columbia, SC.* <sup>2</sup>*University of South Carolina, Columbia, SC.*  
 Email: bulgen07@gmail.com  
 (No relationships reported)

HISTORY: 19-year-old right-handed male college intramural indoor soccer goalie one day prior to office visit sustained a right hand injury when he inadvertently punched a wall while attempting to block a shot. He has pain with squeezing hand into a fist. Noticed moderate swelling. He wrapped his hand in Ace wrap and took ibuprofen last night.

PHYSICAL EXAMINATION: Examination in clinic reveals moderate swelling of wrist. Skin intact without erythema or deformity. Decreased range of motion of right wrist. Wrist flexion and extension 3/5 strength. Positive for tenderness on palpation of distal carpal row and proximal metacarpals. No anatomic snuffbox tenderness. Sensation and pulses intact.

DIFFERENTIAL DIAGNOSIS:

1. Fracture: carpal, metacarpal
2. Carpal dislocation
3. Wrist sprain
4. Contusion (hand)
5. Acute traumatic compartment syndrome
6. Traumatic median or radial nerve palsy
7. Wrist flexor/extensor tenosynovitis/rupture

TESTS AND RESULTS:

- X-ray right wrist 3 view:
- Radiologist read: no acute fracture or dislocation

- Sports medicine interpretation: Avulsion fracture of carpal bone, unable to determine if capitate, hamate or triquetrum involved.
- CT right wrist without contrast (ordered to evaluate radiographic carpal abnormality):
- Hamate fracture, mildly comminuted primarily oblique fracture through the distal dorsal aspect of hamate extending into the 4<sup>th</sup> carpometacarpal joint with approximately 3 mm of diastasis
- Capitate fracture, tiny oblique fracture through the distal dorsal ulnar aspect of the capitate extending into the 3<sup>rd</sup> carpometacarpal joint.
- Incidental finding of carpal boss.

FINAL/WORKING DIAGNOSIS:

Capitate and hamate fractures, closed

TREATMENT AND OUTCOMES:

1. Immobilization with short arm cast for 6 weeks and referral to hand surgery due to multiple carpal fractures and high risk for nonunion
2. Repeat radiographs at 6 weeks show non-union of fracture at the distal end of the capitate
3. At 6 weeks, hand surgery notes that he may have continued pain for some time but at the present point can begin actively using the wrist as tolerated. Patient can follow-up again with hand surgery as necessary.

**A-35 Free Communication/Poster - Aging**

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
 Room: Exhibit Hall A/B

164 Board #1 June 1, 9:30 AM - 11:00 AM  
**Identification and Prediction of the Walking Cadence Required to Reach Moderate Intensity in Older Adults**

Danielle R. Bouchard<sup>1</sup>, Fagner Serrano<sup>2</sup>, Jana Slaght<sup>2</sup>, Martin Sénéchal<sup>1</sup>, Todd Duhamel<sup>2</sup>. <sup>1</sup>*University of New Brunswick, Fredericton, NB, Canada.* <sup>2</sup>*University of Manitoba, Winnipeg, MB, Canada.*  
 Email: danielle.bouchard@unb.ca  
 (No relationships reported)

PURPOSE: To evaluate the walking cadence needed to reach moderate intensity in older adults and to develop an algorithm to individualize the prescription.  
METHODS: Peak oxygen consumption was established with 121 inactive adults (doing less than 150 minutes of aerobic exercise per week) age 55 and above on a treadmill. Walking cadence at moderate intensity was established when participants reached 40% of peak oxygen consumption on an indoor flat surface. Other variables potentially associated with walking cadence were collected (e.g., body weight, stride length, height) to contribute to the algorithm developed with half the sample, randomly selected, and validate with the other half.  
RESULTS: Mean walking cadence to reach moderate intensity was 115.8 ± 10.3 steps per minute. The best algorithm to predict the walking cadence needed to reach moderate intensity in this sample was: 117.95 - .23 X body weight (kg) + self-selected walking cadence (steps/min).  
CONCLUSION: In general, adults aged 55 and above need more than 100 steps per minute to reach moderate intensity when the prescription is individualized. Body weight and the self-selected walking cadence are useful to predict walking cadence needed to reach moderate intensity in this population.

165 Board #2 June 1, 9:30 AM - 11:00 AM  
**The Effectiveness of Rebounders on Balance in Older Adults**

Charilaos Papadopoulos<sup>1</sup>, Kimber Maroney<sup>1</sup>, Willow Eaton<sup>2</sup>. <sup>1</sup>*Pacific Lutheran University, Tacoma, WA.* <sup>2</sup>*City of Tacoma, Lighthouse Senior Activity Center, Tacoma, WA.* (Sponsor: Leslie Jerome Brandon, FACSM)  
 Email: papadoha@plu.edu  
 (No relationships reported)

Balance impairment has been shown to be a risk factor for falls among older adults. Typical exercise training programs often include a range of static and dynamic exercises that are designed to train the motor system by altering the task demand. However, in order to train the sensory system, the goal should be to manipulate the environment by performing balance activities either standing or moving on a compliant or moving surface. PURPOSE: The aim of this study was to evaluate the effectiveness of rebounders on balance and postural control in a group of older adults over 16 weeks. METHODS: Thirty-three participants (mean age: 74.1 ± 7.9 yrs) were divided into an experimental (E) group that participated in a rebounder exercise program twice per week, a reference (R) group which consisted of individuals that participated in an evidence-based program emphasizing strength and balance development, and a control (C) group. Each participant completed the Berg Balance Scale and the Mini

Balance Evaluation System Test (Mini-BEST) which differentiates balance into four underlying systems: anticipatory, reactive postural control, sensory orientation, and dynamic gait. A trained and experienced evaluator assessed all participants at baseline and after 16 weeks. A repeated measures ANOVA with one within factor (time) and one between factor (groups) was used to evaluate differences between pre and post and among groups. Significance was established at  $p < 0.05$ . **RESULTS:** There was no significant ( $p = 0.38$ ) difference in age among groups. Static balance and postural control increased for the E group after 16 weeks of training, but this increase was not statistically significant ( $p = 0.52$ ). Reactive postural control was significantly ( $p < 0.001$ ) different post training for the E group only. Anticipatory, sensory orientation, and dynamic gait balance was not significantly different between pre and post training and among groups ( $p > 0.05$ ). **CONCLUSION:** These results showed that after 16 weeks of training using rebounders, reactive postural control increased in a group of older adults. These results indicate that short, medium and long proprioceptive feedback loops responsible for autonomic postural responses to slips, trips and pushes can be improved with this type of exercise training. Supported by WREMS Grant

166 Board #3 June 1, 9:30 AM - 11:00 AM  
**Effects Of Hopping Exercise Training On Postural Stability And Leg Power In Older People**

Toshiaki Nakatani<sup>1</sup>, Kazufumi Terada<sup>1</sup>, Akira Shiraishi<sup>1</sup>, Masakazu Nadamoto<sup>2</sup>. <sup>1</sup>Tenri University, Tenri, Japan. <sup>2</sup>Poole Gakuin University, Sakai, Japan.  
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 (No relationships reported)

**PURPOSE:** Reductions in muscle power and strength seem to be a cause of poor postural stability in older adults. This study was performed to investigate the effects of hopping exercise (HE) training on static postural stability and leg power in healthy older adults.

**METHODS:** Twenty-six men and women (mean age  $\pm$  standard deviation, 71.3  $\pm$  5.0 years) were randomly assigned to either an HE group ( $n = 13$ ) or balance exercise group (BE,  $n = 13$ ). Both groups trained for 12 weeks. The HE group performed two sets of two-legged hopping at a frequency of 90 bpm until they reached a rate of 15 (hard) on the Borg scale of perceived exertion twice a week. The BE group performed on a foam stability pad or a narrow balance beam. They participated in a 30-min supervised group exercise session held once every 2 weeks at a local center. Outcome measures included the center of foot pressure (CoP) sway parameters (linear length of sway path, area of sway path, and linear length of sway path in a particular unit of time) and leg muscle power (cycling power and vertical jump).

**RESULTS:** Repeated-measures analysis of variance showed only a significant main effect of time. After the training session, the HE group demonstrated a significantly decreased path length (45.0  $\pm$  17.4 vs. 37.6  $\pm$  12.5 cm,  $P < 0.05$ ), sway area (2.71  $\pm$  1.40 vs. 2.09  $\pm$  1.25 cm<sup>2</sup>,  $P < 0.05$ ), and sway velocity (2.25  $\pm$  0.87 vs. 1.88  $\pm$  0.63 cm/s,  $P < 0.05$ ) and an increased cycling power (4.44  $\pm$  0.97 vs. 4.68  $\pm$  0.93 W/kg,  $P < 0.05$ ), but no change in vertical jump (25.1  $\pm$  6.3 vs. 23.5  $\pm$  6.3 cm). The BE group demonstrated a significant change in cycling power (4.57  $\pm$  0.61 vs. 4.80  $\pm$  0.50 W/kg,  $P < 0.05$ ), but no differences in the CoP sway parameters (path length: 43.9  $\pm$  11.3 vs. 42.5  $\pm$  9.8 cm, sway area: 2.83  $\pm$  1.13 vs. 2.58  $\pm$  0.99 cm<sup>2</sup>, sway velocity: 2.20  $\pm$  0.57 vs. 2.12  $\pm$  0.49 cm/s) or vertical jump (24.2  $\pm$  6.3 vs. 23.9  $\pm$  4.0 cm).

**CONCLUSIONS:** Our results suggest that a dynamic two-legged HE program is more effective than static BE in improving postural stability and leg muscle power in healthy older adults. HE may be recommended as a technique to reduce the risk of falling; however, future studies should examine the safety of this method for older people. Supported by JSPS KAKENHI Number 26350767.

167 Board #4 June 1, 9:30 AM - 11:00 AM  
**Prevalence of Sarcopenia Through Different Diagnostic Criteria in Older Rhode Island Women**

Samuel G. Slezak, Kayla B. Mahoney, Emily N. Renna, Ingrid E. Lofgren, Furong Xu, Disa L. Hatfield, Matthew J. Delmonico.  
 University of Rhode Island, Kingston, RI.  
 (No relationships reported)

Sarcopenia is the age related loss of lean mass and is related to functional limitations and disability in older adults. New guidelines have been developed to define sarcopenia but further research needs to be done to identify the prevalence of sarcopenia in older populations using these new guidelines.

**PURPOSE:** To determine the prevalence of sarcopenia in women aged 65-84 years. **METHODS:** Community-dwelling women ( $n=61$ ) aged 71.9  $\pm$  4.6 years with a BMI 27.3  $\pm$  6.0 kg/m<sup>2</sup> who by self-report were healthy and not involved in a regular, vigorous exercise program were recruited for screening for sarcopenia. Participants were evaluated for sarcopenia status based on definitions established by the European Working Group on Sarcopenia in Older People (EWGSOP), the International Working Group (IWG), and the Foundation for the National Institutes of Health Sarcopenia Project (FNIHSP). Participants were tested under standardized conditions using

established cut points of grip strength, gait speed, and appendicular lean mass (ALM; via multifrequency bioelectrical impedance analysis) to define sarcopenia status. Descriptive statistics were used to evaluate prevalence and a Fisher's exact test was used to analyze the distribution frequency of sarcopenia categories from the different organizations.

**RESULTS:** In this sample 19.7% met EWGSOP sarcopenia criteria, 6.6% met FNIHSP sarcopenia criteria, and 3.3% met IWG sarcopenia criteria. There was a significant difference in distribution frequency for sarcopenia classification status when defined by EWGSOP guidelines vs. IWG guidelines ( $p=0.036$ ). No other significant differences in distributions between definitions were observed.

**CONCLUSION:** The prevalence of sarcopenia appears to be higher than previous estimates and there are significant differences between established definitions of sarcopenia when looking at a sample of older women in Rhode Island. These data, although from a small, homogenous sample, support the relatively large discrepancy among definitions in sarcopenia identification in older women that has been previously reported and suggests the need for additional examination to determine which established definition of sarcopenia is appropriate for different sub-groups (e.g. minority, institutionalized, older) to complement these findings.

168 Board #5 June 1, 9:30 AM - 11:00 AM  
**A Pneumatic Isoinertial Test For Assessing Power Endurance In Older Persons**

Caitlin Lowe, Christopher Bailey, Joseph F. Signorile. University of Miami, Coral Gables, FL. (Sponsor: Dr. Arlette Perry, FACSM)  
 (No relationships reported)

In older populations muscle fatigue (decline in power) has been shown to be an important functional variable. While fatigue measures have been developed for isokinetic testing, isoinertial tests of fatigue using resistance machine are greatly needed. **PURPOSE:** To establish the viability of a new isoinertial fatigue test using computerized pneumatic equipment. **METHODS:** Twenty-seven older independently living subjects were randomly assigned to a training (T;  $n=16$ ; mean $\pm$ SD, 66.6 $\pm$ 7.2 y, 80.4 $\pm$ 15.0kg) or control (C;  $n=11$ ; 69.6 $\pm$ 4.4y, 79.7 $\pm$ 16.1kg). Training involved two circuits on 11 pneumatic machines 3 times per week, using 25 repetitions (reps) at 50% 1RM. Muscular power endurance was evaluated during 20 reps of the chest press (CP) and leg press (LP) performed as fast as possible at 50% of subjects' 1RM after a series of light warm-ups. Separate 2(group)  $\times$  2 (time)  $\times$  20 (rep) mixed ANOVA with Bonferroni post hoc tests were used to detect differences. **RESULTS:** For CP and LP significant time  $\times$  rep  $\times$  training status interactions were detected ( $p=.019$ ). CP post hoc analyses for trained group revealed significant differences across the final 5 repetitions during pretest and beginning as early as the third rep for post-training. For the CP untrained group few significant differences were seen during pretest; while post-test significant differences began by repetition 10. For LP for both trained and untrained groups, during pretest and post-test, a significant repetition effect was shown ( $p<.0001$ ). There were no significant differences revealed in post hoc analysis for the pretest in either group; however, changes were apparent as early as the third repetition for the post-test data in the trained group. No significant differences were found across repetitions for the untrained group. For both the LP and CP groups no significant differences were detected between pretest and post-test across repetitions for the C group; however, the T group showed significant differences across time for repetitions 6-20 and 11-20 for LP and CP, respectively ( $p<.0025$ ). **CONCLUSIONS:** Our results support the use of our isoinertial fatigue test to evaluate power endurance in older persons since changes in the power output patterns which resulted from our endurance training program were not seen in controls.

169 Board #6 June 1, 9:30 AM - 11:00 AM  
**Effects Of Nonlinear Periodization On Maximum And Explosive Muscular Strength In Elderly People**

Rodolfo A. Dellagrana, Bruno M. Moura, Lucas B. R. Orssatto, Raphael L. Sakugawa, Joseflina Bertoli, Samuel M. S. Araújo, Fernando Diefenthaler. Federal University of Santa Catarina, Florianópolis, Brazil.  
 (No relationships reported)

**PURPOSE:** The aim of this study was to investigate on changes in maximal force [one repetition maximum (1RM)] and maximal contractile [rate of force development (RFD)] evoked by nonlinear periodization strength training in elderly people. **METHODS:** Fifteen untrained healthy subjects (10 women = 69.07  $\pm$  13.27 kg, 43.42  $\pm$  8.03 %BF, 158.9  $\pm$  6.78 cm, and 64.8  $\pm$  2.94 yr; and 5 men 71.44  $\pm$  9.67 kg, 21.34  $\pm$  6.23 %BF, 171.78  $\pm$  5.63 cm, and 62.2  $\pm$  1.79 yr) volunteered to participate in the study. Maximum isometric voluntary contraction (MIVC) and 1RM were assessed in four different moments: control period (week -4), baseline (week 0), pre-training (week 4), mid-training (week 8), and post-training (week 12). All subjects trained twice a week during 12 weeks. Volume and intensity was alternated in each day/training. A leg press 45° was used to measure 1RM. MIVC of knee extensors were assessed at a joint angle of 70° (full knee extension = 0°) using an isokinetic dynamometer. After

warm-up, each subject performed 1RM, followed by three MIVC as fast and strong as possible; the interval between tests was 15 min. Normalized RFD (RFDnorm) and 1RM were analyzed using ANOVA with repeated measures, followed by Post-hoc test of Bonferroni. The level of significance was set at 5%. RESULTS: During the control period (week -4 and 0), no changes were observed for 1RM and RFDnorm ( $p > 0.05$ ). There were significant increases ( $p = 0.001$ ) in 1RM after 4, 8 and 12 weeks of intervention ( $162 \pm 49$ ,  $177 \pm 55$ , and  $188 \pm 57$  kg, respectively) in comparison with baseline ( $140 \pm 13$  kg). No significant increase in RFDnorm was observed at time intervals of 0-50 and 0-100 ms after 4 ( $257 \pm 76$  and  $309 \pm 93$  N·m·s<sup>-1</sup>), 8 ( $310 \pm 86$  and  $369 \pm 97$  N·m·s<sup>-1</sup>) and 12 weeks ( $293 \pm 106$  and  $350 \pm 123$  N·m·s<sup>-1</sup>, respectively) in comparison with baseline (0-50 ms =  $270 \pm 80$  and 0-100 ms =  $323 \pm 97$  N·m·s<sup>-1</sup>,  $p < 0.05$ ). However, significant difference was found between baseline and time interval at 0-200 ms after 8 weeks ( $279 \pm 55$  vs.  $325 \pm 43$  N·ms<sup>-1</sup>,  $p < 0.05$ ). CONCLUSIONS: The nonlinear periodization improves maximum and explosive strength in elderly people, suggesting that should be incorporated in strength training to improve daily life activities in this population.

170 Board #7 June 1, 9:30 AM - 11:00 AM  
**Body Protein Retention is Maintained in Older Adults Performing High-Intensity Interval Training (HIIT)**  
 William R. Lunn, Allyson Derosier. *Southern Connecticut State University, New Haven, CT.*  
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 (No relationships reported)

High-intensity interval training (HIIT) is a popular and effective program to elicit physiologic adaptations favorable to quality of life improvement and metabolic disease risk reduction. Whether an older population (>50 y) would be more challenged to retain body protein performing HIIT compared to younger individuals is unknown. PURPOSE: To determine if measures of body protein retention and exercise performance change in older adults completing a 2-week HIIT program, compared to younger adults. METHODS: Healthy, young (n=8;  $24.4 \pm 3.6$  y; BMI= $27.1 \pm 2.8$  kg·m<sup>-2</sup>) and older (n=8;  $59.4 \pm 5.6$  y; BMI= $26.8 \pm 5.6$  kg·m<sup>-2</sup>) males and females completed a 2-week (6 sessions) HIIT program on a cycle ergometer. Baseline nitrogen balance (NBAL) and urinary creatinine (UC) were assessed from 24-h urine collection and 3-d habitual diet recall. Baseline maximal oxygen uptake was determined via graded exercise test with indirect calorimetry on a cycle ergometer. Each HIIT session was 10x60 s at 90% of peak power achieved in the VO<sub>2</sub>max test. Recovery interval was 60 s active recovery (50 W). Nitrogen balance and urinary creatinine were determined on the initial and final (6th) day of the HIIT program by 24-h urine collection and a prescribed, eucaloric, adequate-protein diet (1.5 g protein·kg<sup>-1</sup>·d<sup>-1</sup> and  $\leq 30\%$  of kcal from lipid). A final VO<sub>2</sub>max test was used to assess changes in peak oxygen uptake (VO<sub>2</sub>) and peak power (PP). RESULTS: RMANOVA resulted in no significant mean difference in NBAL, UC, VO<sub>2</sub>, and PP between baseline, initial and final workout days in the young and older groups ( $p < 0.05$ ; see table). CONCLUSION: Older, healthy adults can retain body protein while engaging in HIIT as long as they consume a eucaloric diet with adequate dietary protein (1.5 g·kg<sup>-1</sup>·d<sup>-1</sup>).

|                             | Young       |             |             | Older       |             |             |
|-----------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                             | Baseline    | Initial     | Final       | Baseline    | Initial     | Final       |
| NBAL (g/d)                  | 5.7 ± 4.5   | 3.7 ± 6.1   | 6.7 ± 5.9   | 2.1 ± 7.1   | 6.6 ± 4.5   | 5.6 ± 3.1   |
| UC (g/d)                    | 2.28 ± 0.53 | 2.15 ± 0.63 | 1.92 ± 0.62 | 1.74 ± 0.69 | 1.48 ± 0.48 | 1.63 ± 0.62 |
| VO <sub>2</sub> (mL/kg/min) | 39.8 ± 1.8  | ---         | 40.6 ± 3.3  | 31.8 ± 5.9  | ---         | 32.9 ± 5.6  |
| PP (W/kg)                   | 3.47 ± 0.25 | ---         | 3.56 ± 0.25 | 2.98 ± 0.79 | ---         | 3.12 ± 0.78 |

171 Board #8 June 1, 9:30 AM - 11:00 AM  
**Senior Golfers - Fitness, Mood and Enjoyment Measured Before and After Golf-Specific Training: A Pilot Study**  
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Senior golfers (>50 yrs of age) often play golf to stay physically active and socialize, as well as to hone their skills for competition. Improving golf fitness levels may enable older adults to play golf to a later age, and to maintain their physical capabilities as they continue to enjoy the physical and psychological benefits of participation. PURPOSE: To investigate whether golfers completing a pre-season 8-week golf-training program (GTr) had improved fitness, golf-specific capabilities, enjoyment,

and mood states after the GTr. METHODS: Ten females (mean age of  $63.6 \pm 7.2$  yrs) completed the *Titleist Performance Institute* (TPI) golf fitness screen and the Physical Activity Enjoyment Scale (PACES) before and after GTr. They also completed the Profile of Mood States (POMS) pre- and post- a 6-min walk test performed before and after GTr. Both heart rate (HR) and ratings of perceived exertion (RPE) were measured post-walk tests. One-way (Time) ANOVAs for the variables were calculated (pilot study:  $p \leq 0.10$ ). RESULTS: As expected, physiological characteristics did not change significantly from before to after the GTr. These included the following Ms and SDs: Body weight =  $69.4 \pm 14.3$ ,  $69.8 \pm 14.3$  kg; 6-min walk distance =  $627 \pm 57$ ,  $628 \pm 54$  yds and 6-min walk RPE =  $13.0 \pm 1.9$ ,  $13.5 \pm 2.1$  ("somewhat hard"). The 6-min walk HR =  $127 \pm 20$ ;  $119 \pm 17$  beats/min ( $p = 0.02$ ) and scores for the TPI golf fitness screen ( $18.3 \pm 4.1$ ;  $14.4 \pm 6.9$ ) improved ( $p = 0.10$ ). However, the TPI swing evaluations scores ( $10.0 \pm 7.5$ ;  $8.8 \pm 3.5$ ), and PACES Trait were not significantly different after GTr. Golfers self-reported feeling "ready for the golf season". Results from a two-way repeated measures ANOVA indicated that Total Mood Disturbance (TMD) scores on the POMS changed in desirable directions ( $p = 0.11$ ) after 6-min of walking as "fast as you can" at both the beginning and the end of GTr ( $99.3 \pm 13.7$ ,  $90.4 \pm 16.5$ ;  $101.9 \pm 18.3$ ,  $95.0 \pm 11.6$ ). CONCLUSIONS: Following a pre-season golf-specific training program, TPI golf fitness screen scores improved. Golfers also reported enjoying exercise regardless of GTr and had desirable changes in mood states after the 6-minute walk tests. Additional studies on the benefits of golf training for older adults are needed to help senior golfers stay "on the course."

172 Board #9 June 1, 9:30 AM - 11:00 AM  
**Prevalence and Associated Factors with Sarcopenia in Physically Active Subjects Over 50 Years of Age**  
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The sarcopenia has a high prevalence and various triggers factors, which should be identified for prevention and reversal. PURPOSE: to determine the prevalence and associated factors with sarcopenia in physically active subjects. METHODS: 910 subjects were evaluated (788 women and 122 men) who were involved in physical activity programs from the Longitudinal Project of Aging and Physical Fitness of Sao Caetano do Sul. Sarcopenia was determined by The European Working Group on Sarcopenia in Older People (EWGSOP) criteria that takes into account low muscle mass (arm muscle circumference) and low muscle strength (hand grip) or low physical performance (gait speed). The independent variables were assessed by an anamnesis, as well as anthropometric measures (waist and calf circumference), BMI and level of physical activity assessed by IPAQ short version. Poisson Regression analysis with robust variance was used to estimate the prevalence ratio with 95% confidence intervals. The significance level adopted was  $p < 0.05$ . RESULTS: 18.4% of the sample had low muscle mass, 50.9% low muscle strength and 34.2% had reduced gait speed resulting in 13.5% prevalence of sarcopenia. Both groups met the recommendation of 150 min/week (on average  $247.5 \pm 161.2$  min/week for non sarcopenic and  $297 \pm 162$  min/week for sarcopenic). CONCLUSIONS: Lower calf circumference and low body weight were determined as risk factors for sarcopenia while overweight and greater waist circumference has showed as a protective factor for sarcopenia. It is noteworthy that the level of physical activity of this sample may have contributed to the low prevalence of sarcopenia.

|  | ASSOCIATED FACTORS WITH SARCOOPENIA IN PHYSICALLY ACTIVE MEN AND WOMEN OVER 50 YEARS OF AGE |      |             |      |
|--|---|------|-------------|------|
|  | Prevalence  | PR   | CI 95%      | p    |
| <b>Sarcopenia</b>                            |   |      |             |      |
| <b>Body Mass Index (kg/m<sup>2</sup>)</b>    |   |      |             |      |
| Underweight                                  | 5.7%  | 2.65 | (1.68-4.18) | .001 |
| Normal                                       | 54.5%   | 1    |             |      |
| Overweight                                   | 39.8%   | 0.29 | (0.21-0.41) | .001 |
| <b>Calf Circumference (cm)</b>               |   |      |             |      |
| Normal                                       | 81.6%   | 1    |             |      |
| Low  | 18.4%   | 3.07 | (2.12-4.45) | .001 |
| <b>Waist Circumference (cm)</b>              |   |      |             |      |
| Normal                                       | 55.3%   | 1    |             |      |
| High   | 44.7%   | 0.32 | (0.23-0.45) | .001 |
| <b>Level of Physical Activity (min/week)</b> |   |      |             |      |
| ≥ 150 min                                    | 34.2%   | 1    |             |      |
| < 150 min                                    | 65.8%   | 1.01 | (0.56-1.81) | .96  |

173 Board #10 June 1, 9:30 AM - 11:00 AM  
**6-Minute Walk Test: Relationship To Cognitive Function In Healthy Older Adults**

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By 2030, ~20% of the United States population will be 65 years or older. Regular physical activity is imperative in keeping this population physically and cognitively healthy, thereby maintaining their independence (Ortman et al., 2014). Loss of independence was shown to be associated with low aerobic fitness (Paterson et al., 2004). Aerobic fitness is typically assessed using a VO<sub>2</sub>max test, which is expensive and contraindicated in older populations. Alternatively, the self-paced 6-minute walk test (6MWT) is a safe and efficient assessment of aerobic fitness for older populations (Rikli & Jones, 1998). Previous studies suggest that aerobic fitness is positively correlated with cognitive function in sedentary older adults (Colcombe et al., 2003). However, there is a lack of literature that specifically looks at the relationship between the 6MWT and cognitive function in ethnically diverse healthy populations of 60 years and older. **PURPOSE:** To assess the relationship between 6MWT performance and cognitive function in ethnically diverse healthy populations ages 60-95 yrs. **METHODS:** 43 participants (33 female, 10 male) aged 76.3 ± 10.5 years were recruited from the local area. During the 6MWT, exercise HR, distance walked, and heart rate recovery (HRR) each minute for 5 minutes was recorded. Additional assessments included cognitive tests (Modified Mini-Mental State Test; 3MS, trailmaking tests, animal naming), muscular fitness assessed by hand-grip strength, Physical Activity Scale for Elderly (PASE), Perceived Stress Scale (PSS), and anthropometric measures. **RESULTS:** Aerobic fitness as measured by 6MWT was moderately correlated with 3MS ( $p=0.036$ ,  $r=0.328$ ) and animal naming ( $p=0.011$ ,  $r=0.395$ ). Aerobic fitness levels were highly correlated with peak hand-grip strength ( $p=0.001$ ,  $r=0.492$ ), HRmax ( $p=0.001$ ,  $r=0.567$ ), HRR1 ( $p=0.001$ ,  $r=0.524$ ), HRR2 ( $p=0.001$ ,  $r=0.596$ ). **CONCLUSION:** Findings agree with previous studies (Barnes et al., 2003; Colcombe et al., 2003) suggesting that aerobic fitness is associated with preservation of cognitive function as assessed by 3MS and animal naming. Our findings conclude that the 6MWT can be used as an indicator for aerobic fitness and cognitive function in healthy individuals from ages 60-95 yrs.

174 Board #11 June 1, 9:30 AM - 11:00 AM  
**Qigong Exercise Improves Japanese Old Adults' Quality of Life**

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**PURPOSE:** Daoyin Yangsheng Gong (DYSG) is a system of exercises that involves gentle rotational movements and breath control and it stimulates key acupressure points and cognitive function. We examined the effects of DYSG on measures of physical and psychological quality of life among the participants of the 2014 DYSG national games in Yokohama, Japan using a questionnaire. **METHODS:** 771 of 1,200 DYSG participants with 8.3 y (±6.2) of experience filled in the Anti-Aging Quality of Life Questionnaire, a subjective symptoms inventory. Subjects rated their current physical and psychological condition by recalling their condition before they started to habitually practice DYSG. The questionnaire scores 13 physical (fatigue, breathlessness, joint and muscle pain, etc) and 9 psychological health domains (anger, psychological fatigue, insomnia, vigor, depression, etc) on a 4-point Likert-scale (1: unchanged; 4: significantly improved). **RESULTS:** The sample consisted of 83 males and 679 females (9 participants did not answer) age 81 (n = 28) (22 participants did not give their age). Chi-square and residual analysis revealed that physical fatigue, joint and muscle pain, poor physical condition, and sensitivity to cold (adjusted standardized residuals, SR = 6.2, 3.6, 2.2, and 3.0) and anger, psychological fatigue, insomnia and vigor all improved (SR = 3.5, 6.5, 2.1, and 3.1). Logistic regression analysis showed that in the group age < 60 vs. age 76-80, poor physical condition and sensitivity to cold improved more (adjusted odds ratio, OR = 9.9 and 6.6). Males vs. females perceived more improvements in sensitivity to cold (females' OR = .47). Females vs. males perceived more improvements in psychological fatigue and vigor (OR = 2.4 and 2.8). Participants age 76-80 reported substantially greater improvements in anger compared with the other groups (OR = 4.9).

**CONCLUSIONS:** Despite becoming about 8 years older, DYSG participants, representing a broad segment of old adults, reported that they perceived their health quality actually being at a higher level compared with what they recalled their condition was at the start of DYSG. DYSG seems to provide comprehensive physical and cognitive benefits that may slow aging and prolong health span.

175 Board #12 June 1, 9:30 AM - 11:00 AM  
**Personalized Walking Cadence to Increase Time at Moderate-Vigorous Intensity in Inactive Older Adults**

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**Purpose:** The main goal of this study was to identify if older inactive adults using a pedometer, giving walking cadence required to reach moderate intensity, significantly increased total time spent at moderate to vigorous intensity and 10-minute bouts at moderate to vigorous intensity.

**Methods:** Inactive older adults (N = 42) were instructed to walk 150 minutes/week at no specified intensity during phase 1 (week 1-6). In phase 2 (week 7-12), the intervention group (N = 20) received instructions on how to reach moderate intensity, using a pedometer and individualized walking cadence, while the control group (N = 22) did not. The individualized cadence was based on the number of steps per minute required to reach 40% of VO<sub>2peak</sub>.

**Results:** During phase 1, total time spent at moderate to vigorous intensity increased from 100 ± 6 to 117 ± 64 min. ( $p \leq 0.05$ ) and time spent in moderate to vigorous intensity in 10-minute bouts significantly increased from 10 (25<sup>th</sup>-75<sup>th</sup> percentile: 0-32 min.) to 19 (25<sup>th</sup>-75<sup>th</sup> percentile: 8-53 min.;  $p \leq 0.01$ ). During phase 2, total time spent at moderate to vigorous intensity increased from 129 ± 67 to 203 ± 91 min. ( $p \leq 0.01$ ) and time spent at moderate to vigorous intensity in 10-minute bouts increased from 31 (25<sup>th</sup>-75<sup>th</sup> percentile: 11-55) to 88 (25<sup>th</sup>-75<sup>th</sup> percentile: 52-143);  $p \leq 0.01$ , while the control group significantly decreased both variables ( $p \leq 0.01$ ). In addition, 35% of inactive older adults in the intervention group reached the common prescription of a minimum of 150 minutes of aerobic exercise per week in 10-minute bouts ( $p \leq 0.01$ ). No one in the control group reached 150 minutes of aerobic exercise per week in 10-minute bouts.

**Conclusion:** Inactive older adults can increase total time and 10-minute bouts at moderate to vigorous intensity by using individualized walking cadence. These results are of great importance as it suggests that walking cadence might be a useful strategy to promote exercise at the target intensity recommended for older adults.

176 Board #13 June 1, 9:30 AM - 11:00 AM  
**Effects From "Exergames" Vs. Traditional Exercise On Lower And Upper Body Strength In Older Adults**

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**PURPOSE -** This study compared the effects of exergaming-based program to traditional aerobic exercise on lower and upper body strength in older adults.

**METHODS -** This is a randomized controlled trial. The sample included 27 inactive community-dwelling subjects (aged 55 and over) without cognitive impairment and previous contact with video games or exergames. For exergaming (n = 13), we used games that simulate sports activities (Kinect Sports Ultimate Collection, Xbox 360 Kinecttm). The aerobic exercise program (n = 14) was carried out on treadmills and cycle ergometers (40-59% heart rate reserve). The duration of the sessions was 50 minutes, three days per week (alternate days), for 12 weeks. Individuals performed the 30-s chair stand test (no. of reps.), which assessed lower body muscle strength and endurance; and the Arm Curl test (no. of reps.), which assessed upper muscle strength and endurance, specifically of the biceps.

**RESULTS -** Adherence to intervention programs (attending the sessions) was 90.6% and 86.9%, for the exergame and aerobic groups, respectively. The Mixed Model ANOVA (F- statistics and p-values) showed that the interaction of intervention group by time was significant for the arm curl test (F, 0.732; Effect-size, 0.242;  $p = 0.009$ ). After 12-weeks, both groups showed improvement in the 30-s chair stand test ( $p < 0.05$ ). Arm curl test performance improved significantly ( $p < 0.05$ ) in the exergame group.

**CONCLUSION -** The exergaming-based exercise was feasible and substantially improved upper and lower body muscle strength in older adults and may represent a model for structured training.

177 Board #14 June 1, 9:30 AM - 11:00 AM  
**Optimal Loading for Isoinertial Power in Older Individuals**

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(No relationships reported)

Muscle power decreases exponentially as we age causing decrements in performance of activities of daily living and increased fall probability. High-velocity weight training (power training) has been shown to be an effective intervention to improve older persons' power; however, the optimal loads for maximizing power improvements across different exercises remains undetermined. **PURPOSE:** To determine differences in optimal loads for mechanical power across six isoinertial exercises.

**METHODS:** Forty-two community dwelling older adults (76.0±7.9 years) were tested during two 1.5 hour sessions. One repetition maximums (1RM) were identified across six pneumatic machines following a 10 repetition warm up. After a 5 min recovery and an additional 10 repetition warm up, power outputs were recorded for each machine at random percentages of 1RM ranging from 30 to 90%. Repeated measures ANOVA with Bonferroni post-hoc analyses were used to determine differences among loads.

**RESULTS:** The leg press showed a significant load effect with 60% producing a power output (M=0.95±0.072) that was significantly higher than 30%, 40%, 80%, and 90% 1RM ( $\eta^2=0.335$ ;  $p<0.002$ ). A significant load effect was also observed for the seated row where 40% 1RM produced a significantly higher power output than 30%, 60%, 80%, and 90% 1RM ( $\eta^2=0.444$ ;  $p<0.024$ ). Similarly, the lateral pulldown showed significant differences by load with 40% 1RM (M=0.95±0.064) producing a significantly higher power output than 30%, 70%, 80%, and 90% 1RM ( $\eta^2=0.602$ ;  $p<0.038$ ). Chest press displayed a significant difference among loads with 50% and 60% 1RM both producing higher power outputs than 30%, 70%, 80%, and 90% 1RM ( $\eta^2=0.468$ ;  $p<0.008$ ). The leg curl showed a significantly higher power output at 50% 1RM (M=0.93±0.074) than at 30%, 80%, and 90% 1RM ( $\eta^2=0.363$ ;  $p<0.028$ ). Finally, the calf raise also showed a significant difference between loads with peak power occurring at 60% 1RM (M=0.89±0.107) compared to 30%, 70%, and 90% 1RM ( $\eta^2=0.106$ ;  $p<0.039$ ).

**CONCLUSIONS:** Our results suggest that optimal loads for peak power vary by exercise likely due to differences in the number of joints, muscle characteristics and bony lever systems involved in each exercise.

178 Board #15 June 1, 9:30 AM - 11:00 AM  
**Balance is Associated with Lower Body Strength and Mobility in Older Adults**

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Falls are the leading cause of hospitalizations and loss of independence in older adults. Improving balance and physical function are important strategies to decrease fall risk and increase length of independence. Little is known about the level of balance needed to maintain independence and the relationship between balance and physical function measures in older adults. Recently, Rikli and Jones (2013) developed cut-off points for their Senior Fitness Battery (SFB) physical tests that align with maintenance of independence, over time, for older adults.

**PURPOSE:** The purpose of this study was to assess differences in lower body strength and mobility in older adults with better and poorer balance, and determine balance values associated with SFB cut-off points for independence in lower body strength and mobility.

**METHODS:** Community-dwelling older adults (N=231, Mage = 74.0yr ±8.2) were recruited from non-residential senior centers and completed validated measures of balance, lower body strength, and mobility. Balance was measured with the Balance Tracking System capturing Center of Pressure (COP) postural sway in static eyes-closed stance. Lower body strength and mobility were measured with the SFB sit-to-stand and the 8-ft up and go. One way ANOVAs examined differences in lower body strength and mobility of those with better balance versus poorer balance. Additionally, COP values associated with SFB cut-off scores for maintained independence were reported.

**RESULTS:** Those above the 50th percentile (n=113; COP≥38) for balance had significantly ( $p<0.001$ ) better lower body strength and mobility than those below the 50th percentile (n=120). Further, males (n=23) and females (n=75) with lower body strength above the SFB cut-off to indicate independence had COPs of 48.3cm and 35.3cm, respectively; males (n=27) and females (n=89) with mobility above the cut-off for independence had COPs of 47.3cm and 35.3cm, respectively.

**CONCLUSIONS:** Our study suggests that those with better balance have greater lower body strength and mobility. Also, COP values corresponding to derived cut-off points for independence were identified. Strategies targeting strength, mobility, and balance may increase the likelihood of maintaining independence in aging, and monitoring these may be important for quality of life in older adults.

179 Board #16 June 1, 9:30 AM - 11:00 AM  
**Effects Of A Game-based group Exercise On Functional Fitness For Community-dwelling Elderly Adults**

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Maintaining regular exercise is an important issue and helpful to improve health status for elderly adults. Game-based group exercise program not only can be used to enhance the motivation for regular exercise but also improves the social interaction in old people. However, there are few therapists designed game-based group exercise and investigated the long-term effects on functional fitness in elderly population in Taiwan.

**PURPOSE:** The purpose of this study is to investigate the effects of a 12-month game-based group exercise on functional fitness in community-dwelling older adults.

**METHODS:** Thirty community-dwelling elderly adults (23 female, 7 male; 78.1±7.6 years) were recruited and divided into game-based (n=15) or control group (n=15). Each subject participated in a 60-min exercise program twice per week for 12 months. The exercise program of game-based group consisted 10-min warm up and cool down stretching exercise and 50-min multidimensional physical games, such as ping pong ball blowing, modified London Bridge with resistance band, weight shifting exercise with juggle ball and modified football exercise et al. The control group received traditional physical exercise, including 10-min warm up and cool down stretching exercise, 50-min muscle strength, endurance, mobility, and balance exercise. The functional fitness (body composition, chair-stand [CS], body flexibility, one leg stand [OLS], 8-ft up-and-go, 2-minute knee-up) and Fukuda stepping tests were measured before and after the intervention. SPSS 16.0 was used to analyze data, and the alpha level of statistical significance was set to .05.

**RESULTS:** The comparisons of pre and post-intervention measures showed significantly improvements ( $p<0.05$ ) in waist width (-10.5%), CS (+17.6%), and OLS (+37.1%) for Game-based group, and BMI (-19%), waist width (-9.5%) and OLS (+9.5%) for control group. Game-based group also showed greater and significant improvement in CS (+42.6%,  $p=0.016$ ) and OLS (+27.6%,  $p=0.021$ ) performances compared to control group.

**CONCLUSIONS:** The results suggest that game-based group exercise is an effective exercise program for producing greater functional fitness improvements in elderly population, which would be very helpful to create appropriate exercise programs for community-dwelling elderly adults in the future.

180 Board #17 June 1, 9:30 AM - 11:00 AM  
**Associations Of Muscle Quality And Mass In The Forearm With The Barthel Index In Frail Old Women**

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(No relationships reported)

Since muscle strength declines at a higher rate than muscle mass, an age-related decline in muscle strength/mass ratio (i.e., muscle quality) would be expected. The Barthel Index is considered to be the best activity of daily living (ADL) evaluation scale and may associate with handgrip strength. However, it is unknown whether muscle quality and mass in the forearm associate with the Barthel ADL Index in frail older adults.

**PURPOSE:** To investigate the relationships between forearm muscle mass, muscle quality, and the ADL level assessed using the Barthel Index in old women attending a day care service.

**METHODS:** Twenty-four old women aged 71-103 (mean age 88 [SD 8] years) 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). Handgrip strength (HGS) was also measured for the dominant hand. Muscle quality (MQ) was calculated from the HGS to MT-ulna ratio. The ADL level was assessed using the Barthel Index (10BI) and the highest possible score of the 10BI is 100 (10 items). A select 3 items (3BI) of the 10BI, i.e., dressing, walking, descend/ascend stairs were also scored. Lower extremity function (LEF) was scored by testing balance ability with their

eyes closed, walking speed, and sitting up speed from the chair. Pearson correlation coefficients were performed for all variables. Partial correlations of MT and MQ with selected variables adjusted for age were also statistically quantified.

**RESULTS:**

The 10BI was positively correlated with age ( $r=0.452, p=0.027$ ), MT-ulna ( $r=0.582, p=0.003$ ), MQ ( $r=0.552, p=0.001$ ), and LEF ( $r=0.747, p<0.001$ ). The 3BI was also correlated with age ( $r=0.501, p=0.013$ ), MT-ulna ( $r=0.509, p=0.011$ ), MQ ( $r=0.526, p=0.008$ ), and LEF ( $r=0.737, p<0.001$ ). After adjusting for age, LEF was correlated with both MT-ulna ( $r=0.468, p=0.032$ ) and MQ ( $r=0.660, p=0.001$ ). However, the 10BI was only correlated with MT-ulna ( $r=0.468, p=0.032$ ), and the 3BI was only correlated with MQ ( $r=0.447, p=0.042$ ).

**CONCLUSIONS:**

Muscle quality in the forearm may be an effective variable for determining leg function and abilities like dressing, walking, and descend/ascend stairs in old women attending a day care service.

181 Board #18 June 1, 9:30 AM - 11:00 AM  
**Relationship Between Arthritis And Muscular Strength In Older Women With Symptoms Of Sarcopenia**

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 (No relationships reported)

Hand arthritis and sarcopenia are common health problems in older adults and new sarcopenia guidelines recommend the use of grip strength (GS) to determine weakness. Using GS to identify sarcopenia may present a significant challenge when hand arthritis is present and might not be related to other strength measures. However, this has not been thoroughly investigated in older women classified as sarcopenic or dynapenic **PURPOSE:** To determine if GS is related to other measures of upper and lower body strength and to determine if arthritis status is related to sarcopenia or dynapenia identification status in a sample of older women.

**METHODS:** Community-dwelling older women ( $n=25, \text{age}=72.3 \pm 4.6$  years) who were screened to be dynapenic or sarcopenic based on standard criteria were recruited for this cross-sectional analysis. GS was measured using standard techniques and arthritis status was determined based on self-report. Chest press (CPIRM) and leg press (LPIRM) one-repetition maximum tests were done using standardized protocols after familiarization. Spearman correlations were used to compare CPIRM, LPIRM, GS scores and a Fisher's exact test was used to determine if arthritis status was related to sarcopenia status based on new guidelines.

**RESULTS:** Mean GS was  $16.6 \pm 3.7$  kg and hand arthritis was present in 10 of the 25 women (40%;  $GS=16.3 \pm 4.8$  kg). Seven of the 10 (70%) women with arthritis had low GS ( $<20$  kg) but no other qualifications for sarcopenia, while 8 of the 15 women without arthritis (53%) had low GS but no other qualifications for sarcopenia. These frequency differences were not statistically significant ( $p=0.679$ ). In addition, there was not a significant correlation between GS and CPIRM ( $\rho=0.07, p=0.75$ ) or LPIRM ( $\rho=0.09, p=0.66$ ). However, there was a significant relationship between CPIRM and LPIRM ( $\rho=0.74, p<0.001$ ).

**CONCLUSIONS:** These findings indicate that hand arthritis is not related to other measures of upper or lower body strength and does not affect sarcopenia classification status in this sample of older women. Although the use of GS is an accepted modality by two organizations for measuring strength to help identify older women who have sarcopenia, alternative strength tests should be considered when testing those with hand arthritis.

182 Board #19 June 1, 9:30 AM - 11:00 AM  
**Regression Equation To Predict Body Fat In Elderly Men Using Body Circumference Measures**

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The aging process is associated with increase in subcutaneous fat. This study aims at providing a simple screening tool to help health professionals assess body fat in elderly men. High body fat is a risk factor that reduces quality of life and increases mortality rates.

**PURPOSE:** The purpose of this study was to develop and validate an equation to estimate body composition in elderly men above 60 years of age using body circumference measures. **METHODS:** The sample consisted of 85 male individuals with an average age of  $69.55 \pm 5.89$  from the Vitoria metropolitan area. The group was split into two subgroups: a regression group ( $n=54$ ) used to develop the equations

and a validation group ( $n=31$ ) used for cross reference. A multiple linear regression was used to develop the equation. Both equations were compared using the Student's *t* test for paired samples. The reliability of the equations was analyzed by the *Blant and Altman* method. **RESULTS:** The regression group had the following descriptive metrics: age  $68.59 \pm 4.6$  yr, body weight  $78.5 \pm 14.5$  kg, height  $1.66 \pm 0.6$  m; and percent body fat  $30.41 \pm 6.9\%$ . The validation group had the following descriptive metrics:  $71.21 \pm 7.5$  yr, body weight  $75.25 \pm 11.0$  kg,  $1.65 \pm 0.5$  m; and percent body fat  $29.44 \pm 7.7\%$ . Body circumferences variables were used to develop equations to predict body fat. Using the stepwise selection criteria, the following equation was developed:  $\% \text{ body fat} = 17.837 + 0.307 (\text{abdomen}) - 1.547 (\text{left forearm}) + 0.375 (\text{calf}) + 0.252 (\text{body mass})$ . Several parameters validated the strength of the equation:  $R^2 = 0.742$ ;  $r^2 = 0.76$  (meaning that 76% of the dependent variable can be explained by the predicting variables);  $EPE \leq 3.5\%$ ; and validation of the model based on the partial significance (F) of the subset of variables that showed the strongest effect. **CONCLUSION:** It is possible to develop an accurate and specific equation to estimate of body fat percent in elderly men using circumference measurements that is easy to use as screening tool by health professionals.

183 Board #20 June 1, 9:30 AM - 11:00 AM  
**Comparing The Physiological Responses To Single and Double Leg Cycling In Older Individuals**

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 (No relationships reported)

Single-leg cycling allows for a greater muscle specific exercise capacity and therefore provides a greater stimulus for metabolic and vascular adaptations when compared to standard double-leg cycling. **PURPOSE:** The purpose of this investigation was to compare the metabolic, cardiovascular, and peripheral responses of single-leg cycling to double-leg cycling in a healthy older adult population. **METHODS:** Eleven healthy males (age  $66 \pm 8$  years) performed two cycling conditions consisting of double-leg cycling (DL) and single-leg cycling (SL) with a 97N counterweight attached to the unoccupied crank arm to replicate normal cycling biomechanics. For each condition, participants performed cycling trials (60rpm) at three different work rates (25, 50, 75 W) for 4 minutes each. Oxygen consumption (VO<sub>2</sub>), respiratory exchange ratio (RER), heart rate (HR), mean arterial pressure (MAP), femoral blood flow, rating of perceived exertion (RPE), and liking scores were recorded. **RESULTS:** HR was similar between DL and SL conditions at all three intensities ( $92 \pm 19, 102 \pm 17$  and  $115 \pm 17$  for SL versus  $91 \pm 21, 100 \pm 18$  and  $112 \pm 20$  for DL;  $p \geq 0.160$ ). VO<sub>2</sub> was similar between DL and SL at 25W and 50W ( $p \geq 0.35$ ), however at 75W VO<sub>2</sub> was greater during the SL condition ( $16.1 \pm 2.7$  ml/kg/min) compared to DL ( $14.4 \pm 1.9$  ml/kg/min;  $p=0.037$ ). Femoral artery blood flow was significantly greater during SL cycling for the 50W ( $670 \pm 287$  versus  $456 \pm 217$  ml/min;  $p=0.01$ ) and 75W work rates ( $923 \pm 282$  versus  $608 \pm 270$ ;  $p<0.001$ ) but not at 25W. RER was significantly higher for SL ( $0.86 \pm 0.06, 0.91 \pm 0.09$  and  $0.97 \pm 0.09$ ) compare to DL ( $0.81 \pm 0.06, 0.86 \pm 0.07$  and  $0.90 \pm 0.07$ ) across all three intensities ( $p \leq 0.018$ ). RPE and liking were similar between both conditions ( $p=0.065$  and  $p=0.060$ , respectively). **CONCLUSIONS:** At least at low and moderate intensities, counterweighted single-leg cycling provides a greater peripheral stress for the same cardiovascular demand as double-leg cycling in a healthy elderly adult population. Furthermore, enjoyment of single-leg cycling was similar to double-leg. Thus, single-leg cycling with a counterweight may be an alternative exercise modality to maximize peripheral adaptations in the healthy aging population and those with central or peripheral diseases (i.e. peripheral vascular disease, diabetes, cardiovascular disease).

184 Board #21 June 1, 9:30 AM - 11:00 AM  
**Determining The Optimal Average Velocity During High-speed Power Training In Older Adults**

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Velocity based training in young, athletic populations has established the optimal velocity at which performance benefits are maximized; however, there is little data on the optimal velocity at which older adults should train to enhance performance of daily functional tasks. **PURPOSE:** To examine lower limb velocity during high-speed power training (HSPT) to identify whether differences in limb movement velocity may impact physical functioning in older adults.

**METHODS:** 28 older men and women ( $71.5 \pm 6.8$  yrs) participated in 12 weeks of lower extremity HSPT consisting of 3 sets of 14 repetitions of leg press (LP) exercises at 40% 1RM, 3 times/week. Participants performed the concentric portion of each contraction at a self-selected maximal speed (i.e., "as fast as possible"). Average velocity of each contraction of the left and right leg during training (14 repetitions x 3 sets, 3x/wk) was assessed over 12 weeks (36 training visits). Group allocation to high velocity (HI-V;  $n=14$ ) and low-velocity (LO-V;  $n=14$ ) was assigned based on

performance of LP exercise above or below the median average velocity obtained throughout the 12-week training period. The change scores (post minus baseline) of 3 functional measures (habitual gait velocity [HGV], maximal gait velocity [MGV], and timed up and go [TUG]) were compared between HI-V and LO-V using ANOVA models covarying for age, sex, and baseline functional score a priori. Statistical significance was accepted at  $p < 0.05$ .

**RESULTS:** The median average velocity of 42 left and right LP contractions ( $n=3024$ ; 3 x 14 over 36 visits) for each of the 28 participants was 0.88 m/s (HI-V: 1.0±0.08 m/s; LO-V: 0.75±0.09 m/s;  $p < 0.001$ ). Improvements in HGV (HI-V: 0.09±0.04 m/s vs. LO-V: -0.06±0.05 m/s;  $p=0.03$ ), MGV (HI-V: 0.08±0.04 m/s vs. LO-V: -0.12±0.05 m/s;  $p=0.01$ ), and TUG (HI-V: -1.15±0.30 s vs. LO-V: 0.53±0.34 s;  $p=0.003$ ) were significantly greater for HI-V compared to LO-V.

**CONCLUSIONS:** Because of the variable nature of self-selected maximal limb velocity during HSPT in older adults, identification of the optimal average velocity at which to train to improve functional performance is paramount. These data indicate that an average velocity of 0.88 m/s during LP exercise training may be necessary to ensure functional improvements in older adults participating in HSPT.

185 Board #22 June 1, 9:30 AM - 11:00 AM  
**Relationships Among Cognitive Function and Handgrip Strength And Endurance In Older Men And Women**

Amelia A. Miramonti, Terry J. Housh, FACSM, Nathaniel D.M. Jenkins, Kristen C. Cochrane, Ethan C. Hill, Cory M. Smith, Richard J. Schmidt, Glen O. Johnson, FACSM, Joel T. Cramer, FACSM. *University of Nebraska - Lincoln, Lincoln, NE.* (Sponsor: Joel T. Cramer, FACSM)  
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(No relationships reported)

**PURPOSE:** To examine the relationships among cognitive function and handgrip strength and endurance in older adults.

**METHODS:** Seventy-one healthy older adults (22 men, 49 women) ages 65-85 years (mean±SD height=168±8 cm, mass=76±14 kg) participated. After familiarization, participants were tested for cognitive function: serial sevens (S7), trail making (TM), and Rey Auditory Verbal Learning Test (RAVLT). The S7 test was timed to completion (S7T) and number of errors (S7E) while counting backwards from 100 by sevens. The TM test timed participants drawing lines sequentially connecting encircled numbers and letters using two patterns: A (TMA) and B (TMB). The RAVLT scored five 15-item auditory word recalls (RSUM), an interference word recall (RB), a 6th word recall (R6), and a 15-item visual word recognition trial (RR). After maximal handgrip strength measurements (HGMAX, Jamar®, Warrenville, IL), intermittent handgrip contractions at 50% of HGMAX were performed until failure, and the number of contractions was recorded as handgrip endurance (HGCON). Independent samples t-tests (or Mann-Whitney U) for gender differences and Pearson r (or Spearman's  $\rho$ ) for correlations analyzed the normally (or non-normally) distributed variables.

**RESULTS:** Men were taller and heavier ( $p < 0.05$ ), but there was no gender difference in age ( $p > 0.05$ ). Women scored better ( $p < 0.05$ ) than men for RSUM, R6, and RR, while men had greater handgrip strength ( $p < 0.01$ ). For women, HGCON was related to RSUM ( $p=0.30$ ,  $p=0.04$ ) and R6 ( $p=0.36$ ,  $p=0.01$ ). For men, HGMAX was correlated with R6 ( $p=0.49$ ,  $p=0.02$ ).

**CONCLUSIONS:** Handgrip endurance (HGCON) was positively related to word recall scores for women, but not men. Conversely, handgrip strength (HGMAX) was positively related to one word recall score (R6) for men, but not for women. These findings suggested that any relationships among cognitive function and handgrip strength and/or endurance may be gender-specific in healthy adults.

A-36 Free Communication/Poster - Assessment of Injury Risk

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM

Room: Exhibit Hall A/B

186 Board #23 June 1, 11:00 AM - 12:30 PM  
**Morphological Characteristics Of The Foot With Jones Fracture**

Kohei Fujitaka<sup>1</sup>, Akira Taniguchi<sup>2</sup>, Shinji Isomoto<sup>3</sup>, Norihiro Samoto<sup>3</sup>, Kazuya Sugimoto<sup>3</sup>, Tsukasa Kumai<sup>2</sup>, Yasuhiro Tanaka<sup>2</sup>.  
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**Objective:** To perform appropriate treatment for Jones fracture, it is important to understand its pathogenesis. The purpose of this study was to investigate morphological characteristics of the foot with Jones fracture. **Method:** Twenty-eight feet in 27 patients (Age: 19.4±1.4 years) with Jones fracture (injury group; injured side) and twenty-six feet of contralateral side in 27 patients (injury group; non injured side) were investigated in this retrospective study. Sixty-two feet in 41 patients (Age: 18.7±2.0 years) who has no evidence of fracture or deformities around foot and ankle in investigated side were used as control (control group; right foot and left foot). A two-dimensional coordinate system was used to compare the anatomic features in these two groups with weight bearing dorsoplantar radiographs of the foot. On the radiography that was imported to personal computer, certain points of tarsal bones defined in the previous reports were plotted in the two-dimensional coordinate system where the axis of the second metatarsal was defined as the X axis; the intersection of the X axis with the proximal end of the second metatarsal was the origin (MB2), and the perpendicular to the X axis passing through the origin was denoted as the Y axis. The points of intersection of the axes of the metatarsals with the distal ends of the metatarsals were marked as MH1-MH5, respectively, and the points of intersection of the axes with the proximal ends were marked as MB1-MB5, respectively. The length of the 5<sup>th</sup> metatarsal and the X coordinate of MH5 were compared between injury groups (injured side, non injured side) and control groups (right foot, left foot). Unpaired t-test was performed to compare differences between the two groups. **Result:** Length of the 5<sup>th</sup> metatarsal was significantly greater in injury group (injured side; 76.2±6.2 mm, non injured side; 75.5±7.2 mm) than in control group (right foot; 70.0±4.4 mm, left foot; 70.0±4.5 mm) ( $p < 0.05$ ). X coordinate of MB5 was significantly smaller in injury group (injured side; -30.3±6.2, non injured side; -29.8±5.3) than in control group (right foot; -26.4±6.8, left foot; -26.2±6.8) ( $p < 0.05$ ). **Conclusion:** The long 5<sup>th</sup> metatarsal may cause rotational stress or stress from lateral side. In such a case, stress may concentrate on the plantar side of the 5<sup>th</sup> metatarsal base.

187 Board #24 June 1, 11:00 AM - 12:30 PM  
**Injury History Predicts Musculoskeletal Lower Extremity Injury Risk in High School Athletes: The FPPE Project**

James Onate<sup>1</sup>, Cambrie Starkel<sup>1</sup>, James Borchers, FACSM<sup>1</sup>, Ajit Chaudhari, FACSM<sup>1</sup>, Daniel Clifton<sup>1</sup>, Dawn Comstock<sup>2</sup>, Nelson Cortes<sup>3</sup>, Dustin Grooms<sup>4</sup>, Jay Hertel, FACSM<sup>5</sup>, Michael McNally<sup>1</sup>, Meghan Miller<sup>1</sup>, Xueliang Pan<sup>1</sup>, Eric Schussler<sup>1</sup>, Bonnie Van Lunen<sup>6</sup>, Thomas M. Best, FACSM<sup>1</sup>. <sup>1</sup>The Ohio State University, Columbus, OH. <sup>2</sup>University of Colorado-Denver, Denver, CO. <sup>3</sup>George Mason University, Manassas, VA. <sup>4</sup>Ohio University, Athens, OH. <sup>5</sup>University of Virginia, Charlottesville, VA. <sup>6</sup>Old Dominion University, Norfolk, VA. (Sponsor: Thomas M. Best, FACSM)

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(No relationships reported)

Previous musculoskeletal (MSK) injury history is thought to predispose athletes to increased risk of lower extremity (LE) injury.

**Purpose:** Determine if including injury history on a pre-participation examination (PPE) will improve the ability to predict MSK LE injury risk in high school athletes.

**Methods:** Prior to the start of their respective sports seasons, 3,587 high school football, soccer, basketball and lacrosse athletes ( $m/f=2,271/1,316$ , 15.6±1.2 y, 1.73±0.07 m, 69.3±15.5 kg) completed a functional performance assessment as part of the ongoing national pre-participation physical evaluation (FPPE) project. Certified Athletic Trainers (ATCs) using the national surveillance tool, High School Reporting Information Online (RIO), collected LE injury data ( $n=406$  injuries reported) across 2 years. An injury was defined as requiring medical care from a physician or ATC and resulting in at least one day lost from athletic participation. Injury history was self-

reported on state mandated PPE forms. Binary logistic regression with a two block entry design was used to determine if assessing injury history significantly improved a LE injury risk prediction model. A model was developed by entering age, height, weight, gender, sport, single leg anterior reach (SLAR) asymmetry, and single leg hop (SLHOP) asymmetry into block one using forward conditional selection. A variable indicating a history of injury was added to the model in block two to determine if it significantly improved the model developed in block one. Alpha level was set *a priori* at  $p < 0.05$

**Results:** The initial model best predicting injury included age, height, weight, gender, sport, and SLHOP asymmetry greater than 20% ( $X^2 = 90.301$ ,  $df = 8$ ,  $p < 0.001$ ). Adding history of injury significantly improved the model ( $X^2$  change = 30.528,  $df = 1$ ,  $p < 0.001$ ). Additionally, when incorporated into the model created in block one, the odds of suffering a LE injury during the study period were 1.98 times greater for individuals with a history of injury (OR = 1.98, 95% CI = 1.56, 2.50,  $p < 0.001$ ).

**Conclusion:** Including injury history may significantly improve the ability to predict adolescent athletes' MSK injury risk.

188 Board #25 June 1, 11:00 AM - 12:30 PM

### Risk Factors of Anterior Cruciate Ligament Injury in Anthropometry: A Meta-Analysis

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(No relationships reported)

**PURPOSE:** Anterior cruciate ligament (ACL) injuries are considered the most costly injuries in sports and some recreational activities. It has been reported that 70% of ACL injuries are noncontact in nature, however, the mechanism of ACL injury is complex and multi-factorial. The purpose of this meta-analysis was to determine the risk factors related to anthropometry in ACL injury between the injured and uninjured populations.

**METHODS:** Studies that investigated the risk factor of ACL injury were identified through a computerized search of all electronic databases: AgeLine, CINAHL, Medline, PsycINFO, PubMed, SPORTDiscus, and Web of Science. Thorough the electronic

search and selection, seven anthropometric studies with comparisons between the injured and uninjured groups were included in this meta-analysis. Six variables included were: NWI-Notch width index (NWI), Medial or lateral tibial plateau slopes (MLTPS), Depths or width of tibial or femoral (DWTF), Tibial or femoral angles (TFA), Related knee angles (RKA) and Tibial anterior displacement (TAD).

**RESULTS:** Two variables, RKA and TAD out of six variables were significantly different

( $p < .05$ ) between the injured and uninjured groups. The injured group had significant higher values of RKA and TAD than the uninjured group did and the effective sizes (ES) were ES = 0.76 for RKA representing Q-angle and knee hyperextension angle, and ES = 0.56 for TAD representing tibial anterior displacement.

**CONCLUSIONS:** Knee functional anthropometric variables in terms of Q-angle and knee hyperextension angle, and tibial anterior displacement may be the better predictable risk factors of ACL injury.

189 Board #26 June 1, 11:00 AM - 12:30 PM

### Evaluation Of Reliability And Validity Of A New Device To Measure Knee Rotation

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(No relationships reported)

Rotational laxity of knee is known as the one of the intrinsic risk factors of anterior cruciate ligament (ACL) injury. However, there is no simple device to measure knee rotation. The "RotorMeter" is a newly developed, simple, non-invasive, external device that is specifically designed to measure the lower leg rotation relative to the femur in vivo.

**PURPOSE:** To determine the reliability and validity of the RotorMeter.

**METHODS:** Two measurements were made with the RotorMeter at 90° of knee flexion and 90° of hip flexion applying 8 Nm torque by 2 independent examiners in 14 healthy female subjects (21.1±1.2 yrs, 28 knees). Image analysis to obtain the rotation of the right lower leg was simultaneously carried out. Statistical analysis was performed using intra-class correlation coefficients (ICC, intra-examiner and inter-examiner) and Pearson's correlation coefficient between the 2 methods.

**RESULTS:** Total (internal + external) knee rotation ranged from 100.0° to 105.7° (standard error of measurement ranged from 2.3° to 3.7°) by the RotorMeter and was

62.2±8.24° by the image analysis. Intra-examiner ICC(1,1) results were 0.705 and 0.721, and inter-examiner ICC(2,2) was 0.828. The correlation coefficient between the results of RotorMeter and image analysis was 0.875 (significant at  $P < 0.05$ ).

**CONCLUSIONS:** The RotorMeter was found to be a reliable and valid measurement instrument concerning knee rotation. It is easy to perform and might be used in a wide field to measure knee rotation. But the deformation of soft tissue and the movement of subtalar joint should be considered.

This study was supported by a Grant-in Aid Exploratory Research from NUHW (2013-A-30).



190 Board #27 June 1, 11:00 AM - 12:30 PM

### Prediction of Lower Extremity Injury in Collegiate Women's Soccer Players

Ryan S. McCann<sup>1</sup>, Kyle B. Kosik<sup>1</sup>, Masafumi Terada<sup>1</sup>, Megan Q. Beard<sup>2</sup>, Gretchen E. Buskirk<sup>3</sup>, Phillip A. Gribble<sup>1</sup>. <sup>1</sup>University of Kentucky, Lexington, KY. <sup>2</sup>Capital University, Columbus, OH. <sup>3</sup>University of Toledo, Toledo, OH.

(No relationships reported)

Lower extremity musculoskeletal injuries are extremely common in women's soccer. Decreased dynamic postural control and muscular strength at the hip have been identified as potential risk factors for athletic injuries. However, the ability of dynamic postural control and hip strength to predict injuries in women's soccer specifically has not been investigated.

**PURPOSE:** To develop a prediction model for acute lower extremity injury in collegiate women's soccer using tests of dynamic postural control and hip extension strength.

**METHODS:** Twenty-eight NCAA Division I women's soccer players (19.6±1.2 yrs; 167.7±3.7 cm; 60.3±4.8 kg) underwent preseason assessments of the Star Excursion Balance Test anterior reach (SEBT-A) and isometric hip extension strength (IHES) bilaterally. The SEBT-A consisted of a single leg stance and reach for maximum distance with the non-stance limb in the anterior direction. Reach distances of three trials were averaged and normalized as a percentage of stance leg length. For IHES, participants lay prone with the test knee flexed to 90° and a hand-held dynamometer placed over the posterior thigh. Mean peak torque obtained from 3, 5-second trials was normalized as a percentage of body mass. Subsequent lower extremity injuries were tracked through the competitive season by a certified Athletic Trainer. Binary logistic regression was used to determine the predictive value of the SEBT and IHES for ipsilateral lower extremity injury occurrence.

**RESULTS:** A logistic regression model indicated that decreased SEBT-A and IHES were associated with more than 3 times increased estimated odds of injury (OR: 3.24; 95%CI: 0.69, 15.21;  $P = 0.258$ ).

**CONCLUSION:** The diagnostic odds ratio suggests that lower SEBT-A performance and IHES may be important predictors of lower extremity injury in collegiate women's soccer players. The non-significant logistic regression model may be limited by the small sample size. The utility of the SEBT-A and IHES as predictors of lower extremity injury should continue to be investigated among larger populations, including different sports, genders, and age groups.

191 Board #28 June 1, 11:00 AM - 12:30 PM  
**Prior Injuries In Division 1 Collegiate Football: A Retrospective Analysis**  
 Nikolas J. Sarac, William B. Haynes, Angela D. Pedroza, Christopher C. Kaeding, James R. Borchers, FACSM. *The Ohio State University, Columbus, OH.*  
 (No relationships reported)

**Purpose:** It is perceived that football players are entering college with more injuries than in the past. The purpose of this study was to quantify the prevalence of injuries to incoming freshmen in a Division 1 college football team.  
**Methods:** Pre-participation questionnaires from 605 first-year football players from the past 20 years (1996-2015) were examined to determine the prevalence of concussions, stingers, fractures, and surgeries sustained before playing at the collegiate level. Players were grouped by position: wide receiver and defensive back (WR/DB), offensive and defensive line (OL/DL), and all other positions (OP). Prevalence of injuries by year and position was compared using Pearson's  $\chi^2$  Test ( $p < 0.05$ ).  
**Results:** The percentage of all players reporting a prior injury is as follows: concussion (21%), stinger (23%), surgery (31%), and fracture (44%). There was no significant difference in the percent of players reporting a prior concussion by year: 1996-2000 (11%), 2001-2005 (22%), 2006-2010 (20%), 2011-2015 (24%) ( $\chi^2=5.42, p=0.14$ ) or by position: WR/DB (17%), OL/DL (23%), OP (22%) ( $\chi^2=2.41, p=0.49$ ). There was a significant difference in the percent of players reporting a prior stinger by year: 1996-2000 (44%), 2001-2005 (39%), 2006-2010 (21%), 2011-2015 (3%) ( $\chi^2=89.59, p < 0.001$ ) but not by position: WR/DB (24%), OL/DL (19%), OP (25%) ( $\chi^2=3.58, p=0.31$ ). There was no significant difference in the percent of players reporting a prior surgery by year: 1996-2000 (33%), 2001-2005 (25%), 2006-2010 (33%), 2011-2015 (35%) ( $\chi^2=4.70, p=0.20$ ) or by position WR/DB (33%), OL/DL (31%), OP (31%) ( $\chi^2=0.28, p=0.96$ ). There was no significant difference in the percent of players reporting a prior fracture by year: 1996-2000 (46%), 2001-2005 (43%), 2006-2010 (47%), 2011-2015 (40%) ( $\chi^2=1.90, p=0.59$ ) or by position: WR/DB (44%), OL/DL (40%), OP (47%) ( $\chi^2=1.87, p=0.60$ ).  
**Conclusion:** A decrease in stingers was observed over time, possibly due to less contact in practices and increased focus on protective equipment. However, there was no significant difference among any other injury recorded. We expected to see an increase in concussions and surgeries over time. Under reporting is a major concern as players may fear disqualification or that they are evaluated by the coaching staff based on their medical history.

192 Board #29 June 1, 11:00 AM - 12:30 PM  
**Acute Pre-race Illness Reduces The Ability To Finish A Race - A Study In 7035 Runners**  
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**PURPOSE:** Distance runners are more prone to acute illness during periods of intense and prolonged training. There are little data on how many runners have symptoms of acute pre-race illness (APRI) and how many runners with APRI, who choose to start the race, do not finish the race. The purpose of this study was to determine the period prevalence of runners with APRI, the incidence of runners with APRI who received educational information and then did not start the race, and the incidence of runners with APRI who chose to start the race, but do not finish the race. **METHODS:** 1338 of 7031 21km or 56km runners (19%) reported one or more symptoms of APRI in the 7-day period before the race via an online questionnaire and 5693 were asymptomatic controls. Runners with APRI received educational information about APRI, risks when exercising with APRI, and guidelines when not to participate. Runners with APRI were further divided into sub-groups as follows: systemic symptoms group (n=530), respiratory symptoms group (n=896), gastrointestinal symptoms group (n=249) and runners who failed the "neck check" (n=878). All runners (N=7031) were then followed prospectively on race day, documenting the did-not-start (DNS) frequency (%) and the did-not-finish (DNF) frequency (%). **RESULTS:** 7.5% experienced systemic APRI, and 12.5% failed the "neck check". The DNS % for the APRI group (11.0%), was higher ( $p=0.0002$ ) than the control group (6.6%). Runners with systemic APRI also had the highest (15.1%) DNS % (2.4%) ( $p=0.0286$  vs. control). The DNF % was also higher in the systemic APRI group (2.1%) vs. the control group (1.3%) ( $p=0.0344$ ). **CONCLUSION:** APRI is common in runners and a pre-race screening process can identify runners with APRI. An educational intervention can be applied that increases the rate of not starting a race. However, runners with APRI who decided to start the race, despite educational information had a significantly higher did-not-finish (DNF) rate compared to control runners.

193 Board #30 June 1, 11:00 AM - 12:30 PM  
**Prevalence Of Fms Asymmetries And Its Implications On Injury Risk In Male And Female Adolescents**  
 Daniel Crusoe, Laura Smith, Ryan Bean, James Creps, Bara Alsalaheen. *University of Michigan - Flint, Flint, MI.*  
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 (No relationships reported)

The Functional Movement Screen™ (FMSTM) is a screening instrument which evaluates the quality of specific movement patterns and bilateral symmetry of movement patterns to determine if an athlete is at an increased risk for injury. Previous literature suggests that adolescent female athletes are at a higher risk for sustaining injury than males. Prior studies have demonstrated that a composite score less than 14 may be a cutoff for increased risk for injury. It has also been shown that any asymmetry may lead to increased injury risk. **PURPOSE:** To compare FMSTM composite scores and number of asymmetries in male and female high school athletes. A secondary aim is to explore proportions of high school athletes that fall below a cut-off score of 14 and observe frequency of asymmetries within the population. **METHODS:** Ninety-four (65 male and 29 female) high school athletes, aged between 13.8 and 18.6 years old, were recruited to complete testing. Participants completed a battery of tests, which included FMSTM. Tests were scored in accordance with previously established FMSTM criteria. A Fisher's exact test was performed to see if there was a difference between genders for those without risk of injury (Composite score greater than or equal to 14 and no asymmetries) vs. those at risk of injury (Composite score less than 14 or any asymmetries). **RESULTS:** The median number of asymmetries for the entire sample was 1 with the number asymmetries ranging from 0 to 4. The number of asymmetries did not differ between genders ( $U_{92} = 820.5, Z = -1.059, p = .290$ ). One or more asymmetry was observed in 70 (74.5%) of the participants. Forty two participants (45%) presented with 1 asymmetry and twenty eight participants (28%) presented with more than one asymmetry. The median composite score for the entire sample was 16 with scores ranging from 9 to 20. Composite score did not differ between genders ( $U_{92} = 791.5, Z = -1.248, p = .212$ ). Nineteen (20.2%) participants scored below the established cutoff composite score of 14. The Fisher's exact was not significant ( $p = .435$ ). **CONCLUSION:** The majority of participants, 72 of the 94 (76.5%), had an asymmetry or a composite score less than 14, placing them at an increased risk for injury. However, the asymmetries and risk of injuries (i.e. scores <14) appeared to be equally prevalent across gender groups.

194 Board #31 June 1, 11:00 AM - 12:30 PM  
**Baseball Pitcher Shoulder Internal and External Rotational Range of Motion as an Injury Risk Indicator**  
 Brent Harper, Kevin Steinberger, John Shifflett, M Chad Hyatt, Steven Boswell, Cory Lail, Cameron Holhouser, Kristen Jagger, Adrian Aron. *Radford University, Roanoke, VA.* (Sponsor: Lynn Millar, FACSM)  
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Prior research has demonstrated that pitchers with a deficit greater than five degrees in total rotation passive range of motion (TRM) in the dominant shoulder had a 2.6 times higher risk of injury to their elbow. **PURPOSE:** To evaluate the clinical utility of total range of motion (TRM), global internal rotation deficits (GIRD), and differences between rotational active and passive range of motion (A/PROM) as injury predictors among intercollegiate pitchers. **METHODS:** Fifteen division I baseball pitchers (age  $19.4 \pm 1.06$  years; BMI  $26.71 \pm 1.92$ kg/m<sup>2</sup>) were tested during a competitive season. Range of motion measurements included active and passive external and internal rotation at 90° abduction in the scapular plane. TRM, GIRD, and A/PROM were compared between injured and uninjured players. **RESULTS:** Overall upper and lower body injury rate was 46.6% (seven out of 15). Elbow injury rate was 13.3% (two out of 15). Average difference in GIRD was  $12.2 \pm 13.92$ , in TRM was  $23.07 \pm 13.92$ , and in A/PROM was  $37.13 \pm 15.40$ . There were no statistically significant differences in TRM, GIRD, or A/PROM between the injured and non-injured groups. Pearson Chi-square analysis revealed no association between injury frequency with GIRD measurements >20 degrees for injured and uninjured. All participants of this study had TRM measurements > 5 degrees and A/PROM difference of >10 degrees. A/PROM difference of >40 degrees was analyzed between injured and uninjured with no significant difference. **CONCLUSIONS:** All pitchers in this study were at risk for elbow injury; two sustained injuries. Although not statistically significant, probably due to sample size, this is a much higher injury rate (13.3%) than previous research predicts (2.6%). The authors hypothesize it may be more appropriate to evaluate the difference of A/PROM to identify a motor control impairment as a cause of injury. Future studies should investigate the effects of upper extremity motor control on injury frequency among pitchers.

WEDNESDAY, JUNE 1, 2016

195 Board #32 June 1, 11:00 AM - 12:30 PM  
**Medial Tibial Stress Syndrome: Reliably Diagnosed using History and Clinical Examination?**

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**Purpose** In sports medicine the majority of overuse injuries are diagnosed using clinical examination as the cornerstone. Whether this can be done reliably has hardly ever been investigated. Medial tibial stress syndrome (MTSS) is a common lower limb overuse injury which is defined as: exercise-induced pain along the posteromedial tibial border, and provocation of recognisable pain on palpation  $\geq$  5cm of the posteromedial tibial border. This diagnosis does not involve costly additional imaging. Our aim was to assess if MTSS can be diagnosed reliably, using history and clinical examination.

**Methods** In this cross-sectional study all athletes with lower leg pain presenting to a sports physical therapy centre were assessed by 2 physical therapist assessors, chosen from a pool of 5 and blinded to each others' diagnoses, for having MTSS (yes/no). We calculated the prevalence, percentage of agreement, the observed percentage of positive agreement (Ppos), the observed percentage of negative agreement (Pneg), and the chance-corrected ratio of agreement, the Kappa-statistic with 95% confidence interval (CI). We calculated the bias- and prevalence index (BI and PI) to assess their possible effect on the kappa-statistic.

**Results** Fifty-one subjects participate in this prospective reliability cross-sectional study. Preliminary analysis of 32 athletes with lower leg pain showed the prevalence of MTSS to be 73.4%. The number of females was 22 (68.8%) and the mean age (years  $\pm$ SD) was 20.8 $\pm$ 2.0. The percentage of agreement was 97%. The Ppos and Pneg were 98% and 94% respectively. The chance-corrected ratio for agreement, the kappa-statistic was almost perfect;  $k = 0.92$  (95% CI 0.77-1.00). The bias index did not affect the Kappa-statistic, BI = -0.03, whereas the high prevalence may have deflated Kappa, PI = 0.47.

**Conclusion** MTSS can be reliably diagnosed in athletic populations with exercise-induced lower leg pain, using history and clinical examination.

196 Board #33 June 1, 11:00 AM - 12:30 PM  
**Collegiate Cross Country Athlete Lower Extremity Stress Fracture Risk Factors**

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Atypical lower extremity (LE) kinematics, ranges of motion (ROM), and body composition increase LE stress fracture risk. It is unknown which variables differ between collegiate cross country athletes who go on to sustain a stress fracture (SFx) and those who do not (NSFx). **PURPOSE:** To determine kinematic, ROM, and body composition differences between SFx and NSFx groups. **METHODS:** Overhead squat (OHS) errors, passive ROMs, and demographic data were assessed bilaterally in 37 NCAA Division I cross country athletes ( $m=20$ ,  $f=17$ ). Medical staff recorded LE stress fractures for one year following testing. OHS errors included: feet flattening/turning out, heel lift, knee valgus/varus motion, lateral weight shift, low back arching/rounding, and arms falling forward. ROM measurements included: great toe extension, ankle dorsiflexion, knee extension, and hip internal/external rotation, abduction, and extension. Body mass index (BMI) was calculated for each athlete. OHS total and specific errors, ROMs, and BMI group differences were assessed via independent samples t-test and chi-square analyses ( $\alpha \leq 0.05$ ). **RESULTS:** Nine athletes (24.3%;  $m=2$ ,  $f=7$ ) sustained a LE stress fracture. Females were at greater stress fracture risk than males ( $\chi^2(1, N=37)=4.85$ ,  $P=0.03$ ; SFx=77% female, NSFx=35.7% female). The SFx group had less hip external rotation ROM (SFx: 42.6 $\pm$ 6.9, NSFx: 52.3 $\pm$ 7.8;  $t_{35}=3.33$ ,  $p<0.01$ ) and greater knee extension ROM side-to-side differences (SFx: 11.7 $\pm$ 6.9, NSFx: 6.8 $\pm$ 5.4;  $t_{35}=-2.21$ ,  $p=0.03$ ) than the NSFx group. The SFx group also had smaller BMI (SFx: 19.9 $\pm$ 0.7, NSFx: 21.6 $\pm$ 2.3;  $t_{35}=2.20$ ,  $p=0.03$ ). No other differences were observed. **CONCLUSION:** Visual observation of the OHS was unable to discriminate between the SFx and NSFx groups. Kinematic differences are reported between similar groups during landings. The OHS may not sufficiently load the LE and thus movement errors are not as pronounced as they are during landings. Hip musculature can alter distal kinematics and increase injury risk; thus, normal

and symmetrical hip ROMs may be protective against stress fractures. Our ROM and BMI group differences support previously identified LE stress fracture risks. These findings aid clinicians in identifying runners at greater LE stress fracture risk so injury prevention strategies can be implemented.

197 Board #34 June 1, 11:00 AM - 12:30 PM  
**Does Ecg Predict Cardiac Hypertrophy In American-style Football Athletes?**

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The accurate and cost effective identification of left ventricular (LV) hypertrophy is clinically relevant due to its association with cardiac mortality in the general population. **PURPOSE:** To determine if electrocardiographic (ECG) voltage criteria predicts LV mass measured with cardiac ultrasound in collegiate American-style football (ASF) players. **METHODS:** Over a 3-year period, standard resting, supine 12-lead ECG and echocardiographic (ECHO) procedures were performed on 76 collegiate ASF players first entering an NCAA Football Bowl Subdivision university as part of their preparticipation physical exams. Player demographics were: age=18 $\pm$ 1 yr., height=186 $\pm$ 7 cm, weight=100.1 $\pm$ 22.0 kg, BMI=28.6 $\pm$ 5.0 kg-m<sup>2</sup>, and BSA=2.24 $\pm$ 0.25 m<sup>2</sup>. Linear regression was used to predict ECHO-derived LV mass and LV mass/BSA index from ECG precordial-lead voltage criteria [sum largest S (V1 or V2) + R (V5 or V6)  $\geq$  35 mm]. **RESULTS:** ECG voltage criteria did not significantly ( $p > 0.05$ ) predict ECHO LV mass (LV mass = -0.12x + 216.94,  $r = 0.024$ ,  $R^2 = 0.0006$ ), or LV mass/BSA index (LV mass/BSA = 0.3063x + 81.951,  $r = 0.17$ ,  $R^2 = 0.0244$ ). **CONCLUSION:** ECG precordial lead voltage was not clinically useful in diagnosing ECHO-derived LV hypertrophy in our sample of first-year collegiate ASF players. We suggest that new and more accurate algorithms for evaluating LV hypertrophy in ASF athletes be explored, possibly using demographic, body habitus, cardiovascular, and other ECG criteria.

198 Board #35 June 1, 11:00 AM - 12:30 PM  
**Cardiac screening practices among United States National Governing Bodies and Paralympic Committees**

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Cardiac screening in athletes has recently been a focus of investigation and debate among the sports medicine community. Many athletic associations and organizations, including the International Olympic Committee, have issued recommendations regarding screening practices in an effort to prevent sudden cardiac death in sport. **PURPOSE:** To evaluate the prevalence and components of cardiac screening programs among United States National Governing Bodies (NGBs) and National Paralympic Committees (NPCs). **METHODS:** Medical team members for United States NGBs and NPCs were identified through online searches, affiliation with the American Medical Society for Sports Medicine, and professional contacts. The medical team members were then asked to complete an online survey regarding the cardiac screening practices of their respective NGBs or NPCs. **RESULTS:** At time of abstract submission, medical team members for 45 of 72 (63%) of the United States NGBs and NPCs were identified and contacted. Surveys from 38/45 teams (84%) were received, 32 from NGBs and 6 from NPCs. Seventeen of 38 teams (45%) reported that there was a periodic health evaluation requirement that directed the cardiac screening components, frequency, and/or provider. The following screening components were reported as being performed at least once in all or most athletes: personal history (90% of teams), family history (84%), physical exam (84%), electrocardiogram (32%), echocardiogram (5%), and stress test (3%). For teams who did not screen athletes with ECG, the most frequently cited reasons for not screening were lack of ECG equipment (40%), lack of evidence (33%), and lack of follow-up test consensus (20%).

**CONCLUSION:** The United States NGBs and NPCs are a heterogeneous collection of athletic teams that have varying approaches to cardiac screening. Lack of infrastructure appears to be the biggest barrier to implementing advanced screening protocols.

199 Board #36 June 1, 11:00 AM - 12:30 PM  
**Evaluation of Peripheral Vascular Impairment in the Fingers of Baseball Players: A Comparison among Positions**

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**PURPOSE:** Digital vessel trauma from repetitive impact on the fingers and hand is a concern for baseball players (BPs). Laser-Doppler blood perfusion imaging (LDPI) is a technique that employs two-dimensional horizontal scanning of the blood flow in a specific tissue, without the necessity for surface contact. The LDPI method may have the benefit of detecting vasospastic abnormalities and occlusion of the digital arteries, which generally appears as an inhomogeneous reaction to the cold. This study used LDPI to investigate whether the changes in finger skin blood flow that occurred in response to a cold water immersion test depended on the position of BPs.

**METHODS:** The study included 57 male university BPs, aged 20 ± 1 years, who play at 3 different positions. From this study subject group, there were: 18 pitchers, 23 infielders (InF), and 16 outfielders (OtF). A cold provocation test was carried out by immersing a subject's catching hand into cold water (10°C) for 10 min. Repeated image scanning of skin blood flow on the palm was performed every 2 min before, during, and after cold water immersion, by using LDPI. The mean blood perfusion values in the index finger area were calculated on each color-coded image. A numerical perfusion reading was also obtained for each measurement site in terms of the voltage (V). From the perfusion reading and the mean blood pressure, we calculated the cutaneous vascular conductance (CVC). The finger skin temperature was recorded by using an electrode thermistor attached to the skin on the dorsal side of the index finger.

**RESULTS:** CVC values of the InF were significantly lower compared with those of the OtF at pre-immersion (2.4 ± 0.6 V/mmHg vs. 3.3 ± 1.0 V/mmHg, p < 0.01) and at early post-immersion (1.2 ± 0.4 V/mmHg vs. 1.5 ± 0.5 V/mmHg, p < 0.05). However, the index finger skin temperature did not significantly differ among the different player positions at any measurement point.

**CONCLUSIONS:** These findings suggest that the changes in finger skin blood flow that occurred in response to cold water immersion, as measured by using LDPI, were dependent on the position of the BP. Repetitive trauma caused by the impact of a baseball also leads to peripheral vascular impairment in the index finger on the gloved hand of InF. Therefore, this method can be used for the assessment of peripheral circulatory function in BPs.

200 Board #37 June 1, 11:00 AM - 12:30 PM  
**Comparison of Tissue Interface Pressure of the Scoop Stretcher and Long Back Board in Rugby**

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**Purpose** Extrication and transportation of injured athletes is a vital component of pre hospital care (PHC). Concerns have been voiced that prolonged use of the Long Back Board (LBB) can cause avoidable complications. A 2013 consensus statement (Faculty PHC) advocates use of the Scoop Stretcher (SS) as a transfer and immobilisation device, limiting the LBB to extrication only. So as to abate pressure effects the SS is recommended for a maximum 45 minutes.

The study was designed to compare tissue interface pressures (IP), pain and comfort scores of players immobilized on a SS compared to LBB over time and to determine any time critical points when IP differed.

**Methods** Six professional and six amateur players IP at 4 contact points on each device were measured continuously using a BodiTrak pressure mat. Each player was triple immobilised for 45-minutes, had 45-minutes rest, then repeated the procedure on the alternate device. Visual Analogue Scale (VAS) comfort and pain data were collected every 5 minutes.

**Results** Mean age was 24.3 years, height 181.6cm, weight 100.7kg. Mean IP at the head, scapulae, sacrum and heels on the LBB over 45-minutes were 186.07, 151.17, 152.82 and 197.73mmHg and SS 198.38, 173.23, 123.44 and 182.4mmHg, thus higher pressure on the SS in upper body and lower in lower body (p>0.05) at all time points on all sites.

IP declined over time, therefore a critical time point could not be defined. Only IP at the sacrum on both devices showed significance (p=0.23). Total VAS pain ratings rose on both devices from from 0mm at 0-minutes to 3.5mm at 45-minutes (p=0.001). Total

comfort ratings rose from 0.5mm to 4.6mm on the SS and 1mm to 5.5mm on LBB (p<0.001), suggesting the LBB is less comfortable. However, 58% of players preferred the LBB.

**Conclusion** No significant differences were seen between devices for IP, comfort or pain, suggesting the SS is not superior to the LBB. Over time IP on both devices decline whereas pain and comfort worsen.

Due to differences between general versus sport PHC, questions have arisen for the applicability of the new consensus in sport. Given no significant differences and player preference for the LBB, a move to SS in sport, creating change where it may not be validated, requires further in-depth consideration before being adopted at huge cost by all sports clubs in the UK.

Ethics, University of Nottingham

201 Board #38 June 1, 11:00 AM - 12:30 PM  
**A Systematic Approach To "Pitch-Side" Shoulder Relocation After An Acute Shoulder Dislocation Occurring During Sport**

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**Background & Purpose:**

The shoulder, specifically the glenohumeral joint, by virtue of its anatomical characteristics and biomechanics, confers a large range of movement, which ultimately results in a joint that is inherently prone to becoming unstable. The incidence of acute traumatic shoulder dislocation varies within the sporting environment and most commonly occurs following direct trauma; i.e. a fall onto an outstretched hand or a blow to the upper arm when the arm is oriented in an abducted and externally rotated position.

Anterior dislocations account for nearly 90% of all shoulder dislocation. Whilst most are referred and managed in the Emergency department, pitch-side relocation by experienced clinicians does occur prior to referral. The aim of this study was to delineate a guideline specifically for the pitch-side management of this common injury.

**Method:** A literature search of PubMed and Medline using the keywords: 'pre-hospital', 'pitch-side', 'shoulder dislocation' and 'reduction' or 'relocation technique' was performed, and the available literature reviewed and collated. We then reviewed articles focusing on reduction techniques for anteriorly dislocated shoulders with particular consideration on their applicability to a pitch-side setting.

**Results:**

Whilst studies exist that compare and contrast examination and reduction techniques, most are based in an in-hospital, acute setting. To date, there is no standardized management protocol published for the initial management of an anterior dislocated shoulder in a pitch-side setting. This article addresses this discrepancy and proposes a structured, systematic approach to the pitch-side management of a shoulder dislocation. Furthermore, the article addresses factors to consider in a pitch-side setting, suitable techniques and post-reduction care.

**Conclusion:**

Whilst a systematic approach has been delineated in this article, we recommend those pitch-side medical practitioners who provide this form of support should have attended appropriate training and ensure adequate malpractice cover.

202 Board #39 June 1, 11:00 AM - 12:30 PM  
**Muscle-Damaged Biomarkers Associated with Surfing Sessions of Elite Brazilian Surfers**

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Besides physical fitness, surfing demands multifactorial tasks and continuing interactions with unpredictable scenario. Depending on swell characteristics and professional commitments, surfers are overexposed to physical challenges. Muscle damage biomarkers, such as creatine-kinase levels (CK), has clinical association with delayed onset of muscle soreness (DOMS) and might be used as tools to guide muscle-recovery.

**PURPOSE:** The aim of this study was to evaluate muscle cell-stress biomarker-CK on a routine training-day of elite professional surfers from Brazil, and the influence of cold-compression automated system. **METHODS:** 4 professional male surfers (23±2yrs) were evaluated for CK levels (Reflotron®) on a typical day of training on a Hawaii winter season, on the morning before 3x90 minutes surf session (10-15ft waves), after sessions and 12h (next morning). After each session, the rate of

perceived exertion was collected (scale 6-20 basis). The resting and sleeping period were analyzed using a Lickert pattern scale (0-10) as also. All were exposed to 60minutes session of cold-compression (0oC) wraps on the main muscle-skeletal groups before sleep. RESULTS: CK levels before sessions were  $200\pm 73\text{mg/dL}$  increasing to  $375\pm 98\text{mg/dL}$  after. The subjective perceived exertion suggested a heavy day of training (BORG 16). After 12h of resting and sleep (Lickert 6), CK levels were  $305.7\pm 83\text{mg/dL}$ . CONCLUSION: Professional surfers are constantly travelling, and all the issues regarding resting and sleeping pattern, and performance should be focussed, besides the challenging to accomplish. Surfing it self is a multitask demand, and to perform at cutting edge limits of performance, science background should link the gap between science and the application of it. Depending on surfing sessions and resting period, tools should guide muscle-recovery improvements for safety and performance.

### A-37 Free Communication/Poster - Behavioral and Psychological Aspects of Sport

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM

Room: Exhibit Hall A/B

#### 203 Board #40 June 1, 9:30 AM - 11:00 AM Perceptions Of Appropriate Relationships Between Athletic Training Students And Student-athletes In The University/college Setting

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(No relationships reported)

Dual relationships are an issue in healthcare professions. Dual relationships develop between athletic training students and student-athletes are of concern in the university and college setting. Policies regarding ethical relationships are in place for most institutions. However, dual relationships between athletic training students and student-athletes continue to occur. PURPOSE: To understand the perceptions of appropriate ethical relationships between athletic training students and athletes while promoting ethical knowledge. METHODS: NATA Survey Service sent survey to 1,000 random NATA student membership participants from the inclusion criteria. 106 undergraduate and graduate athletic training students participated. Participants evaluated scenarios detailing ethical dilemmas typically faced as student athletic trainers. Participants then chose from preset answers to gain perspective on their choice. Statistical analysis included Chi-square set at the .05 level and phi. Since this is the first study within athletic training program student, items with a significance to .06 were considered. RESULTS: Scenario 1 detailed a conflict of interest scenario asking if the athletic training student would re-evaluate an injury of a significant other. Females were more likely to re-evaluate the injury ( $\chi^2 (1, N = 106) = .027 p = 4.896$ ) than males. Phi indicated the strength of association is very weak ( $\phi c = -0.019$ ). Undergraduates ( $\chi^2 = (1, N = 106) = 0.055 p = 3.686$ ) were more likely to re-evaluate the injury. Phi indicated the strength of association of education level is very weak ( $\phi c = -0.186$ ). Scenario 5 detailed the ethical dilemma of revealing HIPPA related information to another athletic training student. Students with ethics education were less likely to reveal sensitive HIPPA information ( $\chi^2 = (1, N = 106) = 3.621 p = 0.057$ ) than those without. Phi indicated the strength of association of education level is very weak ( $\phi c = -0.094$ ). CONCLUSION: Ethics education is needed early and often during athletic training education to help promote proper ethical practice in practicing athletic trainers.

#### 204 Board #41 June 1, 9:30 AM - 11:00 AM Perceived Social Context Factors As Indicators Of Sporting Excellence: Comparison Between Gender And Countries

Nancy Ponce-Carbajal<sup>1</sup>, Jeanette M. López-Walle<sup>1</sup>, José Leandro Tristán Rodríguez<sup>1</sup>, José Carlos Jaenes Sanchez<sup>2</sup>, Abril Cantú-Berrueto<sup>1</sup>. <sup>1</sup>UNIVERSIDAD AUTÓNOMA DE NUEVO LEÓN, Nuevo León, Mexico. <sup>2</sup>UNIVERSIDAD PABLO DE OLAVIDE, Sevilla, Spain.

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<Excellence in the sport depends on many psychological and social factors that strengthen or hinder athletic performance.

PURPOSE: Determine the differences between the perceptions of the social context factors related to athletic excellence in athletes between gender and countries.

METHODS: Participated 405 athletes (251 men and 152 women) from nine countries was gathered through convenience sampling during the Central American and Caribbean Games 2014 in Veracruz, México. Age varied between 18 and 47 years

(M = 24.2; SD = 5.07). The Mean of competitive experience in their sport was 11.13 years (SD = 5.43). Athletes answered the following questionnaire: Perception factors related to Sports Excellence Questionnaire, consisting of 54 items, which measure six factors of social context: coach, environment and resources, athlete, family, nature and characteristics of training workout. RESULTS: The internal consistency analysis was performed using Cronbach's alpha values resulting adequate (alpha .87 to .95). The results of the Kruskal-Wallis test statistics indicate that there are significant differences in the perception of the six factors of social context among nine countries: coach (K = 59,048,  $p < .01$ ), environment and resources (K = 39,330,  $p < .01$ ), sportsman (K = 35,687,  $p < .01$ ), family (K = 25,700,  $p < .01$ ), nature of the training (K = 26,000,  $p < .01$ ) and training characteristics (K = 42,610,  $p < .01$ ). Also specific differences between pairs countries: Coach (Guatemala = 6.8 and Cuba = 9.1); Environment and Resources (Colombia = 6.06 and República Dominicana = 8.4); Family (Costa Rica = 8.4 and Cuba = 9.4); nature of Training (Costa Rica = 6.0 and México = 7.3) and characteristics of training (Guatemala = 7.2 and Cuba = 9.1). Moreover, Man-Whitney U test was used for comparison of two samples between social and gender factors, resulting that women in training factor characteristics obtained higher values than males (U = 22 919,  $p < .01$ ). CONCLUSION: We conclude based on the cross-cultural comparison, those athletes from Cuba perceive the coach features; the family atmosphere and characteristics of training are major factors as determinants of social context to achieve their sporting success. Also, according to gender, women involved as a determinant the factor of characteristics of workout.

#### 205 Board #42 June 1, 9:30 AM - 11:00 AM Time Commitment In Youth Sports: A Survey Of Youth Lacrosse Families

Richard Ginsburg<sup>1</sup>, Lisa Hepburn<sup>2</sup>, Andrew Lincoln<sup>2</sup>, Shane Caswell<sup>3</sup>, Bruce Griffin<sup>4</sup>. <sup>1</sup>Massachusetts General Hospital, Boston, MA. <sup>2</sup>MedStar Sports Medicine, Baltimore, MD. <sup>3</sup>George Mason University, Manassas, VA. <sup>4</sup>US Lacrosse, Baltimore, MD.

(No relationships reported)

Purpose: To describe the time and type of involvement in sport among youth lacrosse players.

Methods: Parents of youth lacrosse players throughout the United States answered an online survey about their child's involvement in lacrosse within the last 12 months. The survey included questions about the number and types of teams their child played on, practice and game frequency, tournament participation, private training, as well as involvement in other sports, age their child began playing lacrosse and questions about lacrosse-related injuries.

Results: 1580 parents of youth lacrosse players from 47 states completed the survey. The age of youth players ranged from 9 to 15 (mean=12). Seventy percent of the responses (n=1090) described male players. Eighty-two percent (n=1295) of players also participated in other sports. The average age children began playing lacrosse was 8.7 years. Sixty-seven percent played on club or travel teams, 58% played on recreational teams. Participation in club or travel teams increased with age. Forty-four percent of players age 9 played on a club or travel team compared to 75% of athletes age 14 or 15. Sixty-eight percent of youth players (n=1075) had participated in private lacrosse skill training either alone or as part of a small group. Both male and female athletes participated in private training at equal rates. Ninety-four percent of players (n=1466) participated in lacrosse during the spring season. Among these players, 24% (n=351) played on more than one team at the same time and 47% (n=689) participated in two or more weekend tournaments during the spring season.

Conclusions: Youth lacrosse is a growing sport throughout the United States. Two-thirds of youth lacrosse players have engaged in private skill training outside of team practice, 1/3 play on more than one team during a season and 1/2 participate in weekend tournaments.

Youth lacrosse often involves a significant time commitment for parents and families. Further research is needed to assess the benefits associated with participation as well as mental and physical health risks.

This research was funded by a grant from US Lacrosse

#### 206 Board #43 June 1, 9:30 AM - 11:00 AM Knowledge and Experience of Placebo Effects Modifies Athletes' Intentions to Use Sport Supplements

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The gateway hypothesis posits that athletes who use legal sports supplements may be at risk of transitioning to doping (Backhouse *et al.*, 2013). Anti-doping interventions focused on reducing *legal* substance use could therefore be effective. Several authors have argued that if athletes were made aware through either direct experience or

indirect education of the role of expectation in mediating the efficacy of supplements, fewer people would use them, reducing the risk of doping behaviour. **PURPOSE:** To determine if knowledge and experience of placebo effects influence athletes' intentions, attitudes and beliefs towards sport supplements and doping substances. **METHODS:** Team sport athletes (n = 305) completed a questionnaire that assessed their intention to use, and their beliefs about, sport supplements, as well as their attitudes towards doping. Participants were then exposed to an intervention designed to elicit a placebo response (Beedie *et al.*, 2007). Participants performed 5 × 20m sprints at baseline before experimental administration of a placebo deceptively described as a sport supplement. The sprint protocol was repeated 20 minutes later, following which athletes were debriefed and presented with the results (see Beedie *et al.*, 2015 ACSM conference submission), as well as an overview of research attesting to the role of placebo effects in sports performance. Athletes re-completed the questionnaires, and were asked if knowledge of placebo effects would influence their decision to use sport supplements. **RESULTS:** Post experiential intervention, participants reported significantly reduced intention to use sport supplements ( $P < 0.001$ , Effect size [ES] = 0.48), reduced belief in the effectiveness of sport supplements ( $P < 0.001$ , ES = 0.61), and less favourable attitudes towards doping ( $P < 0.001$ , ES = 0.44). Qualitative responses suggested that knowledge of placebo effects influenced pre-post changes in intention to use sport supplements. **CONCLUSION:** An experiential placebo intervention positively affected athletes' attitudes and beliefs associated with the use and effectiveness of sport supplements and doping substances. Knowledge and experience of placebo effects appears to reduce the intention to use sport supplements and may prevent the transition towards doping.

207 Board #44 June 1, 9:30 AM - 11:00 AM  
**Executive Functioning Differs Between Expert Sailors' Responsibilities**  
 Karen E. Welman, Claire N. Walker. *Stellenbosch University, Matieland, South Africa.*  
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 (No relationships reported)

**PURPOSE:** Previous research suggest that competitive athletes have better cognitive functioning, i.e. sports-related executive functions (EF), compared to non-athletes. EF assist athletes in thinking before acting (Inhibitory control;IC), updating their thinking or planning (Updating;UP) and thinking outside the box (Cognitive flexibility;CF), and as a result make better decisions as well as plan and problem-solve efficiently. Therefore this novel descriptive observational study set out to explore the EF of expert sailors according to i) professional sailing ranking and ii) sailing role. **METHODS:** Fifteen national sailors (age: 24±8 years) with an average of 12±4 years of professional sailing experience volunteered. Primary outcome variables included IC, UP and CF. Sailing history information, global cognition (Montreal Cognitive Assessment; MoCA) and an EF test battery including the Wisconsin Card Sorting Test (WCST), Trail Making Tests A and B, and Stroop task was randomly administered. Participants were assessed as a group and comparisons are made between top (TRS) and bottom ranking (BRS) sailors as well as between sailors' positions i.e. crew or helm. **RESULTS:** Participants scored an average of 28±2 on the MoCA. TRS score 92% in global WCST score ( $p < 0.05$ ) and 127% better on Failure-To-Maintain-Set (WCST) compared to BRS ( $d = 0.75$ ;  $p = 0.26$ ). Crew demonstrated better CF ( $d = 0.92-0.95$ ;  $p > 0.05$ ) and IC ( $d = 1.41$ ;  $p = 0.046$ ), while helm had 30% better visuomotor speed and visual scanning ( $d = 1.62$ ;  $p = 0.03$ ). **CONCLUSION:** This is the first study to investigate the EF of sailors. These preliminary findings suggests that CF and IC may be important contributing cognitive skills for success in sailing. Also that less successful sailors may have inferior attentional capacity and therefore be more distractible; contributing to poorer decision-making skills. The responsibilities of sailors may contribute to the differences between helm and crew's EF, or vice versa, i.e. helm needs to continuously be taking in visual cues and information whereas crew's EF suggest that they anticipate the next event better, and as a result are able to actively adjust between strategies in ever-changing environments.

208 Board #45 June 1, 9:30 AM - 11:00 AM  
**Exploring Self-compassion And Self-objectification Among College Athletes**  
 Beth Ransford, Lindsey Bryant, Urska Dobersek, Mindy Hartman Mayol, K. Lee Everett, Matthew D. Beekley, FACSM.  
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 (No relationships reported)

Sexual objectification is when one's body is recognized for its physical and sexual desire. When this concept is used to demonstrate that individuals' values are dependent on their appearance (when individuals look at themselves as objects), these individuals are considered to be engaging in self-objectification (SO). SO tends to contribute to numerous psychological and mental health issues (Frederickson & Roberts, 1997).

Previous research suggests that self-compassion (SC) buffers the negative ramifications of SO. **PURPOSE:** The purpose of this study was to examine SC and SO between more (MOA) and less (LOA) objectified athletes. **METHOD:** One hundred sixty-four athletes, ages 18 to 23 ( $M = 19.45$ ,  $SD = 1.33$ ), from seven NCAA Division II teams participated in this study. They completed a demographic survey, the Short 12-item Self-Compassion Scale survey consisting of six subscales (self-kindness, common humanity, mindfulness, self-judgment, isolation, and over-identification) measured on a 5-point Likert scale (1 = almost never to 5 = almost always), and Shame and Surveillance subscales of the Objectified Body Consciousness Scale using a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree). Sports were divided into MOA (swimming and diving, volleyball, wrestling = 84) and LOA (basketball, soccer, lacrosse = 80). A one-way Analysis of Variance (ANOVA), controlling for age and gender, was used to test the differences between MOA and LOA on SC, shame, and surveillance. **RESULTS:** There was a statistically significant difference on SC,  $F(5, 158) = 7.84$ ,  $p = .006$ , between MOA ( $M = 3.13$ ,  $SD = 0.62$ ) and LOA ( $M = 3.00$ ,  $SD = 0.75$ ) and surveillance,  $F(5, 158) = 8.51$ ,  $p = .004$ , between MOA ( $M = 3.89$ ,  $SD = 1.07$ ) and LOA ( $M = 4.08$ ,  $SD = 1.19$ ). There was no significant difference between MOA and LOA on the shame subscale,  $F(5, 158) = 3.56$ ,  $p = .069$ . **CONCLUSION:** Some findings of this study are congruent with the previous self-objectification research suggesting that MOA experience higher surveillance compared to LOA. The SC finding - MOA scoring higher on SC than LOA - uniquely contributes to the sports psychology field since no previous studies on SC and collegiate athletes have been done. Future research is warranted for a better understanding of the SC and its effects on SO among college athletes.

209 Board #46 June 1, 9:30 AM - 11:00 AM  
**Coping Skills and Dispositional Resilience/Hardiness of Big Sky Conference Track and Field Athletes**  
 Andrew D. Polenske<sup>1</sup>, Michael C. Meyers, FACSM<sup>1</sup>, Anthony E. Bourgeois<sup>2</sup>, Arnold D. LeUnes<sup>2</sup>, Kristin M. Shuman<sup>1</sup>. *<sup>1</sup>Idaho State University, Pocatello, ID. <sup>2</sup>Texas A&M University, College Station, TX.* (Sponsor: Michael Meyers, FACSM)  
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 (No relationships reported)

**PURPOSE:** To quantify the coping skills and hardiness of Big Sky Conference track and field athletes. **METHODS:** Following written informed consent, 224 collegiate athletes (93 male, 131 female; mean age 20.1 1.6) completed the Athletic Coping Skills Inventory (ACSI; Smith *et al.*, 1995): coping with adversity (COPE), peaking under pressure (PEAK), goal setting/mental preparation (GOAL), concentration (CONC), freedom from worry (FREE), confidence and achievement motivation (CONF), coachability (COAC), and personal coping resources (PCR); the Sports Inventory for Pain (SIP); Meyers *et al.*, 1992): direct coping (COP), cognitive (COG), catastrophizing (CAT), avoidance (AVD), body awareness (BOD), and total coping resources (TCR); and the Dispositional Resilience/Hardiness scale (Bartone *et al.*, 1989): commitment (CM), control (CO), challenge (CH), and psychological hardiness (PH). Data were grouped by skill level (conference qualifiers, non-qualifiers), event (track, field), class [lowerclassmen (freshmen, sophomores), upperclassmen (juniors, seniors)], and gender. **RESULTS:** MANOVAs (Wilks' Lambda) indicated significant main effects across skill level [ $F(17,167) = 1.990$ ;  $P = 0.014$ ], class [ $F(34,410) = 2.325$ ;  $P < 0.0001$ ], and gender [ $F(17,206) = 3.323$ ;  $P < 0.0001$ ]; but no significant effect across event [ $F(17,206) = 1.148$ ;  $P = 0.311$ ]. Univariate analyses (mean SEM) indicated a trend for conference qualifiers to respond higher in CONF (9.1 0.2 vs 8.1 0.2) and PCR (54.6 1.1 vs 51.6 1.0), and lower in CAT (10.0 0.3 vs 11.3 0.3) than non-qualifiers, respectively. Lowerclassmen responded higher in COP (28.6 1.5 vs 27.4 2.1) and COG (16.4 0.3 vs 15.2 0.4) than upperclassmen, respectively. Males responded higher in COPE (7.4 0.2 vs 6.3 0.2), PEAK (8.1 0.3 vs 6.1 0.2), CONC (7.9 0.2 vs 6.9 0.2), FREE (6.6 0.3 vs 5.8 0.2), CONF (9.1 0.2 vs 8.1 0.2), and PCR (56.7 1.0 vs 50.7 0.8) than females, respectively. **CONCLUSIONS:** Conference qualifiers, lowerclassmen, and males possess stronger coping and hardiness abilities than their respective peers. It is recommended that the coaches incorporate time within their workout routines to conduct coping skills training involving sport psychologists familiar with track and field.

210 Board #47 June 1, 9:30 AM - 11:00 AM  
**Differences In Sport Motivation, Self-esteem And Grit Among Collegiate Swimmers And Divers**  
 Jill Cain, Elaina Voss, Mindy Hartman Mayol, Urska Dobersek, K. Lee Everett, Matthew D. Beekley, FACSM. *University of Indianapolis, Indianapolis, IN.*  
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 (No relationships reported)

Research suggests that motivation and self-esteem can greatly impact athletic performance. Grit, a determination and a passion for long-term goals, is a novel

concept within college athletics yet has been shown to be a predictor of youth academic achievement. **PURPOSE:** To examine sport motivation, grit, trait self-esteem and the potential for scholarship influences or class standing effects in collegiate swimmers and divers. **METHODS:** Fifty-one athletes ( $n = 24$  male;  $n = 27$  female) ages 18 to 23 ( $M = 19.40$ ,  $SD = 1.29$ ) completed the 12-item Short Grit Scale measuring grit, 18-item Sport Motivation Scale II measuring six constructs [intrinsic (IR), integrated (INTR), identified (IDR), introjected (INT), external (EXT), amotivated regulation (AMR)], 10-item Trait Self-Esteem Scale measuring one's self-worth and a demographics survey, all paper-based and self-reported. An independent samples t-test and two separate one-way Analyses of Variance (ANOVAs) were used to analyze the data. An alpha level of 0.05 was set for statistical significance. **RESULTS:** Independent t-tests revealed statistically significant differences between males and females in EXT  $t(48) = 2.70$ ,  $p = .010$ , INTR  $t(48) = -2.39$ ,  $p = .021$ , IDR  $t(48) = -2.20$ ,  $p = .032$ , and Grit  $t(48) = -2.14$ ,  $p = .037$ . Males scored higher than females on EXTR ( $M = 9.82$ ,  $SD = 4.03$ ;  $M = 6.70$ ,  $SD = 4.11$ ). Females scored higher than males on INTR ( $M = 18.07$ ,  $SD = 3.13$ ;  $M = 15.50$ ,  $SD = 4.39$ ), IDR ( $M = 17.74$ ,  $SD = 3.05$ ;  $M = 15.70$ ,  $SD = 3.50$ ) and on Grit ( $M = 3.74$ ,  $SD = 0.58$ ;  $M = 3.43$ ,  $SD = 0.43$ ). However, there were no statistically significant differences seen between males and females in IR, INT, AMR and trait self-esteem ( $p > .05$ ). The two ANOVAs also demonstrated no differences in sport motivation, grit and trait self-esteem between swimmers and divers who have full, partial or no scholarships as well as between freshmen, sophomores, juniors or seniors ( $p > .05$ ). **CONCLUSIONS:** Study findings showed higher EXT (rewards and punishments directing behavior) in males and higher INTR (congruency between value and individuals' goals and needs), IDR (perceived autonomy, personal commitment and engagement) and Grit in females. Further investigation of relationships between the more self-determined IR, INTR and IDR types and grit in collegiate athletes is recommended.

211 Board #48 June 1, 9:30 AM - 11:00 AM  
**Parents' Knowledge, Attitudes, and Behaviors Related To Beverage Consumption At Children's Sport Events**  
 Nicole D. Bolter<sup>1</sup>, Yong Gao<sup>2</sup>, Kristin Armstrong<sup>3</sup>, Scott A. Conger<sup>2</sup>, Stacy Beeson<sup>3</sup>, Hilary Flint-Wagner<sup>3</sup>. <sup>1</sup>San Francisco State University, San Francisco, CA. <sup>2</sup>Boise State University, Boise, ID. <sup>3</sup>St. Luke's Health System, Boise, ID. (Sponsor: Lynda Ransdall, FACSM)  
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Despite the potential health benefits of participating in physical activity (PA), research suggests that sugar sweetened beverages (SSBs) (i.e., soft drinks, fruit-flavored drinks, juices, and sports drinks) are provided at children's sporting events, and that parents are primarily responsible for these offerings. **PURPOSE:** To explore parents' knowledge and attitudes toward SSBs and other beverages provided at youth sport events to minimize unhealthy beverage consumption and maximize health benefits gained through PA. **METHODS:** Three focus groups were conducted with 24 parents (21 women, 3 men) of 6-11 year-old children participating in a community recreational soccer league. Interview questions focused on how parents choose and provide beverages for their children, perceived benefits and drawbacks of beverages, and ideas for improving healthy beverage consumption. Two independent coders performed a collaborative inductive content analysis of the interview transcripts. Raw data meaning units were identified and combined into lower- and higher-order themes, followed by more general dimensions. Trustworthiness of the data was established by an external reviewer. **RESULTS:** Four overarching dimensions emerged: Type of Beverages Provided; Knowledge, Attitudes, and Beliefs About Available Beverages; Factors Affecting Beverage Choices; and Suggestions for Promoting Healthy Beverage Consumption. Parents reported water was typically provided during practices and games, while other beverages, including SSBs, were limited to after games or tournaments. Parents expressed uncertainty about which beverages besides water were best for their children's health and performance. Beverage choices were affected by many factors, including age/competitive level, weather, other parents, coaches, kid preferences, convenience, and cost. Parents proposed that health organizations and sports leagues provide specific advice and tangible support to encourage healthy beverage consumption. **CONCLUSION:** Findings highlight the importance of parents' understanding about the risks and benefits of beverage choices during and after youth sporting events. Results can be used to design developmentally appropriate recommendations for the selection of healthy beverage consumption in recreational youth sport.

212 Board #49 June 1, 9:30 AM - 11:00 AM  
**Investigating Future Plans For Sport Involvement, Grit Levels And Motivation Sources In College Athletes**  
 Mindy Hartman Mayol, Beth Ransford, Ryan Colliver, Urska Dobersek, K. Lee Everett, Matthew D. Beekley, FACSM.  
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 (No relationships reported)

An athlete's anticipated participation in their respective sport post-graduation may influence current motivation and grit. **PURPOSE:** To examine collegiate athletes' levels of grit, sport motivation and future intention to participate in their respective sport once graduated [future intention: competitively (COMP) only, recreationally (REC) only, both COMP and REC (BOTH) or not at all (NONE)]. **METHODS:** Three hundred and ninety-one student-athletes (58% males; 42% females) with ages ranging from 18 to 23 years ( $M = 19.52$ ,  $SD = 1.36$ ) from twenty-two NCAA Division II sports teams voluntarily completed three self-report surveys. The 18-item Sport Motivation Scale II was used to measure intrinsic (IR), integrated (INTR), identified (IDR), introjected (INT), external (EXT), amotivated (AMR) regulation, the 12-item Short Grit Scale was used to measure Grit (one's level of perseverance and passion for long-term goals) and a demographics questionnaire. Seven separate one-way Analyses of Variance were used to analyze dependent variables (IR, INTR, IDR, INT, EXTR, AMR, Grit) with an alpha level of 0.05 for was set for statistical significance. Bonferroni adjusted pairwise comparisons were used as post hoc analyses. **RESULTS:** There were statistically significant differences between groups for the following dependent variables: IR  $F(3, 388) = 7.78$ ,  $p < .001$ , INTR  $F(3, 388) = 7.45$ ,  $p < .001$ , IDR  $F(3, 388) = 3.92$ ,  $p = .009$ , AMR  $F(3, 388) = 5.42$ ,  $p = .001$  and Grit  $F(3, 388) = 4.51$ ,  $p = .004$ . No significant differences were demonstrated between groups for ITR and EXTR ( $p > .05$ ). Post hoc analyses revealed the following: COMP, REC and BOTH groups had higher IR scores than athletes in the NONE group. BOTH and COMP groups had higher INTR scores than NONE and BOTH had higher INTR scores than REC. BOTH had higher IDR scores than REC and NONE. BOTH and COMP had lower AMR scores than NONE while COMP had higher Grit scores than REC. **CONCLUSIONS:** Overall, higher scores were exhibited in more self-determined and sustainable motivation types (IR, INTR, IDR) and Grit and lower AMR scores (lack of motivation in their sport) were seen in those groups that had planned on participating in their sport in one or more ways after graduating college. Further research into sources of motivation, grit and future plans of sport participation beyond college is suggested.

213 Board #50 June 1, 9:30 AM - 11:00 AM  
**Predictors Of Grit Levels In An NCAA Division II College Football Team**  
 Koby Orris, Alex Ritchie, Mindy Hartman Mayol, Urska Dobersek, K. Lee Everett, Matthew D. Beekley, FACSM.  
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 (No relationships reported)

Grit is defined as an individual's perseverance and desire to achieve long-term goals. Grit has been demonstrated to be a predictive factor for academic achievement in youth settings but few studies have assessed grit in college athletic populations. **PURPOSE:** To investigate potential factors predicting grit in collegiate football athletes. **METHODS:** Athletes with ages ranging from 18 to 22 years ( $M = 19.40$ ,  $SD = 1.29$ ) from one NCAA Division II football team [ $N = 88$ ; freshmen (43%); sophomores (19%); juniors (21%); seniors (17%)] completed five self-reported measures at one time point: the Short Grit Scale (GRIT-S), the Sport Motivation Scale II (SMS II), the Short Self-Compassion Scale (SSCS), the Objectified Body Consciousness Scale (OBCS) and a demographics questionnaire. The 12-item GRIT-S was used to measure grit, the 18-item SMS II scale was used to assess six factors of athletes' motivation within their given sport (intrinsic regulation, four types of extrinsic regulation and amotivation), the 12-item SSCS was used to measure levels of self-compassion, and the 8-item Control Beliefs subscale of the OBCS was used assess the degree to which individuals believe that they are responsible for their appearance and that they can control their appearance with enough effort. A multiple regression analysis was conducted and an alpha level of 0.05 was set for statistical significance. **RESULTS:** Results revealed that three factors statistically significantly predicted grit ( $R^2 = .35$ ,  $F(3,84) = 15.14$ ,  $p < .001$ ): control beliefs ( $\beta = .38$ ,  $p < .001$ ), intrinsic regulation ( $\beta = .28$ ,  $p = .006$ ) and self-compassion ( $\beta = .21$ ,  $p = .033$ ). **CONCLUSIONS:** Results indicated that three predictor variables explained 35% of the variance for grit in this population of collegiate football players. Those working diligently through failures, adversities and plateaus while maintaining a fervent level of interest to achieve success possess more "gritiness." It is gleaned from this study that one's degree of control over beliefs about one's appearance, level of intrinsic regulation (internal satisfaction and enjoyment of competing) and self-compassion levels greatly influence grit. Further research is needed to better understand grit in a national sample of college athletic teams that may provide more generalizable results.

214 Board #51 June 1, 9:30 AM - 11:00 AM  
**The Effect of Nine Sessions of Mindfulness-Acceptance-Commitment on Sport Performance and Attention in Volleyball Players**  
 Marcio Cascante-Rusenhack<sup>1</sup>, Gerardo Araya-Vargas<sup>1</sup>, José Moncada-Jiménez<sup>2</sup>. <sup>1</sup>University of Costa Rica, San José, Costa Rica. <sup>2</sup>Human Movement Sciences Research Center (CIMOHU), San José, Costa Rica.  
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**PURPOSE:** To determine the effect of nine sessions of Mindfulness-Acceptance-Commitment (MAC) on fitness and attention in volleyball players. A secondary aim was to study the association between attention and performance in volleyball players. **METHODS:** Participants were 18 volleyball players (mean age = 19.5 ± 5.3 yr.) randomly assigned to a control (CTRL) and an experimental (EXP) group. The EXP condition performed 9 sessions of MAC consisting of 30-min of meditation, 30-min Yoga exercises and 30-min of body scanning. The control group did not perform exercise. Dependent variables were measured before (pre-test) and after (post-test) the intervention. The Stroop Test was used to assess attention and physical fitness was measured by volleyball serve and attacking skills. Three mixed factorial 2 x 2 ANOVAs were used to analyze dependent variables attention and skill performance. Pearson correlation was used to determine attention scores change ( $\Delta$  = post-test minus pre-test) association with skill performance change ( $\Delta$  = post-test minus pre-test) **RESULTS:** No significant ANOVA interactions were observed for physical volleyball skills ( $p > 0.05$ ). ANOVA results indicated significant differences on attention scores in the CTRL (pre-test = 53.6 ± 7.8, post-test = 57.1 ± 6.8) and EXP (pre-test = 51.7 ± 5.6, post-test = 59.3 ± 4.0) groups ( $p < 0.05$ ). Post hoc analysis indicated that mean post-test attention scores in the EXP group were significantly higher than in the CTRL group ( $p < 0.05$ ). A significant correlation ( $r = 0.478, p < 0.05$ ) was found between score changes in attacking volleyball skills ( $\Delta = 26$ ) and attention ( $\Delta = 6.6$ ) scores. **CONCLUSIONS:** Results from this study suggest that MAC is effective for improving attentional skills following nine sessions of 90 min. Attention might be used as an indicator of attacking skills in volleyball.

215 Board #52 June 1, 9:30 AM - 11:00 AM  
**Relationship Between Coaches' Subjective Perception Of Players' Basketball Abilities And Their On-court Performance**  
 Ali Boolani<sup>1</sup>, Holly Bronson<sup>1</sup>, Chris Towler<sup>1</sup>, Timothy Baghurst<sup>2</sup>, Bert Jacobson, FACSM<sup>2</sup>. <sup>1</sup>Clarkson University, Potsdam, NY. <sup>2</sup>Oklahoma State University, Stillwater, OK.  
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**Purpose:** This study sought to determine whether the head coaches' perceptions of players' basketball ability was related to their statistical output. **Methodology:** Using a Visual Analog Scale, a NCAA Division I head men's (HCM) and head women's basketball (HCW) coach was asked post-season to rate their players' abilities for offensive IQ, defensive IQ, overall basketball IQ, passing ability, and anticipation ability. Players' game statistics were acquired from the university website, and unadjusted Player Efficiency Ratings (PER) were calculated using statistics for all universities from the conference website, an unadjusted Player Efficiency Rating (PER) was calculated. Data was normalized so that basketball output was projected over 30 minutes of playing time and analyzed using a bivariate correlation. **Results:** Analysis yielded significant positive interactions between HCM offensive basketball IQ and total minutes played, assists (AST)/30min assists/field goal attempt (FGA), and AST/turnover (TO) ratio; HCM defensive basketball IQ and AST/30min, AST/FGA, AST/TO ratio; HCM overall basketball IQ and AST/30min, AST/FGA and AST/TO ratio; HCM passing ability and minutes played and AST/30min. There was a negative relationship between HCM offensive IQ and steals/AST ratio; HCM defensive IQ and Offensive rebounds/30min; WCM overall basketball IQ, passing ability and anticipation and FGA/30min. An additional negative correlation was revealed between HCW anticipation and steals/30min. **Conclusion:** Both coaches valued passing and rated players lower if they attempted too many field goals. The HCM valued offensive abilities and dictated playing time based on his perception of offensive abilities however we were unable to determine what the HCW used to determine playing time Using perceptions versus advanced statistics to dictate playing time and player combinations during game may impact overall outcome of games and recruitment of players. Further investigations are needed to determine whether certain coaches are more accurate in their perceptions of athletes and the statistical performance on the court.

216 Board #53 June 1, 9:30 AM - 11:00 AM  
**Assessing Symptoms And Concerns Characteristic Of Eating Disorders Among Non-elite Multisport Endurance Athletes**  
 Jessica Mongrain, Geneviève Masson, Benoit Lamarche. Université Laval, Québec, QC, Canada.  
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 (No relationships reported)

Stringent management of body weight is considered by many athletes to be an intrinsic component of performance. Weight management is of particular importance in elite athletes involved in multisport endurance events. However, the prevalence and magnitude of concerns about food and body weight in non-elite multisport endurance athletes is unknown. **PURPOSE:** To evaluate symptoms and concerns related to eating disorders among non-elite athletes involved in multisport endurance summer and winter events. **METHODS:** A total of 145 non-elite athletes (102 men and 43 women) were recruited from the following multisport endurance events: winter triathlon, winter pentathlon, half-Ironman and Ironman. Self-reported symptoms and concerns related to eating disorders were assessed using the validated Eating Attitude Test-26 (EAT-26) questionnaire. **RESULTS:** Mean age (±SD) of participants was 39.6±10.8 years while age and gender-specific ranking in the sporting events was 49.0±27.4%. The mean EAT-26 score (±SD) was 7.1±6.5 with higher values among women than men (9.4±7.9 vs. 6.2±5.5,  $P=0.004$ ). The EAT-26 scores were also higher among athletes involved in the half-Ironman than among athletes competing in winter multisport events (10.1±1.1 vs. 6.0±1.0,  $P=0.04$ ). When adjusted for sex, there was no correlation between percentile ranking in the sporting event and the EAT-26 score. Finally, only 8 athletes (5.5 %) scored above the EAT-26 cut-off score of 20 for eating disorders. **CONCLUSIONS:** Unsurprisingly, non-elite multisport endurance female athletes scored higher on the EAT-26 than non-elite male athletes. However, the prevalence of self-reported symptoms and concerns about food and body image was very low in this sample of non-elite endurance athletes. This suggests that multisport endurance environments do not significantly induce and sustain unhealthy behaviors towards foods and body image.

217 Board #54 June 1, 9:30 AM - 11:00 AM  
**The Rest-q Recovery-stress State To Quantify The Effect Of Jet Lag In Travelling Athletes**  
 Audrey Jansen van Rensburg, Dina C. Janse Van Rensburg, FACSM, Catharina C. Grant. University of Pretoria, Pretoria, South Africa.  
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**PURPOSE:** International rugby tournaments require high-performance players to travel long distances from different global locations and over various time zones. The complex effects of intense training programs, rapid environmental changes, jet lag adaptation periods, and fatigue on performance outcomes are relevant concerns. The physical and mental impact of these effects on athlete stress and recovery rates may be considered a key factor in performance. **METHODS:** In order to assess the jet lag effect, a pilot study was initiated following 5 rugby players during an International Rugby Tournament over a 6 week period after crossing 10 time zones from west to east in order to compete. The Recovery-Stress-Questionnaire for Athletes (RESTQ-Sport), a validated assessment tool in recognising physiological and psychological markers of the recovery-stress state in athletes, was completed 6 times, one week apart: at baseline, before and after each of the four games played and on return. **RESULTS:** The rugby team lost their first match, which was scheduled during the first week of arrival at their destination. For the group of 5 players the total stress score had an escalating trend, and the total recovery score a declining trend during week 1, week 2 and week 3 respectively. Total recovery-stress state gradually improved towards week 6 compared to week 1 to 3. Individually, the 5 players were influenced differently and adapted differently over different periods of time. The REST-Q response results clearly indicated that the main period for jet lag adjustment and adaptation was quantifiable in the first 2 weeks after travel. **CONCLUSIONS:** Intense training programs, stress, environmental changes, adaptation to jet lag and fatigue may influence personal and team performance outcomes. Stress and, to an extent, travel adaptation to jet lag is very much an individual mechanism closely related to personality. Athletes are rushed from one peak performance to the other and the recovery phases become too short in the limits of human performance, which may generate a high level of perceived fatigue and general stress. This study showed that the first two weeks of adaption is the most crucial, and special management strategies should be put in place to alleviate the detrimental effects of jet lag.

WEDNESDAY, JUNE 1, 2016

218 Board #55 June 1, 9:30 AM - 11:00 AM  
**Water Pipe Smoking Among Young Arabic High School Girls**

Daniel S. Moran, FACSM<sup>1</sup>, Maysoun Essa<sup>2</sup>, Halima Badir<sup>2</sup>.  
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Water pipe smoking (Aka, Shisha, Narghille, Hookah) has become a trendy pursuit among young people today, mainly in the Middle East. Many of them believe that water pipe smoking is less harmful than smoking cigarettes. **PURPOSE:** To examine the reasons for water pipe smoking, the awareness of its negative health effects, and to examine whether smoking is an inter-generational phenomenon. **METHODS:** An anonymous survey questionnaire was filled by 103 young (16-18 yrs) Arabic high school girls who live in Israel. Chi-squared test was used to determine the independent variables that influence smoking water pipe. The Binomial test was performed to test the distribution significance between the two groups: smokers and non-smokers water pipe. Data analysis was done by SPSS. **RESULTS:** Out of 103 girls, 47 (45.6%) were water pipe smokers. Among 61.3% of the smokers at least one parent smokes compared to 3.6% for the non-smokers group. Among 79% of the smokers at least one parent knows that his/her daughter smokes. 58% of the smokers smoke because of peer pressure and 42% of them smoke a jester of maturation, authoritative and power. 81% of the smokers are aware of the negative health effects of water pipe smoking, and 75% would quit if they would see research, which shows a connection between smoking and cancer. 58% of the girls' parents don't see a difference between water pipe smoking and cigarette smoking. Finally, 86% of the girls claim their primary doctors don't have any influence on them regarding smoking. **CONCLUSIONS:** Water pipe smoking among young Arabic girls is an inter-generational phenomenon, where most Arabic parents know that their daughters smoke. The girls, as well as their parents, aren't aware of all the health risks involved with water pipe smoking. Direct education regarding the health hazards of water pipe smoking can be more influential to quit smoking than talking with the girls' primary care physician.

219 Board #56 June 1, 9:30 AM - 11:00 AM  
**The Effects Of Motivational Self-talk On Endurance Performance And Rate Of Perceived Exertion In Division III Athletes.**

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 (No relationships reported)

**The Effects of Motivational Self-Talk on Endurance Performance and Rate of Perceived Exertion in Division III Athletes**

**ABSTRACT**

**BACKGROUND:** Self-talk is one of the most commonly used strategies to influence the intensity and duration of physical performance. However, it has received little attention as a coping method in the study of perceived effort, particularly in National Collegiate Athletes Association (NCAA) Division III athletes.

**PURPOSE:** To examine the effect of motivational self-talk on endurance performance and rate of perceived exertion in 16 division III athletes.

**METHODS:** 16 (control = 7; intervention = 9), participants performed 3 separate cycle ergometer incremental  $\dot{V}O_2$  Max test, with a 72 hour rest period between the first and second visit, and a one week rest period between the second and third visit. The incremental test started with a 2-minute rest, the output increased by 1 Kilopascal every 2 minutes until volitional exhaustion. Exhaustion was defined as a reduction in cadence on the cycle ergometer below 60 revolutions per minute (rpm) for five consecutive seconds. After the second test, the experimental group was introduced to motivational self-talk. Each participant was given a sheet with three motivational self-talk statements which they had to use when working out during their two week rest period, before completing their final test. During the second and third visits, participants were asked every two minutes to point at Borg's Rate of Perceived Exertion Scale in order to measure how much energy they were exerting during the test. After each test, participants were asked to complete the Brunel Mood Scale, the motivational scale of the Dundee State Stress Questionnaire (DSSQ), and the Sport Motivation Scale (SMS-28).

**RESULTS:** It was found that motivational self-talk did not improve the endurance performance of the experimental group, compared to the control group ( $p=0.678$ ). Rate of perceived exertion did not decrease in the experimental group compared to the control group ( $p=0.818$ ). There were also no significant differences between the groups for success motivation ( $p=0.191$ ) or intrinsic motivation ( $p=0.606$ ).

**CONCLUSION:** This study does not support the suggestion that motivational self-talk increases endurance performance and rate of perceived exertion in 16 division III athletes.

220 Board #57 June 1, 9:30 AM - 11:00 AM  
**Coach versus Athlete Perceptions of Effort in Evaluation of Training Load.**

Justin Kraft, FACSM<sup>1</sup>, James M. Green, FACSM<sup>2</sup>, Matt Laurent<sup>3</sup>, Jessica M. Helm<sup>1</sup>, Cooper R. Roberts<sup>1</sup>, Swan Holt<sup>1</sup>.  
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Athletes can utilize the session RPE (SRPE) to assess training load (TL). However, the ability of coaches to effectively use this model is unclear. **PURPOSE:** This study examined coach and athlete SRPE during sport training and evaluated the effectiveness of perceptually-based TL monitoring.

**METHODS:** TL scores were calculated via the Edward's Heart rate (HR) method (Edward's TL) and a SRPE-based method for 42 (Men's and Women's basketball and Women's soccer) players. Athletes and their coach reported SRPE ~15 minutes post practice. SRPE was multiplied by exercise duration to calculate the SRPE-based TL score (SRPE-TL coach or SRPE-TL athlete).

**RESULTS:** A significant correlation existed between Edward's TL score and SRPE-TL coach ( $r = 0.76, p \leq 0.05$ ) and SRPE-TL athlete ( $r = 0.78, p \leq 0.05$ ). T-tests indicated SRPE estimated by coaches was higher than SRPE estimated by athletes ( $5.0 \pm 2.1$  vs  $4.6 \pm 2.0, p \leq 0.05$ ). Observations were similar when data were analyzed separately by team. Correlations of varying strength existed between Edwards TL score and the SRPE-TL score of both coaches and athletes (range:  $r = 0.27-0.79$ ) with all correlations except Edwards TL vs. SRPE-TL athlete for Men's basketball being stronger than  $r = 0.5$ . SRPE coach was higher than SRPE athlete for Men's ( $6.4 \pm 1.0$  vs.  $5.3 \pm 1.5, p \leq 0.05$ ) and Women's basketball ( $5.6 \pm 1.7$  vs.  $5.2 \pm 1.9, p \leq 0.05$ ) but the difference only approached significance for Women's soccer ( $3.1 \pm 1.8$  vs.  $3.3 \pm 2.0, p = 0.06$ ).

**CONCLUSIONS:** SRPE-TL for coach and athlete were moderately to strongly correlated with the Edward's HR-based TL supporting the monitoring of training load with perceptual markers. Although differences in SRPE estimated by coach and athlete existed, there was little practical impact on training load scores. Results indicate that both coaches' and athletes' subjective estimations of exertion provided a similar estimate of training load.

221 Board #58 June 1, 9:30 AM - 11:00 AM  
**Motivation for Sports Participation Among High- and Middle School Students: A Mixed-Methods Analysis**

Alvin Tran<sup>1</sup>, Jeanette Garcia<sup>1</sup>, John R. Sirard<sup>2</sup>, Diane Whaley<sup>3</sup>, Nancy Deutsch<sup>3</sup>, David J. Rice<sup>4</sup>, Arthur Welman, FACSM<sup>3</sup>.  
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<sup>2</sup>University of Massachusetts, Amherst, MA. <sup>3</sup>University of Virginia, Charlottesville, VA. <sup>4</sup>Fitchburg State University, Fitchburg, MA. (Sponsor: Arthur Weltman, FACSM)  
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**PURPOSE:** 1) To examine whether sports participation is associated with greater levels of moderate to vigorous physical activity (MVPA) and lower levels of objective sedentary behavior and screen time compared to those who do not play sports; 2) Using the social ecological model, compare individual psychological, social, and environmental influences on sports participation in middle and high school students; 3) Compare across gender & school level.

**METHODS:** 108 adolescents (58% female, 49% high school, 14.6 yrs) participated. MVPA and sedentary behavior (SB) were assessed by accelerometers, while screen time (ST) was assessed via questionnaires. Adolescents participated in focus groups, which followed a semi-structured format with questions pertaining to influences on MVPA and sport participation. Themes were categorized based on sex and school level to examine potential differences between high- and middle school males and females. Independent t-tests compared MVPA, SB, and ST between sports participants (SP) and Non-SP.

**RESULTS:** Overall, 69% of males and 75% of females reported participating in organized sports. Compared to NSP, SP had significantly greater MVPA (53 min/day vs 32.72 min/day,  $p < .0001$ ) and less ST (8.9 hrs/wk vs 13.56 hrs/wk,  $p = .002$ ). Focus group analyses suggest 88% of participants reported enjoyment as the main reason for sports participation, but the definition of enjoyment differed by sex and school level. Ninety-three percent of middle school males and females reported they enjoyed sports because they were "fun" and got to spend time with friends. The majority of high school males who participated in sports reported competition as the primary reason for participating. HS females talked about the stress relieving benefits of sports, and placed emphasis on other psychological benefits. Social influences on sports participation (parents, coaches, etc.) were mainly in the form of positive encouragement and co-participation, although high school females reported feeling pressure from parents to play sports.

CONCLUSION: Adolescent SP has greater levels of MVPA and less ST than NSP. Interventions to encourage sports participation in NSP should focus on increasing the psychological benefits, such as enjoyment, as well as promoting positive social interactions with other adolescent SP.

### A-38 Free Communication/Poster - Cardiac

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
Room: Exhibit Hall A/B

#### 222 Board #59 June 1, 11:00 AM - 12:30 PM Effects of the High Intensity Interval Training on Myocardial Mitochondria Function in Patients with Type 2 Diabetes

Shinji Sato<sup>1</sup>, Takao Kato<sup>2</sup>, Mayumi Kubota<sup>3</sup>, Shingo Otsuki<sup>1</sup>, Shiro Tanaka<sup>1</sup>, Shigeru Makita<sup>4</sup>, Ryuji Nohara<sup>5</sup>. <sup>1</sup>Osaka Sangyo University, Osaka, Japan. <sup>2</sup>Kyoto University, Kyoto, Japan. <sup>3</sup>Kansai Medical University, Osaka, Japan. <sup>4</sup>Saitama Medical University, Saitama, Japan. <sup>5</sup>Hirakata Kohsai Hospital, Osaka, Japan.  
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**PURPOSE:** Although impaired myocardial function is commonly observed in patients with type 2 diabetes (T2DM), it remains unclear whether this impairment can be improved. We hypothesized that high-intensity interval training (HIIT) has a favorable effect on myocardial function in patients with T2DM. **METHODS:** Twelve patients with T2DM (men/women, 6/6; mean age, 54.2 years; mean hemoglobin A1c, 6.8%) were randomized into a either conventional moderate-intensity walking program (CWP; n = 7) or into a HIIT program (n = 5; twice weekly for 12 weeks). The oxygen consumption over heart rate (VO<sub>2</sub>/HR), which is an exercise-related index of stroke volume, was assessed using cardiopulmonary exercise testing at baseline and after training. Additionally, myocardial mitochondrial function was assessed using technetium-99m sestamibi (MIBI) imaging. **RESULTS:** After training, the peak VO<sub>2</sub>/HR tend to be greater extent in the HIIT group than in the CWP group (10.8 vs. 0.8%; p=0.097). Furthermore, the peak VO<sub>2</sub>/HR was associated with MIBI counts (r = 0.60, p=0.06). **CONCLUSIONS:** In patients with T2DM, HIIT training was more beneficial than CWP for increasing the maximal stroke volume. This may be linked to superior effects on myocardial mitochondrial function.

#### 223 Board #60 June 1, 11:00 AM - 12:30 PM Arterial-Ventricular Coupling during Moderate Intensity Exercise in Heart Failure with Reduced Ejection Fraction and Severe Exercise Intolerance

Corey R. Tomczak<sup>1</sup>, Mark J. Haykowsky<sup>2</sup>, Ian Paterson<sup>3</sup>. <sup>1</sup>University of Saskatchewan, Saskatoon, SK, Canada. <sup>2</sup>University of Texas Arlington, Arlington, TX. <sup>3</sup>University of Alberta, Edmonton, AB, Canada.  
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A hallmark of heart failure with reduced ejection fraction (HFrEF) is impaired exercise tolerance. We have previously reported (Am J Physiol Heart Circ Physiol 302: H2635-H2654, 2012) in the current HFrEF study group with severe exercise intolerance that stroke volume reserve was significantly blunted from rest to moderate intensity exercise (below the ventilatory threshold). Arterial-ventricular coupling during moderate intensity exercise in patients with HFrEF and severe exercise intolerance is not well studied. **PURPOSE:** To determine arterial-ventricular coupling from rest to moderate intensity exercise in patients with HFrEF and severe exercise intolerance. **METHODS:** Seven patients with HFrEF (59 ± 9 years; m = 5; f = 2; NYHA III = 6; NYHA IV = 1; ejection fraction = 17 ± 3%) and severe exercise intolerance (peak VO<sub>2</sub>: 12.5 ± 3.6 ml/kg/min) were studied. Following a rest period, subjects performed cycle ergometry at a power output equivalent to 90% of the ventilatory threshold (22 ± 8 W) for 4 min. Left ventricular volumes were determined at rest and during exercise using contrast enhanced echocardiography in the apical 4-chamber view. Blood pressure was measured manually at the brachium. End-systolic pressure (ESP) was approximated as 0.9 × systolic blood pressure. Effective arterial elastance (Ea) was calculated as ESP/stroke volume and end-systolic elastance (Ees) was calculated as ESP/end-systolic volume. Arterial-ventricular coupling was calculated as Ea/Ees. Comparisons were made with paired t-tests. Data are mean ± SD and p < 0.05 was significant. **RESULTS:** There was no significant increase in Ea from rest (2.17 ± 0.36 mmHg/mL) to exercise (2.45 ± 0.47 mmHg/mL; p > 0.05). Ees increased modestly from rest (0.46 ± 0.09 mmHg/mL) to exercise (0.50 ± 0.12 mmHg/

mL; p = 0.02). There was a non-significant increase in mean Ea/Ees from rest (4.84 ± 1.08 mmHg/mL) to exercise (5.24 ± 2.20 mmHg/mL; p > 0.05) for the study group. **CONCLUSION:** The failure to augment arterial-ventricular coupling during moderate intensity exercise in patients with HFrEF and severe exercise intolerance likely contributes to impaired exercise left ventricular function.

#### 224 Board #61 June 1, 11:00 AM - 12:30 PM Descriptive Outcomes of Computer Assisted Auscultation During a Routine Cardiac Pre-Participation Screening in Athletes

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The ability to differentiate between athletic changes and pathological findings in the heart presents a challenge for clinicians during routine pre-participation screening. Cardiac auscultation provides clinicians with valuable diagnostic information on heart murmurs (HM). However, this practice requires skill and extensive clinical experience which often makes it difficult to reliably detect abnormalities. **PURPOSE:** To determine how computer assisted auscultation (CAA) can assist clinicians in the decision making and further management of athletes with systolic HM. **METHODS:** Collegiate athletes from different sporting codes were assessed for heart murmurs during a routine pre-participation evaluation (PPE). Participants underwent a 12-element focused clinical history and physical examination with a sports physician according to the American Heart Association guidelines. In addition a CAA assessment was performed by a technician who was blinded to the physician's findings. Based on the outcome of these independent assessments, all athletes with suspected pathological (PATH) murmurs were referred to a cardiologist for a confirmatory echocardiogram (echo). **RESULTS:** 131 athletes were screened (104 males and 28 females; mean age 20 ± 2 yrs.). In total the physician detected 17 murmurs (5 PATH vs. 12 physiological) compared to 14 PATH murmurs with CAA. Overall, 25 referrals were made to a cardiologist (3 PATH from physician, 12 PATH from CAA, 2 PATH both CAA and physician, and 8 for other reasons, e.g. history etc.). Subsequent echo revealed 3 PATH and 22 physiological murmurs. CAA showed a comparable sensitivity to the screening physician concerning the detection of PATH murmurs (3/3 vs. 2/3), but resulted in a higher false discovery rate (11/14 vs. 3/5). **CONCLUSIONS:** CAA was able to correctly identify all cases of PATH murmurs in athletes despite having resulted in a number of unnecessary referrals. In comparison the sports physician detected all but one PATH murmur (due to a patent foramen ovale in the septum region) but showed a lower false discovery rate. While not conclusive these findings suggest that CAA may prove to be a useful supportive diagnostic tool to aid a clinician's decision making process. However, further investigation is needed to establish reasons for the overestimation of PATH cases.

#### 225 Board #62 June 1, 11:00 AM - 12:30 PM Improved Isovolumetric Relaxation Time with a 12-Week Aerobic Training Program in Older and Young Individuals

Daniilo Iannetta<sup>1</sup>, Kaitlin M. McLay<sup>2</sup>, Donald H. Paterson, FACSM<sup>2</sup>, Juan M. Murias<sup>1</sup>. <sup>1</sup>University of Calgary, Calgary, AB, Canada. <sup>2</sup>University of Western Ontario, London, ON, Canada. (Sponsor: Donald H. Paterson, FACSM)  
(No relationships reported)

Although diastolic function is known to be impaired by aging, aerobic exercise training has been shown to decrease this detrimental effect. However, little is known about the effects of short exercise training interventions on diastolic function in older compared to young healthy individuals.

**PURPOSE:** To compare diastolic function in older and young healthy men and women before, midway, and immediately after a 12-week aerobic exercise training program. **METHODS:** Doppler-derived resting echocardiographic indices of left ventricular function were measured at baseline, six weeks, and twelve weeks of an aerobic training program. Measurements included diastolic flow velocity ratio (E/A) and isovolumetric relaxation time (IVRT). Fourteen older (O) (8 men and 6 women; 68 ± 6.9 yrs.) and 17 young (Y) (9 men and 8 women; 24 ± 4.9 yrs.) healthy sedentary individuals took part in an aerobic training program on a cycle ergometer (3 x week, 45 min/session, at a power output representing 70% VO<sub>2max</sub>; training intensity was adjusted at three weeks intervals). **RESULTS:** Exercise training resulted in a 20% increase in VO<sub>2max</sub> in older (Pre: 2.05 ± 0.49 L·min<sup>-1</sup>; Post: 2.55 ± 0.62 L·min<sup>-1</sup>; p < 0.05) and a 16% increase in VO<sub>2max</sub> in young (Pre: 3.23 ± 0.72 L·min<sup>-1</sup>; Post: 3.84 ± 0.73 L·min<sup>-1</sup>; p < 0.05). The exercise training intervention did not affect the E/A ratio neither in older (Pre: 1.0 ± 0.3; Mid: 1.0 ± 0.3; Post: 1.0 ± 0.2; p > 0.05), nor in young individuals (Pre: 2.0 ± 0.7; Mid: 1.9 ± 0.5; Post: 2.0 ± 0.5; p > 0.05). However, the IVRT was significantly lowered at post- compared to pre- and mid-training in both older (Pre 108.3 ± 17.5; Mid: 107.7 ± 25.21.7; Post: 95.8 ± 15.4 ms) and young individuals (Pre: 73.1 ± 8.6 ms; Mid: 76.8 ± 9.6; Post: 70.6 ± 9.1 ms). **CONCLUSION:** This study demonstrated that a short-

duration (12 weeks) aerobic training program, that improved cardiovascular fitness (i.e., increased  $\dot{V}O_{2max}$ ), resulted in improved diastolic function as expressed by a faster IVRT. Importantly, older individuals showed a similar ability to adapt as compared to their younger counterparts.

226 Board #63 June 1, 11:00 AM - 12:30 PM  
**Synchronizing Foot Strike and Cardiac Cycle Phase Affects Heart Rate and Metabolic Responses to Running**

Keren Constantini<sup>1</sup>, Abby S. Stickford<sup>2</sup>, Jeffery L. Bleich<sup>3</sup>, Paul D. Mannheimer<sup>3</sup>, Benjamin D. Levine, FACSM<sup>4</sup>, Robert F. Chapman, FACSM<sup>1</sup>. <sup>1</sup>Indiana University, Bloomington, IN. <sup>2</sup>Appalachian State University, Boone, NC. <sup>3</sup>Pulson Inc, Palo Alto, CA. <sup>4</sup>Institute for Exercise & Environmental Medicine, Presbyterian Hospital of Dallas, University of Texas Southwestern Medical Center, Dallas, TX.  
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The interplay between physiological factors such as muscle perfusion and venous return to the heart has a major role in cardiovascular and peripheral responses during running. Timing cardiac contraction (i.e. systole) to occur in synchrony with skeletal muscle relaxation (swing phase of the gait cycle) may reduce cardiac afterload and promote coronary and skeletal muscle perfusion. In turn, this should manifest in a reduced HR response at a constant running velocity, secondary to an increased stroke volume. **PURPOSE:** To assess HR and metabolic responses associated with running when foot strikes are timed to occur during 1) the systolic phase of the cardiac cycle, or 2) the diastolic phase. **METHODS:** Ten elite male distance runners performed a testing session on the treadmill at 4.72 m/s (5:40 min/mile) pace while matching their steps to an auditory tone and wearing a chest strap that generated accelerometer and ECG signals. Testing began with a 3-min control stage (no tone), immediately followed by 2 or 3 pairs of "toned" stepping phases (pair = 2 x 3-min), where the signal to step was given either at 100% of the subject's R-R interval (systolic stepping, SS) or 45% of R-R (diastolic stepping, DS). The order of DS and SS within each pair was randomized and double blinded.  $\dot{V}O_2$ , VE and RER were measured continuously. **RESULTS:** Twenty-eight pairs of DS + SS were used for HR, step rate (SR) and length (SL) comparisons and 24 pairs were included in metabolic data analyses. All subjects accurately timed their steps with the auditory tones (DS:  $45.0 \pm 4.3\%$ ; SS:  $100.1 \pm 5.0\%$  of R-R interval). While  $\dot{V}O_2$  was similar, HR, SR, VE and RER were significantly ( $p < 0.001$ ) lower during DS compared to SS (HR:  $172 \pm 6$  vs  $175 \pm 7$  beats  $\cdot$  min<sup>-1</sup>; SR:  $172 \pm 6$  vs  $175 \pm 7$  steps  $\cdot$  min<sup>-1</sup>; VE:  $100.0 \pm 10.8$  vs  $103.7 \pm 11.8$  l  $\cdot$  min<sup>-1</sup>; RER:  $0.93 \pm 0.03$  vs  $0.95 \pm 0.03$ , for DS & SS, respectively) despite subjects having to lengthen their steps more during DS compared to SS ( $p < 0.001$ ;  $2.5 \pm 3.1$  vs  $0.9 \pm 3.2\%$  of control SL, respectively) to match HR. **CONCLUSION:** Synchronizing foot strike to occur during diastole, as opposed to systole, reduces HR during running, presumably as a result of an increase in stroke volume and/or enhanced muscle perfusion. The cardiac advantage with DS may be beneficial to distance running performance.

Supported by a grant from Pulson Inc.

227 Board #64 June 1, 11:00 AM - 12:30 PM  
**Effects Of Endurance Exercise Training On The Cardiac Function Quantification By Echocardiography In STZ-DM Rats**

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Many studies have demonstrated that diabetes mellitus (DM) is associated with cardiac dysfunction. Exercise training is beneficial for the treatment of chronic heart failure. **PURPOSE:** the aim of the present study was to evaluate effects of endurance exercise training (EX) on cardiac function quantification by echocardiography in DM rats. We also evaluated the levels of connexin 43 of the heart. **METHODS:** the Sprague-Dawley (SD) male rats were divided into 3 groups as two experimental groups and one control group. The first groups as a control group received adjuvant. The second and third groups were the DM groups, received 150 mg/kg STZ by intraperitoneal injection. After one week, EX was carried out in the third group (DM-EX group) for four weeks. The cardiac functions of those animals were evaluated by echocardiography method. The animals were sacrificed; the connexin 43 of heart was evaluated by western blot. The tissues of heart were stained by H&E or Masson's trichrome stain. The morphology and fibrosis of cardiac cells were analyzed. **RESULTS:** the results show that the distances of interventricular septal and left ventricular (LV) posterior wall were shorter in DM and DM-EX groups than in control group ( $P < 0.05$ ). The LV diameter

was longer in DM-EX group than in control group ( $P < 0.05$ ). The weights of rat's body, heart and LV mass were lower in DM and DM-EX groups than in control group ( $P < 0.05$ ). The values of heart and LV mass weighted by body mass were higher in DM group than in control group ( $P < 0.05$ ). The heart connexin 43 was lowest in DM group than in control and DM-EX group ( $P < 0.05$ ). The length of cardiomyocyte diameter was longer in DM and DM-EX group than in control group ( $P < 0.05$ ). The percent of fibrotic area in heart tissue was highest in DM group than in others ( $P < 0.05$ ). The fibrotic area of heart was smaller in DM-EX group than in DM group ( $P < 0.05$ ). **CONCLUSIONS:** those results suggested that EX may decrease cardiac dysfunction from DM damage through connexin 43 increasing and lower myocardial fibrosis.

228 Board #65 June 1, 11:00 AM - 12:30 PM  
**Importance Of Non-invasive Imaging For Prevention Of Sudden Death In Athletes**

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1. Clinical picture:

A 40-year old man sought medical care in our institution (ICBA) because during the past years he underwent several exercise stress tests with ST-T segment changes in the electrocardiogram (ECG) during peak exercise without signs suggestive of ischemia by gated SPECT myocardial perfusion imaging.

2. Screening tests:

After history taking and physical examination, the patient underwent exercise stress echocardiography, which showed 1.5 mm ST-segment depression at 17.9 METs in leads II, III and VF and from V3 to V6, returning to normal values during the recovery phase associated with hypokinesia of the basal inferior and mid segments. A multi-slice computed tomography (CT) coronary angiography with a 64-row scanner was ordered for further evaluation and showed anomalous origin of the right coronary artery from the left coronary sinus and intra-arterial course.

3. Management:

The diagnosis of anomalous origin of the right coronary artery from the left coronary sinus and intra-arterial course with evidence of ischemia was made, and due to the high incidence of sudden cardiac death during competitive sports activities, the patient was advised to quit sports and underwent myocardial revascularization surgery to correct the defect.

4. Conclusion:

The diagnosis of the cause of the electrocardiographic changes was made using image testing and a multidisciplinary approach.

Computed tomography coronary angiography is a non-invasive test with high negative predictive value to rule out coronary artery stenosis. In athletes with ECG abnormalities and low probability of coronary artery stenosis, CT coronary angiography constitutes an interesting method to rule out significant coronary artery disease (the first cause of death in athletes > 40 years), make an accurate evaluation of the origin of the coronary arteries, visualize the course and anatomy of the coronary arteries and the presence of muscular bridges, which are well-recognized causes of sudden cardiac death in young athletes.

229 Board #66 June 1, 11:00 AM - 12:30 PM  
**Parasympathetic Modulation In Aging Adults: The Influence Of Body Composition**

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Limited evidence suggests a decline in parasympathetic modulation with aging. Such decline is not uniform and may be influenced by changes in body composition associated with aging, but this remains poorly understood. **PURPOSE:** To compare differences in body composition in older adults with low vs. high levels of parasympathetic modulation. **METHODS:** Fifteen older adults were split into low (n=7) and high (n=8) groups based on a marker of cardiovagal modulation--the root mean square of successive differences (RMSSD). Body composition was assessed using DXA, with total body fat %, total fat mass (kg), fat free mass (kg), abdominal adiposity, and abdomen-to-hip ratio reported. **RESULTS:** There were group differences in RMSSD ( $P < 0.05$ ). Group differences were observed for age and the abdomen-to-hip ratio, with the Low RMSSD group having higher values ( $P < 0.05$ ). Further analyses showed age did not contribute to the difference in the abdomen-to-hip ratio. **CONCLUSION:** Our results suggest that the distribution of body fat may be an important factor affecting age-related decline in parasympathetic modulation in aging adults. However, the small sample size suggest caution when interpreting the findings.

|                                      | Low RMSSD | High RMSSD |
|--------------------------------------|-----------|------------|
| Age (years)*                         | 60±1      | 56±2       |
| Heart rate (bpm)                     | 60±3      | 57±3       |
| Weight (kg)                          | 88.6±7.1  | 83.0±4.2   |
| RMSSD (ms)*                          | 19±2      | 69±14      |
| Body mass index (kg/m <sup>2</sup> ) | 29.9±2.1  | 29.9±2.7   |
| Body fat (%)                         | 41.1±2.9  | 38.9±5.0   |
| Fat mass (kg)                        | 36.3±4.0  | 33.2±5.4   |
| Fat-free mass (kg)                   | 52.3±5.2  | 49.8±3.0   |
| Abdomen (% fat)                      | 46.5±3.4  | 40.5±5.0   |
| Abdomen fat (kg)                     | 5.3±0.9   | 3.8±0.8    |
| Abdomen-to-hip ratio*                | 0.75±0.07 | 0.58±0.04  |

Data are mean±SE. \*P<0.05, group difference.

230 Board #67 June 1, 11:00 AM - 12:30 PM  
**Heart Rate Recovery Responses to Maximal Exercise and Childhood Vagal Tone**

Laurie Wideman<sup>1</sup>, James A. Janssen<sup>1</sup>, Alexis B. Slutsky<sup>1</sup>, Nathaniel T. Berry<sup>1</sup>, Lilly Shanahan<sup>2</sup>, Cheryl Lovelady<sup>1</sup>, Susan P. Keane<sup>1</sup>, Susan D. Calkins<sup>1</sup>. <sup>1</sup>UNC Greensboro, Greensboro, NC. <sup>2</sup>UNC Chapel Hill, Chapel Hill, NC. (Sponsor: Sandra Shultz, FACSM)  
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Heart rate variability (HRV) is reduced in many diseases, while faster heart rate recovery (HRR) is reflective of better fitness. In the biobehavioral sciences, decreased vagal tone (vagal withdrawal (VW)), is considered a physiological strategy indicative of active coping in situations where emotional and/or behavioral regulation is required; however little is known about how these measures are related to HRV or HRR in response to exercise. **PURPOSE:** To investigate the relationship between changes in HRV and HRR after maximal exercise in young adults compared to early childhood and adolescent baseline vagal tone (VT) and VW. **METHODS:** As part of a larger longitudinal study, 36 young adults [YA; Age=18-20, Female=48.1%] completed a maximal graded exercise test to volitional exhaustion. HRR was assessed at 2 (HRR2) and 4 (HRR4) min post-exercise and HRV was assessed pre (PR-EX) and ~20 mins post exercise in a seated position. At age 2 and 15, these same individuals had completed an age-appropriate, self-regulatory testing paradigm to assess VT and VW. Spearman correlations were completed using SPSS. **RESULTS:** Baseline VT at age 2 was not related to either baseline VT at age 15 or PR-EX HRV measures in YA, however baseline VT at age 15 was correlated to PR-EX HRV [SD of beat-to-beat intervals (SDNN; r=0.446, p=0.008) and root mean square of successive differences (RMSSD; r=0.48, p=0.004)] in YA. HRR2 was correlated to baseline VT at age 2 (r=0.32, p=0.053) and baseline VT at age 15 (r=0.59, p<0.001), while HRR4 was correlated to baseline VT at age 15 only (r=0.46, p=0.005). HRR2 was not correlated to VW at age 2 on any task, but was related to VW at age 15 on the speech task (r=0.40, p=0.014). HRR4 was correlated to VW on the fear task at age 2 (r=0.34, p=0.041). **CONCLUSION:** These preliminary results suggest that despite significant temporal separation, HRR after maximal exercise was related to childhood and adolescent baseline VT and VW on self-regulatory tasks that induce significant physiological stress (fear task at age 2 and speech task at age 15). Contrary to previous work using shorter temporal separation, we did not find trait-like stability in our baseline VT measures over time. This may be the result of the significant time separation (15+ yrs) or the small N in the current cohort. Support provided by NIMH 58144, NICHD R01 HD078346-01A1

231 Board #68 June 1, 11:00 AM - 12:30 PM  
**Ecg Screening In Ncaa Athletes: A Feasibility Study In Division 2 And 3 Athletes**

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**Purpose:** A universal agreement on screening strategy to identify athletes at risk for sudden cardiac death remains a topic of debate. The purpose of this study is to evaluate the benefit and feasibility of including electrocardiogram (ECG) screening during the pre-participation evaluation of NCAA athletes. **Methods and Study Design:** This is part of a prospective multi-center study funded by NCAA. Study participants were recruited from Division 2 and 3 athletic programs currently under the care of Kaiser Permanente Southern California physicians. Data was collected on three dates between April and May 2014. Study participants completed a cardiovascular screening questionnaire (AHA 12 point) and screening

ECG. Computer-based ECG devices were provided by the University of Washington parent investigational site. De-identified data was uploaded to a secure data repository and then shared with the parent research institution. The ECGs were over-read by a cardiology study team. The site investigator was alerted of abnormal results and responsible for arranging follow up care for participants.

**Results:** Thirty nine ECG recordings were obtained from two sites (51% female, 49% male). Participants represented 10 sports from Division 2 and 3 programs. Overall, 90% of female participants and 95% of male participants had normal screening ECGs. RVH was identified in one male participant (2.5%). Sinus arrhythmia with Mobitz type II was identified in one female participant (2.5%). Sinus bradycardia with competing ventricular escape rhythm was identified in one female participant (2.5%). The participant with RVH was recommended to have follow-up testing with echocardiogram, which was normal. No students were disqualified from sport as a result of these findings.

**Conclusion:** ECG screening in the Division 2 and 3 collegiate setting is feasible and allows for improved detection of those at increased risk for SCD when equipment is available.

**Significance:** The inclusion of a screening ECG in pre-participation evaluations of collegiate athletes allows for improved detection of those at risk for sudden cardiac death.

A-39 Free Communication/Poster - Ergogenic Aids I

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
 Room: Exhibit Hall A/B

232 Board #69 June 1, 9:30 AM - 11:00 AM  
**Effects Of Ergogenic Nutritional Supplements In Blood Flow Restricted Resistance Training**

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Low intensity training with partial restricted blood flow has been proved effective for increasing morphological and functional adaptations in a short period of time, in both sedentary populations and athletes. Morphological and functional adaptations of strength training can be amplified by proper nutrition and enhanced by ergogenic nutritional supplements.

**PURPOSE:** the objective of this study was to compare the effects of a partial restricted blood flow program with different supplementation regimes on brachial biceps thickness.

**METHODS:** 15 students from the University of Valencia with a minimum of 1 year of experience in resistance training were recruited. They all conducted a partial restricted blood flow program through an axillary tourniquet that was inflated to 20% of maximum occlusion. The occlusion was applied during a biceps curl at 30% 1RM for 3 sets of 15 repetitions. The subjects were grouped into a control group (CG) (ingesting placebo), a creatine group (MHCr G) (ingesting 0.3g / kg of creatine monohydrate per kilogram body weight), and a Beta-hydroxy beta-methylbutyrate (HMB) plus creatine group (MHCrHMB G) (ingesting 0.3 g / kg of creatine monohydrate per kilogram body weight, combined with 3 grams of HMB). The thickness of the brachial biceps was assessed by ecography (ultrasound) at baseline and after 3 weeks. A one-factor ANOVA with post-hoc multiple comparisons DMS was applied.

**RESULTS:** All three groups experienced an increase in the thickness of the biceps (CG: pre 1.52±0.2, post 1.96±0.15 cm p=0.003; MHCr G: pre 1.49±0.31, post 1.8±0.25 cm, p=0.031; MHCrHMB G: pre 1.2±0.33, post 1.62±0.17 cm; p=0.048). Although there were no significant differences between groups (p>0.05), the group that ingested HMB combined with creatine experienced the largest increase (35%) than others (28.9 CG and 20.8 MHCr G).

**CONCLUSIONS:** Three weeks of partial (20%) occlusion training increases the thickness of the brachial biceps. This adaptation may be enhanced by the intake of ergogenic nutritional supplementation such as HMB and creatine.

233 Board #70 June 1, 9:30 AM - 11:00 AM  
**Effects Of A Protein-containing Anabolic Mixture And Dhea On Muscle Mass In Hindlimb Suspended Rats: The Role Of Autophagy**  
 Cheng- Tai Lin<sup>1</sup>, Chung-Yu Chen<sup>1</sup>, Yi-Hung Liao<sup>2</sup>. <sup>1</sup>University of Taipei, Taipei, Taiwan. <sup>2</sup>National Taipei University of Nursing and Health Science, Taipei, Taiwan.  
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 (No relationships reported)

**PURPOSE:** The purpose of the present investigation was to determine the effects of an anabolic mixture containing leucine, whey protein with or without DHEA on muscle loss and cellular signaling pathways controlling autophagy in disuse atrophy model. **METHODS:** Thirty-two male Sprague-Dawley (SD) rats (280-330g) were randomly assigned into 4 groups: control (C), HS, HS/protein (HSP), HS/protein/DHEA (HSPD). Anabolic mixture supplement (10 ml/kg body wt containing 300 mg/kg body wt of leucine, 400 mg/kg of whey protein with or without 75 mg/kg of DHEA) was oral gavigated twice a day during hindlimb unloading. After 14 days of HS, skeletal muscles were removed and weighed for biochemical analyses. **RESULTS:** HS significantly decreased soleus and gastrocnemius weights in all groups compared with control ( $P < .01$ ). In plantaris muscle, the loss of muscle mass did not occur in HSP group compared with C. Plantaris in HSP group was significantly heavier than in HS ( $P < .01$ ), whereas no significant difference was found between HSP and HSPD. Bcl-2 in the HS group was significantly decreased below that in the C group ( $P < .05$ ). Neither protein nor DHEA was found to have effects on Bcl-2 in plantaris. Beclin 1 in HSPD group was significantly lower than that in C group ( $P < .05$ ), while the comparison of C with HS or HSP was not different. The expression of p62 was lowered by nutrient supplement with or without DHEA. The expression of HSP70 was unchanged among all experimental groups. **CONCLUSIONS:** The protein-containing anabolic supplement selectively prevented disuse-caused muscle atrophy. Addition of DHEA into the supplement has no additional effect on reversing muscle atrophy. In addition, the p62 expression induced by hindlimb suspension was markedly suppressed by the provision of protein supplement, but addition of DHEA did not further suppress p62 levels.

234 Board #71 June 1, 9:30 AM - 11:00 AM  
**The Effects of Testosterone Boosters on Testosterone, Strength, and Body Composition in Young Trained Males**  
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 (No relationships reported)

Athletes frequently use nutritional supplementation to improve physical performance. Herbal testosterone boosters claim to increase testosterone and maximize strength gains and lean body mass. **PURPOSE:** To investigate if testosterone, strength and lean body mass are increased in young trained males taking an herbal testosterone supplement compared to a placebo during a 6-week resistance training period. **METHODS:** Participants were randomly assigned to the placebo (pl) group ( $n = 6$ ) or the experimental (exp) group ( $n = 5$ ). Participants and researchers were blinded to group assignments. Blood and saliva samples were collected in the fasted state prior to the intervention (pre), 3 weeks (mid) and 6 weeks (post) to measure testosterone. 1RM squat and bench press and body composition were measured at all three time points. Participants supplemented with the herbal testosterone booster or 500mg of oregano in capsule form twice daily. **RESULTS:** No significant difference was detected between groups for % change in squat ( $p = 0.792$ ) or bench press ( $p = 0.429$ ). There was no significant difference between groups for unbound serum testosterone % change from pre to post ( $p = 1.000$ ) as well as between groups for unbound serum testosterone concentrations (pre  $p = 0.429$ , 3w  $p = 0.622$ , post  $p = 0.537$ ). No significant difference occurred between groups for total saliva testosterone % change from pre to post (exp =  $16.69 \pm 21.22\%$ , pl =  $40.48 \pm 38.17\%$ ;  $p = 0.329$ ). A significant difference was detected between groups post-test saliva testosterone concentration (exp  $728.82 \pm 199.37$  ng-dl-1, pl  $1153.54 \pm 357.11$  ng-dl-1;  $p = 0.030$ ) as well as for % weight change (WT%) for the exp group compared to the pl group from pre to mid ( $p = 0.004$ , exp mean WT % change  $-1.44 \pm 0.288\%$ , pl mean WT % change  $1.76 \pm 1.39\%$ ;  $p = 0.004$ ). **CONCLUSION:** It appears that supplementation with a testosterone booster during a resistance training intervention does not increase testosterone, strength or lean body mass when compared to a placebo. Supported by a West Chester University Student-Faculty Research Award

235 Board #72 June 1, 9:30 AM - 11:00 AM  
**Effects of Increased Plasma Branched-chain Amino Acids and Insulin on Muscle Protein Metabolism**  
 Christos S. Katsanos<sup>1</sup>, Sarah Everman<sup>2</sup>, Lee Tran<sup>1</sup>, Nyssa Hoffman<sup>1</sup>, William L. Dedmon<sup>3</sup>, Chad C. Carroll<sup>3</sup>. <sup>1</sup>Arizona State University / Mayo Clinic in Arizona, Scottsdale, AZ. <sup>2</sup>Arizona State University, Tempe, AZ. <sup>3</sup>Midwestern University, Glendale, AZ.  
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**Purpose:** Insulin and branched-chain amino acids (BCAA) are two potent stimuli among plasma circulating factors in enhancing muscle protein anabolism. However, little is known whether either BCAA alone or BCAA+insulin enhance muscle protein metabolism in humans. **Methods:** Seven healthy young subjects (gender, 4M/3F; age,  $19 \pm 1$  years; BMI,  $23 \pm 1$ ) were infused with BCAA (5  $\mu\text{mol/kg/min}$ ) for six hours (BCAA) and insulin [either 40  $\mu\text{mU/m}^2/\text{min}$  ( $n=3$ ) or 80  $\mu\text{mU/m}^2/\text{min}$  ( $n=4$ )] during the last three hours of the BCAA infusion. Another seven (gender, 6M/1F; age,  $23 \pm 2$  years; BMI,  $23 \pm 1$ ) underwent the same protocol but with saline instead of BCAA infusion (Saline). The effects of BCAA on muscle protein synthesis and whole-body protein breakdown, an indirect estimate of muscle protein breakdown, were studied between BCAA and Saline groups, while those of insulin within each group, and in conjunction with continuous infusion of L-[ring-2H5]phenylalanine and muscle biopsies at selected time points. **Results:** There were no differences between BCAA and Saline groups in the fractional synthesis rate (FSR; %/h) of muscle proteins before the insulin infusion ( $0.06 \pm 0.02$  vs  $0.05 \pm 0.01$ ;  $P > 0.05$ ). Insulin infusion did not increase the FSR within either BCAA ( $0.06 \pm 0.02$  vs  $0.05 \pm 0.01$ ;  $P > 0.05$ ) or Saline ( $0.05 \pm 0.01$  vs  $0.06 \pm 0.01$ ;  $P > 0.05$ ) groups. However, whole-body protein breakdown ( $\mu\text{mol/kg/min}$ ) tended to be lower in the BCAA vs Saline group ( $0.97 \pm 0.07$  vs  $1.10 \pm 0.05$ ;  $P = 0.09$ ), and decreased following the insulin infusion within both BCAA ( $0.97 \pm 0.07$  vs  $.67 \pm 0.3$ ;  $P < 0.01$ ) and Saline ( $1.10 \pm 0.05$  vs  $0.83 \pm 0.03$ ;  $P < 0.01$ ) groups, with a significantly greater effect between groups during insulin ( $P < 0.01$ ). Insulin infusion decreased the concentration of plasma total as well as non-BCAA essential amino acid concentrations in both BCAA and Saline ( $P < 0.05$ ) with no differences between groups ( $P > 0.05$ ). **Conclusions:** These findings show that the effects of BCAA are augmented by insulin, resulting in suppressed muscle protein breakdown with no changes in muscle protein synthesis.

236 Board #73 June 1, 9:30 AM - 11:00 AM  
**Effects Of A Nutritive Administration Of Carbohydrates And Protein By Food On Skeletal Muscle Inflammation And Damage After Acute Endurance Exercise**  
 Patrick Diel<sup>1</sup>, Duc Le Viet<sup>1</sup>, Jascha Huss<sup>1</sup>, Stefan Geisler<sup>2</sup>. <sup>1</sup>Geman Sports University Cologne, Cologne, Germany. <sup>2</sup>IST - University of Applied Sciences, Duesseldorf, Germany.  
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**Abstract:** Scientific Background: Protein ingestion has been recently described to enhance the effects of carbohydrate drinks on skeletal muscle recovery. The aim of this study was to investigate the beneficial effects of a co-ingestion of carbohydrate and protein by food in amateur sportsmen. **Methods:** 16 male subjects performed a 10km run at 80% of individual ANS. Immediately after exercise subjects ingest either nothing (control), carbohydrates by eating white bread, or a combination of carbohydrates and protein by eating white bread and a sour milk cheese. Blood samples were taken at different time points. Serum glucose, serum insulin, serum creatine kinase (CK) and the serum levels of IL6, IL 10, MIF and TNF alpha were determined. **Results:** Blood glucose was increased by endurance exercise. Blood glucose levels decreased rapidly after exercise, here the strongest decrease could be observed in the bread/cheese group. Food uptake results in strong increase of serum insulin not differing between bread and bread/cheese. CK serum levels as a marker for skeletal muscle damage strongly increased 24h after exercise in the control and bread group but not in the bread cheese group. Exercise resulted in an increase of serum IL 6 and MIF which was reduced in the bread/cheese group. Serum IL 10 was increased by bread/cheese ingestion. TNF alpha serum concentration was decreased by exercise. This decrease was antagonized by bread/cheese ingestion. **Conclusion:** Our data demonstrate that uptake of a combination of protein and carbohydrate by food immediately after endurance exercise effect's physiological responses like blood glucose levels of the individual's and antagonize the induction of serum CK, a marker of skeletal muscle damage. Moreover this nutritive carbohydrate/protein uptake seems to influence the inflammatory response of the skeletal muscle indicated by reduced concentrations of proinflammatory markers and an increase of anti-inflammatory markers.

237 Board #74 June 1, 9:30 AM - 11:00 AM

**Oral Essential Amino Acids, Sprint Exercise And Collagens In Human Skeletal Muscle**Mona Esbjörnsson, Håkan Rundqvist, Andreas Montelius, Haroon Bayani, Ted Österlund, Eva Jansson. *Karolinska Institutet, Stockholm, Sweden.*

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*(No relationships reported)*

**PURPOSE:** To investigate the effects of oral ingestion of essential amino acids (EAA exercise on the global gene expression in skeletal muscle after sprint exercise. **METHODS:** Twelve healthy physically active subjects (age 20-30 years) performed three 30-s cycle sprints with maximal voluntary pedaling rate on a mechanically braked cycle ergometer with 20 min rest between the sprints. The braking force was set at 0.75 N/kg body weight. The subjects consumed either EAA + maltodextrin solution or flavored water (placebo) in a randomized order. A post exercise biopsy (m. vastus lateralis) was taken 200 minutes after the last cycle sprint. RNA was isolated from the frozen muscle biopsies using TRIzol protocol. Purification was executed using RNeasy Mini Kit (Qiagen). The RNA concentration was determined using the NanoDrop (Thermo Fischer Scientific) and quality assessed by Agilent (Agilent Technologies). The Affymetrix Gene Chip Whole Transcript (WT) Sense Target Labeling Assay Manual was used for complementary DNA (cDNA) generation, hybridization and array processing (GeneChip® Human Transcriptome Array 2.0). Differentially expressed genes in response to EEA in combination with the sprint exercise were analyzed using the Ingenuity Pathways Analysis (IPA) software application. To validate microarray data total RNA was reverse transcribed using random hexamer primers. Real-time PCR was applied to measure mRNA expression using RPS18 as reference to correct for potential variation in RNA loading. **RESULTS:** The IPA Network analysis showed an enrichment of activated genes related to collagen metabolism. Some of the genes in the pathway analysis were validated by the PCR analysis. The expression of COL15A1, COL1A1, COL2A1 and BGN was higher in the EEA condition compared to the placebo condition ( $P < 0.05$ ). **CONCLUSION:** Oral ingestion of EAA after sprint exercise increases expression of genes related to collagen metabolism. The functional role of an activation of collagen metabolism is not known, although it could be speculated that an altered collagen metabolism reflects an extracellular remodeling after exercise and that this process is enhanced by oral ingestion of EEA. **SUPPORT:** The study was supported by grants from the Swedish National Center for Research in Sports.

238 Board #75 June 1, 9:30 AM - 11:00 AM

**L-glutamine And L-alanine Attenuate Fatigue Markers In Rats Submitted To Resistance Training**Julio Tirapegui, Audrey Y. Coqueiro, Raquel Raizel, Thaís M. Hypolito, Jaqueline S M Leite. *University of São Paulo, São Paulo, Brazil.*

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Accumulation of metabolic products, such as ammonia, and pH reduction, due to increased synthesis of lactate for energy purposes, are associated with the development of fatigue. Peripheral fatigue culminates in decline of muscle strength and contraction velocity, which may affect performance in resistance exercise. Glutamine and alanine are used as energy substrates and carry ammonia from the skeletal muscle to be metabolized in the liver and eliminated through the kidneys, which may attenuate the muscle accumulation of lactate and ammonia. **PURPOSE:** The aim of this study was to determine the effects of chronic oral supplementation with L-glutamine and L-alanine on fatigue markers in rats submitted to resistance training. **METHODS:** Adult male Wistar rats ( $n=8$  per group) were submitted to eight-week resistance training, which consisted to climb a ladder from three to six sets with progressive loads (25% to 100% of body weight). In the last 21 days of training, supplements were given in a 4% solution dissolved in drinking water. Animals were supplemented with L-glutamine and L-alanine, as a dipeptide or in their free form (DIP, GLN+ALA and ALA groups, respectively), or water (SED and CTRL groups). Animals were sacrificed one hour after the last training session. Ammonia was determined in Extensor digitorum longus (EDL) muscle and lactate was determined in plasma. **RESULTS:** Resistance exercise increased muscle ammonia concentration by approximately 150% ( $p < 0.05$  vs. SED). However, administered supplementations reverted this scenario. Treatments with ALA, GLN+ALA and DIP reduced muscle ammonia levels by 55, 57 and 58%, respectively, compared to CTRL group ( $p < 0.05$ ). Lactate was reduced in plasma of control rats ( $p < 0.05$  vs. SED) and treatments containing L-glutamine improved this effect. Supplements with DIP and GLN+ALA reduced plasmatic levels of lactate by 43 and 44%, respectively, compared to CTRL group ( $p < 0.05$ ).

**CONCLUSIONS:** Chronic oral supplementation with L-glutamine and L-alanine, both in their free form or as a dipeptide, reduces ammonia levels in EDL muscle, while DIP and GLN+ALA reduced plasmatic levels of lactate, which may delay fatigue and improve performance in rats submitted to resistance exercise. Supported by FAPESP.

239 Board #76 June 1, 9:30 AM - 11:00 AM

**Effect Of 14 Days Hmb Supplement On Osteoclastogenesis Related Protein Expression And Bone Metabolism Regulate Cytokines Level In Healthy College Male.**Yao-Hung Kuo<sup>1</sup>, Yu-Wen Weng<sup>1</sup>, Chih-Li Lin<sup>2</sup>, Chen-Kang Chang<sup>1</sup>, Wei Hung<sup>1</sup>. <sup>1</sup>National Taiwan University of Sport, Taichung, Taiwan. <sup>2</sup>Chung Shan Medical University, Taichung, Taiwan.

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*(No relationships reported)*

Beta-hydroxy-beta-methylbutyrate (HMB) supplement had extensively use as ergogenic aids among athlete and fitness population. Previous researches indicated that HMB not only enhance muscular fitness but also affect bone homeostasis. HMB enhanced bone formation through IGF pathway and inhibit bone resorption through unknown mechanism. Previous studies indicated that HMB downregulate osteoclastogenesis by inhibit NF- $\kappa$ B pathway and downstream protein expression. Downstream expression of dendritic cell-specific transmembrane protein (DC-STAMP) which responsible for cell to cell fusion during osteoclastogenesis might be the downregulation target of HMB in NF- $\kappa$ B pathway. Therefore, we design present study to investigate effects of HMB supplement on NF- $\kappa$ B related protein expression in peripheral blood mononuclear cell (PBMC). 12 healthy college male aged 20-22 years old were recruited as subject for present study. All subjects intake 3 grams of HMB daily in the early morning for 14 days and daily diet were recorded. Fasting blood samples were collected through venipuncture on day 2, 3, 4, 6, 8, 11, 15 and 1, 2, 3, 6, 9, 12 hours after HMB supplement on day 1. Plasma osteoprotegerin (OPG) and soluble receptor activator of nuclear factor  $\kappa$ B ligand (sRANKL) level were analyzed by ELISA. Receptor activator of nuclear factor  $\kappa$ B (RANK) and DC-STAMP expression on PBMC surface were analyzed by Flow cytometer. RANK expression on PBMC was significantly decreased within 6 hours and remains lower than baseline for the next two days. DC-STAMP expression on PBMC also decreased within 6 hours after HMB ingestion and remains lower than normal for the next two days as well. Plasma sRANKL and OPG level remain stable for entire supplement period. Results of present study indicated that HMB supplement downregulate the expression of RANK and DC-STAMP, both upstream and downstream protein of NF- $\kappa$ B pathway without alter sRANKL and OPG level. Current results indicated that downregulate of osteoclastogenesis by short-term HMB supplement might media through NF- $\kappa$ B pathway. However, plasma sRANKL and OPG level were not altered. Effects of long term HMB supplement on osteoclastogenesis require further study to Clarify. Effects of HMB supplement on bone metabolism related cells such as stroma cells and osteoblast require further study as well.

240 Board #77 June 1, 9:30 AM - 11:00 AM

**Whey Protein Hydrolysates Accelerate Rat Muscle Protein Synthesis At Lower Doses Than Intact Whey Protein**Ryoichi Tagawa, Kyosuke Nakayama, Chiaki Sanbongi, Shuji Ikegami, Shigeru Taniguchi. *Food Science Research Laboratories, Meiji Co., Ltd., Odawara, Kanagawa, Japan.*

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**Reported Relationships:** R. Tagawa: Salary; Meiji Co., Ltd.

**PURPOSE:** The intake of whey protein is highly effective for accelerating muscle protein synthesis. Many studies have revealed that a rapid absorption rate and the leucine-rich amino-acid composition of whey protein contribute to the acceleration of muscle protein synthesis. Whey protein hydrolysates (WPH) have amino-acid composition identical to intact whey protein isolate (WPI) and are absorbed more rapidly than WPI. Our hypothesis was that WPH is a more potent accelerator for muscle protein synthesis than WPI. The aim of the present study was to compare the effects of WPH on muscle protein synthesis with WPI. **METHODS:** Male Sprague-Dawley (SD) rats swam for 2 h. Immediately after exercise, WPI was administered to the rats as a single dose (amounts of protein were 2.0 g/kg BW). Phe- $D_3$  was injected via the tail vein 15 min before euthanasia for the measurement of the protein fractional synthesis rate (FSR). Rats were euthanized at designated postprandial time points (30, 60, 90 or 120 min) and triceps muscle samples were collected ( $n = 7-9$ /time point). FSR were measured to find out the time point at which FSR became highest.

Subsequently, another group of male SD rats swam for 2 h. Immediately after exercise, WPH, WPI or deionized water (control, n = 8) was administered to the rats as a single dose (amounts of protein were 0.5 or 2.0 g/kg BW, n = 8/treatment/dose). Phe-D<sub>2</sub> was injected via the tail vein 15 min before euthanasia. At the time point that the first study revealed postprandial FSR became highest, rats were anesthetized and their triceps muscles were excised to measure FSR.

**RESULTS:** Postprandial FSR became highest at 60 min after WPI was administered (2.68±0.25, 3.64±0.19, 4.62±0.28, 4.19±0.21 and 3.99±0.19 %/day for 0, 30, 60, 90 and 120 min).

60 min after administration, WPH had significantly higher ( $p < 0.05$ ) FSR compared to control at a dose of either 0.5 or 2.0 g/kg BW (5.21±0.22, 5.22±0.18 and 3.74±0.24 %/day for 0.5, 2.0 g/kg BW and control, respectively). However, WPI had significantly higher ( $p < 0.05$ ) FSR compared to control only at a dose of 2.0 g/kg BW (4.51±0.10 and 5.09±0.20 for 0.5 and 2.0 g/kg BW). WPH had significantly higher ( $p < 0.05$ ) FSR compared to WPI at 0.5 g/kg BW.

**CONCLUSIONS:** Whey protein hydrolysates stimulate muscle protein synthesis at lower doses compared to intact whey protein.

241 Board #78 June 1, 9:30 AM - 11:00 AM

### Combined Oral Intake of GABA with Whey Protein Improves Lean Mass in Resistance-trained Men

Maya Sakashita<sup>1</sup>, Utano Nakamura<sup>1</sup>, Isafumi Maru<sup>1</sup>, Seiyu Harada<sup>1</sup>, Jeong Won Kim<sup>1</sup>, Noriko Horie<sup>1</sup>, Mujo Kim<sup>1</sup>, Yasuhiro Yokoyama<sup>2</sup>, Satoshi Fujita<sup>3</sup>. <sup>1</sup>Pharma Foods International CO., LTD., Kyoto, Japan. <sup>2</sup>Mitsubishi Corporation, Tokyo, Japan. <sup>3</sup>Ritsumeikan University, Shiga, Japan.  
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(No relationships reported)

Gamma aminobutyric acid (GABA) is one of the amino acids and is an inhibitory neurotransmitter. Oral administration GABA reportedly elevates resting serum growth hormone (GH) concentrations. GH is an important regulator of body composition including muscle protein synthesis, although the effect of GABA on muscle anabolism is unclear. On the other hand, it is well known that ingestion of protein after exercise stimulates protein synthesis in skeletal muscles. In addition to post-exercise protein supplementation, the ingestion of GABA may have additive effect in training-induced muscle hypertrophy.

**PURPOSE:** To examine the effect of oral administration of GABA combined with whey protein on muscular hypertrophy during progressive resistance training in men. **METHODS:** Twenty-six healthy male volunteers (26-48 yrs) were divided into one of two groups: whey protein (WP) group ingesting 10g of whey protein, or whey protein + GABA (WP+G) group ingesting 10g of whey protein and 100 mg of GABA every day for 12 weeks. Both groups were subjected to a resistance training twice a week in which they performed three sets of 12 repetitions at 60% of one-repetition maximum on the following exercises: leg press, leg extension, leg curl, chest press and pull down. Body composition was assessed by dual-energy X-ray absorptiometry at baseline and 12wk after the training period. Resting plasma GH concentration was assessed at baseline, 4, 8 and 12wk.

**RESULTS:** In WP+G group, plasma GH level in resting state was elevated significantly at 4 and 8wk compared with week 0 (689 ± 203, 661 ± 199 vs. 264 ± 93 pg/mL,  $p < 0.05$  respectively). On the other hand, plasma GH level in WP group was elevated significantly only at 8wk as compared with baseline (589 ± 179 vs. 237 ± 86 pg/mL,  $p < 0.05$ ). After 12 wk, change in whole body lean mass was significantly higher in WP+G group compared to that in WP group (1340 ± 465 vs. 146 ± 218 g,  $p < 0.05$ ).

**CONCLUSIONS:** Combined ingestion of GABA with whey protein increased lean mass more effectively than ingestion of whey protein alone in resistance-trained men. Therefore, dairy supplementation with GABA may be a useful addition to whey protein for augmenting exercise-induced muscle hypertrophy.

242 Board #79 June 1, 9:30 AM - 11:00 AM

### Effects of Multiple Carbohydrates and Protein on Time Trial Performance in Trained Cyclists

Anthony Wolfe<sup>1</sup>, Sallee Brandt<sup>1</sup>, Josh Aponte<sup>2</sup>, Isaac Krause<sup>1</sup>, Rachel Mavison<sup>2</sup>, Lisa Ferguson-Stegall<sup>1</sup>. <sup>1</sup>Hamline University, St. Paul, MN. <sup>2</sup>North Hennepin Community College, Brooklyn Park, MN. (Sponsor: John L. Ivy, FACSM)  
(No relationships reported)

Ingestion of multiple carbohydrate (CHO) types (e.g., dextrose+fructose) during exercise can increase CHO oxidation rates compared to ingesting a single CHO (e.g., dextrose), and may improve endurance performance. It has been reported that adding protein to a multiple-CHO beverage increased cycling time to exhaustion compared to a single CHO beverage alone. However, it is unclear whether the improved performance was due to the multiple CHOs or the addition of protein. **PURPOSE:** This study aimed to determine whether the addition of 1.2% protein to a 3% multiple-CHO beverage improved performance and muscle strength recovery in 2 same-day time trials compared to an isocaloric multiple CHO-only beverage. **METHODS:** 11 cyclists

(39.9±11.8 y; VO<sub>2</sub>max 53.7±6.9 ml/kg/min) performed 3 trials, a familiarization trial and 2 randomly ordered, double-blinded experimental trials. Each trial consisted of a pre-trial leg strength measurement, 40km time trial (TT), 30 min recovery, 10km TT, and post-trial leg strength testing. Subjects ingested 275 mL of a multiple-CHO (MCO) or multiple-CHO+protein (MCP) beverage at 7 time points during the protocol. Blood glucose, lactate, heart rate (HR) and rating of perceived exertion (RPE) were measured. Leg strength was assessed using a custom Isometric Leg Strength System. Continuous variables were analyzed with paired t-tests. Repeated measures were analyzed with repeated measures ANOVA. **RESULTS:** No significant differences were found between MCO and MCP in 40km TT time (82.3±2.6 vs 82.8±2.8 min, respectively,  $p=0.32$ ) and power output (233.3±16.0 vs 231.6±16.7 W,  $p=0.55$ ) nor in 10km time (24.4±0.9 vs 24.5±1.1 min,  $p=0.61$ ) or power output (238.2±16.7 vs 237.3±17.7 W,  $p=.83$ ). No differences were found in leg strength recovery (pre-post trial) as well ( $p=0.22$ ). Blood glucose, lactate, HR, and RPE were also not different between treatments. **CONCLUSION:** While addition of protein to CHO has been shown to improve TTE, it may not be beneficial in shorter race events. We speculate that in this study, exercise time and intensity were not great enough to deplete glycogen stores or cause muscle damage. Differences in experimental design likely explain the conflicting findings among studies.

243 Board #80 June 1, 9:30 AM - 11:00 AM

### Null Effect Of Dhea On Muscle Strength And Serving Performance In Young Women

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**PURPOSE:** To determine whether oral DHEA supplementation can increase muscle strength and motor performance.

**METHODS:** A randomized placebo-controlled crossover study was conducted among 10 young women (aged 20.2) with a washout period of one month. DHEA (25 mg per day) or Placebo was orally provided one day before assessments.

**RESULTS:** DHEA supplementation significantly increased plasma DHEA-S level from 0.9 to 1.5 microgram/mL. However, no significant change in average hip isokinetic strength, tennis serving accuracy, and ball serving speed. DHEA supplementation did not affect total mood disturbance and blood pressure among participants. Interestingly, monthly variations in hip muscle strength and ball serving speed decreased during DHEA trial.

**CONCLUSIONS:** Despite an existing relationship between plasma DHEA-S and motor performance, we fail to find significant changes in motor performance and mood state with DHEA supplementation.

244 Board #81 June 1, 9:30 AM - 11:00 AM

### Effect Of 24 Weeks β-alanine Supplementation On High-intensity Cycling

Bryan Saunders<sup>1</sup>, Vitor de Salles Painelli<sup>1</sup>, Vinicius Eira Silva<sup>1</sup>, Luana Farias de Oliveira<sup>1</sup>, Rafael Pires da Silva<sup>1</sup>, Craig Sale<sup>2</sup>, Roger Charles Harris<sup>3</sup>, Hamilton Roschel<sup>1</sup>, Guilherme Giannini Artioli<sup>1</sup>, Bruno Gualano<sup>1</sup>. <sup>1</sup>University of Sao Paulo, Sao Paulo, Brazil. <sup>2</sup>Nottingham Trent University, Nottingham, United Kingdom. <sup>3</sup>Junipa Ltd, Newmarket, United Kingdom.  
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(No relationships reported)

β-alanine supplementation over 4-10 weeks has consistently been shown to improve high-intensity cycling capacity (CCT110%) by 12-16% (Hill et al., 2007; Sale et al., 2011; Danaher et al., 2014). However, there is no evidence as to whether further improvements occur when supplementation is prolonged. **PURPOSE:** To determine the effects of 24 weeks of β-alanine supplementation on high-intensity cycling capacity.

**METHODS:** Twenty-five recreationally active males (age 27 ± 4 y, height 1.74 ± 0.08 m, body mass 78.8 ± 11.5 kg) were supplemented with 6.4 g·day<sup>-1</sup> of sustained release β-alanine (N=16; CarnoSyn™, NAI, USA) or placebo (N=9; maltodextrin, NAI, USA) over a 24-week period. Every 4 weeks (Week 0, 4, 8, 12, 16, 20 and 24) participants performed the CCT110%, with time-to-exhaustion (TTE) recorded as the outcome measure. Data were analysed using mixed model ANOVA, magnitude based inferences (MBI) and effect sizes (ES).

**RESULTS:** There was a main-effect of supplement on TTE ( $P=0.048$ ), although there was no interaction effect ( $P=0.07$ ). TTE was improved with β-alanine at all time points (Week 4: +5.0%; Week 8: +2.2%; Week 12: +4.4%; Week 16: +8.1%; Week 20: +11.1%; Week 24: +9.0%) while changes in placebo were minimal (Week 4: +1.8%; Week 8: +1.2%; Week 12: -1.3%; Week 16: +0.1%; Week 20: -7.1%; Week

24: +0.3%). MBIs showed possible to very likely improvements across all weeks with  $\beta$ -alanine compared to Week 0; similarly, ES were greater in the  $\beta$ -alanine supplemented group when compared with placebo at all time points (Table 1). **CONCLUSIONS:** Twenty-four weeks of  $\beta$ -alanine supplementation improved CCT110%, likely due to increases in muscle carnosine concentration and subsequent increases in muscle buffering capacity during exercise.

| Likelihood of a substantial improvement in TTE (%; qualitative) as determined by MBI and ES |                  |                  |                          |         |
|---|------------------|------------------|--------------------------|---------|
| (vs. Week 0)  | TTE              | TTE              | TTE                      | TTE     |
|   | $\beta$ -alanine | $\beta$ -alanine | Placebo                  | Placebo |
|   | MBI              | ES               | MBI                      | ES      |
| Week 4  | 71%; possible    | 0.52             | 31%; possible            | 0.08    |
| Week 8  | 28%; possible    | 0.22             | 21%; unlikely            | 0.009   |
| Week 12   | 57%; possible    | 0.28             | 15%; unlikely            | -0.21   |
| Week 16   | 91%; likely      | 0.70             | 19%; unlikely            | -0.09   |
| Week 20   | 99%; very likely | 1.04             | 1%; almost certainly not | -0.47   |
| Week 24   | 92%; likely      | 0.74             | 25%; unlikely            | -0.007  |

245 Board #82 June 1, 9:30 AM - 11:00 AM  
**Effect Of Branched-chain Amino Acid Supplementation On Creatine Kinase, Exercise Performance, And Perceived Muscle Soreness**

Kurt A. Escobar<sup>1</sup>, Trisha A. McLain<sup>1</sup>, James J. McCormick<sup>1</sup>, Chad M. Kerksick, FACSM<sup>2</sup>, Kelly E. Johnson<sup>1</sup>, Marvin R. Endito<sup>1</sup>, Christine M. Mermier<sup>1</sup>. <sup>1</sup>University of New Mexico, Albuquerque, NM. <sup>2</sup>Lindenwood University, St. Charles, MO. (Sponsor: Chad M. Kerksick, FACSM)  
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 (No relationships reported)

**PURPOSE:**The purpose of this study was to examine the effect of branched-chain amino acid (BCAA) supplementation on markers of recovery from intense eccentric resistance exercise.

**METHODS:**Ten resistance-trained males (age 21±2 yr, height 175.3±4.5 cm, and body mass 84.8±8.3 kg) were randomly assigned to a supplement (n=5) or placebo (PLA) (n=5) group. Subjects consumed either a BCAA supplement (1 g/lb body weight) or PLA for eight days total, with a four day loading period prior to a muscle damaging exercise bout. During the eight day protocol subjects adhered to a diet consisting of 1.2 g/kg protein as administered by a registered dietician. On day five, the damaging exercise protocol was performed which consisted of ten sets of eight repetitions of four-second eccentric squats at 70% one repetition maximum (1RM). Immediately following squat performance, subjects completed 5 sets of 20 split squat jumps (10 each leg). Plasma creatine kinase (CK), vertical jump (VJ), maximal voluntary contraction (MVC), jump squat (40% 1RM), and perceived muscle soreness (0-10 scale; DOMS) were measured as indirect markers of muscle damage. All variables were measured immediately before the exercise protocol, as well as immediately post, and 1, 2, 4, 24, 48, and 72 hours (hrs) post-exercise.

**RESULTS:**Plasma CK concentrations were significantly elevated above baseline (p<0.05) in both BCAA and PLA groups at 24, 48, and 72 hrs post-exercise. Plasma CK values were significantly lower (p<0.05) in the BCAA group compared to PLA group at 48 (BCAA: 1,245 ±202 IU/L; PLA: 2,198±148 IU/L) and 72 hrs (BCAA: 576± 123 IU/L; PLA: 1,376±246 IU/L). Muscle soreness increased from baseline (p<0.05) in both groups at 4, 24, 48, and 72 hrs, however the BCAA group yielded significantly lower values (p<0.05) at 24 (BCAA: 8.06±0.92; PLA: 9.44±0.56), 48 (BCAA: 6.44±2.00; PLA: 9.54 ±0.74), and 72 hrs post-exercise (BCAA: 3.20±1.19; PLA: 5.86±1.24). VJ, MVC, and jump squat decreased significantly (p<0.05) immediately post-exercise, as well as at 1, 2, 4, 24, 48 and 72 hours post, with no differences between groups.

**CONCLUSIONS:**BCAA supplementation may decrease plasma CK concentrations and muscle soreness in response to damaging exercise, but may not impact restoration of muscle function in the acute recovery period.

246 Board #83 June 1, 9:30 AM - 11:00 AM

**Antioxidants and Recovery from Exercise Induced Muscle Damage**

Kara A. Stone<sup>1</sup>, Jennifer Case<sup>2</sup>, Stephen Burns<sup>2</sup>, Michael Godard<sup>2</sup>. <sup>1</sup>North Dakota State University, Fargo, ND. <sup>2</sup>University of Central Missouri, Warrensburg, MO.  
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 (No relationships reported)

**PURPOSE:**To examine the effect of short term (12 days) antioxidant supplementation on performance and metabolic related symptoms of exercise induced muscle damage (EIMD) in female participants.

**METHODS:**Ten non-resistance trained females underwent 12 days of supplementation (one capsule, two times per day) with antioxidants and 1" flour-filled placebo capsules in a randomized, cross-over design, including a two-week wash-out. To induce muscle damage, subjects performed an eccentric leg press protocol (130% of predicted one repetition maximum (RM), 4 sets, 12 repetitions). Assessment variables included: range of motion (ROM), resting blood lactate, leg press 5-RM, Wingate (power output, fatigue index, anaerobic capacity), and perceived muscle soreness (MS). Assessments occurred prior to supplementation, immediately after exercise protocol, 48 and 96 hours post-exercise.

**RESULTS:**An increase in perceived MS (5.0 ± 1.49 vs. 3.3 ± 1.64 arbitrary units, p = 0.038) and a decrease in anaerobic capacity (4.76 ± 1.05 vs 4.05 ± 1.08 W/kg, p=0.017) were observed immediately after and 48 hours post-eccentric exercise compared to baseline, respectively. Resting blood lactate was also significantly higher during antioxidant supplementation at 48 hours post-exercise (2.0 ± 0.7 vs. 1.6 ± 0.4 mmol/L, p=0.015). However, there were no significant changes (p>0.05) in ROM, muscular strength, power output, or MS between trials over the 96 hours following the eccentric protocol.

**CONCLUSIONS:**Though an increase in MS and a decrease in anaerobic power indicate the presence of EIMD, short term antioxidant supplementation had no effect on performance related symptoms of EIMD in untrained females. However, an increase in resting blood lactate indicated an influence of antioxidants on resting energy metabolism.

247 Board #84 June 1, 9:30 AM - 11:00 AM

**Effects Of A Pre-exercise Supplement On Anaerobic Power And Blood Lactate In Males And Females**

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 (No relationships reported)

Pre-workout supplements claim to enhance athletic performance, but these claims have not been evaluated in the context of repeated anaerobic power tests in males and females. Supplements often contain numerous ingredients proposed to work synergistically to enhance performance. **PURPOSE:** We compared the effects of a supplement containing only creatine (CRE) with a supplement containing creatine, beta-alanine, amino acids, caffeine, and B-vitamins (MULT) on maximal anaerobic power, fatigue, and blood lactate accumulation in males and females. It was hypothesized that MULT would be associated with greater anaerobic power, reduced fatigability, and reduced blood lactate levels compared to CRE, with both supplements greater than placebo (PL). **METHODS:** Male and female subjects (n=20) performed two 30 second Wingate anaerobic tests separated by a 5 minute rest period, 20 minutes after consuming PL, CRE, or MULT in a repeated measures, blinded design. Fatigue index was quantified as relative power drop over the duration of the test. Blood lactate levels were measured before test 1 and after tests 1 and 2. **RESULTS:** Peak anaerobic power was not different among all conditions for test 1 or 2 (average for all conditions were 11.5±0.5 and 11.3±0.5 W/kg for males, 9.0±1.1 and 8.8±1.2 W/kg for females). Fatigue index was similar for test 1 and 2 and was not different among conditions or genders. Respective test 1 fatigue index values for males and females were 40.5±2.7% and 37.75±2% for MULT, 43±1.7% and 41±3.4% for CRE, and 43.8±2.8% and 40.8±2.6% for PL. In both genders, increases in lactate from post-test 1 to post-test 2 were not different among conditions. Increases in lactate from pre-test 1 to post test 2 were also not different among conditions or genders with changes in MULT (8.6±0.8 and 8.4±1.2 mmol/L), CR (10.9±1.0 and 7.7±1.0 mmol/L) and PL (10.8±1.3 and 7.2±1.1 mmol/L) for males and females, respectively. **CONCLUSION:** Results suggest that MULT or CRE do not significantly increase peak anaerobic power, reduce fatigability or buffer increases in lactate with repeated anaerobic power tests compared to PL.

WEDNESDAY, JUNE 1, 2016

248 Board #85 June 1, 9:30 AM - 11:00 AM  
**Exercise Performance and Physiological Responses: The Potential Role of Redox Balance**  
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 (No relationships reported)

**PURPOSE:** Increases in oxidative stress or decreases in antioxidant capacity, or disruption to the oxidant-antioxidant (redox) balance, are known to alter physiological function and has been suggested to influence performance. To date, no study has sought to manipulate this balance in the same participants and observe the impact on physiological function and performance.

**METHODS:** Using a single blind, placebo-controlled, and counterbalanced design, this study examined the effects of increasing free radicals, via breathing 100% oxygen, and/or increasing antioxidant capacity, through consuming an antioxidant cocktail (AOC; vitamin C, vitamin E, and  $\alpha$ -lipoic acid), on 5-kilometer (km) time-trial performance, and the physiological and fatigue responses in healthy college-aged males.

**RESULTS:** The AOC significantly reduced power output (PL 222±11 vs. AOC 214±12 watts), increased 5km time (PL 0:08:36±0:00:17 min vs. AOC 0:08:52±0:00:18 min), suppressed ventilatory responses (VE; PL 116±5 vs. AOC 109±13 L/min), despite similar VO<sub>2</sub> (PL 43.1±0.8 vs. AOC 44.9±0.2 ml/kg/min), and increased perception of fatigue (RPE; PL 7.39±0.36 vs. AOC 7.60±0.34) as compared to the placebo during the 5km time-trial. Breathing 100% oxygen prior to the 5km time-trial had no effect on performance or the physiological responses in the placebo or AOC trials.

**CONCLUSIONS:** Our data demonstrated that prior to exercise, ingesting an AOC, but not breathing 100% oxygen, in a young healthy population, likely disrupts the delicate balance between pro- and antioxidant forces, which appears to negatively impact ventilation, ventilatory efficiency (VE/VO<sub>2</sub>), economy (VO<sub>2</sub>/watt), performance (5km time) and fatigue. Thus, caution is warranted in young athletes taking exogenous antioxidants.

249 Board #86 June 1, 9:30 AM - 11:00 AM  
**The Effects of N-Acetylcysteine on Repeated Sprint Performance in College-Aged Recreationally Active Men and Women**  
 Emily J. Sauers, Elizabeth F. Klinger, Chad A. Witmer, Matthew R. Miltenberger, Shala E. Davis, FACSM. *East Stroudsburg University, East Stroudsburg, PA.* (Sponsor: Shala Davis, FACSM)  
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#### The Effects of N-Acetylcysteine on Repeated Sprint Performance in College-Aged Recreationally Active Men and Women

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 Frequent high-intensity exercise increases the production of free radicals in the body, leading to cellular damage that causes inflammation and interferes with muscle contraction. While free radicals eventually cause adaptations, consumption of antioxidants can help to improve exercise performance in the short term. **PURPOSE:** To determine the effect of n-acetylcysteine (NAC) on repeated sprint performance. **METHODS:** 600 mg of NAC were administered in a lemon-flavored beverage twice daily for seven days in recreationally active subjects (n=9, age: 20.3±1.12 yr; height: 1.66±0.109m; weight: 74.8±24.5 kg; body fat: 22.4±9.5%; body mass index: 26.8±6.40) using a single-blind randomized placebo controlled design. On the day of the sprint trials, subjects consumed one final 600 mg dose of NAC 1.5 hours prior to sprinting. The subjects performed 12, 30-meter maximal effort sprints with 35 seconds of rest in between. After a 7-day washout period, treatments were switched. Heart rate (HR) and rating of perceived exertion (RPE) were assessed after each sprint. Cumulative sprint time, average sprint time, and fatigue decrement were calculated. Two sample independent t-tests were used to analyze heart rate, RPE, sprint times and fatigue decrement. A multivariate ANOVA was used to determine the differences between individual sprint times. **RESULTS:** No differences in cumulative sprint time (8;=0.05, t=-0.153, p=0.882), average sprint time (8;=0.05, t=-0.765, p=0.466), individual sprint times (df=12, F=0.806, p=0.650) and fatigue decrement (8;=0.05, t=-1.828, p=0.105) were found between treatments. There were no differences in HR (8;=0.05, t=-0.536, p=0.606) and RPE (8;=0.05, t=-1.413, p=0.195). **CONCLUSION:** NAC supplementation of a relatively low dose for 7 days does not improve repeated sprint performance in recreationally active individuals.

250 Board #87 June 1, 9:30 AM - 11:00 AM  
**The Anti-fatigue Effect of Glutathione (GSH) Intercalation into Layered Double Hydroxide Nanoparticles for Sports Nutrition Supplements**  
 Qin Lili, Hui Juan. *Tongji University, Shanghai, China.*  
 Email: qinlili@tongji.edu.cn  
 (No relationships reported)

The accumulation of reactive free radicals will lead to oxidative stress which can cause oxidative damage to biomolecules such as protein, lipid, and DNA. It also can induce injury to tissues or organs and is one of the reasons for fatigue. Therefore, supplementing with antioxidants has been considered to have an important role in reducing the degree of fatigue caused by free radical and oxidative stress.

**PURPOSE:** Glutathione (GSH) possesses a significant antioxidant effect and reduces oxidative stress. However, GSH like other natural anti-oxidants is limited by poor stability, short half-life in vivo, low bioavailability, and is easily degraded by proteolytic or gastrointestinal enzymes. Therefore, using nanomaterials as an efficient delivery system for antioxidants can solve these problems and improve clinical therapy. **METHODS:** Glutathione (GSH) antioxidants were successfully intercalated into layered double hydroxides (LDH) nanoparticles and characterized by X-ray powder diffraction and transmission electron microscopy. The in vitro cytotoxicity assays was studied by MTT test. The in vivo anti-fatigue effect was examined by animal assay. Sixty mice were randomly divided into six groups with ten mice each: two control groups, two GSH treatment groups and two GSH-LDH treatment groups. The forced swimming test was conducted on the last day and corresponding biochemical parameters were measured. **RESULTS:** The in vitro cytotoxicity assays indicated that GSH-LDH antioxidant system had no significant cytotoxic effect or obvious toxicity to normal cells. It also prolonged the forced swimming time of the mice by 25% and 41% compared to GSH and control groups, respectively. It had an obvious effect on decreasing the blood urea nitrogen and blood lactic acid, while increasing muscle and hepatic glycogen levels. **CONCLUSION:** GSH-LDH might be used as a novel antioxidant and anti-fatigue sports nutritional supplement. Future work will focus on the study of antioxidant and anti-fatigue mechanisms at the molecular level.

This work was financially supported by the National Natural Science Foundation of China (Grant No 31100855, 31401019)

251 Board #88 June 1, 9:30 AM - 11:00 AM  
**The Effects of Guanidinoacetic Acid Supplementation on Muscle Creatine Content: A Pilot Study**  
 Sergej M. Ostojic<sup>1</sup>, Patrik Drid<sup>1</sup>, Jelena Ostojic<sup>2</sup>, Jay R. Hoffman, FACSM<sup>3</sup>. <sup>1</sup>University of Novi Sad, Novi Sad, Serbia. <sup>2</sup>Clinical Center Vojvodina, Novi Sad, Serbia. <sup>3</sup>University of Central Florida, Orlando, FL. (Sponsor: Jay R. Hoffman, FACSM)  
 (No relationships reported)

Guanidinoacetic acid (GAA) is a natural precursor of creatine, and an experimental dietary additive. Recent studies have shown that dietary GAA enhances serum levels of GAA and creatine in humans. However, the effects of supplemental GAA on creatine utilization in tissues with high energy requirements (such as muscle and brain) are poorly described. **PURPOSE:** To examine the effects of four-week oral GAA administration on creatine levels in human skeletal muscle. **METHODS:** Four healthy men (age 24.8 ± 3.9 years, weight 73.5 ± 9.5 kg, height 173.5 ± 5.3 cm) participated in this open-label, repeated-measure pilot case study. The participants were assigned to receive 3.0 grams per day of oral GAA for 4 weeks, and were evaluated at baseline, and following 4-weeks of ingestion. The primary endpoint of GAA efficacy was the change in total creatine levels in the right vastus medialis muscle as determined by magnetic resonance spectroscopy (1.5 T) assessed at baseline and at 4 weeks. **RESULTS:** Supplementation with GAA yielded a statistically significant increase (11.8% corresponding to 3.2 mM, p < 0.05) of the mean concentration of total creatine. Differences were also found for muscle choline and myocellular triglyceride stores after the intervention, with GAA supplementation resulting in improvement of both variables as compared to the baseline values (p < 0.05). **CONCLUSION:** Results indicate that GAA can be used as an experimental dietary supplement to positively affect creatine availability in the skeletal muscle of healthy men.

This project was supported by the Serbian Ministry of Education, Science and Technological Development (Grant No. 175037), and the Faculty of Sport and Physical Education, University of Novi Sad (2015 Annual Award).

252 Board #89 June 1, 9:30 AM - 11:00 AM

**Interactive Effect of Beta-Alanine and Resistance Training on Muscular Endurance in Older Adults**

Christopher H. Bailey, Joseph F. Signorile, Amanda M. Luiso, Caitlin A. Lowe. *University of Miami, Coral Gables, FL.*  
(Sponsor: Dr. Arlette Perry, FACSM)  
(No relationships reported)

Muscular endurance is now considered a major neuromuscular factor associated with independence and fall reduction. **PURPOSE:** To determine the effects of sustained-release beta-alanine supplementation alone or in combination with a resistance training program on muscular endurance and activities of daily living (ADL) in older adults. **METHODS:** Subjects were randomly assigned to one of four groups for a 12-week intervention: 3.2g/day of maltodextrin placebo with no resistance training, 3.2g/day beta-alanine with no resistance training, 3.2g/day maltodextrin placebo with resistance training, or 3.2g/day beta-alanine with resistance training. Before and after the 12-week intervention, subjects' anthropometric measures were taken; and they were tested using the Physical Functional Performance 10 (PFP-10) battery, the Senior Fitness Test (SFT) and upper and lower body strength and endurance. Upper and lower body strength and endurance tests included one-repetition maximum (1RM) and 20 repetitions as fast as possible at 50% 1RM, respectively, using pneumatic resistance equipment. **RESULTS:** 36 subjects completed baseline testing and 27 subjects completed post-testing. Beta-alanine was well tolerated with only 1 subject reporting side effects consisting of muscular aches in the non-resistance training group. Multiple 4 (group) x 2 (time) mixed design ANOVA's indicated no significant group x time interactions ( $p > .05$ ) for any anthropometric and performance measures except 1RM leg press ( $F_{(3,23)} = 4.803, p = .010, \eta^2_p = .385$ ). A *post-hoc* analysis revealed significant improvements in 1RM leg press for both the resistance training group taking beta-alanine (mean difference = 103.125, 95%CI = 58.344 to 147.906,  $p < .001$ ) and the resistance training group taking the placebo (mean difference = 130.625, 95%CI = 85.844 to 175.406,  $p < .001$ ); while no significant between group difference was detected ( $t(14) = -.826, p = .423$ ). **CONCLUSION:** Although beta-alanine was not found to improve body composition, ADL, or performance measures with or without training, future research confirming these results should incorporate a longer intervention period with dietary monitoring and control and perhaps, greater training frequency and intensity.

253 Board #90 June 1, 9:30 AM - 11:00 AM

**Dose Dependent Safety Study Of A Pre-workout Dietary Supplement In Resistance Training Participants**

Majid S. Koozehchian, P Blaise Collins, Abigail O'Connor, Song Yi Shin, Ryan Dalton, Tylor Grubic, Ryan Sowinski, Y Peter Jung, Brittany K. Sanchez, Adriana Coletta, Minye Cho, Aimee Reyes, Chris Rasmussen, Conrad P. Ernest, FACSM, Peter S. Murano, Mike Greenwood, FACSM, Richard B. Kreider, FACSM. *Texas A&M University, College Station, TX.*  
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(No relationships reported)

**PURPOSE:** To examine the short-term safety effects (7-d) of ingesting a pre-workout supplement (PWS), blood lipids and hepatorenal and muscle enzyme function before and 30-minutes following supplement ingestion.

**METHODS:** We recruited 19 apparently healthy and recreationally active men and women (21.84±2.11 yr, 21.61±8.68 %fat, 26.94±3.84 kg/m<sup>2</sup>) with at least 6-months of resistance training, to participate in a double-blind, crossover, randomized and placebo-controlled manner. We instructed subjects to maintain their current diet and training regimens throughout the study. Supplements were (1) a dextrose placebo (PLA, 12 g/d); (2) a PWS supplement containing 5mg tetramethyluric acid, 4.7g B-alanine, 1.6g creatine nitrate, 1.0g arginine AKG, 250mg ascorbic acid, 150mg N-acetyl tyrosine, 150mg caffeine; or (3) PWS at ~150% dosage (PWS150) of the base formula for seven days, interspersed with 7-d of washout. On Day 1 (acute) and Day 7 (chronic), subjects were measured fasted (12 h), before ingesting their respective supplements. Testing also included a series of bench press, (BP), leg press (LP), and Wingate tests initiated 30-min after supplement ingestion. Data were analyzed using a repeated measure MANOVA.

**RESULTS:** Overall, we observed no significant within or between group alterations for any biomarkers associated with glucose; blood lipids including total cholesterol, LDL, HDL, triglycerides; kidney enzymes including creatinine and blood urea nitrogen (BUN); muscle enzymes such as lactate dehydrogenase (LDH) and creatine kinase (CK); and liver enzymes such as alkaline phosphatase (ALP), alanine aminotransferase (ALT), and aspartate aminotransferase (AST) function throughout the study (all makers,  $p \geq 0.05$ ).

**CONCLUSION:** The ingestion of the supplement examined in this study showed no adverse effects on blood lipids or hepatorenal and muscle enzyme function, with

respective responses being similar to treatment with a PLA treatment condition. These findings are in agreement with other studies testing similar ingredients and longer studies appear to be safe to perform on performance related outcomes.

254 Board #91 June 1, 9:30 AM - 11:00 AM

**Effects of Mitochondria-Targeted Antioxidant Supplementation on Mitochondrial Adaptations to Endurance Training in Healthy Men**

William M. Southern, Daniel D. Shill, Kasey A. Lansford, Thomas B. Willingham, Kevin K. McCully, FACSM, Nathan T. Jenkins. *University of Georgia, Athens, GA.*  
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(No relationships reported)

The production of reactive oxygen species (ROS) during exercise is one signal for training-induced mitochondrial biogenesis. Previous studies have shown that antioxidant supplementation blunts mitochondrial adaptations to exercise training via suppression of ROS production. **PURPOSE:** To determine the effects of mitochondria-targeted antioxidant (mtAO) supplementation on mitochondrial adaptations to chronic exercise training.

**METHODS:** Young (22 ± 3 yr), healthy men (n = 19) were randomized to receive either mtAO (n = 9) or placebo (n = 10). Participants performed cycle training for 3-weeks at 50-70% of maximal oxygen uptake (VO<sub>2</sub>max). VO<sub>2</sub>max and an in vivo assessment of mitochondrial oxidative capacity were assessed before and after training. Mitochondrial oxidative capacity was assessed via post-exercise recovery kinetics of muscle oxygen consumption using near infrared spectroscopy (NIRS) in the vastus lateralis (VL) muscle.

**RESULTS:** Exercise training increased VO<sub>2</sub>max (baseline: 40.1 ± 4.8 ml/kg/min; after training: 42.8 ± 3.9 ml/kg/min, main effect:  $p < 0.001$ ), but no differences were detected between treatment groups (training × treatment:  $p = 0.29$ ). Similarly, exercise training increased mitochondrial oxidative capacity rate constants (baseline: 1.8 ± 0.3 min<sup>-1</sup>; after training: 2.2 ± 0.5 min<sup>-1</sup>, main effect:  $p < 0.002$ ), with no differences between treatment groups (training × treatment:  $p = 0.39$ ).

**CONCLUSIONS:** Mitochondria-targeted antioxidant supplementation does not alter mitochondrial adaptations to endurance exercise training. Further, our data indicate that three weeks of cycle training enhances mitochondrial oxidative capacity in the VL as measured by NIRS.

255 Board #92 June 1, 9:30 AM - 11:00 AM

**Astaxanthin, a Potential Preconditioned Neuroprotective Agent to Traumatic Brain Injury**

yuval heled, FACSM<sup>1</sup>, Chen Fleischmann<sup>1</sup>, Esther Shohami<sup>2</sup>, Vika Trembovler<sup>2</sup>, Alex Alexandrovich<sup>2</sup>, Michal Horowitz<sup>3</sup>.  
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(No relationships reported)

**BACKGROUND:** Traumatic brain injury (TBI) is a common injury in some populations such as athletes and soldiers. Prior consumption of an efficient, non-harmful, preconditioning agent, could potentially reduce the severity of the injury. Astaxanthin, a xanthophyll carotenoid supplement, was demonstrated as an effective preconditioning agent in several stress models including ischemia-reperfusion injuries (IRI's). **PURPOSE:** Astaxanthin's BBB permeability and its neuroprotective effects, led us to examine its preconditioned applicability in a mouse model of closed head injury (CHI). **METHODS:** After pretreatment with Astaxanthin (ATX), olive oil (OIL), or no treatment (NT) mice were exposed to CHI or sham treatment. Motor skills (NSS), short term spatial memory (ORT) and cortical HSP72 protein levels were measured during recovery. **RESULTS:** At day 3 post CHI, the extent of recovery, expressed as αNSS (the difference between NSS at any time post injury and at 1 hour) was 20% higher in ATX mice, compared to OIL ( $p < 0.003$ ). This was maintained up to day 30 post CHI. No ATX effect on ORT was observed. Following TBI, NT and OIL mice displayed a time-dependent (up to 8h) reduction in cortical HSP72 in the ipsilateral (injured) hemisphere, while ATX mice tended to recover HSP induction earlier. Contralateral (uninjured) hemisphere levels were only slightly reduced.

**CONCLUSIONS:** Astaxanthin preconditioning improved physical recovery from TBI with no effect on cognitive function (ORT) and was apparently linked to a faster cortical HSP72 recovery around the site of injury. These preliminary results imply a protective preconditioning effect of ATX in TBI and point to the possibility of an added line of defense in TBI in populations at risk.

- This work was supported by a grant from the Israeli MOD.

256 Board #93 June 1, 9:30 AM - 11:00 AM  
**Mitochondria-Targeted Antioxidant Supplementation Does Not Impact Training-induced Changes in Circulating Angiogenic Cells**  
 Daniel D. Shill, Kasey A. Lansford, William M. Southern, Thomas B. Willingham, Kevin K. McCully, FACSM, Nathan T. Jenkins. *University of Georgia, Athens, GA.*  
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 (No relationships reported)

Data from animal studies indicate that mitochondria-targeted antioxidant administration preserves age-related endothelial function by reducing oxidative stress. However, antioxidant administration during training attenuates some health benefits of endurance training (e.g., insulin sensitivity). It is not known whether antioxidant supplementation during exercise training impacts adaptations in human circulating vascular cells **PURPOSE:** To examine the effect of mitochondria-targeted antioxidant (mtAO) supplementation on endurance exercise training-induced adaptations in different circulating angiogenic cell (CAC) subpopulations. **METHODS:** Twenty men ( $22 \pm 3$ yr) performed three weeks of aerobic cycle training, 50-70% maximal oxygen uptake for 45-60 min, with and without mtAO supplementation ( $n = 10$ /group). A blood draw and measures of body composition were obtained before and after training. Blood samples were analyzed by flow cytometry for concentrations of endothelial progenitor cells (CD34+/VEGFR2+), angiogenic endothelial cells (CD62E+), angiogenic monocytes (CD14+/CD31+), T-cells (CD3+), and angiogenic T-cells (CD3+/CD31+). **RESULTS:** Placebo and mtAO groups did not differ in any study outcomes before or after training (all  $P > 0.05$ ). Thus, main effects of endurance training are reported. Percent body fat and fat mass decreased by 4% and 1%, respectively ( $P 0.05$ ). Training induced 88%, 69%, and 21% increases in CD34+/VEGFR2+, CD62E+, and CD14+/CD31+ cells, respectively (all  $P 0.05$ ). **CONCLUSIONS:** These findings indicate that mtAO supplementation does not affect training-induced adaptations of different CAC populations in young healthy men. Importantly, our data demonstrate for the first time that short-term cycle training enhances CD34+/VEGFR2+, CD62E+, and CD14+/CD31+ CACs.

#### A-40 Free Communication/Poster - Ergogenic Aids II

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
 Room: Exhibit Hall A/B

257 Board #94 June 1, 11:00 AM - 12:30 PM  
**Caffeine Supplementation and Muscle Endurance - a Balanced Placebo Design Study**  
 Edgard M. Soares, Guilherme E. Molina, Keila E. Fontana. *University of Brasilia, Brasilia, Brazil.*  
 Email: edgardsoares@gmail.com  
 (No relationships reported)

1,3,7-trimethylxanthine is one of the most consumed psychoactive substances in the world, found in a wide variety of foods and drinks. About 74% of athletes during international and national competitions use caffeine (CAFF) aiming to improve performance. Its effect on aerobic exercise is well known; however, on strength training, more information is needed to determine it. A key point that might help explain such controversies is the placebo effect and its interactions with CAFF use. **PURPOSE:** We aim to analyze the effect of acute caffeine supplementation on muscle endurance using a balanced placebo design to study the physiological effect of CAFF (5 mg/kg of body weight) and the placebo effect. **METHODS:** Five young men underwent six sessions, one for familiarization, one as control and four experimental ones. At the first session, they were submitted to anthropometric measurements, CAFF consumption questionnaire and one repetition maximum test (1RM) in the parallel squat (Smith's machine). At the second session they performed 3 sets to exhaustion with 3 minutes interval between sets using 60%1RM - it's the muscle endurance test (MENT). The last four sessions were randomly distributed using a balanced placebo design having four possibilities: 1 - Session C/C: Subject was informed of CAFF ingestion and was given CAFF. 2 - Session C/P: Subject informed of CAFF ingestion but given placebo (PLA) 3 - Session P/C: Subject informed of PLA ingestion but given CAFF. 4 - Session P/P: Subject informed of PLA ingestion and given PLA. Subjects received CAFF or PLA on arrival at the laboratory then waited about 1h20min to execute the MENT. **RESULTS:** No CAFF effects were observed on the maximal number of repetitions done ( $p > 0.05$ ) - 32.6, 35.0, 33.8 and 32.0, neither on the number of repetitions done at first set ( $p > 0.05$ ) - 16.2, 15.6, 15.8, 15.0 - or on the last set ( $p > 0.05$ ) - 7.4, 8.2, 8.0, 7.2 - during sessions C/C, C/P, P/C, P/P, respectively. Three of the five subjects appeared as CAFF responders (increased 2.2 repetitions average) and two exhibited a PLA effect (increased 3.0 reps average). **CONCLUSION:** CAFF

has no effect on the MENT. Some people may be responsive to CAFF while others may actually present a PLA effect. The use of balanced placebo design seems to be an important method for clarifying future studies results using CAFF supplementation.

258 Board #95 June 1, 11:00 AM - 12:30 PM  
**Effect Of Aerobic Pre-Exercise Carbohydrate Supplementation On Salivary Cortisol Concentration**  
 Matt Kleven, Ben Besch, Paul Mellick. *University of St. Thomas, St. Paul, MN.*  
 (No relationships reported)

#### Title: Effect of aerobic pre-exercise carbohydrate supplementation on salivary cortisol concentration

Authors: Matthew Kleven, Ben Besch, and Paul Mellick, Ph.D. University of St. Thomas, St. Paul, MN 55105  
 Cortisol works to preserve plasma glucose through four primary mechanisms. These mechanisms include the mobilization of amino acids, mobilization of free fatty acids, initiating gluconeogenesis, and blocking plasma glucose entry into cells. Sparing plasma glucose is absolutely essential, especially during exercise, for the functioning of our central nervous system because it is the primary fuel source for the brain. **PURPOSE:** This study aimed to discover whether increasing blood glucose through carbohydrate supplementation is an effective way to diminish cortisol secretions in response to long-duration high-intensity exercise. **METHODS:** For two sessions, 12 recreationally active collegiate females (age =  $20 \pm 1.35$  yrs; Ht =  $167.81 \pm 4.27$  cm; Wt =  $64.50 \pm 8.14$  kg; BF =  $25.79 \pm 5.13\%$ ) participated in this study. Day one subjects used Bod Pod to determine body composition, VO2 max was also assessed via cycle ergometer. With at least 48 hours of rest, day two subjects either ingested a carbohydrate supplement (1 g sugar/kg of body weight), or placebo drink containing no sugar. Thirty minutes after ingestion, subjects began exercising on stationary cycle maintaining 76% heart rate max ( $\pm 5$  BPM) for 60 minutes. Blood glucose and salivary cortisol measurements were taken immediately before beginning exercise (pre), immediately after exercise (post), 30 minutes post exercise (30P), and 60 minutes post exercise (60P). **RESULTS:** The results comparing placebo and treatment blood glucose levels showed significance at the pre time point ( $p = 0.002$ ). There was no significant difference in cortisol levels at any time point. However, the change in cortisol concentrations were statistically significant from post-exercise to pre-exercise ( $p = 0.027$ ) and 60 min post exercise to pre-exercise ( $p = 0.043$ ). **CONCLUSION:** Carbohydrate supplementation prior to high intensity exercise was able to significantly decrease cortisol levels compared to the placebo. Performing aerobic exercise can return elevated blood glucose levels back to normal immediately after ( $p = 0.378$ ) and will remain there 60 minutes post ( $p = 0.601$ ).

259 Board #96 June 1, 11:00 AM - 12:30 PM  
**Effect of 5-Hour Energy Shot on Motor Control Tasks in Sleep-Deprived College-Aged Individuals**  
 Brandon J. Schrom, Philip J. Buckenmeyer, Larissa J. True, Stephen P. Yang, Jeffrey A. Bauer, Nicole J. Lindel, Ayden J. Wilbur, Joseph W. O'Haire. *SUNY Cortland, Cortland, NY.*  
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 (No relationships reported)

Energy drinks are a common choice when seeking feelings of alertness or trying to improve performance. One popular energy drink is the 5-Hour Energy Shot®. The maker claims that one feels awake and alert for hours while also improving work and/or exercise performance. Published research supporting such claims is lacking, particularly with fine motor tasks. **PURPOSE:** To determine if ingesting one 5-Hour Energy Shot® compared to a placebo causes measurable improvement in an anticipation timing or pursuit rotor task in sleep-deprived subjects. **METHODS:** Nine (6 males, 3 females), college-aged ( $20.6 \pm 0.98$  yrs;  $1.7 \pm 0.08$  m in ht;  $74.0 \pm 10.18$  kg in wt), volunteers participated in a double-blind, cross-over, placebo-based study. The participants were tested in a pre-sleep deprived state and a sleep deprived condition while performing specific motor tasks. In the sleep deprived state, subjects ingested either a randomly assigned non-caffeinated placebo (PL) (59 ml; 5 kcal) or the 5-Hour Energy Shot® (5HES) (59 ml; 4 kcal). Subsequently, data were collected at 5 consecutive time intervals (30-min, 1.5hr, 2.5hr, 3.5hr, and 4.5hr) after ingesting the drink. A two-way repeated measures ANOVA was run to determine the effect of treatment (placebo vs 5-hr energy) and time on reaction/anticipation time, as measured by a Bassin anticipation timer. Anticipation time score was measured as absolute error. A two-way repeated measures ANOVA was also run to determine the effect of time and treatment (placebo vs 5-hr energy) on time-on-target (sec), as assessed by a rotary pursuit. Significance was established at  $p < 0.05$ . **RESULTS:** There was no statistically significant two-way interaction between treatment and time for the anticipation timer or pursuit rotor task. However, for the 5HES trials, absolute error decreased significantly by  $\pm 0.046$ -sec from the initial rested trial to the final, sleep-deprived trial, a difference that was statistically significant,  $F(5, 40) = 3.158, p = .017$ , partial  $\eta^2 = .283$ . **CONCLUSION:** When compared to a placebo, 5-Hour Energy Shot® did not

significantly improve performance in sleep-deprived college-aged participants for motor tasks involving anticipation timing or rotary pursuit. Yet, decreased absolute error over time while sleep deprived was seen in the SHES condition.

260 Board #97 June 1, 11:00 AM - 12:30 PM  
**Effects Of Energy Drinks On Cardiovascular And Performance Measures.**

Willard W. Peveler, Gabe Sanders. *Northern Kentucky University, Highland Heights, KY.*  
(No relationships reported)

The use of energy drinks among athletes has risen greatly. A recent survey found that 89% of varsity athletes and 82% of recreational athletes use energy drinks. The number of U.S. emergency department visits involving energy drinks doubled over the last 5 years. Underlying reasons for these visits have yet to be fully elucidated. However, reviews of patient health complications have highlighted adverse cardiovascular events after ingestion of energy drinks. Caffeine is known to moderately increase blood pressure and heart rate; however, the other ingredients in these beverages other than caffeine may also be contributing to adverse effects. **PURPOSE:** To determine the effect of three different energy drinks on cardiovascular and performance measures during economy trials. **METHODS:** Fifteen college adults completed five trials on five separate days with at least one day recovery between trials. The first trial consisted of a graded treadmill protocol to determine  $\dot{V}O_{2max}$ . The four remaining trials each subject was required to blindly ingest one of three energy drinks or a placebo drink one hour prior to their exercise. Next, each subject completed 15 minutes of treadmill exercise at a speed consistent with 70% of his or her  $\dot{V}O_{2max}$ . The trials were conducted in a counterbalanced order. HR, BP,  $\dot{V}O_2$ , and RPE were recorded during the treadmill exercise trials. Means for dependent measures were compared using repeated measures ANOVA at an alpha of 0.05. **RESULTS:** Fifteen minute systolic blood pressure readings were found to be significantly lower in the placebo trials ( $156.93 \pm 15.50$ ) in relation to the three energy drink trials ( $163.87 \pm 13.30$ ,  $166.47 \pm 13.71$  and  $165.00 \pm 15.23$ ). There were no significant differences in diastolic blood pressure and heart rate. There were also no significant differences in  $\dot{V}O_2$  or RPE measures between placebo and the three energy drinks. **CONCLUSION:** Ingestion of energy drinks prior to performance demonstrated no increase in performance measures ( $\dot{V}O_2$  or RPE) during 15 minutes of treadmill exercise trials. The findings show no performance benefits under the conditions of this study. However, there does appear to be a significant increase in systolic blood pressure. It is unknown if the small significant increase in systolic blood pressure (8.18 mmHg) impacts health. Study was funded by NIH KBRIN grant

261 Board #98 June 1, 11:00 AM - 12:30 PM  
**Effect Of 5-hour Energy Shot® On Simulated Car Racing Ability in Sleep-deprived College-aged Individuals**

Philip J. Buckenmeyer, Larissa True, Stephen P. Yang, Jeffrey A. Bauer, Nicole Lindel, Ayden Wilber, Joseph W. O'Haire, Brandon J. Schrom. *SUNY Cortland, Cortland, NY.*  
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(No relationships reported)

The use of energy drinks has become commonplace in everyday activities, including sports. One of the more popular energy drinks on the market is the 5-Hour Energy Shot®. Commercial advertising of this drink suggests that one feels more awake and alert for hours while improving work and/or exercise performance. Published research supporting such claims is lacking. **PURPOSE:** To determine if ingesting one 5-Hour Energy Shot® compared to a placebo causes measurable improvement in performance related variables during a simulated driving task (SDT) in sleep-deprived subjects. **METHODS:** Nine (6 males, 3 females), college-aged ( $20.6 \pm 0.98$  yrs;  $1.7 \pm 0.08$  m in ht;  $74.0 \pm 10.18$  kg in wt), volunteers participated in a double-blind, cross-over, placebo-based study. The participants were tested in a non-sleep-deprived state, and a sleep-deprived condition while driving a simulated race course. In the sleep-deprived state, subjects ingested either a randomly assigned non-caffeinated placebo (PL) (59 ml; 5 kcals) or the 5-Hour Energy Shot® (SHES) (59 ml; 4 kcals). Subsequently, data were collected at 5 consecutive time intervals (30-min, 1.5hr, 2.5hr, 3.5hr, and 4.5hr) after ingesting the drink. The SDT was a solo timed road race (Forza Horizon game) on an Xbox 360 gaming system. During each of the 6 data collection trials, heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), drive time (DT), and number of crashes (#C) were recorded. Subjects were also evaluated for drink effectiveness at each of same time points. A two-way repeated measures ANOVA was run to determine the effect of time and treatment (placebo vs 5-hr energy) on HR, SBP, DBP, DT, and #C. Significance was established at  $p < 0.05$ . **RESULTS:** There was no statistically significant two-way interaction between treatment and time for any of the variables (HR, SBP, DBP, DT, #C). However, for the 5-hr energy trials, post-drive HR decreased significantly by 11.714 bpm from the initial, non-sleep deprived trial to the final, sleep-deprived trial. **CONCLUSION:** When compared to a placebo, 5-Hour

Energy Shot® did not significantly alter post-driving HR or BP measures, nor improve performance (race time or #crashes) of a simulated driving task in sleep-deprived college-aged participants.

262 Board #99 June 1, 11:00 AM - 12:30 PM  
**Effects Of Carbohydrate Mouth Rinsing On Depleted-State Wrestlers Using A Yo-yo Ir Level 2 Intermittent Test**

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Recent literature has suggested that carbohydrate mouth rinsing may benefit endurance performances but produces less ergogenic effects in power sports such as hockey and sprinting. It has been suggested that the nutritional state and hydration status may affect the ergogenic ability of carbohydrate mouth rinsing on improving performance. A commonality among wrestlers in competition is reduced performance due to the glycogen and fluid depleted state resulting from the rigors of dietary restriction and dehydration required to make weight.

**PURPOSE:** The purpose of this study was to compare the effects of carbohydrate mouth rinsing in wrestlers in a depleted-state performing YO-YO IR testing compared to an indistinguishable placebo condition. **METHODS:** Twelve male wrestlers (age 18-22) volunteered for this study which took place over four weeks with each collection period approximately 1 week apart. Participants initially completed a familiarization trial of the YO-YO IR test and one week later completed a self-selected, repeated weight cut within 2 lbs. of their weight category and baseline YO-YO IR test. Participants then completed two trials of mouth rinse or placebo using a randomized, double-blinded, counterbalanced design. After weigh-in, wrestlers mouth rinsed with an artificially sweetened 6.4% maltodextrin carbohydrate solution or indistinguishable placebo for 10 seconds (expectorating solution). After a standardized warm up, another mouth rinse was provided and YO-YO IR testing commenced. Final distances were recorded once test subjects were no longer able to complete the pacer run in the given time.

**RESULTS:** There was no significant difference in distance covered between treatments (Placebo  $1261.8 \pm 424$  / CHO  $1221.8 \pm 285$  meters). There appears to be a learning/training effect as baseline distance ( $1127.3 \pm 370$ ) was significantly different from visit 4 ( $1276.4 \pm 326$ ) independent of treatment condition ( $p < 0.05$ ).

**CONCLUSIONS:** Carbohydrate mouth rinsing was not ergogenic compared to placebo in wrestlers making weight for a YOYO IR-2 test. However, there was a learning effect between baseline shuttle run versus last trial run. The YOYO IR in the depleted state might require more familiarization to see if distance covered balances out and has no effect.

263 Board #100 June 1, 11:00 AM - 12:30 PM  
**Caffeine Alters Core Temperature and RPE during Thermally Exhaustive Exercise**

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**Danna Juarez, Max Polin, Daryl Parker PhD, Roberto Quintana, PhD**  
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Caffeine has been shown to blunt ratings of perceived exertion (RPE), thirst, and alter thermal perception despite increases in core temperature. This indicates that consumption of caffeine could unknowingly place athletes at risk for heat illness. **PURPOSE:** To examine effects of caffeine consumption (5mg/kg) during continuous submaximal cycling exercise bouts in a thermal stressful environment on RPE, time to exhaustion, and thermal perception. **METHODS:** A total of 9 male cyclists ( $30.33 \pm 8.14$ yr,  $57.33 \pm 5.04$ VO<sub>2max</sub>) were required to complete a graded exercise test (GXT) and a submaximal detection test to determine exercise intensity at 5% below first ventilation threshold (V<sub>1</sub>). Each subject performed three experimental time to exhaustion trials (TTE) at V<sub>1</sub> under warm conditions, ~36 °C and ~35% relative humidity, in a double blind, randomized order. Heart rate (HR), water consumption (H<sub>2</sub>O), body weight change ( $\Delta$ BW), and internal core temperature (T<sub>c</sub>), Perceptual heat stress (PHS), RPE, and thirst score (TS) were collected pre, during and at the end of each trial. Statistical analysis was conducted between all three groups, caffeinated (C), placebo (P), and control (CON) group using a significance level of  $p < 0.05$ . A repeated measures ANOVA was used to determine mean differences between treatments and time with respect to T<sub>c</sub>, PHS, TS, H<sub>2</sub>O,  $\Delta$ BW, and RPE. **RESULTS:** There was no significant effect of C on TTE,  $p = 0.22$ . End trial T<sub>c</sub> for C was significantly higher than placebo (P),  $39.00 \pm 0.53$  vs  $38.54 \pm 0.57$ ,  $p = 0.009$ . End trial HR response for C trended higher,  $168.6 \pm 8.60$ ,  $167.2 \pm 11.6$ ,  $172.5 \pm 11.6$ , for control, PL, and C, respectively,  $p = 0.067$ . There was a trend for mean RPE to be 3.6% lower in C trial  $p = 0.085$ . No significant difference in TS and PHS were found between P and

C,  $p > 0.05$ . CONCLUSION: Ingestion of C was found to significantly elevate Tc and trended towards increased HR at end of TTE. Perceptually, C slightly depressed mean RPE but did not alter TS and PHS. C ingestion is related to higher Tc during TTE and this may be due to altered perceptual feedback at the central level.

264 Board #101 June 1, 11:00 AM - 12:30 PM

### Physical and Cognitive Performance Effects of Caffeine in Women and Men Exercising in the Heat

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(No relationships reported)

Acute caffeine ingestion is considered effective in improving endurance capacity. Caffeine may also improve cognitive functions and mood. However, current knowledge about the effects of caffeine is based on the findings of studies which mainly have been conducted in temperate environmental conditions and on male subjects, whereas some physiological and mood effects of caffeine have been shown to differ between sexes.

**PURPOSE:** The aim of this study was to compare physical and cognitive performance effects of caffeine in young women and men during constant-load treadmill walk to exhaustion in the heat.

**METHODS:** Thirteen male (age  $24.9 \pm 4.1$  yr, height  $1.83 \pm 0.06$  m, body mass  $78.8 \pm 7.9$  kg,  $VO_{2peak}$   $51.7 \pm 2.7$  ml·kg<sup>-1</sup>·min<sup>-1</sup>) and ten female (age  $22.5 \pm 2.0$  yr, height  $1.67 \pm 0.05$  m, body mass  $61.0 \pm 5.4$  kg,  $VO_{2peak}$   $45.6 \pm 4.0$  ml·kg<sup>-1</sup>·min<sup>-1</sup>) physically active students completed two constant-load walks (60%  $VO_{2peak}$ ) on a treadmill until volitional exhaustion in a climatic chamber (air temperature 42°C and relative humidity 20%) after caffeine (CAF) and placebo (wheat flour; PLC) ingestion in a double-blind, randomly assigned, crossover manner. Both CAF and PLC were administered in gelatine capsules in 2 doses: 60 min (4 mg/kg) and immediately (2 mg/kg) prior to exercise.

**RESULTS:** Walking time to exhaustion was  $82 \pm 15$  min and  $76 \pm 11$  min ( $p > 0.05$ ) in females and  $83 \pm 17$  min and  $82 \pm 14$  min ( $p > 0.05$ ) in males in PLC and CAF trial, respectively. CAF compared to PLC increased ( $p < 0.05$ ) heart rate and blood lactate concentration in both males and females, but had no impact ( $p > 0.05$ ) on changes in rectal and mean weighted skin temperature during walk to exhaustion. CAF had no impact ( $p > 0.05$ ) on changes in mood, short-term memory and working memory during exercise in either gender, however, CAF compared to PLC decreased ( $p < 0.05$ ) ratings of perceived exertion and fatigue in males, but not in females. In females, but not in males, stronger belief that they had administered CAF associated with shorter time to exhaustion.

**CONCLUSION:** In both males and females, caffeine has no impact on endurance capacity, cognitive performance or mood under hot environmental conditions. Supported by the Estonian Ministry of Education and Research, institutional research funding IUT 20-58.

265 Board #102 June 1, 11:00 AM - 12:30 PM

### Substrate Metabolism At Rest And During Steady-state Cycling Following Four Weeks Of N-3 Pufa Supplementation.

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(No relationships reported)

Omega-3 polyunsaturated fatty acids (n-3 PUFA) can mediate numerous biological processes, including changing skeletal muscle membrane composition. Given the metabolic role of skeletal muscle, n-3 PUFA supplementation may influence fuel metabolism at rest and/or during exercise. Purpose. This study aimed to investigate the effects of n-3 PUFA supplementation both at rest and during steady-state exercise in endurance-trained individuals. Methods. Twenty-one male cyclists and triathletes underwent two experimental trials separated by four weeks. During this period participants were supplemented twice daily with a juice based drink containing fish oil with 2 g EPA and 2 g DHA, or an isocaloric taste-matched drink containing no fish oil. During the experimental trials, expired gas was collected at rest and during 60 minutes of cycling at 85% of the individual lactate threshold. Results. When compared to the control, n-3 PUFA supplementation significantly increased RER ( $\Delta 0.04 \pm 0.03$  compared to  $\Delta 0.01 \pm 0.02$ ,  $p < 0.05$ ) and CHO oxidation ( $\Delta 0.41 \pm 0.32$  g·min<sup>-1</sup> compared to  $\Delta 0.05 \pm 0.30$  g·min<sup>-1</sup>  $p < 0.05$ ) during steady-state exercise. However no differences were observed at rest. There also was a tendency for reduced fat oxidation during exercise following n-3 PUFA supplementation ( $p = 0.07$ ). Conclusion. Our results indicate that n-3 PUFA supplementation may potentiate a shift in fuel utilization to carbohydrate oxidation during steady-state exercise in endurance-trained cyclists. Supported by Smartfish, Norway.

266 Board #103 June 1, 11:00 AM - 12:30 PM

### Long-term Effects Of Fish Oil Supplementation On Exercise Performance And Anti-fatigue In College Students

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(No relationships reported)

To improve exercise performance and attenuate exercise-induced fatigue, dietary supplementations have been shown to have beneficial effects. Fish oil rich in omega-3 fatty acids, specifically docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), which have been found to improve cardiac energy efficiency, fat metabolism and immunomodulatory response. **PURPOSE:** The study was to determine the long-term effects of supplemental fish oil on body composition, exercise performance and the markers of exercise-induced fatigue in college students. **METHODS:** Twenty healthy subjects (age  $22.1 \pm 2.07$  yrs) participated in a randomized crossover-design study. Each subject consumed both 3 capsules/d of fish oil (FO group), providing 1050 mg EPA + 750 mg DHA and their normal diet (Control group) for 3 weeks, in varied order. Before and after supplementation, all subjects performed a continuous run at a speed corresponding to 70% maximum heart rate (HR<sub>max</sub>) for 30 min, and then the running speed was increased by 1 km/hr every minute until exhausted. Blood samples were taken before, during, at exhaustion, 30 and 60 min after exercise. We evaluated two key parameters: 1) exercise performance: rated perceived exertion (RPE) score was recorded every 3 min during exercise and time to exhaustion; 2) biomarkers of exercise-induced fatigue: plasma free fatty acid, lactate, ammonia, and creatine phosphokinase (CPK) concentrations. **RESULTS:** Compared to the control group, fish oil consumption showed a significant decrease in body fat percentage ( $19.3 \pm 5.37\%$  vs.  $19.9 \pm 5.62\%$ ,  $p = 0.01$ ), RPE score and blood lactate concentration ( $4.34 \pm 1.83$  vs.  $5.73 \pm 2.83$  mmol/L,  $p = 0.03$ ) during exercise and increase in running time ( $37.2$  vs.  $34.4$  min,  $p < 0.05$ ). It also significantly attenuated the exercise-induced elevation of plasma ammonia (mean change in FO vs. control groups:  $+37.0 \pm 10.7$  vs.  $+48.0 \pm 15.1$  umol/L,  $p = 0.02$ ) and increased free fatty acid levels ( $+0.45 \pm 0.31$  vs.  $+0.27 \pm 0.20$  mmol/L,  $p = 0.01$ ). Decreased serum CPK was found by fish oil intake but the difference was not statistically significant. **CONCLUSION:** Consumption of Fish oil for 3 weeks could decrease body fat percentage and improve exercise performance and physiological recovery after exercise. Therefore, Fish oil may provide ergogenic effects and act as an anti-fatigue supplements.

267 Board #104 June 1, 11:00 AM - 12:30 PM

### Apple versus Caffeinated Beverages as Ergogenic Aids During Physical and Cognitive Performance: A Pilot Study

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(No relationships reported)

Athletes use a variety of common strategies to stimulate arousal, cognition, and performance before morning training, such as a coffee, energy drinks, or fruit. Each method contains stimulant compounds shown to antagonize central adenosine receptors, such as caffeine or quercetin, a phenolic flavonoid.

**PURPOSE:** The objective of this pilot study was to explore the performance outcomes of consuming a whole food containing quercetin versus caffeinated beverages before exercise and cognitive tasks.

**METHODS:** Six volunteers ( $n = 6$ , age =  $22 \pm 3$ ) were tested in a single-blind crossover study on 5 different days, separated by at least 48 hours. On their first visit, subjects performed a treadmill graded exercise test to exhaustion and a familiarization trial on a computerized Flanker Cognitive Test, which evaluated % accuracy and reaction time. Gas exchange values were recorded and the exercise levels were determined using the respiratory compensation point in which there was an a-linear increase in VEO<sub>2</sub>, and decrease in PetCO<sub>2</sub>. On the following 4 visits, subjects were randomly assigned to fasted (CON), a 12 oz caffeinated energy drink (CED), 0.114 oz/kg bw black coffee (COF) or an apple (APP). Thirty minutes after consumption, subjects performed a Flanker test, followed by a time to exhaustion test (TET) performed at the respiratory compensation point. Data were analyzed using a repeated measures ANOVA.

**RESULTS:** No significant differences existed between the two cognitive components of the Flanker test (Accuracy:  $p = .08$ , Reaction Time:  $p = .83$ ). The mean (SD) times to exhaustion were  $317.2$  (59.4) (CON),  $372.5$  (112.3) (APP),  $408.2$  (98.2) (CED), and  $364.0$  (95.3) (COF) min. No significant differences were found in TET ( $p = .09$ ,  $\eta^2 = .34$ ).

**CONCLUSIONS:** There were no differences among the common morning strategies to increase accuracy and reaction time, markers of cognition. Since no significant differences were found between the apple and caffeinated beverages, an apple may be just as beneficial as specifically formulated energy drinks. Future research should control for relative amounts of adenosine blockade, carbohydrate intake, and calories to determine whether foods containing quercetin, work as well as caffeinated beverages for cognition and exercise performance.

268 Board #105 June 1, 11:00 AM - 12:30 PM  
**Acute Effects of an American Ephedra (*Ephedra viridis*) Herbal Supplement Blend**

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**Reported Relationships:** S.M. Talbott: Salary; employee of *EQQIL Inc.*

**PURPOSE:** This study was conducted to determine the acute cardiovascular, metabolic, and psychological effects of a prototype herbal supplement blend containing American ephedra (*Ephedra viridis*), green tea, caffeine, New Zealand pine bark (*Pinus radiata*), trimethylglycine, quercetin, octopamine, yohimbine, and niacin in healthy active adults.

**METHODS:** Eight subjects (3 Male, 5 Female, age 45±9, BMI 22.8) participated in three 2-hour interventions (Control, Single-Serving, Double-Serving) separated by 3 days. Measures of systolic and diastolic blood pressure (SBP/DBP), heart rate (HR), resting metabolic rate (RMR), and both negative and positive mood state (NMS/PMS) were collected at baseline and every 15min for 2-hours.

**RESULTS:** Compared to Control (109±2 mmHg), average SBP was 10% (120±2 mmHg) and 11% (121±4 mmHg) higher after ingestion of a single-serving (SS) or double-serving (DS) of the herbal supplement ( $p<0.05$ ). Similarly, compared to Control (73±2 mmHg), average DBP was also elevated 11% (81±3 mmHg) and 14% (83±3 mmHg) after SS and DS, respectively. In contrast, average HR was 5% lower in both supplement interventions (64±5 bpm Control vs. 61±2 bpm in SS and DS). RMR was 3% (1502±30 kcal) and 5% (1527±123 kcal) higher in SS and DS, respectively compared to Control (1456±32 kcal). Compared to Control (44±9 VAS) negative mood state parameters were reduced by 41% (26±4 VAS) and 39% (27±5 VAS), while positive mood state (35±7 VAS) was improved by 100% (70±4 VAS) and 71% (60±9 VAS) in SS and DS, respectively ( $p<0.05$ ).

**CONCLUSION:** These findings indicate that, at two different intake levels, this American ephedra herbal supplement blend moderately increased average blood pressure and reduced heart rate within normal healthy ranges. Such changes in blood pressure are consistent in magnitude and time course with previous trials of coffee and caffeine consumption. RMR was slightly elevated 3-5% by the herbal blend, also consistent with previous research on the thermogenic effects of green tea consumption. A novel finding of this pilot study, is that psychological parameters were significantly influenced by the American ephedra herbal blend, with a dramatic fall in negative mood state and rise in positive mood state, indicating an overall improvement in subjective feelings of well-being.

269 Board #106 June 1, 11:00 AM - 12:30 PM  
**Effect of Caffeine on Recovery from an Endurance Cycling Event**

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(No relationships reported)

Muscle soreness is commonly experienced following prolonged endurance exercise. Caffeine can reduce muscle pain during exercise. However, the effects of caffeine on recovery from a demanding exercise bout have not been elucidated. **PURPOSE:** The purpose of this study was to investigate the effects of caffeine intake on ratings of perceived muscle soreness (RPMS) and perceived lower extremity functionality (LEF) following the completion of a 100-mile endurance cycling event.

**METHODS:** Males ( $n=26$ ; age 53±10 years) and females ( $n=6$ ; age 46±11 years) who participated in the Hotter'N Hell Hundred bicycle ride volunteered. Immediately following the ride 20 subjects, in a double-blinded randomized fashion, were provided 3 mg/kg body mass of caffeine (CAF) while 12 subjects ingested identical looking placebo (PLA) pills. Before cycling or pill ingestion, RPMS (1-to-6; 6=severe soreness) and LEF (0-to-80; 80=full functionality) was assessed via questionnaires. Participants repeated ingestion of their assigned pills and completed the questionnaires for the next 3 mornings and 4 afternoons. Only those with significant changes in RPMS or LEF immediately post-ride were included in the final analysis. Differences between treatment groups over time were assessed with a two-way repeated measures ANOVA.

**RESULTS:** Sixteen participants were included in the analysis of LEF (PLA=9, CAF=7) and RPMS (PLA=12, CAF=4). There were no effects of condition or time on LEF when measured in the morning ( $p>0.05$ ). However, changes over time in LEF in the afternoon were dependent on treatment group ( $p=0.02$ ) with the CAF group having significantly higher LEF at 1 day post ride [63.5±6.3 vs 72.3±6.7; arbitrary units (AU) for PLA and CAF, respectively;  $p=0.02$ ]. There was an overall trend for the CAF

group to have reduced RPMS in the morning compared to PLA (1.21±0.13 vs. 0.70±0.23;  $p=0.07$ ). RPMS in the afternoon was significantly lower in the CAF group (1.33±0.16 vs 0.52±0.29;  $p=0.03$ ). Specifically, on the afternoons of days 1 & 2 post race, RPMS was lower in the CAF vs. PLA ( $p<0.05$ ).

**CONCLUSIONS:** These data suggest that caffeine can reduce perceived leg soreness following an endurance cycling event. Therefore, there is potential for caffeine to aid in the recovery from an endurance cycling event.

270 Board #107 June 1, 11:00 AM - 12:30 PM  
**Solid, Gel, Liquid and Combined Carbohydrate Format Effects on Gut Comfort and Cycling Performance**

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(No relationships reported)

Carbohydrate ingested in the beverage format results in worthwhile improvements to endurance performance tasks compared with non-caloric placebos. However, it is unknown how carbohydrate ingested in other formats affects intense endurance performance, relative to the beverage format. **PURPOSE:** To establish the effect of carbohydrate format, via commonly available sources: drink, gel and bar, on performance and gastrointestinal comfort during intense endurance cycling, while controlling for carbohydrate energy, type, and total fluid ingestion. **METHODS:** In a treatment-apparent Latin-square randomised crossover design, 12 well-trained male cyclists completed 4 trials, each comprising a 140-min road cycling race simulation, followed by a performance-feedback concealed, double blind, slow-ramp test to exhaustion (0.333 W·s<sup>-1</sup>). Carbohydrate comprising 0.5:1.0 ratio of fructose:maltodextrin was ingested every 20 min via commercial beverage, gel, bar, or a mix of all 3, each providing 80 g·h<sup>-1</sup> carbohydrate. Fluid was ingested every 20 min to total 705 ml·h<sup>-1</sup>, with water taken with gel and bar, and a dilute carbohydrate beverage with mix. Perceived exertion, muscle fatigue, and gastrointestinal discomfort were recorded on 0-100 point Likert scales 10 min following each fed. Data interpretation was by magnitude-based inference; threshold important change to peak power was 2%. **RESULTS:** Performance peak power was 371, 375, 364 and 371 W (between-subject SD 11%) for carbohydrate drink, gels, bars, and mix respectively. The impairment (-4.2%; 99%CI -10.9, 2.9) following bar ingestion relative to gel was substantial (81.2% likely harmful; 0.8% very unlikely beneficial), but the other contrasts were not clearly different. Bars produced likely small standardized (sample SD) increases in nausea, stomach fullness, abdominal cramps, exercise exertion and tiredness, relative to gels and drink; mix also increased nausea and stomach fullness, relative to gels. **CONCLUSION:** Ingesting carbohydrates alone in the solid carbohydrate format of sports bars likely impairs peak power, relative to ingestion of carbohydrate in beverages, gels or in bar-gel-drink combination. The bar effects were associated with higher gut discomfort and perceived exertion. Supported by an internal project grant.

271 Board #108 June 1, 11:00 AM - 12:30 PM  
**Marine Lipid Fraction Pcs0-524™ (lyprinol®/omega-xl®) Of The New Zealand Green-lipped Mussel Does Not Improve Pulmonary And Respiratory Muscle Function In Non-asthmatic Elite Runners**

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(No relationships reported)

Habitual endurance training may be associated with mild airway inflammation and subsequent deterioration in lung function. It has been shown that PCSO-524™ (Lyprinol®/Omega-XL®), a supplement extracted from the New Zealand green-lipped mussel (*Perna canaliculus*) comprising of up to 90 essential fatty acids, can moderate airway inflammation in humans with asthma, and in a murine-model of allergic airway disease. **PURPOSE:** To determine whether supplementation with PCSO-524™ (Lyprinol®/Omega-XL®) can improve pulmonary and respiratory muscle function in non-asthmatic elite runners. **METHODS:** 16 male, non-asthmatic elite runners participated in the study. Participants completed baseline resting pulmonary and respiratory muscle function testing, then were randomly assigned to either a treatment (PCSO-524™; 1 capsule contains 50 mg n-3 polyunsaturated fatty acids and 100 mg olive oil,  $n=8$ ) or placebo (1 capsule contains 100 mg olive oil,  $n=8$ ) group. During the supplementation period, subjects ingested 8 capsules of either treatment or placebo per day for 12 weeks. Following baseline testing, pulmonary and respiratory muscle function was assessed every two weeks throughout the 12 week supplementation period. **RESULTS:** Significant between-subjects main effects were not observed in forced vital capacity (FVC), forced expiratory volume in 1-second (FEV<sub>1.0</sub>), forced expiratory flow from 25-75% of lung volume (FEF<sub>25-75%</sub>), peak expiratory flow (PEF), maximal voluntary ventilation (MVV), maximal inspiratory mouth pressure (PI<sub>max</sub>), maximal expiratory mouth pressure (PE<sub>max</sub>), lung diffusion capacity (D<sub>LCO</sub>), and closing

volume (CV) (all  $p > 0.05$ ). A significant within-subjects main effect was observed in  $PE_{max}$  ( $p = 0.0242$ ) and  $D_{LCO}$  ( $p < 0.0001$ ). No significant within-subject main effects were observed in FVC,  $FEV_{1.0}$ ,  $FEF_{25-75}$ , PEF, MVV,  $PI_{max}$ , and CV (all  $p > 0.05$ ). A significant treatment by time interaction was observed in  $FEF_{25-75}$  ( $p = 0.0264$ ) and  $D_{LCO}$  ( $p = 0.0247$ ), but no other significant interactions were observed (all  $p > 0.05$ ). **CONCLUSION:** Supplementation with PCSO-524™ (Lyprinol®/Omega-XL®) does not improve pulmonary or respiratory muscle function in non-asthmatic elite runners.

272 Board #109 June 1, 11:00 AM - 12:30 PM

### Carbohydrate Mouth Rinse following Fatiguing Resistance Exercise does not Improve Muscle Function

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**PURPOSE:** Carbohydrate mouth rinse has been shown to enhance the performance of endurance exercise. However, the effects of carbohydrate mouth rinse on other types of exercise, including strength and power exercises, have yet to be established. The primary purpose of this study was to assess the effect of carbohydrate mouth rinse on muscular performance after a fatiguing resistance exercise protocol. **METHODS:** Twenty-one, recreationally resistance trained participants (13 ♀, 8 ♂ Age:  $22 \pm 2$  yr) completed a fatiguing resistance exercise protocol consisting of 8 lower and upper body exercises at 70% of their 1 RM. Volunteers completed the resistance exercise protocol on three occasions, followed by muscle function tests. In a double-blind, randomized, and counterbalanced fashion, each subject was tested under a control (CON) (no rinse), carbohydrate rinse (CHO) (25 ml of 6.4% maltodextrin solution), or placebo rinse (PLC) (non-caloric artificial sweetener placebo solution) condition. During each vertical jump, each attempt at maximal strength (1-RM), and each set of the muscular endurance tests for both the back squat and bench press exercises, subjects rinsed with a CHO or PLC solution for 10 to 15 seconds. ANOVAs were conducted to locate differences between conditions. **RESULTS:** There were no significant differences in vertical jump (CON =  $46.8 \pm 9.7$ , CHO =  $48.7 \pm 9.7$ , PLC =  $48.0 \pm 9.7$  cm), maximal strength for back squat (CON =  $85.0 \pm 41.4$ , CHO =  $87.7 \pm 41.1$ , PLC =  $86.6 \pm 41.0$  kg), and bench press (CON =  $56.1 \pm 35.7$ , CHO =  $57.4 \pm 35.3$ , PLC =  $57.0 \pm 35.1$  kg) between conditions ( $p > 0.05$ ). The number of repetitions performed during the back squat (CON =  $48 \pm 14$ , CHO =  $53 \pm 16$ , PLC =  $50 \pm 13$  repetitions) and bench press (CHO =  $44 \pm 9$ , CHO =  $49 \pm 11$ , PLC =  $48 \pm 11$  repetitions) muscular endurance tests also did not differ significantly between conditions ( $p > 0.05$ ). **CONCLUSION:** Carbohydrate mouth rinsing following a fatiguing resistance exercise protocol does not affect muscular power, maximal strength, or muscular endurance performance.

273 Board #110 June 1, 11:00 AM - 12:30 PM

### Carbohydrate Mouth Rinsing Does Not Enhance Maximal Strength or Motor-Unit Recruitment Following Fatigue

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Carbohydrate (CHO) mouth rinsing without ingestion of the solution has been shown to improve endurance exercise performance. It has also been shown to attenuate the decline of maximal voluntary strength (MVC) following fatiguing exercise. **PURPOSE:** The purpose of this study was to determine the effect of CHO mouth rinse on MVC and motor-unit recruitment and following fatiguing exercise. **METHODS:** Ten recreationally trained adults (3 males, 7 females) participated in a double-blind, cross-over study. MVC of the dominant knee extensors was assessed and motor-unit recruitment was determined using twitch-interpolation. Participants then performed an isometric contraction at 50% of MVC until volitional fatigue (a decrease in force of 10%). This was immediately followed by a 20s mouth rinse of a 25ml solution of 8% maltodextrin (CARB) or placebo (PLA) solution. Three MVCs were then performed; each separated by 10 seconds. Five minutes of rest was provided and 3 MVCs were again performed. **RESULTS:** MVC did not differ between the CARB and PLA conditions ( $213.0 \pm 82.5$  vs.  $219.2 \pm 81.7$ ;  $p \geq 0.16$ ). A main effect for time ( $p0.33$ ). However, iPost was reduced compared to 5Post ( $p < 0.001$ ). Motor-unit recruitment (%ACT) did not differ between conditions ( $87 \pm 10\%$  vs.  $90 \pm 5\%$ ;  $p = 0.11$  for interaction and  $p = 0.15$  for main effect) nor did it change from pre to post fatiguing exercise ( $p = 0.57$ ). Evoked twitch torque (TT) also did not differ between CARB and PLA conditions ( $70.2 \pm 22.3$  vs.  $71.4 \pm 19.8$ ;

$p \geq 0.51$ ), but was reduced ( $p = 0.003$ ) following fatiguing exercise with all post-fatigue values differing from Pre ( $p \leq 0.024$ ) and with all post fatigue values differing from each other ( $p \leq 0.04$ ), except the final two following 5 minutes of recovery ( $p = 0.25$ ). **CONCLUSIONS:** A carbohydrate mouth-rinse had no effect on maximal voluntary strength, motor-unit recruitment, or electrically evoked torque following fatiguing exercise. This finding suggests the ergogenic effect of carbohydrate mouth rinsing is not mediated via enhanced strength and motor-unit recruitment.

274 Board #111 June 1, 11:00 AM - 12:30 PM

### The Effects of Caffeine on Vertical Jump Height and Execution in Collegiate Athletes

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Caffeine ingestion elicits a variety of physiological effects that may be beneficial to maximal-intensity exercise performance, though its effectiveness and physical mechanism of action enhancing ballistic task performance are unclear. **PURPOSE:** The purpose of this study was to examine the effects of caffeine ingestion on vertical jump height and jump execution in NCAA Division I athletes. **METHODS:** The study used single-blind, randomized, crossover design. Athletes ( $n = 25$ ) were recruited from sports in which maximal-intensity ballistic tasks were incorporated in training and competition. Athletes either consumed caffeine (5 mg·kg<sup>-1</sup>) or placebo in pill form. After a sixty-minute waiting period athletes performed three squat jumps and three countermovement jumps while standing on a force platform. Jump height and execution variables were calculated from mechanography data. Paired samples  $t$ -tests were used to compare the differences between Caffeine and placebo conditions. **RESULTS:** In comparison to placebo, caffeine increased squat jump height ( $32.8 \pm 6.2$  vs.  $34.5 \pm 6.7$  cm;  $p = 0.001$ ) and countermovement jump height ( $36.4 \pm 6.9$  vs.  $37.9 \pm 7.4$  cm;  $p = 0.001$ ). Peak force ( $p = 0.032$ ) and average rate of force development ( $p = 0.037$ ) were increased during the countermovement jump in the caffeine trial compared to the control. Time to half peak force was the only execution variable improved with caffeine ( $p = 0.019$ ) during the squat jump. **CONCLUSIONS:** Our data indicates that caffeine (5 mg·kg<sup>-1</sup>) enhances vertical jump performance in Division I collegiate athletes competing in sports involving maximal-intensity ballistic tasks. It appears that the physical mechanism of enhancement is increased rate of force development and / or peak force production during jumping. The importance of rate of force development and peak force production during the performance of maximal-intensity ballistic tasks is well known. Thus, our data suggest that the ergogenic effects of caffeine may transfer to other ballistic tasks involving the lower-body musculature in collegiate athletes. Caffeine may be effective to enhance the quality of maximal-intent ballistic tasks during training and competition.

275 Board #112 June 1, 11:00 AM - 12:30 PM

### Carbohydrate Mouth Rinsing Does Not Alter Skeletal Muscle Contractile Properties Following Fatigue

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Carbohydrate (CHO) mouth rinsing without ingestion of the solution has been shown to improve endurance exercise performance and to attenuate the decline of muscular strength following fatiguing exercise. However it is unclear whether central or peripheral factors are responsible for the attenuated force decline. **PURPOSE:** The purpose of this study was to determine the effect of CHO mouth rinse on electrically evoke skeletal muscle contractile properties following fatiguing exercise. **METHODS:** Ten recreationally trained adults (3 males, 7 females) participated in a double-blind, cross-over study. Maximal twitch torque (TT), time-to-peak-tension (TTP), half-relaxation time (HRT), rate of torque development (RTD), and rate of torque relaxation (RTR) were determined via electrical stimulation in the dominant knee extensors. Participants then performed an isometric contraction at 50% of MVC until volitional fatigue. This was immediately followed by a 20s mouth rinse of a 25ml solution of 8% maltodextrin (CARB) or placebo (PLA) solution. TT was then re-assessed 3 times, each separated by 10 seconds. Five minutes of rest was provided and TT was again re-assessed 3 times. **RESULTS:** Evoked twitch torque (TT) did not differ between CARB and PLA conditions ( $70.2 \pm 22.3$  vs.  $71.4 \pm 19.8$  Nm;  $p \geq 0.51$ ), but was reduced ( $-28\%$ ;  $p = 0.003$ ) following fatiguing exercise with all post-fatigue values differing from pre-fatigue values ( $p \leq 0.024$ ). TTP ( $121.6 \pm 11.6$  vs.  $125.6 \pm 7.8$  ms) and RTD ( $584 \pm 211$  vs.  $565 \pm 141$  Nm/sec) did not differ between conditions, but both decreased (slowed) following fatigue ( $-20\%$ ;  $p \leq 0.02$ ) and returned to near pre levels following 5 minutes of recovery. Similarly, HRT ( $67.2 \pm 10.2$  vs.  $67.3 \pm 32.0$ )

and RTR (538±199 vs. 602±262 Nm/sec) were also slowed following fatigue (~60%;  $p \leq 0.001$ ), but did not recover to baseline levels following 5 minutes of recovery ( $p \leq 0.04$ ). **CONCLUSIONS:** A carbohydrate mouth-rinse had no effect on electrically evoked torque and skeletal muscle contractile properties following fatiguing exercise. This finding suggests any effect of carbohydrate mouth rinsing is likely mediated by "central" mechanisms rather than a direct effect on skeletal muscle.

276 Board #113 June 1, 11:00 AM - 12:30 PM  
**The Effects of Caffeine and Exhaustive Exercise on Manipulative Dexterity**

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Research has demonstrated that caffeine and exhaustive exercise may impact performance on cognitive and fine motor tasks. **PURPOSE:** The purpose of the present study was to determine if caffeine administered at different time points influenced manipulative dexterity following exhaustive exercise. **METHODS:** Eight healthy, physically active ( $50 \pm 5$  ml·kg<sup>-1</sup>·min<sup>-1</sup>), younger ( $25 \pm 5$  years) males participated in five separate laboratory sessions. During the first visit, subjects underwent a graded exercise test on a Lode cycle ergometer to determine maximal oxygen consumption (VO<sub>2</sub>max) and were allotted time to practice the grooved pegboard task. For each of the next four visits, 3 pieces of chewing gum [caffeine (CAFF) or placebo (PLA)] were administered at 3 time points, 120 min pre exercise, 60 min pre exercise, and 5 min pre exercise. In 3 of the 4 experimental trials, CAFF was administered at one of the three time points and PLA at the other two time points. During the control trial, PLA gum was administered at all three time points. The order in which participants completed the experimental trials was randomized. Following time allotted for gum administration, and a standard warm-up, participants cycled at 75% VO<sub>2</sub>max (constant Wattage) for 15 min then completed a 7 kJ·kg<sup>-1</sup> performance ride. The grooved pegboard task was completed at baseline (Pre) and immediately following the performance ride (Post). Time (sec) to complete the pegboard task was utilized as an indicator of manipulative dexterity. **RESULTS:** Data were analyzed using a 4 (treatment) by 2 (time) analysis of variance (ANOVA). The ANOVA demonstrated a main effect of time ( $p = 0.047$ ) for improvements in time to complete the pegboard task (Pre =  $57.9 \pm 0.9$ s, Post =  $54.3 \pm 1.4$ s). No main effect of treatment ( $p = 0.292$ ) or treatment by time interaction ( $p = 0.239$ ) was observed. **CONCLUSION:** These data suggest that manipulative dexterity improved following exhaustive cycling with and without caffeine. Further work in this area is warranted.

**A-41 Exercise is Medicine®/Poster - Exercise Across the Life Span and General Aspects**

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
Room: Exhibit Hall A/B

277 Board #114 June 1, 9:30 AM - 11:00 AM  
**Inverse Association Between Muscular Fitness and Clustered Score Of Inflammatory Biomarkers In Portuguese Adolescents: Labmed Physical Activity Study**

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**Introduction:** Presently, there is a growing interest on the health benefits of muscular fitness (MF). The investigations have showed that metabolic risk factors are inversely associated with muscle strength. However, to date, there is a lack of knowledge on the relationship between muscular fitness and inflammatory biomarkers in adolescents. We aimed to evaluate the association between MF and clustered score of inflammatory biomarkers in Portuguese adolescents, controlling for several potential confounders. **Methods:** This is a cross-sectional analysis with 529 Portuguese adolescents ( $n=267$  girls) aged 12-18 years (mean age  $14.33 \pm 1.7$ ). A MF score was computed as the mean of the handgrip strength adjusted by weight and standing long jump standardized values by age and gender. Cardiorespiratory fitness was measured using the 20 m shuttle run test. To assess the degree of adherence to the Mediterranean diet the KIDMED index (Mediterranean Diet Quality Index for children and adolescents) was used. Intravenous blood samples were taken after an overnight fast to determine inflammatory markers. Z-scores of C-reactive protein, complement factors C3 and

C4, leptin and fibrinogen were summed to create continuous score of clustered inflammatory biomarkers. **Results:** Regression analyses, showed a significant inverse association between clustered score of inflammatory biomarkers with MF score (unstandardized  $\beta = -0.206$ ;  $p < 0.037$ ), after adjustments for age, sex, pubertal stage, socioeconomic status, adherence to the Mediterranean diet, cardiorespiratory fitness, insulin resistance (HOMA-IR), and body mass index. **Conclusion:** MF was inversely associated with clustered score of inflammatory biomarkers, adjusted. Our results do support to the current physical activity guidelines for children and adolescents, which recommend regular engagement in muscle-strengthening activities due to its health-related benefits, including prevention in CVD and metabolic risk factors.

278 Board #115 June 1, 9:30 AM - 11:00 AM  
**Does Physical Activity Levels in South African Children Compare to Recommended Levels set by International Standards?**

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(No relationships reported)

Physical activity plays an integral role in the normal physical, mental, social and cognitive development of children. One of the leading risk factors for childhood obesity and early onset non communicable diseases in low- and middle-income countries, such as South Africa, is physical inactivity. **PURPOSE:** The aim of this study was to measure the physical activity in boys and girls from section 21, quintile 5 pre-primary and primary schools in a small rural South African town and compare findings to the recommended international physical activity levels. **METHOD:** Seventy-eight rural children, representing Caucasian and black African children, divided in three age groups, were issued a piezo-electric pedometer for seven complete days. Pedometer data analysed included total steps, aerobic steps, aerobic walking time, calories and distance. Steps per day were compared to international levels. Correlation statistics examined the association between physical activity and adiposity. **RESULTS:** There was a statistically significant difference in activity levels of boys in the age groups 9-11 and 12-14 years compared to girls in the same age, with boys being more active than girls ( $p=0.003$  and  $0.042$  respectively). Although girls' physical activity levels tend to decrease with age, their aerobic activity levels increase with age. Rural children investigated in this study have physical activity levels far lower than the recommended international normative levels. No correlation was found between physical activity and adiposity. **CONCLUSION:** The pedometer data indicated that gender and age influence the activity of children. This group of rural children's physical activity is far less than international normative levels. Boys aged 9 - 11 were the most active group, while girls aged 12-14 years old were the most aerobic active in this study. The authors concluded that, in order to increase physical activity, the age group 9 to 11 may be the ideal age to focus on for gender specific intervention programs.

279 Board #116 June 1, 9:30 AM - 11:00 AM  
**The Association Of PA And Sedentary Behavior With Cardiometabolic Risk Factors In Chinese Children Aged 8-15**

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(No relationships reported)

**PURPOSE:** This study explored associations between physical activity, sedentary behavior and cardiovascular risk factors in Chinese children. **METHODS:** 269 participants aged 9-11 years were enrolled. Physical activity and sedentary behavior were self-reported by 7-Day Physical Activity Questionnaire. Cardiovascular indicators included waist circumference, fasting glucose, lipids and blood pressure. Associations between activity levels and cardiovascular risk factors were examined using ANCOVA, partial correlations and multiple linear regressions with adjustment for covariates: age, sex and Body Mass Index.

**RESULTS:** Results showed that the MVPA energy expenditure and time of secondary students were significantly higher than those of primary students (Primary: 378.8kcal/d and 78.3min/d, secondary: 499.9kcal/d and 91.7min/d). The secondary school students spent more time on sedentary behaviors than primary school students (275.8min/d vs. 195.7min/d). The prevalence of screen time  $\geq 2$  h for secondary and primary school students were 11% and 6.7%, respectively. The total energy expenditure, MVPA time and TV time were significantly related to HDL-C and waist circumference. In multiple linear regressions, total energy expenditure and MVPA time were associated with better levels of several cardiovascular risk factors adjusting for sedentary time and covariates. Sedentary time were significantly positively related with several indicators ( $\beta$  coefficients: waist circumference: 0.066, fasting glucose: 0.213, systolic blood pressure: 0.155, diastolic blood pressure: 0.193.) adjusting for MVPA time and covariates. Further analyses showed that TV time was positively correlated with diastolic blood pressure ( $\beta$  coefficient: 0.109,  $P < 0.05$ ) adjusting for MVPA, sedentary behaviors time and covariates.

**CONCLUSIONS:** In this urban Chinese school students' population, the total physical activity expenditure and MVPA time has positive influences on better cardiovascular risk factors, and we should also notice the differential influence of physical activity intensities on certain cardiovascular risk factors. Overall sedentary behavior time and TV time has negative influence on cardiovascular health.

280 Board #117 June 1, 9:30 AM - 11:00 AM  
**Effects Of A 6-month Structured Exercise Program On Quality Of Life Measures In Women**

Megan Bowdon<sup>1</sup>, Pamela Marcovitz<sup>1</sup>, Barry Franklin, FACSM<sup>1</sup>, Judith Boura<sup>1</sup>, Zachary Cantor<sup>2</sup>, Maxwell Sandberg<sup>3</sup>, Scott Billecke<sup>4</sup>. <sup>1</sup>Beaumont Health, Royal Oak, MI. <sup>2</sup>Michigan State University, Lansing, MI. <sup>3</sup>Union College, Schenectady, NY. <sup>4</sup>KMAC, LLC, Farmington Hills, MI. (Sponsor: Barry Franklin, FACSM)  
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Few data are available regarding the impact of structured exercise on quality of life (QOL) measures in middle-aged and older women.

**Purpose:** To evaluate QOL, cardiovascular efficiency and anthropometric measures at baseline and following a 6-month structured exercise intervention in women at risk for cardiovascular disease (CVD).

**Methods:** Women  $\geq 18$  years without known CVD with  $\geq 1$  risk factor were enrolled in a 6-month structured exercise intervention. Participants exercised under direct supervision of cardiac nurses and exercise physiologists  $\geq 3$  days per/wk for  $\geq 30$  min/session for 6-months. Exercise intensity approximated 60-85% of the maximal heart rate (HR). Rating of perceived exertion (RPE; 6-20 category scale) was used as an adjunctive intensity modulator, adjusting workloads to achieve 11-14 ("fairly light" to "somewhat hard") ratings. Pre-versus post conditioning QOL assessments (depression [PHQ-9] and general level of daytime sleepiness [Epworth scale]), changes in cardiovascular efficiency (systolic/diastolic blood pressure [SBP/DBP], HR, RPE during a standardized submaximal exercise workload), and anthropometric measures, including body weight, body mass index (BMI), and waist circumference, were evaluated.

**Results:** 288 subjects (mean  $\pm$  SD age = 59.6  $\pm$  9.1), including 167 Caucasian and 121 African American women, completed the exercise intervention. Decreases in body weight (197.6  $\pm$  46.2 vs 192.7  $\pm$  45.5 lbs), BMI (33.5  $\pm$  7.2 vs 32.8  $\pm$  7.1 kg/m<sup>2</sup>), waist circumference (38.8  $\pm$  6.3 vs 36.9  $\pm$  6 in), and resting SBP/DBP (127.6  $\pm$  14 vs 119.7  $\pm$  10.1 mmHg and 78  $\pm$  8.7 vs 74.8  $\pm$  7.6 mmHg) (all p values  $< 0.0001$ ) were noted. At a standard submaximal workload, significant reductions were seen in HR (123.7  $\pm$  13.3 vs 106.1  $\pm$  13.4 bpm), SBP (153.1  $\pm$  17.8 vs 132.9  $\pm$  15.4 mmHg), DBP (69.8  $\pm$  10.6 vs 65.8  $\pm$  8.2 mmHg) and RPE (12.6  $\pm$  1 vs 10.4  $\pm$  1.6), (all p values  $< 0.0001$ ). Both PHQ-9 (4.3  $\pm$  4.2 vs 2.0  $\pm$  2.8) and Epworth scores (6.2  $\pm$  4.1 vs 4.7  $\pm$  3.3) decreased significantly (p  $< 0.0001$ ).

**Conclusion:** The present findings, in a large cohort of Caucasian and African American women, demonstrate that a 6-month exercise intervention results in significant reductions in depression and sleepiness scores. Improvements in cardiovascular efficiency and anthropometric measures substantiated a 'training effect.'

281 Board #118 June 1, 9:30 AM - 11:00 AM  
**Self-regulation And Its Relationship With Sedentary Behavior After A Structured Exercise Program In Young Women**

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Sedentary behavior is related to many diseases and global mortality. Therefore, it is important to determine the effect of exercise interventions on sedentary behavior

as well as psychological variables associated with sedentary behavior. Purpose: To examine the relationship between self-regulation for physical activity and sedentary behavior in young women after a structured exercise program. Methods: 20 women (M Age = 25.4  $\pm$  4.5) participated in a 10-week exercise intervention, consisting of 30 sessions of a high intensity interval treadmill protocol and resistance training. Sedentary behavior was measured before and after the intervention, with an Actigraph accelerometer GT3X. Validated cut points were used to determine time spent in sedentary behavior ( $< 100$  CPM). Self-regulation was measured with a questionnaire based on Social Cognitive Theory (reinforcements, social support, goal setting, self-monitoring, time management, and relapse prevention). Results: The results showed a reduction in time spent in sedentary behavior per day (600.2  $\pm$  50.5 - 530.4  $\pm$  101.4) and an improvement in self-regulation (95.6  $\pm$  26.3 - 130.6  $\pm$  24.2) after the intervention. A simple linear regression showed that a better self-regulation process for physical activity predicts a reduction in time spent in sedentary behavior,  $F(1,18) = 3.86, p = .032$ . Changes in self-regulation accounted for 17.7% of the explained variability on changes in sedentary behavior. Conclusion: Self-regulation predicts positive changes in sedentary behavior and should be a focus for reducing sedentary time.

282 Board #119 June 1, 9:30 AM - 11:00 AM  
**The Acute Effect of Yoga on Inflammation and Stress in Healthy Women**

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 (No relationships reported)

>Yoga has been reported to improve physical fitness levels, promote relaxation, and reduce perceived stress in both healthy and diseased populations, however its effect on physiological variables associated with chronic low-level inflammation and stress is less defined. **PURPOSE:** The purpose of the current study was to compare the effects of hatha yoga, low-intensity aerobic exercise, and quiet rest on salivary IL-6 and cortisol levels, and state anxiety in healthy women. **METHODS:** Sixteen healthy females (mean  $\pm$  SD; age, 26.5  $\pm$  4.37 yr; estimated O<sub>2</sub>max, 41.96  $\pm$  5.18 mlkg<sup>-1</sup>min<sup>-1</sup>) who were experienced in yoga, completed three 60-min intervention sessions: hatha yoga, steady-state treadmill walking, and quiet rest. For each session, salivary samples were collected pre-intervention, immediately post-intervention, and 60-min post-intervention for analysis of interleukin-6 (IL-6) and cortisol concentrations to determine inflammation and stress response levels, respectively. In addition, each subject completed the state anxiety portion of the State-Trait Anxiety Inventory (STAI) pre-intervention and immediately post-intervention. Heart rate was also recorded at 10-min intervals for each intervention. Factorial ANOVAs were run to determine if differences or an interaction existed between intervention type and time for the following dependent variables: salivary IL-6, salivary cortisol, modified STAI scores, and heart rate. **RESULTS:** For both salivary IL-6 and cortisol analysis, no significant interactions or main effects ( $p > .05$ ) were reported. For the modified STAI scores, significant main effect differences were reported for intervention type ( $p = .002$ ), with significantly lower scores associated with the yoga session compared to the treadmill session. For heart rate, a significant interaction ( $p = .01$ ) was reported. A simple effects test concluded that heart rates were significantly different amongst all three interventions at the 10-min, 30-min, 40-min, and 60-min time points. **CONCLUSION:** While no changes in IL-6 or cortisol were found in any intervention session, the yoga session lowered state anxiety scores more than treadmill walking within the healthy female population, suggesting a relaxed and lowered perceived stress state after completion of yoga.

283 Board #120 June 1, 9:30 AM - 11:00 AM  
**Elder-friendly Approaches To The Surgical Environment: Bedside Reconditioning For Functional Improvements**

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 (No relationships reported)

Current hospital procedures are based around cautious exercise prescriptions, especially in the frail elderly population. While activity restrictions are placed for patient safety, there is currently no consensus on the level of restriction necessary or what activities should be restricted in the frail surgical patient. Exercise is a key component to a healthy lifestyle and is recognized in its role in managing symptoms and reducing the functional decline in aging. Therefore, it should be administered as a component of the treatment plan in order to reduce the muscular atrophy that occurs upon the stress of surgery and hospitalization in the elderly.

**PURPOSE:** To compare the functional status of elderly abdominal surgery patients post surgery and to determine how a regularly performed reconditioning program will affect the functional decline associated with bed rest. **METHODS:** 30 patients over the

age of 65 performed 30-Second Sit-To-Stands (STS) on day 2 post-operation (POD2) and immediately prior to discharge in our control group. The intervention group will receive the reconditioning program and will perform the exercises between the two STS trials. Patients are prescribed exercise programs based on frailty level upon hospital admission. RESULTS: The STS data from the control group demonstrates that only 4 of the 30 patients were able to achieve the STS score required for independent living, despite the majority of patients discharged home without support of additional medical care. Results for the intervention group are currently being analyzed. CONCLUSION: Current surgical bed rest practices may be exacerbating the functional decline in our elderly surgical patients. Patients are leaving the hospital in a reduced functional state due to long periods of inactivity following emergency abdominal surgery. A reconditioning intervention to address the deconditioning effects of bed rest following acute abdominal surgery is currently being implemented. Preliminary findings will be presented. Supported by the SCN Surgical Network Grant through Alberta Health Services as well as the PRIHS Grant through Alberta Innovates Health Solutions.

284 Board #121 June 1, 9:30 AM - 11:00 AM  
**Exercise And Sleep: A Systematic Review Of Previous Meta-analyses And A Meta-analysis**  
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 (No relationships reported)

Previous meta-analyses have yielded conflicting results with respect to the effects of exercise on sleep in adults.

**PURPOSE:** Conduct a systematic review of previous meta-analyses and a meta-analysis on exercise and sleep in adults. **METHODS:** Meta-analyses of randomized controlled exercise intervention trials were included by searching 9 electronic databases and cross-referencing. Dual-selection and data abstraction were conducted. Methodological quality was assessed using AMSTAR while quality of the evidence was assessed using GRADE. Results were summarized and prediction intervals, number needed-to-treat (NNT), and percentile improvements calculated. A random-effects model was used to pool results from the individual studies included in each meta-analysis. **RESULTS:** Of 277 citations screened, 3 meta-analyses that included 2-9 studies and 63-599 men and women (total N = 950) were included. Moderate to vigorous exercise was performed for 5-52 weeks, 3-10 times per week, for 20-90 minutes per session. Methodological quality ranged from 36%-64% while quality of the evidence was very low to low. Statistically significant improvements ( $p < 0.05$ ) were observed for the Apnea-Hypopnea Index (AHI), overall sleep quality, global score, subjective sleep and sleep latency. No statistically significant differences were observed for sleep duration, efficiency, disturbance or daytime function. The NNT and percentile improvements ranged from 4-7 and 18.1-21.9, respectively. With the exception of AHI, statistically significant heterogeneity and a large amount of inconsistency were observed for all statistically significant outcomes. When pooled, statistically significant standardized mean difference (SMD) improvements along with statistically significant heterogeneity and a large amount of inconsistency were found for overall sleep quality (SMD = -0.50, 95% CI, -0.72, -0.28,  $z = 4.6$ ,  $p < 0.001$ ;  $Q = 30.7$ ,  $p = 0.004$ ; I-squared = 57.7%, 95% CI, 23.4%-76.6%). The NNT was 7 while percentile improvement was 19. **CONCLUSIONS:** Exercise is associated with improvements in selected sleep outcomes in the sample of adults included. A need exists for a large, well-designed, and more inclusive meta-analysis. (PROSPERO Registration #CRD42015023449). Supported by NIH Grant U54GM104942.

285 Board #122 June 1, 9:30 AM - 11:00 AM  
**The Effects Of Exergaming On Patients' Rehabilitative Outcomes: A Meta-analysis**  
 Zachary Pope<sup>1</sup>, Nan Zeng<sup>2</sup>, Jung E. Lee<sup>1</sup>, Nicole Cheung<sup>1</sup>, Hannah Niswonger<sup>1</sup>, Avery Veldhouse<sup>1</sup>, Zan Gao, FACSM<sup>1</sup>.  
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**PURPOSE:** Although a few reviews on exergaming as a rehabilitative tool are available, meta-analytic procedures have not been conducted on the topic. Therefore, this meta-analysis synthesized the effectiveness of exergaming on patients' rehabilitative outcomes.

**METHODS:** A total of 98 published studies on exergaming and rehabilitation were obtained with 20 studies meeting the following inclusion criteria: 1) data-based articles published in English between 2008 and 2015; 2) investigated some type of exergaming on rehabilitative outcome(s) among patients of any age group; and 3) at least one comparison was present in each study. Data extraction for comparisons was completed for three age categories: 1) youth/young adults (aged 5-25 years); 2) middle-aged adults (aged 40-65 years); and 3) older adults (≥ 65 years old). Comprehensive Meta-

Analysis software was used to calculate effect size (ES; Hedge's g) for each entry. Separate analyses were run between exergaming and control (i.e., no treatment or standard care) or comparison (i.e., another experimental treatment) conditions. **RESULTS:** Across all age categories, exergaming was used for balance rehabilitation. Compared to control conditions, exergaming had a large positive effect on balance among youth/young adults (ES = .81,  $p < .05$ ) and comparison (ES = .14,  $p > .05$ ) with the same true of older adults compared to control conditions (ES = .16,  $p > .05$ ). Notably, exergaming's effect on balance versus comparison among older adults was small yet negative (ES = -.12,  $p > .05$ ). Exergaming was also used to enhance physical functioning (PF) among middle-aged and older adults. Versus control and comparison, exergaming had little effect on middle aged adults' PF (ES = -.054 and -.046, respectively) or older adults' PF (ES = .04 and .002). Finally, exergaming had a moderate effect on fall efficacy versus control among older adults (ES = .61,  $p = .01$ ). No similar psychological rehabilitative outcomes were found. **CONCLUSIONS:** Findings favor exergaming for youth/young adult balance rehabilitation and promotion of fall efficacy in older adults. Larger samples and greater concentration on the cognitive rehabilitative outcomes resulting from exergaming are warranted.

286 Board #123 June 1, 9:30 AM - 11:00 AM  
**Correlations Among Physical Activity Level, Diet, and Prescription Medication Use in Older Adults**  
 Julie A. Richards, Sheridan M. Jonas, Rachel A. Keller, Angelina R. Caradonna, Rachel L. Ondrejko, Bryce Phillips, Kyle L. Timmerman. *Miami University, Oxford, OH.* (Sponsor: Helaine Alessio, FACSM)  
 (No relationships reported)

Older adults (≥65y) make up approximately 14% of the population and receive over 1/4 of all prescribed drugs in the United States. Additionally, as they are more likely than young adults to be prescribed multiple medications for long-term use, they are at increased risk for adverse drug events. Identifying lifestyle factors such as physical activity (PA) and/or diet that may impact the use of prescription medications may have important health-related implications in this population. The **PURPOSE** of this study was to examine potential associations among PA level, physical function, diet, and prescription medication use in older adults. **METHODS:** In 68 older adults (37F, 31M, 78±8y) prescription medication use (Rx), PA level (Community Healthy Activities Model Program for Seniors, CHAMPS), and six-minute walk test (6MWT) distance were quantified. In a subset of 28 subjects, habitual dietary intake of macro- and micronutrients was assessed (3-day dietary records). Pearson product-moment correlations were run between variables while controlling for age, sex, and body mass index (BMI). Significance was set to  $p < 0.05$ . **RESULTS:** Mean values for select variables include: total PA: 2286±231 kcal·wk<sup>-1</sup>; moderate-to-vigorous PA (MVPA): 1,234±142 kcal·wk<sup>-1</sup>; 6MWT distance: 407±15m; Rx number: 4.1±0.4; total caloric intake: 1,953±107 kcal·d<sup>-1</sup>; and PUFA intake: 9.2±1.0 g·d<sup>-1</sup>. Rx was inversely correlated with moderate-to-vigorous PA (N=68,  $r = -0.25$ ,  $p < 0.05$ ), 6MWT distance (N= 68,  $r = -0.32$ ,  $p < 0.05$ ), and dietary intake of PUFA (N= 28,  $r = -0.53$ ,  $p < 0.05$ ). There were no significant correlations between Rx and any other macro- or micronutrients. **CONCLUSION:** These preliminary data show that Rx use in older adults is inversely associated with physical activity level, physical function, and PUFA intake. These findings are important given the potential for adverse drug events from the over-prescription and accidental misuse of medications in older adults. Longitudinal randomized, controlled studies are needed to assess if increasing PA level in older adults, and/or altering diet, permits the safe withdrawal of prescription medications.

287 Board #124 June 1, 9:30 AM - 11:00 AM  
**Correlates Among Physical Activity, Physical Function, Diet, Depression And Satisfaction With Life In Older Adults**  
 Sheridan M. Jonas, Julie R. Richards, Rachel A. Keller, Angelina R. Caradonna, Rachel L. Ondrejko, Bryce Phillips, Kyle L. Timmerman. *Miami University, Oxford, OH.* (Sponsor: Helaine Alessio, FACSM)  
 (No relationships reported)

Research suggests that aging is associated with increased depression and decreased satisfaction with life (SWL). Thus, identifying lifestyle factors related to depression and SWL are of substantial importance. Physical activity (PA) and dietary intake of certain micronutrients (i.e. vitamin D, calcium, iron, and omega-3 fatty acids) have been proposed to influence depression in older adults. These data, especially the potential influence of dietary intake of certain micronutrients on depression and SWL, are somewhat equivocal. Thus, the **PURPOSE** of the present study was to determine if PA level, physical function, and dietary intake of vitamin D, calcium, iron, or omega-3 fatty acids were correlated with depression and SWL in older adults. **Methods:** In sixty-eight subjects (78±0.8y, 37W/31M, BMI: 26±4 kg·m<sup>-2</sup>) we evaluated self-reported physical activity (Community Health Physical Activities Model Program for

Seniors, CHAMPS), 6-minute walk test (6MWT) distance, lower body function (Short Physical Performance Battery, SPPB), geriatric depression (Geriatric Depression Scale, GDS), and SWL (Satisfaction with Life Survey, SWLS). In a subset of 28 subjects, dietary analysis was performed using 3-day dietary logs and diet analysis software (Food Processor, Salem, OR). Relationships between variables were analyzed using Pearson product-moment correlations while controlling for age, sex, and BMI. Statistical significance was set to  $p < 0.05$ . **Results:** Mean values for select variables include: Total PA:  $2,285 \pm 231$  kcal·wk<sup>-1</sup>, SPPB:  $9.5 \pm 2.2$  out of 12, GDS:  $1.5 \pm 0.23$  out of 15, and SWLS:  $29 \pm 5$  out of 35. These data showed that age was positively correlated with GDS ( $r=0.34$ ,  $p < 0.05$ ), but not with SWLS ( $r=-0.12$ ,  $p=0.35$ ). 6MWT distance was negatively correlated with GDS ( $r=-0.41$ ,  $p < 0.05$ ) and positively correlated with SWLS scores ( $r=0.47$ ,  $p < 0.05$ ). SPPB was negatively correlated with GDS ( $r=-0.50$ ,  $p < 0.05$ ) and positively correlated with SWLS ( $r=0.37$ ,  $p < 0.05$ ). There were no significant correlations between GDS or SWLS and dietary intake of any micronutrients. **Conclusions:** Independent of age, sex, and BMI, indices of physical function (6MWT and SPPB) were associated with fewer depressive symptoms and greater SWLS.

288 Board #125 June 1, 9:30 AM - 11:00 AM

### The Antihypertensive Benefits of Tai Chi Exercise among Older Adults: A Meta-Analysis

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(No relationships reported)

Tai Chi exercise training elicits changes in resting blood pressure (BP) ranging from -13 to +5 mmHg in the English literature. Reasons for the variability in the BP response are not clear. **PURPOSE:** This meta-analysis investigated the efficacy of Tai Chi as antihypertensive therapy and attempted to identify moderators of the BP response to Tai Chi. **METHODS:** Electronic databases were searched to identify trials that: 1) involved a Tai Chi intervention and control group; 2) measured pre- and post-intervention BP; 3) enrolled adult subjects ( $\geq 19$ yr) without severe debilitating disease(s) (e.g., Parkinson's disease); and 4) were published in English. Study quality was assessed with an augmented Downs and Black checklist. Heterogeneity was evaluated using Cochran's Q and the I<sup>2</sup> statistic, a standardized measure of homogeneity that ranges from 0%-100% (i.e., low to high). All analyses followed random-effects assumptions. **RESULTS:** 18 studies of moderate methodological study quality qualified (57.7 $\pm$ 11.1% of items satisfied on the augmented Downs and Black checklist). Participants ( $n=1,827$ ) were older ( $61.8 \pm 11.0$ yr), overweight ( $25.7 \pm 2.5$ kg/m<sup>2</sup>) adults (69.1% women) with prehypertension (systolic BP [SBP]/diastolic BP [DBP]:  $137.0 \pm 11.3/81.2 \pm 4.7$ mmHg). Tai Chi was performed for  $58.3 \pm 4.5$ min/session for  $3.2 \pm 1.6$  sessions/wk for  $20.6 \pm 13.9$  wk. Tai Chi reduced BP (SBP  $d+ = -0.52$ ; -7.2mmHg; I<sup>2</sup>=72.1%, 95%CI: 55.2, 82.6/DBP  $d+ = -0.20$ ; -3.7 mmHg; I<sup>2</sup>=60.3%, 95%CI: 33.5, 76.3) compared to control ( $p < 0.001$ ). Despite the high levels of heterogeneity in the BP response, we were unable to identify any significant moderators due to: 1) the small number of studies ( $k=18$ ); and 2) lack of disclosure of features of the Tai Chi intervention. **CONCLUSION:** Tai Chi performed 3 sessions/wk for ~60 min/session lowered BP on average 4-7 mmHg among older adults with prehypertension compared to non-exercise control. The magnitude of these BP reductions equals or exceeds those reported from aerobic and resistance exercise training. Additional high-quality randomized controlled trials are warranted to confirm the efficacy of Tai Chi as antihypertensive therapy.

### A-42 Exercise is Medicine®/Poster - Exercise and the Cardiovascular, Respiratory and Bone Systems

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
Room: Exhibit Hall A/B

289 Board #126 June 1, 11:00 AM - 12:30 PM

### Long-term Follow-up Of Clinical Effectiveness Of A Cardiac Rehabilitation Program For Women.

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**PURPOSE:** Cardiovascular disease (CVD) is the number one killer among Canadian women. Women living with CVD who participate in cardiac rehabilitation (CR) are able to improve their functional capacity, CVD risk profile, and health-related quality of life. Although CR has been shown to be an important intervention, studies continue to report low enrollment and participation rates for women compared to men. In

addition to this under-representation in traditional CR programs, follow-up outcomes post CR is limited in this population. The purpose of this study was to describe long-term outcomes from a women-only CR program.

**METHODS:** A retrospective single-centre cohort of participants who entered a 24-week CR program between Jan 1, 2007 and Oct 1, 2013 was evaluated for exercise capacity, cardiac risk factors and quality of life at entry, discharge, and 6- and 12-month follow-up from discharge.

**RESULTS:** Of 981 participants assessed for intake between Jan 1, 2007 and Oct 1, 2013, 589 patients entered CR (mean age =  $62.5 \pm 11.6$  yrs) and 392 entered Primary Prevention (mean age =  $57 \pm 10.7$  yrs). Baseline characteristics will be described. Among 422 patients completing the CR program (dropout rate of 14.7%), significant improvements were seen at discharge compared to intake with exercise capacity ( $p < 0.001$ ), Duke Activity Status Index ( $p=.005$ ), Beck Depression Inventory ( $p < 0.001$ ), and SF-36 physical summary scores (PCS) ( $p < 0.001$ ) Sixty percent of women who completed the program returned for a 6-month follow-up ( $n=252$ ), and 73% of those women returned for a 12 month follow-up ( $n=183$ ). Improvements measured at discharge in aerobic capacity, Duke Activity Status Index, Beck Depression Inventory, SF-36 PCS were maintained at 6- and 12-month follow-up time points. Serum low density lipoprotein was not significantly different at discharge but was significantly reduced at 6mos compared to intake ( $p=0.003$ ) and maintained at 12 months.

**CONCLUSIONS:** The 24-week comprehensive women's only program was successful at reducing important cardiac risk factors, such as aerobic capacity, physical health, moods and quality of life, long term. Whether or not the improvements are sustained in those who do not attend for follow-up is currently unknown and worthy of further investigation.

290 Board #127 June 1, 11:00 AM - 12:30 PM

### Frequency of Structured Exercise and Modulators of Attendance in Long-Term Cardiac Rehabilitation Program Participants

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(No relationships reported)

Participants enrolled in maintenance, exercise-based outpatient cardiac rehabilitation (CR) programs (phase III) are commonly counseled to participate in  $\geq 3$  aerobic exercise sessions/wk. The frequency of exercise participation in CR has been related to long-term cardiovascular outcomes. **PURPOSE:** To evaluate the average frequency (sessions/wk) of medically-supervised, exercise training in long-term phase III CR participants ( $> 1$  to 27 years), with specific reference to demographic, clinical, and psychosocial modulators of attendance. **METHODS:** A retrospective review of patient charts and exercise attendance records was conducted to access the average weekly frequency of structured exercise and modulators of attendance over a 1-year period (July, 2014 through June, 2015) in a subset of long-term CR program participants. Exercise sessions were offered 5 days/wk, excluding weekends and holidays. Patients that discharged from the program temporarily (e.g., extended vacation) or who were non-compliant due to medical reasons, symptoms, or extended hospitalizations, were excluded. **RESULTS:** 122 cardiac patients (mean  $\pm$  SD age =  $73.2 \pm 8.7$  yrs, 84% men) comprised the study population. Most (77%) were not working and/or retired. Their mean  $\pm$  SD body mass index (BMI), ejection fraction, and exercise training workloads were  $28.0 \pm 4.0$  kg/m<sup>2</sup>,  $55.5 \pm 12.9\%$ , and  $5.4 \pm 2.1$  METs, respectively. This patient cohort ( $n = 122$ ) attended  $< 2$  sessions/wk ( $n = 41$ ; 34%),  $\geq 2$  to 3 sessions/wk ( $n = 59$ ; 48%), and  $\geq 3$  sessions/wk ( $n = 22$ ; 18%). Age, BMI, ejection fraction, depression score, distance from the Center, and related co-morbid conditions, including diabetes and chronic obstructive pulmonary disease, were unrelated to attendance. In contrast, educational status was significantly related to attendance ( $p < 0.03$ ), with the highest percentage of advanced degrees being in the highest attending group ( $\geq 3$  sessions/wk). The most compliant cohort also demonstrated higher training workloads ( $p < 0.04$ ) than their less compliant counterparts. **CONCLUSION:** Less than 1 in 5 long-term CR participants consistently attend  $\geq 3$  exercise training sessions per week. CR participants should be strongly encouraged to complement their medically-supervised training sessions with home training, increased lifestyle physical activity, or both.

291 Board #128 June 1, 11:00 AM - 12:30 PM  
**Modulators of Improvements in Depression Scores Following Phase II Cardiac Rehabilitation**  
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*(No relationships reported)*

Patients with depression following an acute cardiac event and/or coronary revascularization intervention are less likely to take prescribed medications and adhere to recommended lifestyle modification intended to reduce the risk of recurrent cardiac events. Accordingly, clinical depression is widely recognized as a prognostic indicator. **PURPOSE:** We evaluated the impact of an exercise-based phase II cardiac rehabilitation (CR) program on Patient Health Questionnaire (PHQ-9) depression scores, with specific reference to psychosocial, demographic and clinical outcome modulators.

**METHODS:** 154 cardiac patients (28 women, 126 men; mean  $\pm$  SD age and body mass index were  $64.4 \pm 11.4$  years and  $29.0$  kg/m<sup>2</sup>, respectively) completed the PHQ-9 before and after participating in a phase II CR program. PHQ-9 scores of 1-4, 5-9, and  $\geq 10$  were interpreted as indicating minimal, mild, and moderate-to-severe degrees of clinical depression, respectively. A decrease in score signifies improvement. Patients with a baseline score of '0' (n=23), indicating no evidence of even minimal clinical depression, were eliminated from subsequent analyses. The remaining 131 served as our study population.

**RESULTS:** Patients completed an average of  $21.4 \pm 6.3$  exercise training sessions, demonstrating a mean improvement of  $1.5 \pm 1.4$  metabolic equivalents (METs) in training loads at a given heart rate and/or perceived exertion. PHQ-9 scores before and after the intervention averaged 4.0 and 2.6, respectively. At baseline and follow-up, minimal, mild, and moderate-to-severe indices of clinical depression were noted in 56% vs 73%, 35% vs 22%, and 8% vs 4% of our subjects, respectively. Changes in PHQ-9 scores were unrelated to gender, left ventricular function, vocational status, spousal support, improvement in training METs, or the total number of sessions attended. In contrast, the higher the pre PHQ-9 score, the greater the likelihood of improvement in the post PHQ-9 score ( $r = -0.55$ ;  $p < 0.0001$ ). The improved group (n=78) were also more likely to be younger, a never smoker, and not post myocardial infarction ( $p < 0.05$  for all).

**CONCLUSIONS:** Our findings indicate that exercise-based CR is associated with improved PHQ-9 scores and that patient's with higher baseline levels of clinical depression are more likely to demonstrate the greatest benefit.

292 Board #129 June 1, 11:00 AM - 12:30 PM  
**The Impact of Ambulation Orderlies on Physical Recovery After Cardiac Surgery: A Randomized Controlled Trial**  
 Erin A. Woodbury<sup>1</sup>, Samuel Headley, FACSM<sup>1</sup>, Christa Winter<sup>1</sup>, Sara Mazur<sup>1</sup>, Paul Visintainer<sup>2</sup>, Peter K. Lindenauer<sup>2</sup>, Quinn R. Pack<sup>2</sup>. <sup>1</sup>Springfield College, Springfield, MA. <sup>2</sup>Baystate Medical Center, Springfield, MA. (Sponsor: Samuel Headley, FACSM)  
*(No relationships reported)*

**PURPOSE:** Although daily walking is beneficial, most hospitalized patients are placed on bedrest and rarely initiate walking on their own. We evaluated the impact of an ambulation orderly (AO) on the physical and functional recovery among patients recovering from open-heart surgery.

**METHODS:** Post-operative cardiac patients were recruited at the time of transfer from the intensive care unit to the telemetry floor. Participants were then randomized to a nurse-directed (RN) or AO-directed ambulation group where they walked with the AO up to 3-4 times/day. All participants completed a 6-minute walk test (6 MWT) and a Barthel index (BI), which measures functional independence, at baseline and again before hospital discharge. In addition, each participant wore an accelerometer (Actigraph, Pensacola, Florida) during the usual 2-5 day stay on the telemetry floor.

**RESULTS:** We recruited 36 participants after open heart surgery (27 male, 9 female, age  $66 \pm 16$  years). Overall, patients exhibited significant recovery of physical function from baseline to discharge in the 6 MWT (from 83 to 172 meters,  $p < .0001$ ) and showed improvement in independent function (Barthel Index, 67 to 87,  $p < .0001$ ). Notably, each additional barrier to ambulation (supplemental oxygen, IV poles, walkers, and chest tubes) reduced average daily step count (330 steps,  $p = 0.04$ ). However, little difference was found between groups (AO vs. RN) in average daily step counts (2718 vs. 2541 steps/day,  $p = 0.63$ ), in the 6 MWT improvement (82 vs. 91 meters,  $p = 0.71$ ), or in the Barthel index (21 vs. 20,  $p = 0.89$ ), but median telemetry floor length of stay trended towards shorter length of stay in the AO group (from 3 to 2.5 days,  $p = 0.06$ ).

**CONCLUSIONS:** In this pilot study, we found that the addition of an AO marginally decreased length of stay, but did not significantly improve in-hospital physical or functional recovery from cardiac surgery. This could have been due to a low-intensity

intervention, lack of RN blinding, or small sample sizes. However, we did demonstrate feasibility of our protocol, the important role that barriers play in daily step count, and noted substantial in-hospital recovery from cardiac surgery in both groups.

**ClinicalTrials Registration Number:** NCT02375282  
 Grant Support: NCATS and NIH award KL2TR001063

293 Board #130 June 1, 11:00 AM - 12:30 PM  
**Physical Activity Monitors as Interventions for Reducing Blood Pressure in Hypertensives: A Meta Analysis**  
 Ashtun EP. May, Belinda J. Parmenter. *University of New South Wales, Sydney, Australia.*  
*(No relationships reported)*

**PURPOSE:** Exercise is effective at reducing resting blood pressure (BP); however this reduction is dependent on exercise adherence. Research indicates that physical activity monitors (PAMs) improve adherence to exercise, however, the role of PAMs in lowering BP in hypertensives is not well established. We systematically reviewed the literature to determine if PAMs have been used as an intervention and are effective in reducing BP in people with hypertension. **METHODS:** Electronic databases (PubMed, Medline, CINAHL, Cochrane, Scopus) were searched up until 30th July 2015. We included randomised controlled trials (RCTs) on participants' classified as hypertensive (mean baseline BP  $\geq 135/85$ mmHg) where a PAM, fitness tracking device, pedometer or smart phone application was used as an intervention for  $>4$  weeks duration. Text message or phone interventions and non-English language trials were excluded. Meta-analysis was completed on diastolic (DBP) and systolic blood pressure (SBP) outcomes. **RESULTS:** The search identified 1,932 articles. Of these 3 RCT's, studying 292 people (61% male; mean age  $50.6 \pm 6.4$  yrs) were included. Mean body mass index was  $30.9 \pm 5$  kg/m<sup>2</sup> and mean baseline BP was  $141/88$ mmHg. Interventions ranged from 6-52 weeks duration, walking 4-7 days per week without supervision. Actual step count was only reported in one study, with the intervention significantly increasing steps from  $5400 \pm 500$  to  $9700 \pm 400$  per day when compared to the control ( $p < 0.05$ ). When compared to controls, PAM interventions significantly reduced SBP ( $-6.51$ mmHg [ $-10.13, -2.89$ ];  $p = 0.0004$ ) and DBP ( $-2.95$  [ $-4.05, -1.84$ ];  $p < 0.000001$ ). This reduction was clinically relevant, with all 3 studies reporting  $< 140/90$ mmHg post intervention, with  $2 < 135/85$ mmHg. **CONCLUSION:** Commercial PAM's appear to be an effective intervention for lowering BP in hypertensives. However, with only 3 trials to date, more study is required to identify the most effective prescriptions (e.g. number of steps per day, frequency and length of interventions required) and whether PAMs are as effective as supervised exercise therapy. Future studies should examine the effect of variations in step count, exercise intensity (via heart rate monitoring), energy expenditure and progressions in physical activity in order to identify the most effective PAM prescription.

294 Board #131 June 1, 11:00 AM - 12:30 PM  
**Association of Resting Blood Pressure with Adiposity and Physical Activity in Young Adults**  
 Robert J. Kowalsky, Bethany Barone Gibbs, Kelliann K. Davis, FACSM, Renee J. Rogers, Lisa Wisniewski, John M. Jakicic, FACSM. *University of Pittsburgh, Pittsburgh, PA. (Sponsor: John M. Jakicic, FACSM)*  
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Elevated blood pressure (BP) is associated with obesity and lack of moderate-to-vigorous physical activity (MVPA). Due to prevalence of obesity in young adults, which may increase the risk for cardiovascular disease (CVD), it is important to understand whether these factors are associated with resting BP in this population.

**PURPOSE:** To examine cross-sectional associations between resting BP and both body mass index (BMI) and MVPA in young adults.

**METHODS:** 464 young adults who were overweight or obese (age:  $30.1 \pm 3.7$  years; BMI:  $31.5 \pm 3.9$  kg/m<sup>2</sup>) and not on antihypertensive medications were assessed for BMI, MVPA, and resting systolic (SBP) and diastolic (DBP) BP. MVPA was assessed using an activity monitor and defined as min/wk from activity bouts  $\geq 10$  minutes in duration at  $\geq 3$  METs. SBP and DBP were assessed in a seated position after a 5-minute rest.

**RESULTS:** MVPA was  $151.0 \pm 212.2$  min/wk. SBP and DBP were  $115.2 \pm 10.4$  and  $70.5 \pm 8.5$  mmHg, respectively. Across all subjects, BMI was significantly correlated with SBP ( $r = 0.26$ ,  $p < 0.001$ ) and DBP ( $r = 0.10$ ,  $p = 0.04$ ), and MVPA was not significantly correlated with either SBP or DBP. Among 132 subjects with SBP  $> 120$  mmHg, neither BMI ( $r = 0.08$ ,  $p = 0.38$ ) nor MVPA ( $r = -0.13$ ,  $p = 0.13$ ) were correlated with SBP. Among 54 subjects with SBP  $> 120$  mmHg and DBP  $> 90$  mmHg, BMI was significantly correlated with both SBP ( $r = 0.49$ ,  $p < 0.001$ ) and DBP ( $r = 0.35$ ,  $p = 0.01$ ), and MVPA was correlated with SBP ( $r = -0.28$ ,  $p = 0.04$ ) but not DBP ( $r = -0.17$ ,  $p = 0.21$ ). After controlling for MVPA in those with SBP  $> 120$  mmHg and DBP  $> 80$  mmHg, BMI remained independently correlated with SBP ( $r = 0.47$ ,  $p < 0.001$ ) and DBP ( $r = 0.34$ ,  $p = 0.01$ ).

**CONCLUSION:** In this sample of overweight and obese young adults, there is evidence of elevated resting BP, and both excess body weight and low MVPA were associated with higher BP. These relationships suggest that low activity and excess weight may be important targets for young adults with elevated BP to reduce CVD risk.

Supported by the NIH (U01 HL096770)

295 Board #132 June 1, 11:00 AM - 12:30 PM  
**Pregnancy Blood Pressure And Exercise - Results From A Randomized Controlled Trial**

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 (No relationships reported)

**PURPOSE:** To evaluate the effect of regular exercise on maternal arterial blood pressure (BP) at rest and during uphill walking, in healthy former inactive pregnant women.

**METHODS:** A single blind, single center, randomized controlled trial including 61 out of 105 healthy, inactive nulliparous pregnant women, initially enrolled in a controlled trial studying the effect of 12 weeks of aerobic exercise on maternal weight gain. The intervention included participation in two 60 minutes aerobic dance classes per week for 12 weeks, in addition to 30 minutes of daily self-imposed physical activity. Primary outcome was the mean adjusted difference in change in resting systolic and diastolic BP from baseline to after intervention. Secondary outcome was the mean adjusted difference in change in systolic BP during uphill treadmill walking at critical power. Measurements were performed prior to the intervention (gestation week 17.6±4.2) and after the intervention (gestation week 36.5±0.9).

**RESULTS:** At baseline, resting systolic and diastolic BP was 115/66±12/7 and 115/67±10/9 mmHg in the exercise (n=35) and control group (n=26), respectively. After the intervention, resting systolic BP was 112±8 mmHg in the exercise group and 119±14 mmHg in the control group, giving a between group difference of 7.5 mmHg (95% CI 1.5 to 12.6, p=0.013). Diastolic BP was 71±9 and 76±8 mmHg, with a between group difference of 3.9 mmHg (95% CI -0.07 to 7.8, p=0.054). During uphill treadmill walking at critical power, the between group difference in systolic and diastolic BP was 5.9 mmHg (95% CI -4.4 to 16.1, p=0.254) and 5.5 mmHg (95% CI -0.2 to 11.1, p=0.059), respectively.

**CONCLUSION:** Aerobic exercise reduced resting systolic BP in healthy former inactive pregnant women.

296 Board #133 June 1, 11:00 AM - 12:30 PM  
**The Completeness Of Intervention Descriptions In Randomised Trials Of Supervised Exercise Training In Peripheral Arterial Disease**

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 (No relationships reported)

**PURPOSE:** The purpose of this review was to evaluate the completeness of intervention descriptions in randomised trials of supervised exercise training in people with peripheral arterial disease (PAD).

**METHODS:** A systematic search strategy was used to identify relevant trials published until June 2015. Intervention description completeness in the main trial publication was assessed using the Template for Intervention Description and Replication checklist. Missing intervention details were then sought from additional published material and by emailing authors.

**RESULTS:** Fifty-eight trials were included, reporting on 76 interventions. Within publications, none of the interventions were sufficiently described for all of the items required for replication; this increased to 24 (32%) after contacting authors. Although programme duration, and session frequency and duration were well-reported in publications, complete descriptions of the equipment used, intervention provider, and number of participants per session were missing for three quarters or more of interventions (missing for 75%, 93% and 80% of interventions, respectively). Furthermore, 20%, 24% and 26% of interventions were not sufficiently described for the mode of exercise, intensity of exercise, and tailoring/progression, respectively. Information on intervention adherence/fidelity was also frequently missing: attendance rates were adequately described for 29 (38%) interventions, whereas sufficient detail about the intensity of exercise performed was presented for only 8 (11%) interventions.

**CONCLUSIONS:** Important intervention details are commonly missing for supervised exercise programmes in the PAD trial literature. This has implications for the interpretation of outcome data, the investigation of dose-response effects, and the replication of protocols in future studies and clinical practice.

297 Board #134 June 1, 11:00 AM - 12:30 PM  
**The Effectiveness of Exercise Prescription in Patients Treated for Peripheral Artery Disease of Lower Limbs**

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Exercise training markedly improves walking ability in patients with peripheral artery disease and intermittent claudication. However, the effectiveness of these programs is poorly described when co-administered along with conventional pharmacological therapy. **PURPOSE:** To compare responses in selected hemodynamic outcomes among patient suffering from peripheral artery diseases of lower limbs assigned to medication therapy (MT), and medication therapy and prescribed exercise (MTPE). **METHODS:** Sixty-four male patients participated in this study, with participants separated into MT group (n=33) and MTPE group (n=31). Exercise program included 3-5 sessions per week lasting for 30 to 50 min, during 4-month period. The claudication distance and peak systolic velocity (PSV) were measured for both groups at beginning and at the end of the study. **RESULTS:** At follow up, both PSV and claudication distance improved in MT and MTPE as compared to the baseline (p < 0.05), with the degree of improvement or claudication distance was higher in MTPE group (97.5 vs 61.72%; p < 0.01). **CONCLUSION:** Prescribed exercise program improved clinician-reported outcomes in men with peripheral artery disease when co-administered with pharmacological therapy.

298 Board #135 June 1, 11:00 AM - 12:30 PM  
**Affective Responses to High and Moderate Intensity Interval and Continuous Exercise in Adults with Asthma**

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Subjective enjoyment is an important component of exercise adherence; however, limited research exists on subjective measures of effort, dyspnea, and enjoyment for high intensity interval exercise (HIIE) in adults with exercise induced asthma (EIA). EIA is associated with an increase in dyspnea during exercise which may lead to greater perceptions of in-task effort and lesser physical activity enjoyment.

**PURPOSE:** To examine in-task perceptions of effort, dyspnea, and affective feelings during HIIE, moderate intensity interval exercise (MIIE) and moderate intensity continuous exercise (MICE) in adults with EIA. **METHODS:** Nine adults with EIA (age: 21.1 ± 3.2 years) completed the 3 exercise sessions in random order at least 72 hours apart. Protocols were as follows: HIIE (90% peak power output (PPO) for 1 minute, 10% PPO for 1 minute, repeated 10 times), MIIE (65% PPO for 1 minute, 10% PPO for 1 minute, repeated 10 times) and MICE (65% PPO for 20 minutes). Ratings of perceived exertion (RPE), ratings of perceived dyspnea (RPD), and affective feelings (1-Item Feelings Scale, scale from -5 to 5, higher numbers indicate more positive experience) were monitored each minute during exercise. Participants also completed the Physical Activity Enjoyment Scale (scale from 1- 126, higher numbers indicate more enjoyment) following each exercise protocol. **RESULTS:** RPE was significantly greater during MICE (12.9 ± 1.6) as compared to MIIE (9.3 ± 1.6, p=0.001) and HIIE (11.2 ± 1.7, p=0.011). RPD was also significantly greater during MICE (3.9 ± 1.6) as compared to the MIIE (1.6 ± 0.9, p=0.006) and HIIE (2.6 ± 1.1, p=0.055). Affect was significantly greater in the last interval of MIIE (2.43 ± 1.4) compared to the end of MICE (-0.28 ± 3.9, p=0.46). A trend towards significance was observed for the last interval between MIIE and HIIE (0.43 ± 3.1, p=0.056). No differences in affect were observed between MICE and HIIE. Similar trends were noted when comparing average affect between protocols. Physical activity enjoyment scores did not differ between the MIIE (102.4 ± 4.6, NS), HIIE (103.8 ± 6.0, NS), compared to MICE (96.4 ± 6.3). **CONCLUSION:** Interval exercise is associated with lower perceived effort and dyspnea as well as greater affect when compared to MICE. Therefore interval exercise may be a more palatable prescription for those with EIA.

299 Board #136 June 1, 11:00 AM - 12:30 PM  
**Does the Nordic Walking Improve Bone Mineral Density in Japanese Community-dwelling Adults?**  
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 (No relationships reported)

**PURPOSE:** Recently, Nordic walking (NW) has been widely used as a walking exercise for rehabilitation and health promotion in Japan. In a previous study, Jigami reported that NW increased muscle activity of erector spinae, rectus abdominis and other Local muscles. Such trunk muscle activity may cause increased vertical compressive forces of the spine, which may increase the mechanical stress on the lumbar. Consequently, it is expected that the bone mineral density (BMD) of the lumbar spine would increase. Therefore, the purpose of this study was to clarify the long-term effects of BMD performed by NW in community-dwelling adult women. **METHODS:** In this study, 23 community-dwelling adult women (69.4±8.3 y/o) were recruited. They performed NW for 8 weeks. Physical function, BMD and a questionnaire about daily living activity were measured at pre-, post- and at 6 months after the intervention. Physical function included height, body weight, muscle strength (knee and trunk), 30-second chair stand test (CS-30) and the Timed Up and Go Test. BMD was measured at lumbar supine 2-4 by the dual-energy X-ray absorptiometry (DXA) method. In addition, the participants were required to fill in an exercise diary, and we confirmed the times and frequency of the self-exercise. Finally, these items were statistically analyzed. **RESULTS:** The muscle strength of trunk flexion (pre-; 8.7, post-; 10.9 N) and CS-30 were improved at post-intervention (pre-; 21.7, post-; 23.9 times). BMD was not significantly different at post-intervention; however, it showed significant improvement at 6 months after the intervention (pre-; 0.997, post-; 1.003 and 6M; 1.033 g/cm<sup>2</sup>) (p<0.05). **CONCLUSIONS:** Bone turnover markers, ultrasound evaluation and DXA were used to evaluate the BMD. DXA needed a certain period after the intervention because the effect of intervention did not reflect in the result. In this study, although there was not a significant improvement between pre- and post-intervention, BMD was significantly improved after 6 months. Since there was no control group in this study, improvement of the BMD cannot be attributed to only NW. However, the muscle strength, activity of daily living and self-efficacy of outdoor walking was changed in the 8-week intervention. It is suggested that these changes caused the improvement of BMD.

300 Board #137 June 1, 11:00 AM - 12:30 PM  
**Relationship between Body Composition and Physical Activity with Bone Mineral Density in Postmenopausal Women 40-60**  
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Osteoporosis is a debilitating disease diagnosed by either a fragile fracture or bone mineral density test (DXA). DXAs are typically not ordered or covered by insurance until women are over 65. There is a need for noninvasive, easily administered, readily available screening tools that can predict low bone mineral density before significant losses occur. **PURPOSE:** To determine the relationship between objectively measured physical activity (accelerometry), lower extremity strength (sit to stand test) and body composition with bone mineral density in otherwise healthy, community dwelling women. **METHODS:** A secondary, exploratory analysis of baseline data from post-menopausal women (n=150) collected as part of a larger RCT of 290 women. Bone mineral density (BMD): femoral neck (FN), total femur (TF), and lumbar spine (LS) (L1-L4) and body composition: total fat mass (FM), total lean mass (LM), and lower extremity lean mass (LELM) were measured by DXA (GE model iDXA; software 14.10.002). Lower extremity strength was measured with timed stand test. Physical activity (PA) was measured by accelerometers (Actigraph GT3+) worn on the non-dominant wrist for 4 days (n=103/155) and analyzed using Actilife software (v 6.12, 60 second epochs) to determine minutes of activity of varying intensities. **RESULTS:** No statistically significant relationships between PA (sedentary, light or moderate activity) and BMD at the FN, TF or LS (p>0.05). BMI, LM and FM were significantly related to FN (r<sup>2</sup>=0.28, r<sup>2</sup>=0.29, r<sup>2</sup>=0.28) and TF (r<sup>2</sup>=0.36, r<sup>2</sup>=0.27, r<sup>2</sup>=0.34) (p<0.001). LELM had a significant relationship with FN BMD (r<sup>2</sup>=0.24, p<0.001). When adjusted for BMI, FM was no longer statistically significant at FN and TF (p>0.05) while both LELM and total lean mass remained significant at the FN (p<0.001). No statistically significant relationship was found between sit to stand time and BMD (p>0.05). **CONCLUSION:** In middle aged women, BMI, FM and LM are related to FN & total femur BMD. When controlled for BMI, only LM remained predictive of BMD

supporting the potential for an easy, noninvasive measurement of lower extremity strength. However, neither PA (wrist worn accelerometer) nor the sit to stand test were significantly related to BMD.  
 Supported by NIH/NINR Grant: R01NR013913,Ryan

**A-43 Exercise is Medicine®/Poster - Exercise and Metabolic Factors**  
 Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
 Room: Exhibit Hall A/B

301 Board #138 June 1, 9:30 AM - 11:00 AM  
**Behavioral Markers Of Hypertriglyceridemia And Determinants Of Its Normalization By A Lifestyle Modification Program.**  
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 (No relationships reported)

Hypertriglyceridemia is a component of metabolic syndrome associated with the atherogenic-lipid profile. In free-living subjects high triglycerides levels (TG) are secondary to behavioral lifestyle. **PURPOSE:** To determine the significant behavioral and body-related markers of high TG and their responses to a Lifestyle Modifications Program (LSMP). **METHODS:** The cross-sectional study involved retrospective data of anthropometric, dietary, clinical (blood pressure), plasma biochemistry (urea, HOMA-IR, cholesterol fractions, uric acid,  $\gamma$ -GT and hs-CRP) and VO2max variables from 667 subjects (54.5±11.2 years old, 78.5% females) enrolled in the LSMP from 2004 to 2015. From those, 304 subjects (56.7±9.9 years old, 67.5% females) were submitted to a 10 wk-LSMP composed by 100 min sessions (5x/wk) of supervised combined aerobic exercises (walking and strength). Measurements were done at baseline (M0) and end (M1) of the intervention period along with dietary adequacy advising. Statistical comparisons were undertaken at p=0.05. **RESULTS:** The lower (101mg/dL) and the higher (185mg/dL) quartiles of TG were discriminated by variables: BMI, WC, %body fat, ingested kcal/d, CHO, saturated fat, plasma urea and VO2max. The lower quartile of TG was differentiated from the higher two quartiles (p50=138mg/dL) for the variables, abdominal sagittal diameter (ASD), ingested sugar, protein, MUFA and PUFA whereas all four quartiles of TG were discriminated each other by  $\gamma$ -GT, hs-CRP, HOMA-IR, uric acid, total and HDL-cholesterol. The longitudinal study showed that 171 subjects presented TG>150mg/dL (56.3%) at M0 and, after the 10 wk-LSMP intervention 38.6% of those had their TG normalized. The major determinants of the TG normalization were the decreasing of ASD,  $\gamma$ -GT, hs-CRP and blood pressure. **CONCLUSIONS:** Higher plasma TG are determined by body and abdominal fat in association with higher ingested calorie sources and lower aerobic capacity. Plasma variables of liver inflammation, insulin resistance and pro-oxidative states are the most sensitive markers. The successfully normalization of hypertriglyceridemic subjects with 10 wk-LSMP intervention was determined by the decreasing of the abdominal fat (ASD), inflammatory ( $\gamma$ -GT and hs-CRP) and blood pressure markers. Supported by CAPES and CNPq.

302 Board #139 June 1, 9:30 AM - 11:00 AM  
**Associations Of Fitness, Physical Activity, And Obesity With Heart Rate Recovery In Young Adults With Overweight And Obesity**  
 Sophy J. Perdomo, Bethany Barone Gibbs, Kelliann K. Davis, FACSM, Renee J. Rogers, Lisa Wisniewski, John M. Jakicic, FACSM. *University of Pittsburgh, Pittsburgh, PA.* (Sponsor: John M Jakicic, FACSM)  
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Impaired heart rate recovery (HRR) is indicative of autonomic dysfunction and is predictive of all-cause mortality and cardiovascular events. HRR is inversely associated with moderate-to-vigorous intensity physical activity (MVPA) and obesity. Whether light intensity physical activity (LPA) is also associated with HRR has not been examined. **PURPOSE:** To evaluate cross-sectional associations of LPA, MVPA and obesity with HRR in young adults. **METHODS:** 455 young adults who were overweight or obese (age=30.1±3.7 years; BMI=31.5±3.9 kg/m<sup>2</sup>) participated in this study. Fitness was assessed from a submaximal graded exercise test to 85% of age-predicted maximal heart rate. HRR

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was computed as peak exercise heart rate minus heart rate at 1 minute (HRR-1) and 2 minutes (HRR-2) during active recovery following the exercise test. LPA [minutes of activity between 1.5 to <3 metabolic equivalents (METs)] and MVPA [minutes of activity  $\geq 3$  METs and  $\geq 10$  minutes in duration] were assessed objectively using the SenseWear armband that was worn for 7 days. LPA and MVPA data were considered valid if the armband was worn for at least 4 days for  $\geq 10$  hours per day.

**RESULTS:** Bivariate analyses showed that both HRR-1 and HRR-2 were significantly associated with BMI ( $r=-.15$ ,  $p=0.003$ ;  $r=-.23$ ,  $p<0.001$ ), fitness ( $r=0.34$ ,  $p<0.001$ ;  $r=0.47$ ,  $p<0.001$ ), and MVPA ( $r=0.22$ ,  $p<0.001$ ;  $r=0.26$ ,  $p<0.001$ ), but not LPA ( $r=0.04$ ,  $p=0.41$ ;  $r=0.03$ ,  $p=0.52$ ). Variables shown to be associated with HRR-1 were examined in multivariate regression, and fitness ( $\beta_{\text{std}}=0.292$ ,  $p<0.001$ ) and MVPA ( $\beta_{\text{std}}=0.105$ ,  $p=0.035$ ) were significantly associated but BMI was not ( $\beta_{\text{std}}=-0.033$ ,  $p=0.510$ ). A similar pattern was observed for HRR-2 with both fitness ( $\beta_{\text{std}}=0.407$ ,  $p<0.001$ ) and MVPA ( $\beta_{\text{std}}=0.118$ ,  $p=0.011$ ) significantly associated with HRR, but not BMI ( $\beta_{\text{std}}=0.069$ ,  $p=0.141$ ).

**CONCLUSIONS:** In this population of young adults with overweight or obesity, LPA was not significantly associated with HRR. However, MVPA, but not BMI, was associated with HRR independent of fitness. These results highlight the importance of MVPA, rather than BMI, on autonomic function in young adults who are overweight or obese. Moreover, these findings may inform intervention approaches to maximize health benefits in this population.

Supported by the NIH (U01 HL096770)

303 Board #140 June 1, 9:30 AM - 11:00 AM  
**Comparative Effects of Interval Nordic Walking and Normal Walking in Overweight Middle-Aged Women**

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(No relationships reported)

<Recently, Nordic walking (NW) is becoming widely used in health and leisure time sports. It elicits higher metabolic and cardiovascular demands than the normal walking (W). However, the comparison between NW and W training in overweight individuals was not examined.

**PURPOSE:** To compare the effects of a NW interval training program to those of a W interval training program on physical health and exercise capacity in previously sedentary overweight middle-aged women.

**METHODS:** Twenty-two volunteers (age=50.2 yrs., BMI=24.6 kg/m<sup>2</sup>) were recruited, and divided into three groups; NW (n=8), W (n=7), and control (C=7). Body mass (BM), BMI, body fat mass (BF), heart rate (HR), blood pressure (BP), VO<sub>2</sub>peak, grip and leg strength, bone mass and geriatrics of depression scale were measured before and after the training period. HR and rating of perceived exertion (RPE) were recorded during all training sessions. Interval training consisted of 6 x 5 min with 4 min at preferred walking speed + 1 min. maximal walking speed, and trained three days per week for 12-week. Training effects were analyzed by a two-way ANOVA.

**RESULTS:** After the training period, BM (NW:55±4 →51±5, W: 54±5→51±6 kg), BMI (NW:24.8±2.2 →22.8±1.9, W:24.4±1.8→23.1±1.9 kg/m<sup>2</sup>), BF (NW:26±4 →24±3, W:25±3→23±2 %) and diastolic BP (NW:86±9 →79±8, W: 85±5→73±7 mmHg) changed significantly ( $p<0.05$ ) in both groups. VO<sub>2</sub>peak increased only in NW (23.7±2.6 →27.6±5.0 ml/kg/min,  $p60\%$  of HRR) were higher in NW than in W. The bone mass and RPE were not influenced by the modality of exercise.

**CONCLUSION:** NW could be a useful tool to improve physical health and exercise capacity in previously sedentary overweight middle-aged women. <

304 Board #141 June 1, 9:30 AM - 11:00 AM  
**Cardiorespiratory Fitness within an Obesity Risk Classification Model Identifies Men at Increased Risk of Mortality**

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(No relationships reported)

Guidelines for identification of obesity-related risk stratify disease risk using specific combinations of body mass index (BMI) and waist circumference (WC). Whether the addition of cardiorespiratory fitness (CRF), an independent predictor of disease risk, provides better risk prediction of all-cause mortality within current BMI and WC categories is unknown.

**PURPOSE:** To determine whether the addition of CRF improves prediction of all-cause mortality risk classified by established categorization of BMI and WC.

**METHODS:** Prospective observational data from the Aerobics Center Longitudinal Study (ACLS). A total of 31,267 men (mean (SD) age 43.9 (9.4) years completed a baseline medical examination during 1974-2002. Participants were grouped according to the following BMI- and WC-specific threshold combinations: Normal BMI of 18.5-24.9 kg/m<sup>2</sup>, WC threshold of 90 cm; overweight BMI of 25.0-29.9 kg/m<sup>2</sup>, WC threshold of 100 cm, and obese BMI of 30.0-34.9 kg/m<sup>2</sup>, WC threshold of 110 cm. Participants were classified by CRF as unfit or fit. Unfit was defined as the lowest fifth of the age-specified distribution of maximal exercise test time on treadmill among the entire ACLS population. The main outcome measure was all-cause mortality.

**RESULTS:** 1,399 deaths occurred over an average length of follow-up of 14.1 ± 7.4 years, for a total of 439, 991 person-years of observation. Males who were unfit and normal BMI with WC<90 cm and  $\geq 90$  cm had 95% (1.95, 1.34-2.83) [Hazard ratio, 95% confidence interval] and 163% (2.63, 1.58-4.40) higher mortality risk than males who were fit, respectively ( $p<.05$ ). Males who were unfit and overweight had 41% (1.41, 1.04-1.90) higher mortality risk with a WC <100 cm ( $p<.05$ ), but were at no greater risk (1.30, 0.92-1.84) if their WC was  $\geq 100$  cm ( $p=.14$ ). Males who were unfit and obese were not at increased mortality risk (1.37, 0.90-2.09) with a WC <110 cm ( $p=.14$ ), but were at 111% (2.11, 1.31-3.42) increased risk with a WC  $\geq 110$  cm ( $p<.05$ ).

**CONCLUSIONS:** For most of the BMI and WC categories, inclusion of CRF allowed for improved identification of males at increased mortality risk.

305 Board #142 June 1, 9:30 AM - 11:00 AM  
**Physical Activity and Sedentary Time in Primary Care Patients with Recent Intentional Weight Loss**

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**Purpose:** Regular physical activity (PA) is crucial for weight maintenance; sedentary time is receiving increasing attention as an important predictor of weight. In this study, we describe PA and sedentary time in primary care patients with recent voluntary weight loss and how each relates to weight loss.

**Methods:** Maintaining Activity and Nutrition through Technology-Assisted Innovation in Primary Care (MAINTAIN-pc) is a weight management trial using an electronic health record (EHR) platform. Individuals aged 18-75 with voluntary 5% weight loss in past 2 years (prior BMI  $\geq 25$  kg/m<sup>2</sup>) and no recent bariatric procedures were randomized to coaching + tracking tools (TT) or TT alone. We assessed percent weight loss prior to enrollment through EHR-verified measurements and PA and sedentary time as follows: 1) BRFSS PA estimate of minutes of moderate, vigorous, and moderate + vigorous PA (MVPA); 2) Omron pedometer with 2 week data collection protocol; 3) Sedentary Behavior Questionnaire (SBQ). We used Pearson/Spearman correlations to determine associations between PA and sedentary time and % weight loss at enrollment.

**Results:** We enrolled 194 participants in MAINTAIN-pc. At baseline, participants were 53.4 (SD 12.2) years old, 74% female, and 88% White. Average baseline BMI was 30.4 (5.9) kg/m<sup>2</sup>. Participants had lost an average of 11.3% (SD 6.6) of body weight prior to enrolling. 96% reported moderate PA and 62% vigorous PA. Median moderate PA was 160.0 (IQR 90, 300) minutes/week, vigorous PA was 60.0 (IQR 0, 145) minutes/week, and average MVPA was 240.0 (IQR 135, 420) minutes/week. Median daily step count was 5874.0 (IQR 3677, 7759). Average daily sedentary time was 8.3 (SD 3.5) hours. There were no associations between % weight loss and self-reported moderate PA ( $r=0.05$ ;  $p=0.52$ ), vigorous PA ( $r=0.09$ ;  $p=0.23$ ), MVPA ( $r=0.10$ ;  $p=0.14$ ), or sedentary time ( $r=-0.10$ ;  $p=0.16$ ). However, a higher objectively-measured step count was associated with a greater % weight loss at enrollment ( $r=0.25$ ;  $p=0.0012$ ). **Conclusions:** Objectively-measured pedometer steps but not self-reported MVPA or sedentary time were associated with recent weight loss in primary care patients enrolled in a weight loss maintenance trial. The findings suggest that objective monitoring of PA might be helpful in this population to achieve and maintain weight loss.

306 Board #143 June 1, 9:30 AM - 11:00 AM  
**Fitness · Interdisciplinary Support · Teaching ("Fit Start"); Piloting A Family-based Group Model For The Multidisciplinary Treatment Of Pediatric Obesity**

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**Purpose:** Challenged by reported low physical activity levels and evidence of low patient retention in our standard pediatric weight management treatment program,

providers in the Optimal Weight for Life (OWL) clinic and the New Balance Foundation Obesity Prevention Center at Boston Children's Hospital developed an alternative service delivery model. FIT Start is an intensive family based group program offering multidisciplinary clinical care, structured exercise, a supportive peer environment and outcomes assessment.

Methods: 12 week program ran from September - December 2014. 12 overweight or obese adolescent girls aged 11-15 y/o and their parents/guardians were recruited from the OWL clinic. 7 group clinical education sessions were held at the hospital covering nutrition, exercise and behavior change. Group exercise classes were held 2/week at the YMCA. Individual medical visits were conducted pre/post program.

Results: 92% of participants completed the program. Attendance: clinic sessions: 86%, Exercise classes: 81%. Significant improvement was found in aerobic fitness (change from baseline  $+2.3 \pm 2.1$ ,  $p=0.01$ ) as measured by the PACER test, and the Healthy Fitness Zone (change from baseline  $+7.2 \pm 6.5$ ,  $p=0.01$ ), which is an evidence based level of fitness associated with reduced risk of disease/risk factors standardized for age and gender and calculated from PACER test score. Improvement in BMI z score was significant (change from baseline  $-0.08 \pm 0.10$ ,  $p=0.03$ )

Conclusions: FIT Start provided a successful alternative model for pediatric weight management treatment. It has been widely reported that improvements in fitness are critical for health, particularly for overweight/obese youth, regardless of weight status. Importantly, this program demonstrated significant improvements in fitness, progress towards the Healthy Fitness Zone AND significant change in BMI z score. On post program survey 100% would recommend the program to a friend and a majority cited the peer support aspect of the group format as most valuable. Further research is needed to investigate the correlation between attendance and outcomes, the impact of this program model on clinical markers associated with obesity and the potentially positive financial implications of this model in the healthcare setting.

307 Board #144 June 1, 9:30 AM - 11:00 AM  
**Effects of Exercise Amount and Intensity on Total and Abdominal Adipose Tissue**

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Background: Although exercise is an established strategy for reducing obesity, the separate effects of exercise differing in amount and intensity on total and abdominal obesity continues to be the source of uncertainty and debate.

Objective: The purpose of this study was to determine the separate effects of exercise amount (kcal/session) and intensity (% of  $VO_{2peak}$ ) on total and abdominal adipose tissue (AT) in obese adults.

Methods: Participants were 108 (60% female) sedentary, middle-aged (mean (SD) 52.7 (7.6) years, abdominally obese adults who completed a 24 week intervention. Participants were randomly assigned to: Control ( $n=21$ ), low amount, low intensity exercise (LALI) (180 and 300 kcal/session for women and men, respectively, at 50% of  $VO_{2peak}$ ,  $N=25$ ), high amount, low intensity exercise (HALI) (360 and 600 kcal/session for women and men respectively at 50%  $VO_{2peak}$ ,  $N=32$ ); high amount, high intensity exercise (HAHI) (360 and 600 kcal/session for women and men, respectively, at 75% of  $VO_{2peak}$ ,  $N=30$ ). Participants were asked to perform supervised exercise 5 times/week. MRI was used to measure abdominal and whole body adipose tissue. Unstructured physical activity performed outside of the prescribed exercise was monitored using accelerometers.

Results: Exercise duration in minutes was 32 (4.8) for LALI, 58 (6.6) for HALI, and 40 (6.7) for HAHI. There was no change in unstructured physical activity or caloric intake between exercise groups. Reduction in total AT, subcutaneous AT, total abdominal AT, abdominal SAT, lower body AT, weight and waist circumference were greater in all exercise groups compared to control at 24 weeks ( $p<0.05$ ). Reduction in VAT was greater in LALI ( $-0.5$  kg; SE, 0.1;  $p=0.001$ ), HALI ( $-0.5$  kg; SE, 0.1;  $p<0.001$ ), and in HAHI ( $-0.5$  kg; SE, 0.1;  $p=0.14$ ). Skeletal muscle did not change at 24 weeks within any exercise group compared to control ( $p>0.32$ )

Conclusion: Substantial reduction in total and abdominal AT with a preservation of skeletal muscle mass was observed independent of exercise amount and intensity.

308 Board #145 June 1, 9:30 AM - 11:00 AM  
**Building An Economic Case For Physical Activity As An Intervention For Diabetes In Developing Countries**  
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In Sub-Saharan Africa, the rapid increase in the prevalence of diabetes has resulted in significant public health and socioeconomic liability in the face of scarce resources. Faced with a growing pandemic of non-communicable diseases, developing countries need to be proactive in investigating alternative cost-effective interventions, with the primary aim being to minimize illness and maximize health benefits relative to the limited available resources.

PURPOSE: The aim of this research was to investigate if there was an economic case for physical activity as a primary and secondary preventative measure for type 2 diabetes in a developing country.

METHODS: The study was quantitative in nature and used both primary and secondary data to conduct the cost analysis of a community based physical activity intervention. A questionnaire was administered to 40 patients at a diabetic clinic in a peri-urban community health care centre. Secondary data, consisting of clinic records and an extensive literature review, was used to source the remaining inputs needed for the cost analysis. In order to quantify benefit in the cost-benefit analysis, productivity loss was calculated over a period of 20 years and compared to productivity loss if no physical activity program was implemented.

RESULTS: Results revealed that, for the chosen clinic and study sample, the implementation costs of a physical activity intervention for one year exceeded the costs of continuing the current pharmaceutical program (\$74 221 vs. \$63 992). Physical activity resulted in decreased short term and long-term productivity losses, with significant economic implications at a household level over a 20 year period.

CONCLUSION: Evidence reviewed suggests that physical activity could be used in primary prevention as a viable substitute to pharmaceutical therapy. For secondary disease prevention, however, physical activity was complementary in the production of health benefits, limiting disease progression and morbidity caused by illness. Implementation costs of a physical activity intervention exceed costs of continuing current pharmaceutical interventions, however, the short term and long term micro and macroeconomic gains build a strong case for physical activity as an intervention for type 2 diabetes in developing countries.

309 Board #146 June 1, 9:30 AM - 11:00 AM  
**Comparison Of The Effect Of Aerobic And Resistant Exercise On Blood Glucose In Pre-diabetes**  
 Xijuan Luo<sup>1</sup>, Zhengzhen Wang<sup>2</sup>, Ling Zhu<sup>3</sup>, Xiaolan Zhao<sup>4</sup>, Ni Pan<sup>2</sup>, Li Zhao<sup>2</sup>. <sup>1</sup>Sun Yat-sen University, Guangzhou, China. <sup>2</sup>Beijing Sport University, Beijing, China. <sup>3</sup>Beijing Hospital Health Management Center, Beijing, China. <sup>4</sup>Southwest Hospital Health Management Center, Chongqing, China. (Sponsor: J. Larry Durstine, FACSM)  
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PURPOSE: The intervention effect of aerobic exercise in pre-diabetes (IGR) is widely accepted, but the effect of resistant exercise is still inconsistent. We compared the effect of aerobic and resistant exercise on blood glucose in order to control and reverse IGR better for 2-DM prevention. METHODS: According to Randomized Controlled Trial (RCT), we divided the IGR subjects into 3 groups randomly, aerobic, resistant and control groups. The change in blood glucose after 12-week intervention was compared among the three groups. RESULTS: (1) The following table shows fasting plasma glucose (FPG), plasma glucose 2-hour after oral glucose test (OGTT 2hPG) and glycosylated serum protein (GSP) before/after intervention and their variance ratio ("\*": decline. \* $P<0.05$ , \*\* $P<0.01$  compare with the value before intervention in the same group. # $P<0.05$ , ## $P<0.01$  compare with control group).

| Group     | N  | Intervention stage | FBG (mmol/L)             | OGTT2h BG (mmol/L)         | GSP (umol/L) |
|-----------|----|--------------------|--------------------------|----------------------------|--------------|
| Aerobic   | 26 | Before             | 6.19±0.57                | 9.05±1.36                  | 197.03±25.48 |
|           |    | After              | 5.78±0.42**              | 7.07±1.10**                | 202.44±29.02 |
|           |    | Variance ratio(%)  | -6.17±8.46 <sup>##</sup> | -20.39±17.12 <sup>##</sup> | 3.51±13.97   |
| Resistant | 23 | Before             | 6.09±0.68                | 9.17±1.65                  | 208.61±49.23 |
|           |    | After              | 5.78±0.72*               | 7.47±1.09**                | 197.75±22.47 |
|           |    | Variance ratio(%)  | -4.81±9.26 <sup>##</sup> | -16.50±15.33 <sup>##</sup> | -1.51±20.77  |
| Control   | 21 | Before             | 5.86±0.58                | 8.60±1.20                  | 191.75±20.64 |
|           |    | After              | 5.88±0.57                | 7.73±1.44*                 | 203.51±22.54 |
|           |    | Variance ratio(%)  | 0.52±6.42                | -8.97±19.02                | 7.11±14.18   |

(2) 69.2% of the subjects in aerobic group and 43.5% in resistant group achieved normal FPG level after the intervention, while in control group was only 23.8%; (3) There were 65.2% IGR subjects whose GSP decline in resistant group with a large standard deviation (20.77%), which has significant difference compare with control group (23.8%).

**CONCLUSION:** (1) Both resistant and aerobic exercise intervention can lower blood glucose significantly in IGR. (2) There is no significant influence on GSP by both resistant and aerobic exercise, but individual difference is large in resistant group and more IGR people in resistant group decrease on GSP.

Supported by Specialized Research Fund for the Doctoral Program of Higher Education of China (20131112110002)

310 Board #147 June 1, 9:30 AM - 11:00 AM  
**Association Between Exercise, Cardiorespiratory Fitness and Change in Insulin**

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(No relationships reported)

**Title:** Association between exercise, cardiorespiratory fitness and change in insulin sensitivity

**Background:** Cardiorespiratory fitness (CRF) is an established predictor of insulin sensitivity. Whether this association persists following control for exercise is unclear.

**Purpose:** The primary objective of this study was to investigate the associations between changes in exercise, CRF and insulin sensitivity.

**Methods:** Participants were 140 middle aged [mean (standard deviation), 52.6 (7.7) yrs], abdominally obese (WC: 110.2 (11.5) cm), inactive adults that participated in a 24-week exercise trial. Exercise was performed 5 times per week for the duration of the trial. Exercise-induced energy expenditure (exercise EE) was determined using an individually adjusted heart rate to energy expenditure relationship for each exercise session. CRF was measured using a maximal treadmill test. Waist circumference (WC) was measured at the level of the iliac crest. Daily physical activity performed outside of the exercise sessions was measured by accelerometry. Caloric intake and diet composition was monitored using daily diet records. A 75-gram, 2-hour oral glucose tolerance test was used to determine insulin area under the curve (IAUC).

**Results:** Change in IAUC was associated (p 0.05). After further adjustment for change in WC, neither exercise EE (r = -0.16, p = 0.07) nor change in CRF (r = 0.03, p > 0.10) were associated with change in IAUC. Change in WC was associated with IAUC (r = 0.35, p < 0.001) independent of exercise EE and CRF.

**Conclusions:** Exercise was associated with improvement in insulin sensitivity independent of change in CRF, whereas the opposite was not true.

311 Board #148 June 1, 9:30 AM - 11:00 AM  
**High-intensity Low-volume Training Improves Glycemic Control and Functional Fitness in Type 2 Diabetics**

Chelsea R. Slagowski<sup>1</sup>, Sarah E. Dixon<sup>1</sup>, Rebecca C. Moynes<sup>1</sup>, Boyi Dai<sup>1</sup>, James S. Skinner, FACSM<sup>2</sup>, Derek T. Smith<sup>1</sup>.  
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(No relationships reported)

In the U.S., ~21 million people have Type 2 Diabetes (T2D) and 86 million prediabetes. Resistance Training (RT) improves muscular strength/endurance, body composition, functional fitness and glycemic control in diabetic populations. Lack of time remains a leading perceived barrier to regular exercise. bioDensity™ is a time-sparing, low-volume, high-intensity RT approach that consists of four exercises performed for 5 seconds each at a voluntary-maximal intensity once a week and may overcome this barrier. **PURPOSE:** To determine the efficacy of 24 weeks of bioDensity™ RT on indicators of glycemic control (fasting plasma glucose (FPG), insulin, HbA<sub>1c</sub>, insulin resistance) and functional fitness parameters in prediabetic/T2D participants. **METHODS:** Nineteen participants (N=7/12 males/females; 10/9 T2D/prediabetes; 59.1±7.9 years; BMI = 31.1±7.7 kg/m<sup>2</sup>; FPG=121±30 mg/dL, 53%

medicated) completed 24 weekly bioDensity training sessions. Baseline and 24-week testing included: FPG, insulin, HbA<sub>1c</sub>, body composition (DXA), Y-Balance test, functional fitness testing, and muscular force production tests. Intention-to-treat analysis was applied with paired t-tests and RMANOVA. **RESULTS:** After 24 weeks, force production increased (P<0.05 all): chest press 30.0±36.7%; leg press 87.0±78.3%; and vertical lift 68.5±69.3 without change in lean or fat body mass. Core pull force production did not change. FPG decreased 11 mg/dL (P=0.03) and HbA<sub>1c</sub> improved (7.0±1.0 vs. 6.6±0.8; P=0.01) in T2D. Right and left composite balance scores improved 7.1 and 8.8% (P<0.05), respectively; and functional fitness improved (chair stand, get-up-go, and muscular endurance; P<0.05) in both T2D and prediabetes participants. **CONCLUSION:** This is the first study to demonstrate that the low-volume high-intensity bioDensity resistance training approach improves measures of glycemic control and functional fitness in a T2D. The health-promoting changes of this intervention were more pronounced in T2D compared to prediabetics, but metabolically beneficial and clinically significant adaptations occurred in both impaired glucose tolerance groups with stable/unchanged pharmacotherapy. This study is limited by the absence of a randomized control trial design, but findings are promising in the presence of conservative analysis.

312 Board #149 June 1, 9:30 AM - 11:00 AM  
**Breaking Prolonged Sitting With Different Physical Activity Protocols And Metabolic Risk: A Randomized Cross-over Trial.**

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**Objective**

To investigate the effects of breaking prolonged sitting with different physical activity protocols on metabolic risk in sedentary subjects.

**Methods**

Seven sedentary adult healthy males (BMI: 24.9±5.0 Kg/m<sup>2</sup>) underwent four 24-h interventions in a randomized cross-over design: SIT-subjects sat for 9h; STAND-subjects stood for 15 min every 30 min during 9h of sitting; MVPA-subjects performed a 30-min moderate-intensity exercise bout (~50% VO<sub>2</sub>max), after which they sat for the remaining 8h; MVPA+STAND-subjects performed a 30-min moderate-intensity exercise bout and subsequently stood for 15-min every 30 min during the remaining 8h of sitting. On each trial, subjects were assessed for 24-h energy expenditure (Actiheart monitor), ate three standardized meals (55% CHO, 30% fat, 15% protein), and stayed overnight. Blood samples were collected 10 min before, and 30, 60, 120 and 180 min after meals for the postprandial response assessment of plasma glucose, insulin, and lipids (defined as the 9-h cumulative area under the curve).

**Results**

24-h energy expenditure was lower during SIT (1937±435Kcal) and STAND (1945±425 Kcal) when compared with MVPA (2692±189 Kcal) and MVPA+STAND (2565±589 Kcal) (p<0.05, between-conditions). A tendency towards a higher glucose response was observed during SIT (3075±312 mmol/L) when compared with STAND (2900±174 mmol/L; p=0.07) and MVPA+STAND (2899±180 mmol/L; p=0.07), but not with MVPA (2970±181 mmol/L; p=0.2). A higher insulin response was observed during SIT (206975±109164 pmol/L) when compared with MVPA+STAND (163536±74553 pmol/L; p=0.05), with STAND (183218± 80656 pmol/L; p=0.13) and MVPA (181894±97431 pmol/L; p=0.12), although the latter two comparisons did not reach significance. A lower LDL-cholesterol response was observed during MVPA (1395±573 mmol/L) when compared with SIT (1519±661 mmol/L; p=0.05).

**Conclusion**

Preliminary results suggest that breaking sitting with intermittent standing bouts led to lower glucose post-prandial responses regardless of MVPA. On the other hand, a moderate exercise bout led to lower LDL post-prandial responses, regardless of breaking sitting. Finally, both intermittent standing and MVPA led to lower post-prandial insulin responses, although only the combination of the two strategies led to a significantly improved response.

**A-44 Exercise is Medicine®/Poster - EIM in Clinical Practice, Universities and Communities**

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
 Room: Exhibit Hall A/B

**313 Board #150 June 1, 11:00 AM - 12:30 PM**  
**Exercise Vital Sign Correlates with Acute Coronary Events**

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Kaiser Permanente in Southern California (KPSC) has pioneered use of an exercise vital sign (EVS) to record minutes per week of PA at every visit. Given the established connection between regular PA and cardiovascular disease, it stands to reason that patients who report doing recommended amounts may be less likely to suffer an acute coronary event (ACE) than those who report being sedentary.

**PURPOSE:** To evaluate the correlation between self-reported PA level (using EVS) and the likelihood of suffering an ACE (defined as acute MI or revascularization procedure).

**METHODS:** Data were abstracted from electronic medical records of KPSC members (N=1,423,525) in a cohort study to investigate use of EVS in predicting an ACE. The cohort consisted of all adult patients (>18 yr.) with a minimum of 3 EVS measurements spanning over a year from January 1, 2009 to December 31, 2011, that did not have prior coronary events before or on the date of the last EVS measurement taken. Patients were classified into 1 of 3 distinct categories for EVS: Consistently Inactive (CI) EVS=0 min/wk for every measure), Insufficiently Active (IA) EVS 10-149 min/wk and Consistently Active (CA) EVS≥150 min/wk for every measure). Estimates were adjusted for age, Charlson comorbidity score, BMI, race/ethnicity, marital status, sex, and smoking status. Results are presented as hazards ratios (HR) with corresponding 95% confidence intervals (CI).

**RESULTS:** CA men were found to be less likely to experience an ACE compared to CI men (HR (CI) = 0.74 (0.63, 0.88)), while IA men were not found to differ significantly (HR = 0.91 (0.83, 1.01)). For women, being CA was found to result in nearly a 3 fold decrease in the hazard of an ACE (HR = 0.33 (0.25, 0.45)) compared to CI women. Women who IA were also found to be less likely to experience an ACE (HR = 0.79 (0.72, 0.87)) compared to CI.

**CONCLUSIONS:** Based on EVS data, we conclude that self-reported PA is strongly correlated with the likelihood of suffering an ACE. While we know regular PA has a potent protective effect on cardiovascular disease, this study suggests a low EVS similarly predicts increased risk for CVD. For this reason, any patient presenting with chest pain or other symptoms of an acute coronary event, should be asked about their exercise habits and a low EVS should add to the clinical suspicion for heart disease in such a patient.

**314 Board #151 June 1, 11:00 AM - 12:30 PM**  
**Perceptions Of The Exercise Ismedicine® Initiative: Implications For Integration Into Clinical Practice**

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 (No relationships reported)

**Perceptions of the Exercise isMedicine® Initiative: Implications for Integration**

**PURPOSE:** The purpose of this study was to examine the populations perceptions of the Exercise isMedicine®(EiM) initiative, as well as factors that influence the accurate perception of the EiM. **METHODS:** Participants (N=180; 29 clinicians, mostly NPs; 79 exercise science students at Univ. of Mississippi; 76 general population) ages 18-69 yrs old residing in Oxford, MS were surveyed for this study; the general population was sampled using a probability sampling approach.

**RESULTS:**

**Aim 1: Examine how participants define the term 'medicine'.**

A greater proportion of clinicians defined medicine as having both treatment and preventative aspects: 34.7% for clinicians, 20.2% for students, and 19.4% of the general population.

**Aim 2: Examine the extent to which participants are aware of the EiM.**

Awareness of the initiative was very low, but was slightly higher among clinicians (25.0%), compared to students (20.2%) and the general population (14.2%).

**Aim 3: Examine participants' perception of the EiM.**

A greater proportion of clinicians defined the EiM initiative as having both treatment and preventative aspects: 45.0% for clinicians, 34.7% for students, and 32.9% of the general population. However, there were proportional differences across the subpopulations as to whether they viewed the EiM initiative as being preventative only or treatment/management only; for example, 10.0%, 10.1% and 31.4% of clinicians, students, and general population, respectively, viewed the EiM as being preventative only.

**Aim 4: Identify factors that explain accurate perceptions of the EiM.**

Women, compared to men, had a 56% reduced odds of having an accurate perception of the EiM initiative (OR=0.44; P=0.05). When compared to those who perceived their health as excellent, those who perceived their health as 'good' had a 6-fold increased odds of having an accurate perception of the EiM initiative (OR=6.08; P=0.003).

**CONCLUSION:** All subpopulations, on average, were unaware of the initiative and had misguided or inaccurate perceptions that may reduce their responsiveness to the EiM initiative. Gender and health status predicted accurate perceptions of the initiative, which may need to be taken into consideration when evaluation the efficacy of the initiative.

**315 Board #152 June 1, 11:00 AM - 12:30 PM**  
**Quantification Of Physical Activity As An Exercise Vital Sign In A Pediatric Population**

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 (No relationships reported)

**PURPOSE**

Physical inactivity has become an increasing problem in our youth today and physical inactivity is an important independent factor in the development of chronic disease. Conversely, there is a rise in overuse injuries due to children specializing in sports earlier in their youth. The exercise recommendations by the American Academy of Pediatrics are 60 minutes of moderate to vigorous activity for all school aged youth daily, but research is limited to how many children actually meet these requirements. The goal of the survey was to quantify days, minutes, and exercise activity type of those presenting with an injury to a sports medicine clinic.

**METHODS**

All new patients presenting to outpatient sports medicine clinic were asked questions about their current exercise habits. Subjects self-reported the number of days per week, and minutes per day of moderate to vigorous activity. Moderate activity was described as sweating. Vigorous activity was described as breathlessness. Additionally subjects self-reported current activity participation in organized or unorganized activity.

**RESULTS**

120 subjects consisting of 50 males and 70 females responded to the survey. The mean age of respondents was 13.2 ±2.8 years. Mean days of exercise reported were 4 ±1.6 days. Mean minutes of daily exercise reported was 91.4±42.7 minutes. Mean minutes per week of exercise reported was 450.7±290.0 minutes. Mean activities responded per week was 2.35±1.2.

**CONCLUSION**

The questions provided a screening and quantified activity type, amount, and duration for children presenting to outpatient Sports Medicine clinic for a musculoskeletal complaint. The data gathered in this study demonstrate children are not meeting the daily exercise recommendation. Rather, this population exercised on fewer days with greater than 60 minutes of MVPA. 20% (24) of subjects reported greater than 150 minutes per day MVPA. The high volume training per session is a risk factor for musculoskeletal injury. 52% (63) of these subjects met the minutes per week recommended, and this cohort consists of organized sport participants. Currently, these screening questions serve as forum to discuss activity type, duration, and length as well as council patients on appropriate exercise habits.

**316 Board #153 June 1, 11:00 AM - 12:30 PM**  
**Combining Supervised Exercise And Physical Activity Counselling Might Increase Retention To GP Exercise Referral Programmes.**

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 (No relationships reported)

**Purpose** Evidence for the effectiveness of GP Exercise Referral is weak (1, 2). We examined traditional supervised exercise (TRAD), physical activity counselling (PAC), combined TRAD/PAC (CMB) and wait-list controls (CON) in a community exercise referral programme in South East London, UK. **Methods** PPs (n=141) were identified by their doctors as overweight and at increased risk of Type 2 Diabetes. PPs were randomly assigned to treatment. Measures were blood pressure and body composition at baseline and 12 weeks. **Results** One-way ANOVA of absolute change in dependant variables between treatments indicated that body fat mass, body fat % and systolic blood pressure were reduced at 12 weeks for all groups including CON. No statistically significant between-group effects were observed. Paired sample t-tests indicated that lean mass was significantly increased at 12 weeks for all groups including CON; diastolic blood pressure was significantly decreased for all groups at 12 weeks except PAC. Retention was highest to CMB (75%), followed by CON (68%), with PAC and TRAD both at 55%. **Conclusions** Treatment groups and CON appeared

to benefit from the programme, with likely measurement effects partially explaining improvement in CON. High retention to CMB is of significance to future GP Referral programmes.

**Table 1 Paired samples T-test comparing dependant variables at baseline and 12 weeks**

| Dependant variable              | Group | Baseline |       | 12 Weeks |      | t     | df | p     |
|---------------------------------|-------|----------|-------|----------|------|-------|----|-------|
|                                 |       | M        | SD    | M        | SD   |       |    |       |
| Body Fat Mass (kg)              | TRAD  | 31.5     | 14.2  | 30.2     | 14.2 | 1.82  | 20 | 0.08  |
|                                 | CMB   | 37.0     | 15.8  | 36.7     | 15.3 | 0.34  | 26 | 0.74  |
|                                 | PAC   | 33.4     | 11.2  | 32.2     | 10.7 | 2.49  | 18 | 0.02* |
|                                 | CON   | 31.8     | 11.9  | 31.3     | 12.0 | 1.36  | 44 | 0.18  |
| Body Fat percentage (%)         | TRAD  | 36.4     | 12.2  | 35.8     | 11.8 | 1.23  | 19 | 0.23  |
|                                 | CMB   | 37.8     | 9.4   | 36.9     | 8.7  | 1.64  | 25 | 0.11  |
|                                 | PAC   | 38.8     | 9.1   | 38.6     | 8.9  | 0.38  | 20 | 0.70  |
|                                 | CON   | 36.5     | 8.8   | 36.0     | 9.4  | 1.12  | 45 | 0.27  |
| Lean Body Mass (kg)             | TRAD  | 55.6     | 12.1  | 56.2     | 12.1 | -1.15 | 18 | 0.27  |
|                                 | CMB   | 61.3     | 13.5  | 61.5     | 12.7 | -0.36 | 24 | 0.72  |
|                                 | PAC   | 48.3     | 9.7   | 49.4     | 9.7  | -2.03 | 18 | 0.06  |
|                                 | CON   | 54.7     | 13.4  | 54.8     | 13.2 | -0.40 | 46 | 0.69  |
| Systolic Blood Pressure (mmHg)  | TRAD  | 128.2    | 19.0  | 126.7    | 15.2 | 0.67  | 26 | 0.51  |
|                                 | CMB   | 132.4    | 14.9  | 130.2    | 13.9 | 1.00  | 38 | 0.33  |
|                                 | PAC   | 132.3    | 19.7  | 124.2    | 18.2 | 2.80  | 21 | 0.01* |
|                                 | CON   | 129.0    | 18.2  | 127.0    | 18.1 | 1.22  | 52 | 0.23  |
| Diastolic Blood Pressure (mmHg) | TRAD  | 78.4     | 10.50 | 75.4     | 10.8 | 1.96  | 27 | 0.06  |
|                                 | CMB   | 81.9     | 8.6   | 79.4     | 8.6  | 2.20  | 37 | 0.03* |
|                                 | PAC   | 76.3     | 9.1   | 76.5     | 10.1 | -0.16 | 22 | 0.87  |
|                                 | CON   | 78.2     | 10.1  | 76.9     | 10.5 | 1.14  | 51 | 0.26  |

\* Denotes statistically significant difference  $P < 0.05$

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**317 Board #154 June 1, 11:00 AM - 12:30 PM**  
**Exercise Is Medicine (EIM) For Community Health: Linking Clinics And Communities Through Cooperative Extension**

Joel E. Williams<sup>1</sup>, Kathy Gunter, FACSM<sup>2</sup>, Anne Lindsay<sup>3</sup>, Samantha Harden<sup>4</sup>, Melinda M. Manore, FACSM<sup>2</sup>, Linda Houtkooper, FACSM<sup>5</sup>, Nobuko Hongu<sup>5</sup>, Sarah F. Griffin<sup>1</sup>.  
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**PURPOSE:** EIM has been an active ACSM initiative since 2007 with an initial focus on including physical activity as a vital sign in the electronic medical record. To do this effectively, EIM needs to determine how to link clinical and community health professionals for patient referral and follow-up using multiple models.

**METHODS:** This presentation highlights the ways in which the nationwide Cooperative Extension System (CES) can be leveraged to bridge the gap between clinics and communities to advance the EIM initiative. History, capacity, and resources associated with the CES will be presented.

**RESULTS:** The CES is a nationwide educational network that brings research and knowledge of land-grant institutions to urban and rural communities in each U.S. state and territory by linking the resources and expertise of 105 land-grant colleges and universities to local communities through USDA's National Institute for Food and Agriculture (NIFA). CES professionals offer a variety of face-to-face and electronically delivered education programs related to health promotion/disease prevention and also works to change community environments to make them healthier by working to link communities to local resources. The CES's National Framework for Health and Wellness, released in March 2014, includes strategic priorities related to health promotion and chronic disease prevention and management. The Agriculture

Act of 2014 (commonly known as the Farm Bill) included 'physical activity' as a component of the largest funded USDA program (Supplemental Nutrition Assistance Education Program), demonstrating that the CES, a previously agriculturally centered entity, has embraced physical activity promotion as part of its mission and values. **CONCLUSION:** While leveraging CES's trained health educators would improve the reach of EIM, we do not expect most CES professionals would become EIM credentialed professionals. Instead, these professionals could be trained and certified to deliver specific evidence-based or research tested intervention programs (e.g., Better Bones & Balance, Walk With Ease), which include a physical activity component, as a supplementary approach. Health educators may also serve as liaisons between clinicians and EIM certified health professionals.

**318 Board #155 June 1, 11:00 AM - 12:30 PM**

**Adapting the Exercise is Medicine Model for Community-Based Primary Health Care Clinics**

Jessica Montana<sup>1</sup>, Mark Stoutenberg<sup>2</sup>, Elizabeth Racine<sup>3</sup>, Corliss Allen<sup>3</sup>, Jennifer L. West<sup>1</sup>. <sup>1</sup>Cabarrus Health Alliance, Kannapolis, NC. <sup>2</sup>University of Miami Miller School of Medicine, Miami, FL. <sup>3</sup>University of North Carolina at Charlotte, Charlotte, NC.  
 (No relationships reported)

**PURPOSE:**

The Cabarrus County, NC Exercise is Medicine (EIM) initiative aims to reduce disparities in physical activity levels and chronic disease. As part of a CDC-funded Racial and Ethnic Approaches to Community Health grant, the EIM model of physical activity assessment, prescription and referral was adapted for primary care clinics primarily serving underinsured African American and Hispanic patients.

**METHODS:**

Existing EIM provider training tools were adapted to focus on walking and an inventory of existing free and low-cost community resources for walking was compiled. Tailored plans were drafted for each clinic's staff to administer the 2-question physical activity vital sign (PAVS), to write physical activity prescriptions, to provide referrals to free or low-cost resources, and to track patient progress. Providers at each clinic site were trained to write walking prescriptions based on PAVS responses and to refer patients to the identified resources.

**RESULTS:**

A free clinic, a federally-qualified health center with three locations, and the county health department participated in the EIM initiative. All sites currently administer the PAVS and four of the five sites were able to successfully integrate it into their electronic medical record (EMR) system. The PAVS responses over time was identified as the best way to track patient progress. Due to concerns about providers' time, allied health professionals (nurses, social workers, medical assistants and nutritionists) were included in the trainings. A total of 10 providers and 18 clinic staff completed the EIM training. It is expected that over 5,000 adult patients from our target populations will be reached through these clinics over the next year, including pregnant and post-partum women. Clinic staff feedback included being satisfied with the focus on walking but needing continuing support and education on counselling patients and tailoring prescriptions for other forms of exercise.

**CONCLUSIONS:**

Adaptations of the EIM model included being flexible about EMR integration, including clinic staff in provider trainings, and offering continuing education opportunities. These results provide direction for others implementing EIM in similar settings.

**319 Board #156 June 1, 11:00 AM - 12:30 PM**

**Effects Of Community-based Physical Activity Counselling Among At-risk Individuals**

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**Purpose.** Ensuring that at-risk groups are sufficiently physically active is a major public health challenge. Physical activity counselling (PAC) has shown some promise. However many programmes require multiple PAC sessions that are resource intensive and costly. We report a study of PAC – in this case the UK-based programme 'Let's Get Moving' – built around just one PAC session and delivered from general medical practitioner (GP) surgeries. **Methods.** Participants (n=1601, M±SD age = 41.4±21.8) were identified by their local GP surgeries as meeting one or more of the following: age 18-74, currently sedentary, BMI 28-35, and/or hypertensive, and/or first medication for hypertension in last 6 months, and/or first medication for weight management in last 6 months. Participants attended a PAC session with a local community exercise professional (CEP) who was based at the surgery. At this session participants were encouraged to increase their physical activity and to attend

community exercise sessions provided by local authorities. All participants received a telephone call at 6-weeks and attended a follow-up PAC session with the CEP at 12-weeks. Measures at 0 and 12 weeks were self-reported physical activity (MET-min/week) using the International Physical Activity Questionnaire short-form (IPAQ) and an additional question regarding sport participation. **Results.** Paired sample t-tests indicated significant increases in MET-min/week in Walking ( $M \pm SD = 404.6 \pm 1622.0$ ,  $p < 0.001$ ), Moderate Activity ( $M \pm SD = 151.8 \pm 1365.2$ ,  $p = 0.006$ ), Vigorous Activity ( $M \pm SD = 193.8 \pm 1439.7$ ,  $p = 0.001$ ), Total Activity ( $M \pm SD = 659.6 \pm 2742.3$ ,  $p < 0.001$ ), and Sport Participation ( $M \pm SD = 35.5 \pm 105.5$ ,  $p < 0.001$ ). Repeated measures ANOVA revealed a significant interaction suggesting that Vigorous Activity increased significantly more for females than males ( $F[1,533] = 3.981$ ,  $p = .047$ ). Reasons for this are unclear and warrant further investigation. **Conclusions.** Whilst the absence of controls and the self-report of physical activity are limitations, data suggest that brief PAC is an effective intervention when delivered to at risk individuals, and might be especially effective in encouraging females to adopt more vigorous activity. We also speculate that PAC's effectiveness is enhanced through being located at a GP surgery.

320 Board #157 June 1, 11:00 AM - 12:30 PM  
**Outcomes of Exercise is Medicine in Medical Students**  
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The EIM (ACSM) initiative offers professional preparation necessary to safely and effectively prescribe exercise to a patient population, to develop skills needed to work within the health care system and to develop skills needed to support sustained behavior change. **Purpose:** To determine whether exercise is medicine (EIM) action will be potentially learned and accepted at grass-root medical personnel, we implanted EIM activity into additional part of pre-clinical medical curriculum. **Materials and methods:** Medical students, 3<sup>rd</sup> year (n = 180), participated in part of EIM activity including physical fitness testing, self-interpretation and brain-storming exercise prescriptions. Basic knowledge, understanding on benefits of health-related exercise and future application of EIM were assessed via questionnaires. **Results:** Despite the fact that 46.9% of them realized the benefits of regular exercise, only 38.10% of medical students, themselves, exercised regularly for more than 3 times/wk. Students realized terms of NCD, metabolic syndrome and non-pharmacological intervention at 26.3, 46.3 and 39.4% respectively. About one-third (29.4%) of students had ever visited EIM Thailand website and 47.5% among them gained benefits from it. About half (55%) of them accepted that EIM action supported in-class understanding and might be a tool to solve public health problems (51.3%). They supported EIM action (46.3%) and thought that public health personnel should learn EIM as part of their services (46.9%). Finally, 54.4% of them will pick up EIM concepts for their future practice. Post-EIM participation showed the significant improvement in basic knowledge on health-related exercise ( $6.62 \pm 0.003$  in Pre- and  $6.95 \pm 0.001$  in Post-test, means  $\pm$ SEM) ( $p < 0.05$ ). **Conclusion:** Intervention of EIM action among pre-clinical medical students enhances positive learning outcomes and is accepted. Further investigations should be done continuously when these target groups study in the consecutive years.

Supported by EIM Thailand.

321 Board #158 June 1, 11:00 AM - 12:30 PM  
**Eim@-on Campus Solution: Student Learning, Health Promotion, And Research**  
 Renee M. Jeffreys-Heil, Shomari Kee, Cayla McAvoyn, Kevin Collins, Kristine Phillipine, Greg Jensen, Eric Shamus, Mitchell L. Cordova, FACSM. Florida Gulf Coast University, Fort Myers, FL. (Sponsor: Mitchell L. Cordova, FACSM)  
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Purpose: At Florida Gulf Coast University (FGCU) we have leveraged the Exercise is Medicine® - On Campus (EIM®-OC) solution to create cross campus partnerships among, Campus Recreation (CR), Student Health Services (SHS), Office of Service Learning and Civic Engagement (SL), and the Department of Rehabilitation Sciences (RS) to facilitate student learning, health promotion, and research. This abstract's aim is to share the EIM®@FGCU framework & baseline data. Methods: Phase 1 of the study was designed to build the collaborative framework and created a paperless data collection method. Mobile tablets were installed in SHS exam rooms to collect baseline data while patients were awaiting providers. In addition, exercise is a vital sign at all SHS visits and a procedure/referral code for the EIM@FGCU referral program(October 2015). Questionnaires are updated annually to capture additional

data on the current programs being offered. During the summer of 2015, Exercise Science (ES) Students created a campus wide marketing campaign to promote physical activity. The campaign includes: a social media arm (in partnership with CR), a monthly activity (ranging from Adaptive Recreation Day to the Great American Smoke Out), and promotion program that is delivered through campus housing. ES Students design and implement the monthly events as part of an ongoing SL project. Results: Between March and May 2015, 142 students on campus (6.6% response rate) completed the International Physical Activity Questionnaire assessing their baseline physical activity level which showed that 33% of the students at FGCU do not meet the minimum American College of Sports Medicine recommendation for physical activity. Overwhelmingly, the SL events have broadened the ES students experience and allowed them additional avenues to practice clinical skills. Campus Recreation has submitted the videos produced as part of EIM@FGCU to their national meeting, and SHS is using EIM@FGCU as part of their ongoing quality improvement metric for accreditation. Conclusions: Through improvement of the campus community health, EIM-OC can improve ES student learning and faculty research agendas. This project is funded by an internal, inter-professional grant from the College of Health Professions and Social Work at Florida Gulf Coast University.

322 Board #159 June 1, 11:00 AM - 12:30 PM  
**Mining for Gold in Long Beach: Achieving Gold Level Recognition for Exercise is Medicine on Campus**  
 Joshua A. Cotter, Kimberly Fodran, James Buenaventura, Ayla Donlin. California State University, Long Beach, Long Beach, CA.  
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 (No relationships reported)

Exercise is Medicine on Campus (EIM-OC) is a program designed to engage universities in the promotion of physical activity as critical for overall wellness, improving and maintaining health, and for disease prevention. ACSM launched a recognition program in 2014 to recognize participation in the program which includes bronze, silver, and gold level recognition. **PURPOSE:** The objective of this presentation is to highlight the activities and collaborations across the California State University, Long Beach (CSULB) campus that have allowed for successful implementation of EIM-OC and the achievement of gold level recognition in 2015. **METHODS:** During the planning stages for EIMOC implementation, an analysis of campus departments, centers, and programs was conducted to create a collaborative group that would optimally be able to reach students, faculty, and surrounding community with the goals outlined by the EIM-OC program. **RESULTS:** Currently, the EIM-OC leadership team at CSULB includes a diversified group of individuals from the Student Health Center, PT@The Beach (physical therapy faculty practice), Student Recreation and Wellness Center, LifeFit Center (educational laboratory for the College of Health and Human Services, and the Department of Kinesiology. Leadership is found in the form of faculty, students, and staff engaged in a variety of areas including health, fitness, recreation, wellness, rehabilitation, biomechanics, and physiology. Activities such as physical activity and health assessments, fitness counseling, technology implementation for activity monitoring, health education programs, workshops, and exercise prescriptions have already been successfully implemented. An open-house for EIMOC was recently well received by university leaders and an official EIM-OC student organization is currently awaiting approval. Future plans for significant involvement in large events both on and off campus are being planned as avenues for increasing community awareness of EIM. **CONCLUSIONS:** The EIM-OC leadership team at CSULB has made considerable progress since its inception in order to "mine for gold" level recognition by ACSM and has many future plans for creating a greater awareness of EIM on campus.

323 Board #160 June 1, 11:00 AM - 12:30 PM  
**Physical Activity Training in Australian Medical Education**  
 Halle Beeler<sup>1</sup>, Abigail Strong<sup>2</sup>, Emmanuel Stamatakis<sup>3</sup>, Anita Hobson-Powell<sup>4</sup>, Mark Hargreaves, FACSM<sup>5</sup>, Mark Stoutenberg<sup>2</sup>. <sup>1</sup>Wake Forest University, Winston Salem, NC. <sup>2</sup>University of Miami, Coral Gables, FL. <sup>3</sup>University of Sydney, Sydney, Australia. <sup>4</sup>Exercise & Sports Science Australia, Brisbane, Australia. <sup>5</sup>University of Melbourne, Melbourne, Australia.  
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**PURPOSE:** Previous research has demonstrated that Australian physicians do not feel comfortable communicating with their patients about participating in regular physical activity (PA). This shortcoming may be due to a lack of training during medical school. The purpose of this study was to determine the quality and quantity of PA training in Australian medical schools to better guide programs on how they can modify their curricula in order to improve the physician-patient interaction regarding daily PA.

**METHODS:**

The websites of all 19 accredited Australian medical schools were explored to determine the amount of PA training listed as a part of their curricula. Program leaders at each school were contacted, via email or telephone, to introduce the study and request an appointment to conduct the survey. When necessary, the option of completing an online version of the survey was offered. The survey asked program leaders to describe the amount, content, form, and timing of their PA training.

**RESULTS:**

No Australian medical school websites reported including PA training in their curricula. Seventeen (89%) completed either the phone interview or the online survey. Fifteen schools (88%) reported providing PA training with 8 (53%) providing instruction on the 2014 Australia's Physical Activity Guidelines. Nine of the 15 (60%) schools stated that their students received training on properly referring their patients who needed exercise, PA or physical therapy to an accredited professional. However, only 6 of these 15 (40%) schools reported that they felt their curriculum included a sufficient level of training to prepare students for counseling their patients on exercise/physical activity programs. The most common barriers that medical schools experienced in offering PA training was a lack of time to fit more material into their curricula.

**CONCLUSIONS:**

The majority of medical schools in Australia reported including PA training in their curricula, even though this training was not mentioned on their websites. While PA training is being included in Australian medical school curricula, there appears to be a need for greater emphasis on instruction regarding the national PA guidelines, how physicians can refer their patients to PA specialists, and ensuring that future physicians are adequately prepared to provide PA counseling.

324 Board #161 June 1, 11:00 AM - 12:30 PM  
**Examining Physical Activity Behaviors of Non-Athlete College Students: Insights for Exercise is Medicine Initiatives**  
 Elizabeth Stapleton, Melanie Midkiff, Erin Burke, Robert Powell. *Marshall University, Huntington, WV.*  
*(No relationships reported)*

Exercise is Medicine on Campus® (EIM-OC) calls upon Universities to promote physical activity (PA) as an important health indicator to students. Understanding student's current PA behaviors and what influences their participation in PA is necessary to effectively promote EIM-OC initiatives. **PURPOSE:** To examine the PA behaviors of college students enrolled at Marshall University in Huntington, West Virginia. **METHODS:** Marshall University students were recruited during EIM-OC week to assess their PA behaviors. Data was obtained through written surveys which queried about student's attainment of the current Physical Activity Guidelines for Americans (PAGA), reasons for engaging in PA and their use of recreational facilities. **RESULTS:** A total of 472 students not involved with University athletics completed the survey. Mean age was 20.5±3.3 years [26.9% freshmen, 21% sophomores, 17.8% juniors, 22.3% seniors and 11.7% graduate students]. Majority of students were female (55.1%) with a mean BMI of 25.4±5.30kg/m<sup>2</sup>. Eighty six percent of students are members of either the Campus REC or local fitness facility. However, only 39% (n=180) attend 3 or more days per week. Overall, 99.6% of students agree that PA is beneficial to college aged adults. Still, only 15.7% meet the current PAGA for moderate aerobic physical activity (MAPA); 8.5% for vigorous aerobic physical activity (VAPA) and 37.9% for resistance training (RT). Males are significantly more likely to meet the MAPA (p=.006); VAPA (p=.003) and RT guidelines (p<.001) compared to females. The most frequently cited reasons for engaging in PA is stress management (56.6%) and appearance (56.4%) followed by general health (48.7%), fitness (47.2%) enjoyment (45.1%) and sport (10%). Interestingly, of those who exercise for general health benefits (n=230), only 22.2% actually meet the PAGA for MAPA, 11.3% for VAPA, and 45.7% for RT. Of those who exercise for fitness (n=223), 20.6% meet the PAGA for MAPA, 13% for VAPA and 54.7% for RT. **CONCLUSION:** Many students do not meet the current PAGA. Initial efforts should involve education on PAGA for health and how to effectively obtain fitness goals, particularly in females. Future assessments will determine student's perceptions of enjoyable physical activities to help enhance regular participation in PA.

325 Board #162 June 1, 11:00 AM - 12:30 PM  
**Exercise is Medicine on Campus Week 2015: Impact and Engagement Analysis**  
 Zack Papalia, Melissa Bopp, Christopher M. Bopp, Michele Duffey, Lori Gravish-Hurtack, David N. Proctor, FACSM.  
*Pennsylvania State University, University Park, PA.* (Sponsor: David N. Proctor, FACSM)  
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Exercise is Medicine on Campus (EIMOC) is an international initiative promoting physical activity (PA) participation on college campuses, targeting the decline in PA often seen with the transition to college. Pennsylvania State University has been hosting annual EIMOC Week events since 2012.

**PURPOSE:** To evaluate the reach and effectiveness of EIMOC outreach and engagement strategies on a large U.S. university campus and to provide guidance for successful campus participation and awareness in EIMOC activities.

**METHODS:** EIMOC week was implemented on a large university campus in Fall 2015. Activities included: student volunteers participating in the University Homecoming parade, a kick-off event with campus administrators, and four days of campus-wide outdoor exercise stations. Evaluation of reach, participation and awareness were conducted throughout the week and post-event. Data was also gathered from social media sites, the EIMOC website and digitally published local news articles promoting EIMOC Week.

**RESULTS:** EIMOC week was implemented during Fall 2015. Stations elicited 1,167 exercise bouts from campus participants. Intercept surveys (n=177) 1-week post-event indicated 57% of students had heard about EIM, up from 39% in 2014. An article highlighting EIM Week published ahead of the event recorded 1951 engagements and views. The EIMOC Facebook® page generated 6,148 total impressions and 185 visits during the 10 days surrounding EIMOC Week. Throughout the same period, the EIMOC website received a total of 142 visits. The top referring pages were the Kinesiology department homepage (n=51) and search engines (n=39). Despite the extensive online presence, 62% of students reported hearing about EIMOC week by walking past exercise stations.

**CONCLUSIONS:** The current study offered insight on the reach and impact of an EIMOC event. News articles prior to and during the event proved a valuable tool in raising awareness, as did outreach via social media. Facebook® proved to be the most useful social media platform for both reach and engagement. Live updates from the events garnered the most immediate social media attention. Lessons learned from these analyses can improve awareness, outreach, and engagement for this program, and translate to other EIMOC programs.

326 Board #163 June 1, 11:00 AM - 12:30 PM  
**Assessing Physician's Physical Activity Promotion to College Students.**  
 Robert Powell, Elizabeth Stapleton, Melanie Midkiff, Erin Burke, Tyler Gossett. *Marshall University, Huntington, WV.*  
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*(No relationships reported)*

Approximately 70% of college aged American adults are not meeting the current Physical Activity Guidelines for Americans (PAGA). While healthcare professionals are increasingly being called upon to address physical activity (PA) to prevent and manage chronic disease, the impact of physician promotion of PA in college aged students is yet to be determined. **PURPOSE:** To assess the proportion of physicians who promote physical activity to college students enrolled at Marshall University and its potential impact on students meeting the PAGA. **METHODS:** Marshall University students were recruited during Exercise is Medicine week to assess their PA behaviors. Data was obtained through written surveys which queried about student's attainment of the current PAGA, their frequency of physician visits, and whether their physician recommends PA as a health benefit. **RESULTS:** A total of 472 students not involved with University athletics completed the survey [age= 20.5±3.3 years; 55.1% female, BMI= 25.4±5.30kg/m<sup>2</sup>; physician visits per year = 1.9±1.57 (range=1-12); meet PAGA=56%]. Approximately two thirds [65% (n=310)] of students reported that their Physician promotes physical activity as a health benefit. Of those, only 6.5% (n=20) meet the current PAGA recommendations. Interestingly, Physicians were more likely to promote physical activity if their patients were overweight or obese (p=.054). However, no significant difference existed between meeting PAGA and BMI (p=.82). When comparing number of visits per year, no significant differences existed between BMI status (p=.22) or Physician PA advice (p=.68). Also, no significant differences were found between students who meet the PAGA and number of Physician visits per year (p=.16). **CONCLUSION:** Physicians appear to target overweight and obesity as an indicator for promoting PA. However, PA advice does not correlate with college aged patient's physical activity levels. Future efforts should determine effective PA interventions within Physician practices to enhance the prevention of sedentary induced chronic conditions.

327 Board #164 June 1, 11:00 AM - 12:30 PM

**Advantages of a 4 Week Bootcamp Exercise Intervention Program for University Staff Members**Audrey Jansen van Rensburg, Phathokuhle C. Zondi, Catharina C. Grant, Dina C. Janse van Rensburg, FACSM. *University of Pretoria, Pretoria, South Africa.*

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(No relationships reported)

**PURPOSE:** Physical inactivity is a major risk factor for chronic diseases. An in-house based, low to medium intensity exercise activity intervention program, was designed to encourage and facilitate academic staff members of the University of Pretoria, South Africa, to engage in a healthier lifestyle through physical activity. Bootcamp is a form of group exercise class that combines traditional calisthenics and body weight exercises with interval training and strength training. It provides a supportive and inspiring environment to participants in order to increase the amount of physical activity that is engaged in on a daily/weekly basis.

**METHODS:** Forty six participants (aged 35.1±10.5 years) completed 3 supervised Bootcamp training sessions every week, each lasting 60 minutes in a fitness center. Interventions lasted for one month and focused on muscular endurance, cardiovascular fitness and flexibility exercises. A follow-up questionnaire to evaluate the participant overall experience of increased physical activity and social interaction was completed at the end of the program.

**RESULTS:** The results revealed that the exercise intervention, aiming to increase physical activity, was effective in improving functional performance. Over a period of 4 weeks of exercise intervention, significant increases were seen in muscular endurance doing sit-up's and push-up's (41.1±16.9 vs. 51.37±15.4, p=0.004 and 23.4±9.9 vs. 30.6±11.4, p=0.003 respectively) and in cardiovascular fitness during the 12 minute walk test (1413.6±246.9m vs. 1541.0±149.1m, p=0.004). Although not significant, improvements were also measured in BMI (27.7±7.2 vs. 26.8±5.5, p=0.029) and flexibility testing using sit & reach (31.9±9.5 vs. 36.1±10.0, p=0.044). A follow-up questionnaire indicated that participants continued with exercises due to increased energy (73%), feeling good being more active (67%), decreased stress levels (53%), and social interaction (53%). The main reason for not continuing with exercise was identified as time constraints (36%).

**CONCLUSIONS:** Results confirmed that even a short term intervention of increased low to medium level exercise has a positive effect on muscular endurance, cardiovascular fitness and flexibility as well as an overall feeling of increased well-being in individuals.

**A-45 Free Communication/Poster - Exercise Immunology**

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM

Room: Exhibit Hall A/B

328 Board #165 June 1, 9:30 AM - 11:00 AM

**The Gut Microbiota of TLR5-Deficient Mice Display Elevated Voluntary Physical Activity**Eri OYANAGI<sup>1</sup>, Masataka UCHIDA<sup>2</sup>, Michael J. KREMENIK<sup>2</sup>, Motoyuki IEMITSU<sup>3</sup>, Motohiko MIYACHI<sup>1</sup>, Hiromi YANO<sup>2</sup>.<sup>1</sup>Department of Health Promotion and Exercise, National Institute of Health and Nutrition., Tokyo, Japan. <sup>2</sup>Department of Health and Sports Science, Kawasaki University of Medical Welfare., Kurashiki, Japan. <sup>3</sup>Faculty of Sport and Health Science, Ritsumeikan University., Kusatsu, Japan.

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(No relationships reported)

**PURPOSE:** It is known that Toll-like receptor 5 (TLR5) recognizes flagellin (FG), which is a structural protein of bacterial flagella, and expresses itself on intestinal epithelium cells and immune cells to activate immune reaction. We found that wheel-running activity in mice was reduced by FG treatment, suggesting that TLR5 gene knockout may affect voluntary physical activity. However, this is still unclear. In this study, we investigated the effect of TLR5 gene knockout on physical activity in mice.

**METHODS:** To measure of voluntary physical activity, male 4-week-old C57BL/6 (wild type: WT, n=24) and TLR5 knockout (KO5, n=24) mice were housed individually in cages with (wheel running: WR, n=12) or without (control: Ctrl, n=12) a running wheel that was accessible 24 hours per day for 20 weeks. After the end of the experiment, we carried out measurements of the mRNA expressions in the brain by real-time RT-PCR, and of the hierarchical clustering of the fecal microbiota by metagenomic analysis. In addition, each cecal content was transplanted in recipient mice (male 4-week-old C57BL/6 (n=48) once per week for three weeks by stomach sonde, then it was carried out for nine weeks of breeding with a high-fat-diet.

**RESULTS:** The wheel-running activity of KO5 mice was 2-fold higher than that of WT mice (p<0.01). KO5-WR mice were low in mRNA expressions of IL-1 $\beta$  (p<0.01 vs. WT-WR), but not DRD2, NPY, BDNF, TNF- $\alpha$ , IL-1ra and TGF- $\beta$ , in the brain when compared with WT-WR mice. The hierarchical cluster analysis of the fecal microbiota indicated that the similarity of the intestinal microbiota in KO5 and WT mice after chronic wheel running is strongly dependent upon wheel-running activity. The recipient mice, who were transplanted with cecal content in both KO5- and WT-WR, showed high voluntary physical activity (p<0.01 and P<0.05, respectively vs. WT-Ctrl).

**CONCLUSIONS:** In conclusion, we observed that KO5 mice showed high voluntary physical activity with low expressions of IL-1 $\beta$  mRNA in their brains and changes in intestinal microbiota. It might be that voluntary physical activity is regulated by TLR5.

329 Board #166 June 1, 9:30 AM - 11:00 AM

**Toxicity of Tart Cherry Extract of C2C12 and U937 Cell Lines**Andrew J. Lee<sup>1</sup>, Diana F. Lee<sup>2</sup>, Caitlin Kennedy<sup>2</sup>, Megan Lucier<sup>2</sup>, Benjamin B. Johnson<sup>1</sup>, Gianna Prata<sup>1</sup>, Ken Racicot<sup>1</sup>, Emmanouil Apostolidis<sup>2</sup>, Kevin S. O'Fallon<sup>1</sup>. <sup>1</sup>US Army, Natick, MA.<sup>2</sup>Framingham State University, Framingham, MA.

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(No relationships reported)

Oxidative stress and inflammation are implicated in secondary damage from eccentrically-biased muscle contractions. Research suggests that the antioxidant/anti-inflammatory compounds in tart cherry juice may accelerate strength recovery following damage; however, the underlying mechanisms remain unclear. **PURPOSE:** To investigate the effects of tart cherry extract (TCE) on skeletal muscle (C2C12) and immune cells (U937) and to determine maximum effective dose for subsequent muscle damage experiments. **METHODS:** TCE was purified using a water-based extraction method and evaluated for total phenolic content using the Folin-Ciocalteu's assay. C2C12 myotube cultures were differentiated for 5d, and U937 monocytes were grown to 1x10<sup>6</sup> cells/mL and then preconditioned with TCE for 24-48h. Cultures were then incubated with 50% ethanol (EtOH) to induce cell death. Reactive oxygen species (ROS) scavenging activity of TCE was assessed using a DPPH assay. Toxicity of TCE and EtOH was assessed using an XTT assay. **RESULTS:** ROS inhibition was observed at all [TCE] (7-100 $\mu$ g/mL) in both C2C12 and U937 cell culture media (p<0.05), and ROS inhibition was highest in C2C12 media vs. U937 media (p<0.05). Treatment with EtOH decreased cell viability in both C2C12 (-81±5%) and U937 (-69±11%) cells, relative to untreated control cultures (p<0.05). Pretreatment of C2C12 cells with TCE (7-35 $\mu$ g/mL) for 48h attenuated EtOH-induced toxicity by 18±6%-26±5% (p<0.02), indicating a protective effect of TCE on myotube cultures. Higher [TCE] (50-100 $\mu$ g/mL) decreased viability by 14±3%-20±4%, compared with untreated controls (p<0.02), indicating a toxic threshold for TCE. Pretreatment with TCE for 24h (50-100 $\mu$ g/mL) and 48h (35-100 $\mu$ g/mL) rescued U937 cell viability after the EtOH challenge (p<0.02). Interestingly, U937 cell counts increased when preconditioned with TCE at [21.5-100 $\mu$ g/mL] for 24h vs. untreated controls (p<0.02), suggesting a stimulatory effect on cell proliferation. **CONCLUSION:** These data help establish an experimental range of TCE for future in vitro studies, and demonstrate that TCE has protective antioxidant effects on cultured skeletal muscle cells and monocytes.

Funding Source: Combat Feeding Research & Engineering Program / Framingham State University Department of Chemistry and Food Science.

330 Board #167 June 1, 9:30 AM - 11:00 AM

**A Single Bout of Exercise Enhances The Ex Vivo Manufacture Of Viral-specific T-cells**Guillaume Spielmann<sup>1</sup>, Catherine Bollard<sup>2</sup>, Hawley Kunz<sup>3</sup>, Patrick J. Hanley<sup>2</sup>, Richard J. Simpson, FACSM<sup>3</sup>. <sup>1</sup>Louisiana State University, Baton Rouge, LA. <sup>2</sup>Georges Washington University, Washington, DC. <sup>3</sup>University of Houston, Houston, TX. (Sponsor: Richard Simpson, FACSM)

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(No relationships reported)

Cytomegalovirus (CMV) and Epstein-Barr virus (EBV) infections remain a major cause of morbidity and mortality after allogeneic hematopoietic stem cell transplantation (HSCT). The adoptive transfer of donor-derived viral-specific cytotoxic T-cells (CTLs) is an effective treatment for controlling CMV and EBV infections during HSCT. However, in many instances, the time taken to manufacture adequate numbers of CTLs from healthy donors is too long and requires the collection of large and impractical blood volumes. **PURPOSE:** To determine if a single exercise bout can augment the ex vivo manufacture of viral-specific T-cells from healthy donors. **METHODS:** Nine healthy CMV and EBV seropositive participants (mean  $\pm$  SD age: 31.3  $\pm$  3.3 years) completed a 30-min continuous cycling protocol at a workload corresponding to +15% of the individual blood lactate threshold. PBMCs (10x10<sup>6</sup>) isolated before and immediately after exercise were stimulated with CMV (pp65 and IE1) and EBV (Iimp2 and BMLF1) peptides and expanded over 8 days. At Day 8, viral-

specific T-cells were enumerated using IFN- $\gamma$  ELIPOST assays and the phenotypes of the expanded CTLs and viral-specific T-cells were determined by flow cytometry. RESULTS: Compared to CTLs expanded before exercise, the number of T-cells specific to CMV pp65, EBV Imp2, and EBV BMLF1 was markedly greater among the post-exercise expanded CTLs (fold-difference: CMVpp65: 2.6, EBV Imp-2: 2.5 and EBV BMLF-1: 4.4). Expanded CTLs predominantly consisted of effector memory (CD45RA-/CD62L-) and CD45RA+ effector memory (CD45RA+/CD62L-) T-cells, but no phenotypic differences were observed between CTLs expanded before and after exercise. Moreover, CTLs expanded before and after exercise were equally capable of killing viral-peptide pulsed autologous target cells in an MHC restricted manner. Viral-specific CTLs could not be expanded from a CMV/EBV seronegative participant, indicating that the augmenting effects of exercise are due to the priming and expansion of pre-existing memory T-cells. CONCLUSION: This is the first study to show that a single bout of exercise enhances the ex vivo manufacture of CMV and EBV-specific T-cells from healthy donors without altering their phenotype or function. Exercise may therefore serve as a safe adjuvant to improve viral-specific T-cell generation for HSCT.

331 Board #168 June 1, 9:30 AM - 11:00 AM  
**Acute Eccentric Exercise Does Not Improve Primary Antibody Responses to Ovalbumin Vaccination in Mice.**

YI SUN, Brandt D. Pence, Koyal Garg, Svyatoslav V. Dvoretzkiy, Grace M. Niemi, Jacob M. Allen, Michael De Liso, Marni D. Bopp, Jeffrey A. Woods, FACSM. *University of Illinois at Urbana-Champaign, URBANA, IL.* (Sponsor: Jeffrey A. Woods, FACSM)  
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Vaccination against infectious diseases has been one of the most successful public health interventions and several research have shown that acute eccentric exercise augments the antibody response to vaccination in humans. However, the underlying mechanisms are unclear and animal models are useful to understand the purported eccentric exercise-induced augmentation of antibody responses to vaccination.

**PURPOSE:** To determine if eccentric exercise could improve primary antibody responses to a suboptimal vaccination dose in mice.

**METHODS:** In the first experiment, mice were exercised at 17m/min speed at -20% grade for 60 minutes on a treadmill (ECC1) or remained sedentary (SED). Both ECC1 and SED mice were intramuscularly injected with 25 $\mu$ g of ovalbumin (OVA) and 200 $\mu$ g of alum adjuvant 6 hours post-exercise. In the second experiment, two bouts of downhill treadmill running were performed on consecutive days (ECC2) and all mice were vaccinated immediately after the second bout of exercise. In the third experiment, mice were randomly assigned to an eccentric electrically-stimulated group (ECCstim) or a sham group (Sham). Mice were then vaccinated 6 hours post-exercise. In all experiments, plasma was collected prior to, and at one, two and four weeks post-vaccination. ELISA was performed to analyze anti-OVA IgG.

**RESULTS:** In all three experiments, there was a significant time main effect indicating plasma anti-OVA IgG was significantly increased at one, two and four weeks relative to pre-immunization. However, there were no significant differences between ECC1, ECC2 or ECCstim and respective control groups, demonstrating that acute eccentric exercise did not further enhance the vaccine responses.

**CONCLUSION:** Acute eccentric exercise does not improve primary antibody responses in an animal model.

332 Board #169 June 1, 9:30 AM - 11:00 AM  
**Moderate Intensity Running Alters Salivary Granulocyte Expression Of Lactoferrin And Lysozyme Without Changing Extracellular Saliva Concentration**

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 (No relationships reported)

Acute, moderate exercise is known to increase the secretion of salivary antimicrobial proteins (AMPs). The source of AMPs that are released into the saliva are not understood. **PURPOSE:** To determine if intracellular granulocyte concentration of AMPs are changed with exercise.

**METHODS:** 11 males (age 20.3 $\pm$ 0.8 years, 11.1 $\pm$ 3.8% body fat, 57.2 $\pm$ 7.6 ml/kg/min) ran for 45 min at 70% VO<sub>2</sub>peak after an overnight fast. 12.5 mL of stimulated saliva were collected pre and immediately post exercise. Saliva was filtered through a 30  $\mu$ m filter before analysis of leukocytes (CD45+) and granulocytes (CD15+) using flow cytometry. Positive cells for a given antibody were determined based upon gates drawn according to fluorescence minus one staining. CD45+CD15+ cells were further examined for intracellular concentration of Lactoferrin (Lac) and Lysozyme (Lys). Saliva from a subset of 6 of the 11 subjects was analyzed for extracellular concentrations of Lac and Lys using ELISA.

**RESULTS:** CD45+CD15+ intracellular Lac median fluorescent intensity (MFI) increased from pre to post exercise (pre: 64,268 $\pm$ 46,036 MFI; post: 117,134 $\pm$ 88,115 MFI, p<0.05). CD45+CD15+ intracellular Lys MFI decreased from pre to post exercise (pre: 16,933 $\pm$ 8,249; post: 11,616 $\pm$ 6,875 MFI, p<0.05). There was no change in extracellular Lac (pre: 7,425 $\pm$ 2,760; post: 7,020 $\pm$ 2,500 ng/ml) or Lys (pre: 13,092 $\pm$ 12,564; post: 15,436 $\pm$ 9,747 ng/ml) with exercise. Further, there was no association between intracellular levels of Lac with extracellular Lac pre exercise. Post exercise Lac MFI was associated with post exercise extracellular Lac concentration (r=-0.89, p<0.05). There was no association between intracellular Lys with extracellular Lys before or after exercise.

**CONCLUSIONS:** These data suggest that granulocytes (CD45+CD15+) are not the source of secreted AMPs into the saliva. The increase in Lac MFI with exercise may serve to inhibit inflammation while the decrease in Lys MFI could indicate a down-regulation in mucosal defense.

333 Board #170 June 1, 9:30 AM - 11:00 AM  
**Tam Receptors Expression Enhances By Glucocorticoid In Mouse Macrophages.**

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 (No relationships reported)

**PURPOSE:**

Exercise positively regulates several immune functions. Phagocytic capacity of macrophages also enhances by exercise. Previous study reported that enhancement of the phagocytic capacity of macrophage is regulated by exercise-induced hormones, such as catecholamine and glucocorticoids. TAM receptors, the consist of Tyro3, Axl and MerTK, are contributed to phagocytize an apoptotic cells via indirect-binding to phosphatidylserine. However, the effects of glucocorticoid stimulation on TAM receptors expression in macrophages remain unclear. Here we shown that the determine the effects of glucocorticoid stimulation on TAM receptors expression in mouse macrophages.

**METHODS:**

RAW264 cell and J774.1 cells, mouse macrophage cell line were maintained with DMEM medium and RPMI1640 medium containing 10% FBS and antibiotics. Also, primary macrophages from mouse tissues were incubated 10%FBS/DMEM. These macrophages were treated with glucocorticoid among 24 hours. The mRNA expression of TAM receptors in glucocorticoid-treated macrophages was measured by RT real-time PCR. Also, protein expression of TAM receptors in macrophages was measured with western blot analysis. In addition, Gas6 (protein of bridges TAM receptor to the phosphatidylserine) concentration in culture medium in macrophages was measured by ELISA assay.

**RESULTS:**

Tyro3 and MerTK expression, but not Axl expression, were significantly enhance in glucocorticoid-treated macrophages compared with untreated macrophages. Especially, MerTK expression was remarkable increase by glucocorticoid treatment. In contrast, significantly enhancement of Gas6 expression was no observed.

**CONCLUSIONS:**

Thus, the remarkable increased expression of MerTK had observed in mouse macrophage. Although increased expression of Tyro3 was also observed, its changes were not so much Tyro3 as MerTK. These results suggested that exercise-induced enhancement of phagocytic capacity in macrophages may relate to enhance the TAM receptors expression, especially MerTK.

334 Board #171 June 1, 9:30 AM - 11:00 AM  
**Association of Calprotectin with Leukocyte Chemotactic and Inflammatory Mediators Following Acute Aerobic Exercise**

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**PURPOSE:** The objective of this study was to examine whether acute aerobic exercise-mediated calprotectin in plasma would be associated with monocyte chemotactic protein-1 (MCP-1), myeloperoxidase (MPO), and interleukin-6 (IL-6) in healthy individuals.

**METHODS:** Eleven healthy participants, ages 18 to 30 years old were recruited to perform a 30-minute bout of aerobic exercise at 75% VO<sub>2</sub>max.

**RESULTS:** Acute aerobic exercise elicited a significant elevation across time in plasma calprotectin (P < 0.002), MCP-1 (P < 0.001), MPO (P < 0.001), and IL-6 (P < 0.001). Body mass index (BMI) was positively correlated with calprotectin area-under-the-curves with "respect to increase" (AUCi) and IL-6 AUCi (r = 0.678, r = 0.707, respectively). Furthermore, calprotectin AUCi was positively correlated with IL-6

AUCi and MPO AUCi ( $r = 0.887$ ,  $r = 0.747$ , respectively), even after controlling for BMI. Although MPO AUCi was positively correlated with IL-6 AUCi ( $r = 0.623$ ), this relationship no longer existed after controlling for BMI.

**CONCLUSIONS:** These results suggest that acute aerobic exercise could mediate innate immune response associated with calprotectin and its related leukocyte chemotactic and inflammatory mediators, especially in individuals with elevated BMI.

335 Board #172 June 1, 9:30 AM - 11:00 AM  
**Can A Single Exercise Bout Increase The Yield Of Hematopoietic Stem Cells From Peripheral Blood?**

Nadia H. Agha<sup>1</sup>, Forrest L. Baker<sup>1</sup>, Guillaume Spielmann<sup>2</sup>, Austin B. Bigley<sup>1</sup>, Richard J. Simpson, FACSM<sup>1</sup>. <sup>1</sup>University of Houston, Houston, TX. <sup>2</sup>Louisiana State University, Baton Rouge, LA. (Sponsor: Richard J. Simpson, FACSM)  
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Hematopoietic stem cell transplantation (HSCT) is a common treatment option for patients with hematological malignancies. HSCT donors receive twice-daily injections of mobilizing pharmaceutical agents for 4-5 days before beginning apheresis for an additional 3-4 days. Not only is this a costly and time consuming process, the pharmaceuticals used to mobilize stem cells have several undesirable side effects. A single bout of exercise increases stem cell counts in peripheral blood and may therefore serve as a suitable adjuvant for mobilizing stem cells in allogeneic donors and lessen the need for additional mobilizing agents. **PURPOSE:** To compare short duration high intensity exercise with long duration low intensity exercise in an effort to determine which exercise modality would mobilize the greatest number of stem cells. **METHODS:** 11 Healthy runners completed two exercise sessions in randomized order: 90 minutes at 5% below VT1 (LONG) and 30 minutes at 15% above VT1 (SHORT). Blood samples were taken pre-exercise, mid-exercise (15 and 90 min into exercise), immediately post exercise, and into the recovery period (1-Hr, 2-Hr and 3-Hr Post). Total CD34+ stem cells in whole blood were enumerated by 4-colour flow cytometry. **RESULTS:** Compared to pre-exercise, SHORT yielded a greater post-exercise (mean  $\pm$  SE) CD34+ cell mobilization than LONG ( $+6.7 \pm 1.96$  vs.  $+0.32 \pm 1.71$ ,  $p = 0.069$ ). Peak CD34+ cell mobilization occurred immediately post exercise for SHORT and mid-exercise for LONG ( $+6.7 \pm 1.96$  vs.  $+2.62 \pm 1.33$ ,  $p = 0.142$ ). **CONCLUSIONS:** Short duration high intensity exercise elicits a larger mobilization of CD34+ cells than long duration exercise of lower intensity. Exercise may therefore serve as a suitable adjuvant to mobilize CD34+ cells in healthy donors, although further research is necessary to optimize the exercise protocols for the HSCT donor population.

336 Board #173 June 1, 9:30 AM - 11:00 AM  
**Enhancing The Generation Of Adenovirus-Specific T Cells With Exercise For Immunotherapy**

Hawley Kunz<sup>1</sup>, Guillaume Spielmann<sup>2</sup>, Emily C. LaVoy<sup>1</sup>, Nadia H. Agha<sup>1</sup>, Rachel M. Graff<sup>1</sup>, Catherine M. Bollard<sup>3</sup>, Richard J. Simpson, FACSM<sup>1</sup>. <sup>1</sup>University of Houston, Houston, TX. <sup>2</sup>Louisiana State University, Baton Rouge, LA. <sup>3</sup>Children's Research Institute, Washington, DC. (Sponsor: Richard J. Simpson, FACSM)  
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Adenovirus (AdV) infection is a common cause of morbidity and mortality in pediatric patients after hematopoietic stem cell transplantation (HSCT). The adoptive transfer of virus-specific T cells (VSTs) expanded from healthy donors is often used to treat AdV infections after HSCT; however, current cell manufacturing processes are costly and time-consuming and failure to restore immunity in some patients may be due to insufficient cell numbers being expanded ex vivo. We have shown that a single bout of exercise increases the manufacture of T cells recognizing herpesviruses, but it is not known if AdV-specific T cells are also exercise responsive. **PURPOSE:** To determine if a single exercise bout mobilizes AdV-specific T cells to the bloodstream and augments their ex vivo expansion in response to viral peptide stimulation.

**METHODS:** Eight healthy volunteers (32 $\pm$ 4 yrs) completed 30min of steady state cycling 10-15% above the individual blood lactate threshold. Peripheral blood mononuclear cells (PBMCs) were isolated before (PRE) and immediately after (POST) exercise. A fixed number of PBMCs from PRE and POST were pulsed with synthetic peptides specific for AdV (hexon and penton) and expanded in a gas permeable G-rex for 8 days in the presence of growth cytokines (IL-4, IL-7 and IL-15). The number of AdV-specific T cells in the PBMCs (Day 0) and the expanded cell lines (Day 8) were enumerated in an IFN- $\gamma$  ELISPOT assay. Wilcoxon signed-rank tests were used to compare the number and proportion of AdV-specific T cells PRE and POST. **RESULTS:** Exercise did not significantly increase the number or proportion of hexon- or penton-specific T cells at Day 0 ( $p > 0.05$ ); however, the total numbers of hexon-

and penton-specific T cells at Day 8 were significantly higher ( $p = 0.043$ ;  $p = 0.018$ , respectively) in POST compared to PRE, with 43 $\pm$ 9% more hexon and 90 $\pm$ 8% more penton-specific cells generated after exercise.

**CONCLUSIONS:** While exercise did not preferentially mobilize AdV-specific T cells into circulation, it markedly augmented the manufacture of these cells. This indicates that exercise boosts the manufacture of AdV-specific T cells without the need for changes in their numbers or proportions. A single bout of exercise appears to be an effective and economical adjuvant to augment the expansion of VSTs from healthy donors for immunotherapy.

337 Board #174 June 1, 9:30 AM - 11:00 AM  
**The Effects Of Exercise Intensity And Duration On NK-cell Cytotoxicity And Proliferative Responses To IL-15**

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 (No relationships reported)

NK-cells play a crucial role in immunosurveillance against tumors and are the most exercise responsive lymphocyte subset. We showed recently that highly-differentiated NK-cells are preferentially redeployed by exercise and that NK-cell cytotoxic activity (NKCA) against HLA-expressing tumor cell lines, but not HLA-deficient cell lines, was elevated during exercise recovery. However, the effects of exercise on *ex vivo* NK-cell expansion and exercise intensity/duration on NKCA are not fully understood. **PURPOSE:** To determine the effect of high-intensity exercise on NK-cell expansion and to compare the effects of short and long duration exercise on NKCA. **METHODS:** Four healthy cyclists performed a 30-minute bout of cycling exercise at +15% of blood lactate threshold. Blood samples obtained before, immediately after, and 1h after exercise were used to expand purified NK-cells over 21 days with 30 ng/mL IL-15. Five healthy runners performed a 90-minute bout of running exercise at -5% of ventilatory threshold velocity (LONG) and a 30-minute bout of running exercise at +15% of ventilatory threshold velocity (SHORT) on separate days. Blood samples obtained before, immediately after, and 1h after exercise were used to determine NKCA against HLA-expressing multiple myeloma (U266) and HLA-deficient leukemia (K562) cell lines by 4-color flow cytometry. NKCA was also measured for the expanded NK-cell products. **RESULTS:** Relative to baseline, NK-cell expansion was decreased immediately post-cycling exercise, but enhanced 1h post-exercise (+3.5-fold  $\pm$  2 and +74.3-fold  $\pm$  30 vs. +17.7-fold  $\pm$  7,  $p < 0.05$ ). Expansion caused a 3-fold increase in expression of the activating receptors NKG2C, NKG2D, and NKp30, and NKCA per cell against the U266 and K562 cell lines at all 3 time points ( $p < 0.05$ ). NKCA per cell against the U266 cell line was higher 1h post-exercise after LONG relative to SHORT running exercise ( $0.27 \pm 0.06$  vs.  $0.18 \pm 0.04$ ,  $p < 0.05$ ) and against K562 cells 1h and 2h post-exercise relative to SHORT ( $0.24 \pm 0.05$  vs.  $0.11 \pm 0.05$  and  $0.22 \pm 0.08$  vs.  $0.11 \pm 0.03$ ,  $p < 0.05$ ). **CONCLUSION:** We conclude that long duration (1.5h) exercise enhances NK-cell cytotoxicity independently of HLA expression and that high intensity exercise augments NK-cell expansion rate without lowering activating receptor expression or cytotoxicity.

338 Board #175 June 1, 9:30 AM - 11:00 AM  
**Long Duration Spaceflight Impairs NK-cell Function In Astronauts**

Richard J. Simpson, FACSM<sup>1</sup>, Austin B. Bigley<sup>1</sup>, Guillaume Spielmann<sup>2</sup>, Hawley E. Kunz<sup>1</sup>, Nadia Agha<sup>1</sup>, Forrest Baker<sup>1</sup>, Bridgette Rooney<sup>1</sup>, Pritish L. Mylabathala<sup>1</sup>, Rachel M. Graff<sup>1</sup>, Brian E. Crucian<sup>3</sup>, Mitzi Laughlin<sup>1</sup>, Satish K. Mehta<sup>3</sup>, Duane L. Pierson<sup>3</sup>. <sup>1</sup>University of Houston, Houston, TX. <sup>2</sup>Louisiana State University, Baton Rouge, LA. <sup>3</sup>NASA Johnson Space Center, Houston, TX.  
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 (No relationships reported)

Robust immunity is essential for further human exploration of the solar system beyond Earth's orbit. Immune dysregulation and latent viral reactivation has been documented in astronauts during and after spaceflight, but the effects of long duration missions on the functional properties of NK-cells are not known. **PURPOSE:** To determine the impact of a 6-month mission to the International Space Station (ISS) on the phenotype and function of NK-cells. **METHODS:** Blood samples were taken from 6 ISS crewmembers and 6 ground-based controls before launch (L-180 and L-60), in-flight (FD10, FD90, R-1), immediately upon return to Earth (R+0) and up to 66 days following return (R+18, R+33 and R+66). In-flight samples were returned to the terrestrial laboratory within 30-56h of being drawn and immediately processed with the control samples, which were drawn at identical times to the crew. The levels of surface activating (NKG2C) and inhibitory (NKG2A) receptors and intracellular perforin and granzyme-b expression were determined in CD3-/CD56 NK-cells by 4-color flow cytometry, and NK-cell cytotoxicity activity (NKCA) against tumor cells of leukemia (K562), multiple myeloma (U266) and lymphoma (221.AE9 and 721.221) origin were determined in a 4h NKCA assay. **RESULTS:** All crewmembers

demonstrated a significant reduction in NKCA during flight (FD90) against all tumor target cells to levels that were (mean  $\pm$  SE)  $42 \pm 7\%$  (K562),  $49 \pm 16\%$  (U266),  $28 \pm 5\%$  (221.AEH), and  $36 \pm 10\%$  (721.221) of baseline (L-180) NKCA ( $p < 0.05$ ). FD90 Perforin and granzyme b levels were reduced to  $52 \pm 7\%$  of baseline levels ( $p < 0.05$ ) and these correlated highly ( $R^2 > 0.75$ ) with changes in NKCA. In some crewmembers, NKCA remained suppressed at R-1 and up to R+66. NKG2C and NKG2A expression remained unchanged, except in one crewmember who had a massive expansion of NKG2C+ NK-cells and profound shedding of cytomegalovirus in urine at FD90. No significant changes in NKCA or NK-cell phenotype were found in the ground-based controls ( $p > 0.05$ ). **CONCLUSION:** Long duration spaceflight 'disarms' NK-cells of perforin and granzyme b and suppresses their ability to kill a wide range of tumor target cells during the in-flight phase of the mission. Further research is required to develop countermeasures to help maintain normal immune function during exploration class missions

## A-46 Free Communication/Poster - Fitness Assessment

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
Room: Exhibit Hall A/B

- 339 Board #176 June 1, 11:00 AM - 12:30 PM  
**Physiological And Electromyography Responses During A Maximal Incremental Skating Test On Slide Board**  
Tatiane Piucco, Jessica O'Connell, Masanori Sakaguchi, Darren Stefanyshyn. *University of Calgary, Calgary, AB, Canada.*  
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(No relationships reported)

Specific skating fitness test is challenging to be performed on laboratory or track, because the use of skating treadmill is expensive. Since slide board skating mimics the skating gesture, it could be used as an alternative method to evaluate speed skaters. **PURPOSE:** To analyze the physiological responses and muscle activation characteristics during an incremental slide board skating test. **METHODS:** 10 ice speed skaters completed a maximal 1-min stage incremental cadence skating protocol on an instrumented slide board, until voluntary exhaustion or until they were no longer capable to keep the pace. Oxygen uptake ( $VO_2$ ), heart rate (HR), blood lactate [Lac] and EMG of vastus lateralis (VL), vastus medialis (VM), biceps femoris (BF), gluteus maximum (GM), gluteus medius (GMD) and adductor magnus (AM) muscles were analyzed. Maximal physiological indices and the second ventilatory threshold (VT2) were determined. Root mean square (RMS) of EMG signal was compared between muscles and throughout the test (10%, 40%, 70% and 90% of the test), using Student's t test ( $p < 0.05$ ). **RESULTS:** All participants attained at least three of four criteria for  $VO_{2max}$  attainment ( $VO_2$  plateau, maximum HR predicted,  $RER \geq 1.1$  and [Lac]  $\geq 8$  mmol.l-1). VT2 occurred at  $84.3 \pm 3.1\%$  of maximal cadence (CADmax) obtained during the test. RMS significantly increased as the cadence increased for all the muscles ( $p < 0.05$ ). RMS of all muscles analyzed significantly increased at each instant of time. GM activation at the end of the test ( $227.2 \pm 55.2\%$  of the beginning of the test) was significantly higher than all muscles analyzed, followed by VL ( $183.2 \pm 36.8\%$ ). A significant correlation between RMS and CADmax was found for VL ( $r = 0.87$ ), GM ( $r = 0.86$ ) and GMD ( $r = 0.74$ ). **CONCLUSION:** An incremental maximal skating protocol on slide board elucidated maximal physiological responses and seems adequate to evaluate aerobic indices of performance on skaters. Also, the muscle recruitment pattern during skating on slide board was similar to the one found on treadmill skating and ice skating, since GM muscle and VL are the main responsible for the power generated at the hip and knee, respectively, while GMD is associated with the stroke velocity during skating.

- 340 Board #177 June 1, 11:00 AM - 12:30 PM  
**Comparison of Exclusion Rates Between Station-based and Single Provider Preparticipation Evaluations**  
Daniel Diaz, David Lick, Karim Abdel-Aty, Jaspaul Dulku, Kamran Mir, Robert Ricketts. *William Beaumont Hospital, Sterling heights, MI.*  
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(No relationships reported)

Although the value of the pre-participation medical evaluation (PPE) continues to be debated it is still required for most young athletes to compete in organized sports. There are many potential benefits to the PPE but the primary objective is to detect conditions that may predispose the athlete to injury. The PPE can be provided in an office based setting (OBS) with a single provider or in station-based setting (SBS)

where multiple health care providers evaluate a large number of athletes at the same time. Our program utilizes both types of sites to provide PPEs for young athletes. There is little recent literature available comparing rates of exclusion from sports participation between the two types of settings, especially when performed by the same providers.

**PURPOSE:** To measure exclusion rates and reasons for exclusion for adolescent athletes between the OBS and SBS when performed by the same providers. **METHODS:** For this study we used a retrospective chart review of sports physicals done in the OBS and SBS from 2009-2014. Reasons for exclusion from sports participation were recorded as cardiovascular/pulmonary, vision, musculoskeletal or other. Exclusion criteria for this study included no previously known disability or condition that precluded safe sports participation and patients outside the age range of 10-18 years old. Age, gender, and reason for exclusion were recorded for athletes from the two sites. **RESULTS:** A total of 1798 student athletes were examined in the SBS and 1136 student athletes were examined in the OBS. The overall rates of exclusion or further evaluation before participation between the two sites were similar (5.67% versus 4.84%,  $p = 0.33$ ). There was no difference between exclusion rates for males vs females. There was a statistically significant difference in the reason for exclusion between the two sites ( $p = 0.045$ ) with abnormal vision screening being the most common reason in the SBS and cardiovascular being the most common in OBS. **CONCLUSION:** OBS and SBS PPEs result in similar rates of exclusion or further evaluation from sports participation, although the specific reasons for exclusion differ based on the setting.

- 341 Board #178 June 1, 11:00 AM - 12:30 PM  
**Validity Of Supra-Maximal Eccentrics In Lower-Body Concentric Strength Training: A Meta-Analysis**  
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(No relationships reported)

Training loads approximating the one-repetition maximum (1RM; + 20%) are often used to improve maximal concentric strength in the lower limbs. Supra-maximal training (> 100% 1RM) has been shown to be effective in inducing strength and power adaptation in both trained and untrained populations, however, such methods are associated with heightened risk of injury. **PURPOSE:** To determine whether supra-maximal (> 100% 1RM) eccentrics are a preferred method for improving lower-body concentric strength. **METHODS:** 81 studies were considered for inclusion out of 2384 total studies returned from an electronic data-base enquiry (Google Scholar) and from the reference lists of relevant articles. Five studies (7 effect sizes) were ultimately retained. Key inclusion criteria were the use of modalities typically available to collegiate students (leg press, squat, leg extension, leg flexion; key exclusion: isokinetic dynamometer) and at least three weeks of treatment exposure between pre and post-intervention 1RM assessment. Individual study effect sizes (Cohen's d) were converted to an unbiased estimate (g) using the software program R studio. Mean effect size was determined via a random effects model after the fixed-effects test of homogeneity of effect size was rejected [ $Q$  ( $df=7$ ) = 14.86,  $p = .02$ ]. **RESULTS:** Both supra-maximal (120, 120, 125, 138, 182% 1RM) and sub-maximal (0, 75, 80, 80, 80%) loading significantly improved post-rest 1RM relative to baseline [average ES = 2.21, SE = .77,  $Z = 2.86$ ,  $p < .01$ , CI95% = .70 and 3.73,  $\tau^2 = 3.77$  (REML estimator),  $I^2 = 94.15\%$ , Birge Ratio = 17.08; average ES = 1.86, SE = .93,  $Z = 2.01$ ,  $p < .04$ , CI95% = .05 and 3.68,  $\tau^2 = 5.43$  (REML estimator),  $I^2 = 91.74\%$ , Birge Ratio = 12.01]. Under the RE model using restricted maximum likelihood estimation for between study variance estimate ( $\tau^2 = .36$ ), the overall average study effect of heavy eccentrics relative to sub-maximal concentrics was .47 (SE = .30), which was not significantly significant ( $Z = 1.60$ ,  $p = .11$ , CI95% = -.11 and 1.05). The  $I^2$  finding of 63.19 indicates that 63.19% of the total observed variance was attributable to true differences in effect size, which can be understood to be a moderate-to-high degree of heterogeneity. **CONCLUSION:** Frequent inclusion of supra-maximal eccentrics in lower-body strength training does not appear warranted.

- 342 Board #179 June 1, 11:00 AM - 12:30 PM  
**Physical Fitness Characteristics of Rural Firefighters on the Northern Coast of California**  
Gil Spitz, Anna M. Welch, Jack J. Thorpe, Taylor R. Lyon, Young Sub Kwon. *Humboldt State University, Arcata, CA.*  
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(No relationships reported)

Limited research has been conducted on the health-related physical fitness level of rural firefighters on the northern coast of California. The geographic isolation of rural firefighters creates unique challenges, including staffing shortages placing individual firefighters under unusual physiological stress. **PURPOSE:** The purpose of this study was to examine the health-related physical fitness status of rural firefighters.

**METHODS:** 20 male firefighters (mean±sd, age = 32±7 yr, height = 180±5 cm, body mass = 96±16 kg, fire service = 9±7 yr) on the northern coast of California performed body composition, strength, flexibility, and aerobic capacity tests. Data were compared with age-based normative data.

**RESULTS:** Fitness testing revealed that rural firefighters ranked above average on tests of upper body muscular strength (bench press) and aerobic capacity (VO<sub>2</sub>max) and average on tests of body composition (% fat) and flexibility (sit-and-reach). (Table 1)

**CONCLUSIONS:** Exercise programs for firefighters should focus on improving flexibility and body composition, while maintaining muscular strength and aerobic fitness to meet the demands of firefighting.

| Health-related physical fitness components | Upper body Muscular Strength | Aerobic capacity | Body composition | Flexibility |
|--|------------------------------|------------------|------------------|-------------|
| Percentile rank                            | 65±25                        | 67±25            | 56±31            | 54±25       |

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**Effects Of Environmental Context On Physiological Response During Team Handball Small Sided Games**

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(No relationships reported)

**PURPOSE:** Team handball is a sport of intermittent high intensity and sizeable distances covered during match play. Coaches commonly use small-sided games (SSG) in their training programs, as a means of developing technical and tactile skills. The purpose of this study was to examine the distance covered and physiological response of altering the number of players during SSG in team handball.

**METHODS:** Participants were twelve professional female handball players [24.6±3.7 years, 172±6.2 cm, 68.2 ± 9.9kg, 22.7 ± 2 kg/m<sup>2</sup>]. The SSG were played, first with five on each side (5 vs. 5), then four (4 vs. 4), then three (3 vs. 3). Each game was four minutes long, followed by three minutes of passive rest. The distance covered and time spent in four speed zones (based on player movement speed) were selected for analysis, as follows: Zone 1 (0-1.4 m/s); Zone 2 (1.4-3.4 m/s); Zone 3 (3.4-5.2 m/s); Zone 4 (>5.2 m/s). ANOVA with Bonferroni post-hoc testing were used for statistical analysis.

**RESULTS:** The largest distance covered was during the SSG 3 vs. 3 condition (527.3 ± 70.9 m), followed by 4 vs. 4 (503.9 ± 41.7 m) and 5 vs. 5 (497.4 ± 51.8 m). Statistically significant differences were found in the Zone 2, between SSG conditions 3 vs. 3 and 4 vs. 4 (p=.049, ω<sup>2</sup>= .32). The highest average heart rate was measured during SSG condition 3 vs. 3. A statistically significant difference for average heart rate was found between SSG conditions 3 vs. 3 (89.7 % HRmax) and 5 vs. 5 (87.8 % HRmax) (p= .04, ω<sup>2</sup>= .26). Participant heart rate response between the speed zones was not statistically significant. Heart rate response was negatively correlated with the number of players within the SSG condition. Statistically significant results were found for RPE between SSG condition 3 vs. 3 and the other two SSG conditions (4 vs. 4, p = .01, and 5 vs. 5, p = .00).

**CONCLUSIONS:** These results have both statistical significance and clinical relevance. These results indicate that changing the number of players during SSG in handball can be used to manipulate the physiological response during handball training.

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**A Comparison of Hip Flexibility of Female Collegiate Swimmers and Recreationally Active Non-Swimmers**

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(No relationships reported)

Extensive research has been done on the range of motion and flexibility of the shoulders of swimmers but minimal research has been done on the hip. **PURPOSE:** The purpose of this study is to compare the hip flexibility between recreationally active non-swimmers and intercollegiate swimmers. **METHODS:** The subjects were tested using the passive straight leg raise (PSLR) to measure hip joint range of motion, the sit and reach test (SR) to measure pelvic joint flexibility and a test to measure internal rotation of the hip (IR). Each test was video-taped and analyzed using Dartfish Software to determine maximal range of motion of the joints. **RESULTS:** Independent t-tests were completed to determine if there was a difference between mean values of non-swimmers and swimmers. Non-swimmers were significantly more flexible with the PSLR (Non-swimmers, 108.7 ± 15.2, Swimmers 97.0 ± 15.6, p < 0.05) and the SR, (Non-swimmers, 111.9 ± 7.4, Swimmers 99.9 ± 7.3 p < .001). There was no significant difference between groups when measuring IR. **CONCLUSIONS:** An explanation for this is that swimmers are constantly hyper-extended in the lower back to maintain

proper stroke form. The freestyle and back stroke swimmers engage in rapid short movements of the hip when performing the flutter kick, this may have lead to the decreased hamstring flexibility measured in the PSLR. Practical application of this information would be that swimmers should train with flexibility exercises to increase the range of motion of the pelvis, hip and lower back to decrease risk of injury and improve overall mobility.

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**Cerebral And Muscular Oxygenation Thresholds In Individuals With Different Training Status**

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(No relationships reported)

Cerebral (COX) and muscular (MOX) oxygenation thresholds were observed in well-trained cyclists; whereas two breakpoints were determined in COX (COX1 and COX2), only one threshold was determined in MOX. **PURPOSE:** To compare COX and MOX thresholds in individuals with different training status. The oxygenation thresholds were further compared to ventilatory thresholds (VT1 and VT2). **METHODS:** Nine well-trained cyclists (VO<sub>2</sub>MAX of 52.4 ± 6.2 mL/kg/min) and nine untrained healthy individuals (VO<sub>2</sub>MAX of 38.3 ± 4.7 mL/kg/min) undertake a maximal incremental test until exhaustion, comprised of 25 W/min increments. Data of COX (prefrontal lobe) and MOX (vastus lateralis muscle) at 25 Hz frequency, and gaseous exchange (breath-by-breath) were obtained throughout the test. Crude data was normalized to 1 Hz and COX, MOX, and gaseous exchange data was plotted as a function of the time. Physiological breakpoints were visually identified by three evaluators, and expressed as percentage (%) of the peak power output (WPEAK). A repeated measures ANOVA design compared the physiological thresholds between groups (P < 0.05). **RESULTS:** All thresholds occurred at a greater absolute power output in cyclists than in untrained individual. When expressed as % WPEAK, a threshold main effect (P < 0.001) was observed, so that MOX, COX1 and COX2 thresholds were significantly different from VT1 and VT2 in cyclists and untrained individuals. Additionally, a group main effect and a near threshold by group interaction effect were observed for MOX and COX2; the MOX was greater in cyclists than untrained individuals (P = 0.06), but COX2 was lower in cyclists than in untrained individuals (P = 0.08; effect size d = 0.95). **CONCLUSION:** Results suggest that the greater physical status and exercise tolerance in cyclists may be related to an improved MOX threshold, together with a greater exercise tolerance after the occurrence of COX2 threshold. Thus, most of the improved exercise tolerance in cyclists may be due to an increased muscle capacity to generate power output, together with a greater capacity to tolerate low levels of brain oxygenation.

346 Board #183 June 1, 11:00 AM - 12:30 PM

**Assessing Physical Activity Levels and Motivation in an Urban Midwest Private Liberal Arts College**

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(No relationships reported)

Recent research indicates that over one third of American adults are obese (Ogden, Carroll, Kit, and Flegal, 2014) and only 48% of adults meet the 2008 Physical Activity (PA) Guidelines. In this context, understanding what makes people engage or not in PA becomes of key importance when attempting to prevent obesity and its related comorbidities.

**PURPOSE:** To assess PA, motivation and fitness levels of students, faculty, and staff in an urban Midwest Private College.

**METHODS:** A total of 193 subjects, ages 19-72 years old, were recruited. 119 participants answered questions from the IPAQ-SF (International Physical Activity Questionnaire Short Form) and EMI-2 (Exercise Motivation Inventory-2) and 74 were assessed in the 5 components of fitness. Multiple regression models tested age and gender effects on PA, motivation and fitness.

**RESULTS:** Age was significantly different between groups and was controlled for in the regression models. Despite students being significantly more vigorously active than faculty (p=0.011) and staff (p=0.0015), only 23% of the survey respondents met the guidelines for vigorous activity and 13% for moderate activity. Based on BMI, 28% of participants were overweight and 11% were obese. BMI was a significant predictor of systolic blood pressure (p<0.001). Males were more motivated by competition (p=0.035), had higher muscle endurance, as measured by push-up (p=0.01) and sit up tests (p=0.002), muscle strength, as measured by grip strength (p<0.001), and lower body fat percentage (p= 0.002), as measured by air displacement plethysmography. Females had greater flexibility on the sit and reach test (p=0.002). Age was negatively associated with challenge (p=0.003) and affiliation (p=0.048) and positively associated with health pressures (p=0.025), Ill health pressures (p<0.001),

and nimbleness ( $p < 0.001$ ). Regardless of gender, age was negatively associated with number of push-ups ( $p < 0.001$ ) and sit-ups ( $p < 0.001$ ), and  $\dot{V}O_2$  max, as measured by the YMCA step test ( $p = 0.01$ ), and positively associated with body fat percentage, ( $p = 0.02$ ).

**CONCLUSIONS:** PA and obesity prevalence matched national and state averages. Results suggest that age and gender are significant predictors of PA, motivation, and fitness and should be accounted for when designing effective exercise interventions.

347 Board #184 June 1, 11:00 AM - 12:30 PM  
**Reliability Of Upper Extremity Isokinetic Push And Pull Work Testing**

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(No relationships reported)

While multisegment isokinetic testing more closely resembles functional movement patterns than isolated joint testing, little is known regarding the reliability of upper extremity push-pull testing (UE PPT). Quantifying total isokinetic work provides insight regarding sustainment of muscle force through a range of motion; before examining whether UE PPT work could be a useful injury risk and restoration marker, establishing reliability and limb/velocity/direction effects in healthy individuals is needed. **PURPOSE:** To determine isokinetic UE PPT total work reliability and compare differences between limb (dominant/ nondominant), direction (push/pull), and velocity (24.4 cm/s, 42.7 cm/s, 61.0 cm/s). **METHODS:** Healthy, physically active men ( $n = 12$ ) and women ( $n = 12$ ) aged 18-30 yrs completed a test-retest protocol ( $>96$  hr separation). Following a progressive four repetition warm-up, five maximal push-pull repetitions were completed using the closed kinetic chain attachment on a Biodex Dynamometer (Biodex, Shirley, NY) in a limb and velocity randomized order. **RESULTS:** High (.863-.954) intraclass correlation coefficients (2, 1) and low standard error of measurement (262.5-557.9 N) were demonstrated for work across velocities, limbs, and directions. Pairwise post hoc analysis of a significant velocity by direction interaction ( $P < .001$ ) identified push work to be significantly greater than pull work at each speed ( $P < .001$ ,  $d = .77$  to 1.35). Post hoc trend analysis revealed that while increased velocity prompted significant linear and quadratic work decreases for both directions ( $P < .001$  to .044), the linear decrement was significantly greater for push than pull ( $P < .001$ ,  $d = 1.56$ ). A weak overall limb effect (dominant  $>$  nondominant) was revealed ( $P = .049$ ,  $d = .42$ ). **CONCLUSION:** Isokinetic UE PPT total work is a reliable measure. Healthy, young adults demonstrated asymmetry favoring the dominant limb (5%) and push direction (13 to 23%). We attribute the differential effect of velocity on push-pull action, to greater cross-sectional area of the elbow extensors, shoulder flexors and scapular protractors compared to the elbow flexors, shoulder extensors and scapular retractors. Future research will examine participants with a history of upper extremity injury.

348 Board #185 June 1, 11:00 AM - 12:30 PM  
**The Effects Of Carrying A Simulated Rifle During A Backpack Load-carriage Task**

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**PURPOSE:** Identifying the effects of carrying a rifle during backpack load-carriage is of interest to the military. This study measured the metabolic cost, ratings of perceived exertion (RPE), and stride characteristics for two backpack load-carriage tasks.

**METHODS:** Male participants with military experience ( $n = 14$ ) completed each of the incremental treadmill walking/running protocols (speeds range: 6.4-12.4 km·h<sup>-1</sup>) while carrying a total of 24 kg to volitional exhaustion. The two conditions of the study were: carrying a 24 kg backpack only, and carrying a 20.2 kg backpack with a 3.8 kg simulated rifle in two hands. Oxygen uptake, heart rate, ventilation, metabolic equivalents, RPE and stride length/frequency were recorded at each incremental stage. A univariate factorial analysis of variance (ANOVA) was used to measure the main effects within the conditions and interaction effects between conditions.

**RESULTS:** All interaction effects for each variable were insignificant. Welch's unequal variance t-test was used to measure the significance between conditions at each incremental stage. Carrying the rifle significantly increased % $\dot{V}O_2$  peak at 8.4 and 9.4 km·h<sup>-1</sup>; minute ventilation at 12.4 km·h<sup>-1</sup>; metabolic equivalents at 8.4 and 9.4 km·h<sup>-1</sup>, and RPE at 12.4 km·h<sup>-1</sup>. Stride length significantly decreased at 8.4, 9.4, 11.4, and 12.4 km·h<sup>-1</sup>, compared to carrying the backpack only ( $p < 0.05$ ).

**CONCLUSIONS:** Results from the ANOVA concluded that carrying a rifle has no significant effect on load-carriage performance. Nevertheless, analysis of Welch's t-test provided evidence for future research to cross-validate these findings.

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**Comparison of Strength and Aerobic Capacity Imbalances in the Lower Limbs**

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Limb imbalance is historically described as the difference in muscular strength between limbs. However, whether this imbalance in strength is associated with an imbalance in aerobic capacity is currently unknown. **PURPOSE:** To determine if differences in muscular strength between the lower limbs are associated with differences in aerobic capacity. **METHODS:** Healthy recreational athletes ( $N = 8$ , 3 males, 5 females;  $23.6 \pm 3.5$  years old,  $72.3 \pm 17.3$  kg) participated in the investigation. Maximal knee extensions were performed on an isokinetic dynamometer at 300 deg/s (300 deg/s was utilized as this angular velocity was most similar to that which occurs during cycling). The limb which produced the greatest peak torque was determined to be the dominant limb (DL) and the other limb non-dominant (NDL). Single leg cycling  $\dot{V}O_2$  peak tests were also performed for each limb. Paired T-tests were used to determine if there were peak torque,  $\dot{V}O_2$  peak, and time to fatigue differences between the limbs. Correlations were then used to compare the relative imbalances in peak torque to the relative imbalances of  $\dot{V}O_2$  peak and time to fatigue. **RESULTS:** Peak torque at 300 deg/s was different between DL and NDL (DL =  $63.1 \pm 20.6$  Nm, NDL =  $53.3 \pm 15.4$  Nm,  $P = 0.03$ ).  $\dot{V}O_2$  peak (DL $\dot{V}O_2$  peak =  $30.8 \pm 9.0$  ml/kg/min, NDL  $\dot{V}O_2$  peak =  $32.4 \pm 5.8$  ml/kg/min,  $P = 0.54$ ) was not different however time to fatigue (DL =  $13:33 \pm 2:28$  minutes, NDL =  $14:51 \pm 1:34$  minutes,  $P = 0.02$ ) was different between DL and NDL. Correlations between the relative imbalances in peak torque and  $\dot{V}O_2$  peak ( $R = -0.41$ ,  $P = 0.31$ ) and time to fatigue ( $R = -0.38$ ,  $P = 0.35$ ) were not significant. **CONCLUSION:** Our subjects displayed significant imbalances in peak torque at 300 deg/s and time to fatigue between the dominant and non-dominant limbs. However, these data suggest that between limb variances in muscular strength is not associated with variances in aerobic capacity. Supported by Kent State University's School of Health Sciences.

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**Effect of Stance on Postural Sway During Bilateral Maximal Isometric Handgrip Testing**

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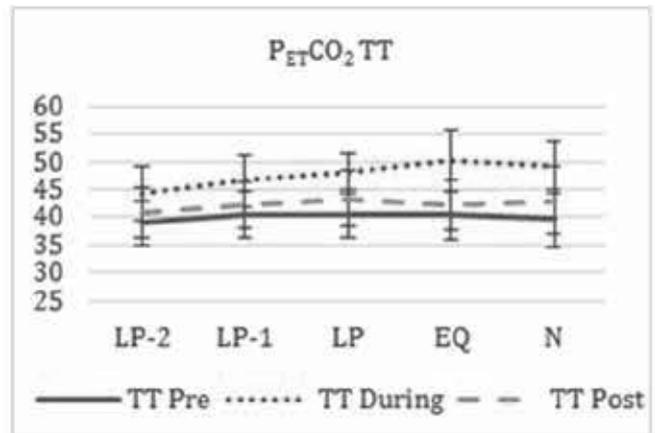
Minimal postural sway while standing is indicative of good balance. The most prevalent method for evaluating postural sway is monitoring center of pressure (COP) motion for a specified duration as an individual stands on a force platform under several pre-planned conditions. Despite the potential need to generate upper body force bilaterally, previous research has focused primarily on COP motion during unilateral handgrip (HG) strength testing **PURPOSE:** To examine the effect of various stances on COP while performing maximal bilateral HG strength testing. **METHODS:** Twenty-six recreationally active male and female volunteers (19 males, 7 females;  $21.9 \pm 3.1$  y;  $75.6 \pm 12.9$  kg;  $171.2 \pm 7.9$  cm) participated in this study and performed nine randomly assigned experimental trials. Each trial consisted of bilateral maximal HG strength assessments measured simultaneously with a HG dynamometer, three times with a neutral (N), dominant foot forward (D), and non-dominant (ND) foot forward stance. All trials were completed while standing on a portable force platform, which was used, in conjunction with corresponding software, to track COP motion while gripping the dynamometer. Subjects were instructed to grasp the dynamometer as forcefully as possible for ~5-sec during each trial. All trials were separated by a recovery period of 60-sec. A Waterloo Footedness Questionnaire was used to determine subject foot dominance, while maximal HG strength during the neutral stance was used to determine hand dominance. Repeated measures analysis of variance was used to detect COP displacements along the anterior/posterior (A/P) and mediolateral (M/L) axes and differences in bilateral HG strength among the three stances. **RESULTS:** Testing results showed that the shift in M/L COP during the D ( $0.67 \pm 0.27$  cm;  $p < 0.001$ ) and ND foot forward stances ( $0.65 \pm 0.28$  cm;  $p < 0.001$ ) were significantly greater than that during the N ( $0.38 \pm 0.24$  cm;  $p = 0.674$ ) stance. No significant interactions were reported for HG strength (D: 26-61 kg, ND: 26-54 kg) across the different stance conditions. **CONCLUSION:** Results indicated that M/L postural sway is increased when standing in both D and ND foot forward stances during maximal HG testing. Additionally, this data indicated that stance has no influence on maximal bilateral HG strength.

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**The Influence Of Foot Stance On Force-Time Curve Parameters During Hand Grip Performance**  
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 (No relationships reported)

**PURPOSE:** To assess the differences in foot position on bilateral grip strength.  
**METHODS:** Nineteen recreationally active men ( $22.74 \pm 3.25$ yr;  $77.86 \pm 12.90$ kg;  $173.69 \pm 6.58$ cm) performed nine randomly assigned experimental trials consisting of maximal handgrip (HG) performance in both dominant (H1) and non-dominant (H2) hands measured simultaneously with a HG dynamometer. Bilateral HG was measured in three different stances [neutral (N), dominant foot forward (D), and non-dominant foot forward (ND)] consisting of three trials each. Subjects grasped as hard as possible for 6s during each trial with a recovery period of 60s between trials. A Waterloo Footedness Questionnaire was used to determine subject foot dominance, while the hand with the highest PF measured in N stance, was considered the H1 hand. The HG dynamometer was connected to a data acquisition system and the force-time curve was analyzed using computer software. The variables measured were: peak force (PF), rate of force development (RFD), time to PF (TPF), force at peak RFD (F@RFD), impulse [area under the curve for the first second (AUC1) and the first two seconds (AUC2)], and time to 90% of PF (T90PF). Repeated measures analysis of variance (RM ANOVA) was used to determine differences in all variables between hands during the three stances.  
**RESULTS:** The H1 hand was greater than the H2 hand in PF ( $42.16 \pm 1.50$ kg vs.  $39.12 \pm 1.48$ kg,  $p < 0.001$ ) and F@RFD ( $35.31 \pm 1.46$ kg vs.  $33.31 \pm 1.33$ kg,  $p < 0.001$ ) independent of stance. Significant hand  $\times$  stance interactions were found for TPF ( $p = 0.010$ ,  $\eta^2 = 0.228$ ) and AUC1 ( $p = 0.008$ ,  $\eta^2 = 0.233$ ). Follow-up analyses showed TPF during the ND stance was shorter in H1 compared to H2 (1.17s vs. 1.53s,  $p = 0.031$ ), while H2 had greater AUC1 in the D stance as compared to the N stance ( $1.16$ N·s vs.  $1.10$ N·s,  $p = 0.043$ ). No differences were observed for RFD, AUC2, and T90PF.  
**CONCLUSIONS:** While maximal HG force or RFD does not appear to be influenced by foot stance, the time needed and ability to generate HG force may be influenced by the ipsilateral/contralateral configuration of the dominant and non-dominant limbs.

352 Board #189 June 1, 11:00 AM - 12:30 PM  
**The Physiological Mechanism Behind the Talk Test**  
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 (No relationships reported)

**Purpose** The Talk Test (TT) is a very simple surrogate of exercise intensity which has been shown to be a useful marker of the ventilatory (VT) and respiratory compensation (RCT) thresholds. The purpose of this study was to evaluate a potential mechanism behind the TT. **Methods** Healthy young adults (n=20) performed a maximal and 2 sub-maximal cycle ergometer tests. The 2 submaximal tests were performed with the Talk Test (TT) (100 word paragraph) or without speaking, the control trial (C).  $VO_2$ ,  $VCO_2$ ,  $V_E$ ,  $P_{ET}CO_2$ , RR and TT times were recorded. **Results**  $VO_2$ ,  $V_E$  and  $VCO_2$  were significantly reduced during the TT and increased immediately after the TT. RR was reduced during the TT.  $P_{ET}CO_2$  values were highest during the TT and lowest before the TT. The time to complete the TT increased across progressive stages. **Conclusion** This study supports the hypothesis that speech production causes  $CO_2$  retention, which may increase  $P_aCO_2$ , causing ventilatory drive to increase. Since, above the VT the ventilatory drive is already high,  $CO_2$  retention with speech may cause speech to become uncomfortable and serve as the mechanism allowing the TT to serve as a marker of VT and RCT.



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**Tensyomyography: Methodological Concerns and Possible Solutions**  
 Rocio Dominguez-Castells, Roberto Laza-Cagigas, Zigor Montalvo-Zenarruzabeitia, Jaime Calle-Herrero. *Spanish Agency for Health Protection in Sport, Madrid, Spain.*  
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 (No relationships reported)

TMG measurements are highly dependent on the sensor location. It is generally placed on the point of greater muscle displacement, which is visually determined and may vary among researchers. Moreover, this point is different when voluntary or electrical contraction is produced. The type of contraction used (isotonic or isometric) may be another source of variability in TMG measurements. **PURPOSE:** To examine the differences in TMG with different methodologies and to propose some guidelines in order to prevent variability among researchers.  
**METHODS:** Eight physically active men participated in this study. Basal TMG measurements were performed on the vastus lateralis, rectus femoris, vastus medialis, biceps femoris and semitendinosus of both legs. Four methodologies were compared: a) classical with isotonic contraction (CL\_IST); b) classical with isometric contraction (CL\_ISM); c) motor point with isotonic contraction (MP\_IST); d) motor point with isometric contraction (MP\_ISM).  
**RESULTS:** When CL\_IST and CL\_ISM were compared, significant differences were found in delay time (Td) ( $23.15 \pm 3.78$  ms vs  $23.86 \pm 2.80$  ms,  $P < 0.05$ ), contraction time (Tc) ( $30.03 \pm 11.88$  ms vs  $31.59 \pm 12.05$  ms,  $P < 0.05$ ), sustained time (Ts) ( $159.51 \pm 92.17$  ms vs  $193.16 \pm 56.56$  ms,  $P < 0.05$ ) and relaxation time (Tr) ( $66.54 \pm 46.62$  ms vs  $105.56 \pm 58.65$  ms,  $P < 0.05$ ). When comparing MP\_IST and MP\_ISM, Ts ( $157.85 \pm 75.44$  ms vs  $201.20 \pm 52.95$  ms,  $P < 0.05$ ) and Tr ( $65.04 \pm 42.66$  ms vs  $106.93 \pm 56.41$  ms,  $P < 0.05$ ) showed significant differences. Td was the only variable to show significant differences in the comparisons CL\_IST - MP\_IST ( $23.15 \pm 3.78$  ms vs  $24.23 \pm 3.00$  ms,  $P < 0.05$ ) and CL\_ISM - MP\_ISM ( $23.86 \pm 2.80$  ms vs  $24.40 \pm 3.02$  ms,  $P < 0.05$ ). No significant differences were detected in the muscle displacement (Dm) among any of the methodologies.  
**CONCLUSIONS:** Longer-maintained contraction and slower relaxation were obtained with isometric contractions, when using both the classical technique and the motor point. One limitation of using isotonic contraction is that legs move freely after the electrical impulse, which may affect the measurement. For this reason, the use of isometric contraction is recommended to obtain more reliable measurements. On the other hand, the results showed that using the motor point technique does not affect the TMG measurement significantly.

354 Board #191 June 1, 11:00 AM - 12:30 PM  
**Profile In Male And Female Junior Basketballers During The Pre- Camp.**  
 Calleja-Gonzalez M. Julio<sup>1</sup>, Braulio Sanchez-Ureña<sup>2</sup>, Guillermo Olcina Camacho<sup>3</sup>, Jeff Mjaanes, FACSM<sup>4</sup>. <sup>1</sup>*Faculty of Sports Sciences, Vitoria, Spain.* <sup>2</sup>*Human Movement and Quality Life School, San Jose, Costa Rica.* <sup>3</sup>*Faculty of Sports Sciences, Caceres, Spain.* <sup>4</sup>*Rush University Medical Center, Chicago, IL.*  
 (Sponsor: Jeff Mjaanes, FACSM)  
 (No relationships reported)

Introduction. Actually, scientific evidence presents a big amount of data concerning to anthropometric and conditional profile of both genders in basketball. However, there is no evidence comparing junior players (both genders) during the pre-camp. Purpose. The main purpose of the present investigation was to analyze Pre-camp variation

in anthropometric and conditional parameters between genders in junior basketball players. **Methods.** Thirty players, 15 men (M) and 15 women (W) were selected to participate. The main characteristics were respectively: age (M: 19.2 ± 1, W: 21.2 ± 1, years), height (M: 1.82 ± 5.3, W: 1.68 ± 4.53, cm), Body mass (M: 92.7 ± 15.2, W: 73.4 ± 9.0, kgs). All the participants were tested at the beginning and the final of the pre camp (8 Weeks duration), consisting of injury prevention programs, endurance and aerobic exercises. Both genders completed 10-H per Week. Each participant performed 1RM, CMJ, 20 meters, bench press, clean and ½squat, 1, 2 and 3 miles running tests were performed. **Results.** At the beginning of the Pre-camp, M and W were significantly different in all variables measured excepting Age, height [1.82 ± 5.3 vs. 1.68 ± 4.53, cm.]; body mass [92.7 ± 15.2 vs. 73.4 ± 9.0, kg], body fat [11.3 ± 2.9 vs. 16.7 ± 5.3, %], CMJ [53.8 ± 6.3 vs. 33.4 ± 6.9, cm], 20 meters [3.19 ± 0.22 vs. 4.25 ± 0.4, m/sg], (M and W, respectively) ( $p < 0.05$ ). Additionally, the M reduced the time in running (-5.9% and -10.3%, 1 and 2 miles respectively) ( $p < 0.05$ ), pre- and post PRE camp. However, no statistically significant differences between groups after the program in any variables tested were found. **Conclusions.** At the beginning of Pre-camp, differences between M and W were described. During the pre-camp Training (10 hours per week of conditioning training), both genders improved the performance without statistical changes, except for squat.

355 Board #192 June 1, 11:00 AM - 12:30 PM  
**Predicting Vo2max From A 6-minute Stairs Climbing And Descending Test (6MSCDT)**

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**PURPOSE:** The purpose of this study was to develop a submaximal field test to estimate VO<sub>2max</sub>.

**METHOD:** Firstly, 201 participants (males=103, females=98 ;20-49 years old) performed 6MSCDT as fast as possible, taking one single step one time, up and down, on a staircase consisting of 2 flights (totally 22 steps, each step of 16 cm in height, 3.52 m total height). The number of steps was calculated. Heart rate was monitored by telemetry, and oxygen uptake was measured by a portable spirometry. After one week, VO<sub>2max</sub> (L/min) was measured through the graded exercise testing (GXT) using the same portable spirometry according to the Bruce protocol on treadmill. Correlation analyses were used to examine the associations between the 6MSCDT variables and VO<sub>2max</sub>. Stepwise regression was used to build a model for the relationship between VO<sub>2max</sub> and a variety of predictor variables.

**RESULT:** There was a high-positive correlation ( $r=0.912, p < 0.01$ ) between Peak oxygen uptake of 6MSCDT and the VO<sub>2max</sub> of GXT. There was a high-positive correlation ( $r=0.777, p < 0.01$ ) between Peak oxygen uptake and steps in 6MSCDT. There was a positive correlation ( $r=0.561, p < 0.01$ ) between steps of 6MSCDT and the VO<sub>2max</sub> of GXT. The new equation is followed:

**VO<sub>2max</sub> (L/min) = -1.572 + 0.002 × Steps + 0.512 × Gender + 0.04 × Body Mass (kg)**  
 Gender: female=0, male=1.

$R = 0.88, R^2 = 0.775, \text{adjusted } R^2 = 0.764, \text{SEE} = 0.425 \text{ (L/min)}$

**CONCLUSION:** The equation predicting VO<sub>2max</sub> developed in this study provides a means of assessing VO<sub>2max</sub>. The 6MSCDT can be used to predict VO<sub>2max</sub> and become a method of evaluation of CRF.

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356 Board #193 June 1, 11:00 AM - 12:30 PM  
**A Comparison of Pickleball and Walking: A Pilot Study**

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Pickleball is one of the rising trends in recreation sports for all ages yet only one study in cardiac patients has reported its cardiorespiratory demands. **Purpose:** The objective of this study was to compare cardiac activity, movement, energy expenditure, perceived exertion, and level of enjoyment during pickleball and walking in healthy adults. **Methods:** Twelve novice to intermediate level pickleball players (4 male: 8 female, age: 48.5 ± 13.1 years, height: 170.8 ± 9.8 cm, mass: 72.9 ± 12.0 kg) participated in this comparative study. Average heart rate, peak heart rate, total steps, and total calories expended during 30-minutes of pickleball doubles and 30-minutes of walking at a self-selected pace were measured using the Hexoskin™ wearable vest. Overall level of perceived exertion (RPE: 6 - 20 category scale) and overall enjoyment (1 low to 5 high Likert scale) were determined for each activity. Subjects participated in both activities in a counter-balanced order with five minutes sitting between activities. Differences between the activities were examined with the use of paired sample t-tests ( $\alpha = 0.05$ ). **Results:** Average heart rate (HR) and peak heart rate (PHR) were significantly higher playing pickleball (*pk*) than walking (*w*) (*pk*HR 117.3 ± 15.5, *w*HR 102.6 ± 16.5, *pk*PHR 140.5 ± 18.5, *w*PHR 119.8 ± 23.3;  $p < 0.001$ ).

While significantly more steps were taken while walking than playing pickleball (*w*Steps 3,175 ± 582, *pk*Steps 1,658 ± 148;  $p < 0.001$ ), significantly more calories (Cal) were expended in pickleball than in walking (*pk*Cal 229.2 ± 61.6, *w*Cal 161.4 ± 50.2;  $p < 0.001$ ). Participants rated their level of exertion higher in pickleball than walking (*pk*RPE 11.0, *w*RPE 8.9) and their level of enjoyment higher in pickleball than walking (*pk*Enjoy 4.7, *w*Enjoy 2.7). **Conclusions:** This study provides critical information on the physiological demands associated with playing pickleball, heretofore, unreported. Pickleball is higher in intensity, expends more calories, and is more enjoyable than walking at a self-selected speed.

357 Board #194 June 1, 11:00 AM - 12:30 PM  
**Classification Agreement for FITNESSGRAM® Aerobic Capacity Between 1-Mile Run and the New PACER Formula**

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To assess aerobic capacity (AC), FITNESSGRAM® offers 1-mile run/walk (1MRW) and PACER tests. AC is estimated from 1MRW time, gender, age, and BMI from a validated prediction equation. Since 2011, PACER laps were converted to 1MRW times using a test-equating method, and AC was estimated from equated 1MRW performance. A new formula for estimating FITNESSGRAM® AC directly from PACER laps and age has been recently adopted. **PURPOSE:** The purpose of this study was to examine the classification agreement between AC estimated from 1MRW times and AC estimated from the new PACER formula. **METHODS:** Subjects were 440 sixth-grade boys and girls, ages 11-13 years, who completed each of the FITNESSGRAM® test components of their yearly physical education assessment. The percent meeting the age and gender AC standards estimated from 1MRW times were 55% for the Healthy Fitness Zone (HFZ), 19% for Some Risk (SR), and 26% in the High Risk (HR) category. The percent meeting the AC standards estimated from the new PACER formula were 32% for HFZ, 32% for SR, and 35% for HR. **RESULTS:** The correlation between AC estimated from 1MRW times and the new PACER formula was .64, compared to .93 between AC estimated from 1MRW times and the old PACER test-equating method. The observed agreement comparing AC estimated from 1MRW times with the new PACER formula for distinguishing HFZ from Needs Improvement (NI) was .68, Kappa = .40, and for distinguishing SR from HR was .71, Kappa = .50. The observed agreement comparing AC estimated from 1MRW times with the old PACER test-equating method for distinguishing HFZ from NI was .94, Kappa = .88, and for distinguishing SR from HR was .96, Kappa = .92. **CONCLUSIONS:** Classification agreement between AC estimated from 1MRW times and the new PACER formula was much lower than for the old PACER test-equating method. This result was due at least in part by the exclusion of BMI in the new PACER formula. The correlation between BMI and AC estimated from the new PACER formula was .47, compared to a correlation of .82 between BMI and AC estimated from 1MRW times. For AC estimated from the new PACER formula there is little variation based on body size, whereas body size is a significant predictor of AC estimated from 1MRW performance. Accurate assessment and classification are important for appropriate interventions, especially for those in the HR category.

358 Board #195 June 1, 11:00 AM - 12:30 PM  
**Physical Fitness Test Of Evaluating Knee Extensor Muscle Strength And Size In University Freshmen Male Students**

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**Introduction:** It is well known that the size and strength of skeletal muscle decreases with increasing age (sarcopenia), notably in the knee extensor muscles. Recent studies have indicated that university students in Japan have low levels of physical activity, and that muscle strength of the lower extremities decreases every year. Therefore, physical fitness for university students should be focused on the size/strength of the knee extensor muscles. However, an appropriate physical fitness test to evaluate knee extensor muscle strength and size in university students has not been designed.

**Purpose:** The purpose of this study was to examine the relationship between knee extensor muscle strength and size and physical fitness results in university freshmen male students.

**Methods:** University students from the faculty of science and engineering in Toyo University participated in the study (N=116). The muscle thickness (MTH) of 104 healthy men (aged 18-20 years) was measured at the anterior half of thigh length; they

performed maximal voluntary isometric strength (MVC) of knee extensors. Physical fitness [30-second chair stand (CS-30) test, standing broad jump (SBJ), handgrip and thigh girth at 50% of thigh length (mid-thigh girth)] were also measured.

**Results:** The following were similar to the standard values of the overall Japanese population for the same age group: age (18.2 ± 0.5 years), standing height (1.71 ± 0.48 m), body mass (62.9 ± 7.9 kg), body mass index (BMI, 21.6 ± 2.6), MVC (41.4 ± 12.2 kg), MTH (52.3 ± 6.6 mm), CS-30 (33.1 ± 4.3 reps), SBJ (2.13 ± 0.20 m), handgrip (41.2 ± 6.4 kg) and mid-thigh girth (50.8 ± 4.3 cm). Knee extensor MVC was correlated with SBJ (r=0.361, p<0.001), hand grip (r=0.523, p<0.001) and mid-thigh girth (r=0.401, p<0.001), but not with CS-30 test (r=0.126, p>0.05). Knee extensor MTH was correlated with handgrip (r=0.317, p<0.001) and mid-thigh girth (r=0.632, p<0.001), but not with SBJ (r=0.038, p>0.05) and CS-30 test (r=0.145, p>0.05).

**Conclusion:** Our results indicated that the measurements of handgrip and mid-thigh girth are useful methods for evaluating knee extensor muscle strength and size, and thus they could play an important role in the physical fitness of university freshmen male students for the prevention of sarcopenia and to maintain an active life in the future.

359 Board #196 June 1, 11:00 AM - 12:30 PM  
**Age-related Physical Fitness Changes In Persons With Intellectual Disabilities**

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**INTRODUCTION:** Physical fitness declines with age in general population. At present, people with intellectual disabilities (ID) present a longer life expectancy and limited research has been done regarding the trend of fitness level in this population. **PURPOSE:** To study the influence of age on physical fitness in population with ID. **METHODS:** 98 persons (44 females and 54 males,) were recruited from an occupational day center for people with ID. A cross sectional study considering 5 groups divided by age (20-29yr, 30-39yr, 40-49yr, 50-59yr, 60-75yr) was developed, obtaining anthropometric data (weight, height, BMI, fat mass and fat free mass) and physical fitness data (aerobic capacity, strength, balance and flexibility) through a metabolic treadmill test, handgrip, Sit&Reach test, Standing Long Jump test, Flamingo test, Gesell bar test, Get up Go test and 6MWT. Descriptive for all variables were calculated, and ANOVA was applied. **RESULTS:** Aerobic capacities, strength, balance and flexibility improves between 20-29yr and 30-39 yr. but after that age the mean value of all the variables declines. The decline in VO2peak was ~20% from age 30-39 yr to age 60-75 yr. **CONCLUSIONS:** Since 20yr until 40 yr, work tasks of individuals with ID requires moderate to vigorous intensity physical labors, consistent with stable levels of physical fitness. Later, they usually acquire sedentary behaviors similar to the general population, which might affect their fitness levels, thus decreasing its values.

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| Descriptive statistics of participants' characteristics by age  |               |               |              |              |              |
|---|---------------|---------------|--------------|--------------|--------------|
| Variables   | 20-29 yr      | 30-39 yr      | 40-49 yr     | 50-59 yr     | 60-75 yr     |
| <b>Characteristics</b>  |               |               |              |              |              |
| Age   | 23 (3)        | 35 (3)        | 44 (3)       | 54 (3)       | 64 (4)       |
| Gender (female/male)  | 6 / 5         | 11 / 12       | 13 / 13      | 9/ 20        | 5 / 4        |
| <b>Anthropometrics</b>  |               |               |              |              |              |
| Weight  | 66.8 (10.6)   | 64.9 (11.8)*  | 80.4 (16.6)  | 75.2 (12.6)  | 72.8 (11.0)  |
| Height  | 158.3 (15.26) | 159.02 (12.1) | 163.9 (11.5) | 159.3 (7.8)  | 161.4 (7.8)  |
| BMI   | 26.9 (4.7)    | 25.7 (4.1)    | 30.5 (8.6)   | 29.7 (5.3)   | 28.1 (5.5)   |
| Fat mass (%)  | 31.1 (10.8)   | 30.1 (7.5)    | 32.1 (10.8)  | 31.8 (8.8)   | 28.5 (11.9)  |
| Fat free mass (%)   | 33.0 (7.8)    | 33.9 (6.1)    | 32.3 (8.0)   | 31.3 (7.0)   | 35.3 (7.9)   |
| <b>Fitness</b>  |               |               |              |              |              |
| HR (beat·min <sup>-1</sup> )  | 75 (13)       | 74 (17)       | 75 (15)      | 72 (12)      | 74 (22)      |
| VO <sub>2</sub> peak (L·min <sup>-1</sup> )   | 1.72 (0.56)   | 1.76 (0.46)   | 1.99 (0.35)  | 1.69 (0.41)  | 1.58 (0.24)  |
| Relative VO <sub>2</sub> peak (ml·kg <sup>-1</sup> ·min <sup>-1</sup> )   | 26.0 (7.9)    | 27.3 (5.9)    | 25.5 (5.8)   | 22.8 (5.1)   | 21.9 (4.0)   |
| HRmax (beat·min <sup>-1</sup> )   | 170 (19)**    | 158 (18)***   | 153 (16)     | 142 (18)     | 136 (24)     |
| Right hand-grip (kg)  | 20.3 (7.3)    | 19.0 (8.6)    | 19.9 (6.8)   | 17.1 (7.4)   | 17.7 (5.0)   |
| Left hand-grip (kg)   | 18.4 (7.6)    | 20.0 (9.6)    | 20.0 (6.5)   | 16.3 (5.7)   | 16.7 (7.1)   |
| Leg strength (kg)   | 35.2 (16.4)   | 37.0 (11.8)   | 32.3 (18.8)  | 31.4 (21.3)  | 27.8 (15.8)  |
| Sit & reach test (cm)   | -9.6 (15.2)   | -12.8 (15.0)  | -13.1 (11.5) | -16.0 (15.8) | -18.8 (14.6) |
| Standing long jump test (m)   | 0.82 (0.35)‡  | 0.75 (0.42)** | 0.47 (0.24)  | 0.46 (0.24)  | 0.45 (0.21)  |
| Flamingo test (sec)   | 8.7 (8.9)     | 8.8 (10.5)    | 6.1 (9.2)    | 6.8 (9.2)    | 6.7 (7.1)    |
| Gesell bar test (sec)   | 13.1 (6.9)    | 15.6 (7.3)    | 24.4 (13.6)† | 19.3 (8.5)   | 19.4 (11.7)  |
| Get up and Go Test (sec)  | 14.0 (3.7)    | 14.6 (3.7)    | 14.9 (2.9)   | 16.0 (2.0)   | 16.8 (2.7)   |
| 6 MWT (m)   | 460.4 (80.4)  | 462.4 (78.2)  | 437.3 (73.0) | 415.1 (74.9) | 410.9 (52.9) |
| Note: values are means (SD)   |               |               |              |              |              |
| Abbreviations: BMI, body mass index; HR, heart rate; SBP, systolic blood pressure; DBP, diastolic blood pressure; VO <sub>2</sub> , oxygen consumption; 6MWT, six minute walk test. |               |               |              |              |              |
| * Significant difference (p < 0.05) 30-39 yr vs. 40-49 yr   |               |               |              |              |              |
| ** Significant difference (p < 0.05) 20-29 yr vs. 50-59 yr and 20-29 yr vs. 60-75 yr  |               |               |              |              |              |
| *** Significant difference (p < 0.05) 30-39 yr vs. 50-59 yr and 30-39 yr vs. 60-75 yr   |               |               |              |              |              |
| † Significant difference (p < 0.05) 20-29 yr vs. 40-49 yr and 20-29 yr vs. 50-59 yr   |               |               |              |              |              |
| ‡ Significant difference (p < 0.05) 30-39 yr vs. 40-49 yr and 30-39 yr vs. 50-59 yr   |               |               |              |              |              |
| § Significant difference (p < 0.05) 20-29 yr vs. 40-49 yr and 30-39 yr vs. 40-49 yr   |               |               |              |              |              |

360 Board #197 June 1, 11:00 AM - 12:30 PM  
**Test-retest Reliability Of A Field-based Physical Fitness Assessment For Children And Adolescents Aged 9-17 Years: The Fuprecol Study**

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**PURPOSE:** Substantial evidence indicates that youth physical fitness levels are an important marker of lifestyle and cardio-metabolic health profiles and predict future risk of chronic diseases. The reliability physical fitness tests have not been explored in Latino-American youth population. The present study aims to determine the test-retest reliability of the Fitness Test Battery in children and adolescents aged 9-17 years. **METHODS:** Participants were 229 Colombian youth (boys n=124 and girls n=105) aged 9 to 17.9 years old. Five components of field-based physical fitness were measured: 1) morphological component: height, weight, body mass index (BMI), waist circumference, triceps skinfold, subscapular skinfold, and body fat (%) via impedance; 2) musculoskeletal component: handgrip and standing long jump test; 3) motor

component: speed/agility test (4x10 m shuttle run); 4) flexibility component (hamstring and lumbar extensibility, sit-and-reach test); 5) cardiorespiratory component: 20-meter shuttle-run test (SRT) to estimate maximal oxygen consumption. The tests were performed two times, 1 week apart on the same day of the week, except for the SRT which was performed only once. Intra-observer technical errors of measurement (TEMs) and inter-rater (reliability) were assessed in the morphological component. RESULTS: Reliability for the Musculoskeletal, motor and cardiorespiratory fitness components was examined using Bland-Altman tests. For the morphological component, TEMs were small and reliability was greater than 95% of all cases. For the musculoskeletal, motor, flexibility and cardiorespiratory components, we found adequate reliability patterns in terms of systematic errors (bias) and random error (95% limits of agreement). When the fitness assessments were performed twice, the systematic error was nearly 0 for all tests, except for the sit and reach (mean difference: -1.03 % [95% CI= -4.35 % to -2.28 %]. CONCLUSIONS: The results from this study indicate that the "Fuprecol study" field-based physical fitness administered by physical education teachers, was reliable for measuring health-related components of fitness in children and adolescents aged 9-17.9 years old in a school setting in Colombia. Funding COLCIENCIAS (Contract N° 671-2014 Code 122265743978).

361 Board #198 June 1, 11:00 AM - 12:30 PM  
**Sex-Based differences of Six Repeated Wingate Anaerobic Cycle Test Performances**  
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 (No relationships reported)

A recent investigation has demonstrated that an active recovery leads to a greater mean anaerobic power output when more than two Wingate Anaerobic Cycle Tests (WANt) are performed successively. However, to date, less is known regarding the impact of sex on successive WANt performances. **Purpose:** To determine the effect of sex on six repeated WANt performances. **Methods:** Ten participants, five males (M: age = 21.60 ± 3.05 yr, ht = 1.75 ± 0.03 m, wt = 65.81 ± 5.12 kg, BMI = 21.42 ± 1.17 kg·m<sup>-2</sup>, %BF = 7.01 ± 1.91 %) and five females (F: age = 19.60 ± 0.55 yr, ht = 1.59 ± 0.04 m, wt = 64.30 ± 5.15 kg, BMI = 25.42 ± 2.65 kg·m<sup>-2</sup>, %BF = 27.61 ± 2.44 %) completed two identical lab sessions, seven to fourteen days apart. The first lab session served as familiarization, "dry run", trial in which data was collected but not reported. During both sessions, participants were asked to warm-up by pedaling on a stationary bike for five minutes, at 50 revolutions per min (RPM) with no resistance, before performing six repeated WANt against a resistance equal to 7.5% of their body weight. The recovery period between tests consisted of three minutes of active recovery (pedaling at 50 RPM with no resistance) and one minute of passive recovery. **Results:** Peak and relative peak anaerobic power were significantly higher in the M group compared to the F group (M: 497.56 ± 25.63; F: 380.60 ± 17.67 W and M: 7.55 ± 0.22; F: 5.93 ± 0.25 W/kg, p<0.05) with no time effect. There was no significant difference between the M and the F groups when peak anaerobic power was expressed relative to lean body mass (M: 8.12 ± 0.20; F: 8.20 ± 0.38 W/kg, p>0.05). Mean and relative mean anaerobic power were significantly higher in the M group compared to the F group (M: 355.49 ± 17.09; F: 256.88 ± 8.40 W and M: 5.39 ± 0.11; F: 4.01 ± 0.13 W/kg, p<0.05) and a significant time effect (p<0.05) was apparent. There was no significant difference between the M and the F groups when mean anaerobic power was expressed relative to lean body mass (M: 5.80 ± 0.12; F: 5.53 ± 0.15 W/kg, p>0.05) but time effect (p<0.05) was apparent. **Conclusion:** Both the M and the F groups demonstrated similar anaerobic performance trends although the M group achieved higher peak and mean absolute and relative power performances, however, the variances seemed to be related to the differences in body composition between the M and the F groups.

362 Board #199 June 1, 11:00 AM - 12:30 PM  
**Validation And Accuracy Of Fitbit Charge: A Pilot Study In A University Worksite Walking Program**  
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Purpose: Wearable activity monitors (e.g., Fitbit®) have become increasingly popular for both researchers and lay people alike. Recent studies have reported several Fitbit® models correlate with research grade monitors; however none to date have examined the Fitbit® Charge model. Furthermore, none have reported on the accuracy of Fitbit® devices.

The primary purpose of this study was to compare step counts assessed by Fitbit® Charge and a research grade accelerometer (i.e., Actigraph®). The secondary purpose of this study was to compare the Fitbit® Charge algorithms for physical activity intensity with an algorithm validated for research purposes.

Methods: Participants (n=8) wore Fitbit® Charge and Actigraph® monitors for 7 days. First, correlations were run to examine the concordance of step counts and physical activity intensity levels derived from Fitbit® Charge and Actigraph® algorithms. Next, accuracy was investigated by paired sample t-tests comparing each device's assessment of step counts and minutes spent in light, moderate and vigorous intensity activity. Results: Significant correlations were found for all study outcomes (p's < .05). Significant differences were observed for step counts on all days and weekly total step count (p's < .05). Analyses of each intensity level revealed significant differences on most days for light and moderate intensity (p's < .05). For vigorous intensity, only day 6 (p = .007) and accumulated weekly total of minutes were different (p = .014). Conclusions: Our correlation results were similar to previous research examining validity of other Fitbit® models. However, Fitbit® Charge devices may overestimate step counts. Moreover, the algorithm used by Fitbit® may overestimate light and vigorous physical activity, while underestimating minutes in moderate physical activity. Further research is needed to determine reliability of Fitbit® Charge to assess activity and intensity that reflects current health recommendations. Therefore, researchers should use discretion if considering use of Fitbit® Charge for research purposes.

363 Board #200 June 1, 11:00 AM - 12:30 PM  
**Accute Effects Of using Custom-made Mouthpiece On Oral Air-flow Dynamics And Wingate Test Parameters**  
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The latest evidences of the ergogenic effects of a dentistry-design bite-aligning mouthpiece required more studies comparing its acute effects in anaerobic ability and ventilatory parameters. However, the cost and the comfortability of the pieces, together with its obstructive effect on air flow dynamics, put the athletes away from its use. **PURPOSE:** To test the ergogenic acute effects of wearing a custom-made mouthpiece on oral airflow dynamics, 30-sec Wingate Anaerobic Test performance parameters. **METHODS:** Twenty-eight healthy and physically active male subjects participated in three sessions. The first session was used to obtain informed consent, to assess anthropometric measurements, and to scan the mouth structure. In the second session, subjects were familiarized with the test protocols during a learning session. During the third session the subjects perform the 30s Wingate test and Spirometer testing. The experimental trials were performed in a random counterbalanced order. **RESULTS:** There were significant differences between mouthpiece and no-mouthpiece condition in mean power (W·Kg<sup>-1</sup>), peak power (W·Kg<sup>-1</sup>), Time to peak (s), Rate to Fatigue (W·s<sup>-1</sup>) of a 30-sec Wingate Anaerobic Test. Also, there were significant lower lactate production (mMol·L<sup>-1</sup>) but no significant differences were found in RPE. In airflow dynamics, the maximum expiratory volume (VEmax L·min<sup>-1</sup>) was significantly higher when comparing the mouthpiece and the no mouthpiece conditions in both forced and unforced conditions. **CONCLUSIONS:** Wearing a customized mouthpiece, the anaerobic ability measured through the performance parameters in Wingate Test has been improved and forced expiratory volume has been increased in an oral airflow testing procedure.

364 Board #201 June 1, 11:00 AM - 12:30 PM  
**Inter-Rater Reliability of a Movement Efficiency Test Among the Firefighter Cadet Population**  
 David J. Cornell, Kyle T. Ebersole. *University of Wisconsin - Milwaukee, Milwaukee, WI.* (Sponsor: Terry J. Housh, FACSM)  
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 (No relationships reported)

Due to previously identified links between functional movement quality and musculoskeletal injury risk among the firefighter population, various tools have been created to quantify functional movement quality. One such tool is the Fusionetics™ Movement Efficiency (ME) test, which utilizes seven different sub-tests to create an overall ME score of 0 – 100 (worst – best). However, the reliability of this tool has yet to be examined. **PURPOSE:** To determine the inter-rater reliability of the Fusionetics™ ME test between two raters of differing expertise among the firefighter cadet population. **METHODS:** Seven firefighter cadets (5 males, 2 females) volunteered to participate in the current study (19.6 ± 0.8 yrs, 166.7 ± 18.0 cm, 69.0 ± 11.5 kg). One rater was a certified strength and conditioning practitioner and the other was a licensed athletic trainer. Both raters independently scored the seven ME sub-tests in real-time according to the protocols described by the Fusionetics™ Human Performance System. These seven ME sub-tests include: a two-leg squat, a two-leg squat with a heel lift, bilateral one-leg squats, a push-up test, four shoulder movements, two trunk movements, and two cervical spine movements. The ME test scores for each rater were then calculated and obtained by a third party. Intraclass correlation coefficients using a two-way mixed effects model (ICC<sub>3,1</sub>) and one-way

analyses of variance (ANOVAs) were utilized to examine the inter-rater reliability of the overall ME score and individual sub-test scores. An  $\alpha < 0.05$  determined statistical significance. **RESULTS:** The ICC<sub>3,1</sub> of the overall ME score and all individual sub-tests were statistically significant ( $ps < 0.05$ ) and no statistically significant differences were identified between raters ( $ps > 0.05$ ). The ICC<sub>3,1</sub> of the overall ME test score was 0.970 (95% CI = 0.840 – 0.995) and the ICC<sub>3,1</sub> of the seven sub-tests ranged from 0.750 – 0.976 (95% CIs = 0.186 – 0.996). **CONCLUSIONS:** The results of the current study suggest that the inter-rater reliability of the Fusionetics™ ME test ranged from moderate to good (ICC<sub>3,1</sub> = 0.750 – 0.976) and no systematic bias was identified between raters. This implies that raters of differing expertise can utilize the Fusionetics™ ME test to quantify functional movement quality among the firefighter cadet cohort population.

365 Board #202 June 1, 11:00 AM - 12:30 PM  
**Comparison of Exercise Intensity between Folk Dance and Walking in Healthy Female**  
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Dance has gained popularity especially by women of all ages as an activity for health and fitness. Dance promotes physical health, mental health, and social health. In Japan, dance is compulsory in elementary and middle school PE. Rhythm dance, creative dance and folk dance are recommended to teach in PE. However, the research on physical aspects of folk dance is still few.

**PURPOSE:** To measure the heart rate and the exercise intensity while dancing folk dance and compare those to walking. **METHODS:** Heart rate of 7 healthy female (21.1±0.4 yrs) were recorded using the heart rate monitor (Polar, RC3GPS) while 1) dancing folk dance "Virginia Reel" with music (duration 7min 30sec, 116 bpm) and 2) walking for the same duration with same music in their own pace (the average walking speed was 83.7±8.6m/min). Exercise intensity was calculated by using maximum heart rate (%HRmax) and heart rate reserved (%HRR). Perceived exertion was measured by the Borg Rating of Perceived Exertion (RPE) 6-20 Scale. Independent t-test was performed with p value under 0.05 considered significant. **RESULTS:** The heart rate while dancing was significantly higher than that of walking (dance 118.9±7.2bpm, walking 93.9±9.5bpm,  $p < .05$ ). %HRmax and %HRR of dance were significantly higher than those of walking (%HRmax dance 59.5±3.5%, walking 47.0±4.7%,  $p < .05$ ; %HRR dance 39.0±4.4%, walking 20.2±5.5%,  $p < .05$ ). RPE of dance was significantly higher than that of walking (dance 13.1±1.2, walking 10±1,  $p < .05$ ). The maximum heart rate during trial was 153±6.8bpm in dance and 111.2±26.5bpm in walking. According to ACSM classification of exercise training intensity, intensity of dance was light to moderate (moderate in %HRmax, light in %HRR, moderate in RPE) and walking intensity was light in all three measures. **CONCLUSION:** Although heart rate, %HRmax, and %HRR of dance are higher than those of walking, the exercise intensity of dance is light to moderate. Dance can be a beneficial physical activity for beginners but we need to consider the pace of dance to meet sufficient intensity.

366 Board #203 June 1, 11:00 AM - 12:30 PM  
**Pre-Training Hydration Status in Adult Male and Female Athletes**  
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Athletes and coaches need to become more aware of athletes' hydration status in order to maximize training potential and competitive performance. The purpose of this study was to evaluate athletes' pre-training hydration. Twenty-eight athletes, who were actively training, volunteered and gave informed consent to participate in this study. The thirteen men had a mean age 21 [2.3] years, height 177.8 [7.9] cm, weight 88.1 [8.5] kg and a body composition 13.2 [5.4] %fat. The 15 women had a mean age 21.9 [3.0] years, height 164.8 [7.5] cm, weight 66.8 [8.9] kg and a body composition of 18.5 [3.9] %fat. After following a pre-determined euhydration (EU) protocol the athletes were measured for hydration status using blood hematocrit (Hct), urine specific gravity (USG) and body weight (BWT). Subsequently, the athletes were randomly measured for hydration status prior to their training sessions (PT) on three different occasions. The mean EU Hct for males and females was 44.8% (3.3) and 39.7% (1.9), respectively. The mean PT Hct for males and females was 46.0% (3.0) and 40.4% (2.0), respectively. The mean EU USG for males and females was 1.017 (0.002) and 1.016 (0.004), respectively. The PT USG for males and females was 1.020 (0.006) and 1.017 (0.006), respectively. The mean EU BWT for males and females was 88.1 kg (8.5) and 66.8 kg (8.9), respectively. The mean PT BWT for males and females was 89.9 kg (7.9) and 67.1 kg (9.1), respectively. There was no significant difference between the EU and PT Hct by gender. Likewise no difference was found between the

EU and PT USG for the females. However, the USG (EU=1.017 [0.002], PT=1.020 [0.006]) of the males was significantly different between the EU and PT conditions. Also, males' BWT increased from the EU to the PT conditions. This was contrary to the Hct and USG trend results. It is concluded that differences in the athletes' training times of day compared to the euhydration protocol time of day significantly affected the BWT and USG measures of hydration status more so than Hct. When EU time and PT time were matched it was found that the athletes tend to be hypohydrated prior to training when measured for hydration status by Hct and USG.

367 Board #204 June 1, 11:00 AM - 12:30 PM  
**Inter-Rater Response Stability of a Movement Efficiency Test Among the Firefighter Cadet Population**  
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 (No relationships reported)

In an attempt to decrease musculoskeletal injury risk, practitioners have begun implementing interventions in an attempt to enhance functional movement quality among various populations, including firefighters. However, the responsiveness of the Fusionetics™ Movement Efficiency (ME) test, a commonly utilized tool used to quantify functional movement quality, has yet to be examined. **PURPOSE:** To determine the response stability of the Fusionetics™ ME test between two raters of differing expertise among the firefighter cadet population. **METHODS:** Seven firefighter cadets (5 males, 2 females) volunteered to participate in the current study (19.6 ± 0.8 yrs, 166.7 ± 18.0 cm, 69.0 ± 11.5 kg). Two raters independently scored the seven ME sub-tests in real-time according to the protocols described by the Fusionetics™ Human Performance System. The Fusionetics™ ME test utilizes seven different sub-tests: a two-leg squat, a two-leg squat with a heel lift, bilateral one-leg squats, a push-up test, four shoulder movements, two trunk movements, and two cervical spine movements. One rater was certified strength and conditioning practitioner and the other was a licensed athletic trainer. The ME test scores of 0 – 100 (worst – best) for each rater were then calculated and obtained by a third party. The standard error of the measurement (SEM) of the overall ME test score and each sub-test were calculated to determine the response stability and the minimal detectable difference (MDD<sub>90%</sub>) between raters. **RESULTS:** The SEM of the overall ME test score was 2.89, with a MDD<sub>90%</sub> of 6.74. The strongest inter-rater response stability was observed in the four shoulder movements sub-test and the weakest inter-rater response stability was observed in the bilateral one-leg squat sub-test (SEM = 3.34, MDD<sub>90%</sub> = 7.79; SEM = 13.55, MDD<sub>90%</sub> = 31.62, respectively). **CONCLUSIONS:** The results of the current study suggest that when utilizing the Fusionetics™ ME test, an error of 2.89 in the overall ME test score can be expected between raters. This implies that a 6.74 change in overall ME test score is required to observe a true difference in overall functional movement quality when the Fusionetics™ ME test is utilized between raters among the firefighter cadet population. However, the range in inter-rater response stability varies among individual ME sub-tests.

368 Board #205 June 1, 11:00 AM - 12:30 PM  
**Validity And Reliability Of A Repeated Defensive Movements Test For Beach Volleyball Players**  
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**PURPOSE:** To design and report reliability and validity of a new test for assessing defensive repeated defensive movements on the sand (Double-X). **METHODS:** Fourteen beach volleyball male amateur players (24±3 yrs; 1.91±0.11 m height; 79.66±10.41 kg weight) were voluntarily recruited for this study. The Double-X test consisted in repeating diagonal runs in different directions between 4 cones situated at the corners of the sand court (separated 8 m). The whole test was video recorded with a Casio ZR-1000 high speed camera (240fps) and the frames were counted to determine the time of different intervals. The second tests consisted in performing block jumps and attack jumps on the sand. Coefficient of variation (CV) was calculated and Person product-moment correlation was used to compare Double-X and jump ability. We also used compared the results of the tests and lactate samples at the end of the test. **RESULTS:** CV was less than 3% in all tests. Significant correlations were found between Double-X time and Block jump ( $r = -0.78$ ;  $p < 0.05$ ). Mean lactate levels of 7.6±2.1 mMol/l were found. We also found relationships between different tranches of the test that indicate differences in the ability to perform quick repeated defensive actions on the sand.

**CONCLUSIONS:** Double-X constitutes a reliable and valid test for repeated defensive movements on the sand court. Lactate levels of the subjects indicated that this is a specific anaerobic test.

- 369 Board #206 June 1, 11:00 AM - 12:30 PM  
**Mechanical Properties of Trunk Muscles using Myoton: Relationships with Physical Fitness of Trunk.**  
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Monitoring of biomechanical properties using Myoton can evaluate muscle disorder and dynamic sports performance. Trunk muscles provide postural control and spinal stability. However, little is known about relationships between mechanical properties and strength, and flexibility in flexion of trunk muscles. **PURPOSE:** The purpose of this study was to investigate whether the mechanical properties of trunk muscles using Myoton were correlated with isokinetic strength and flexibility at trunk flexion. **METHODS:** Eighty-one healthy young men without orthopedic disorders participated in this study. To evaluate the mechanical properties; frequency (F), decrement (D), stiffness (S), creep (C), and relaxation (R), of trunk muscles, Myoton applied on rectus abdominis (RA), external oblique (EO), and 3-site of erector spine (9th thoracic vertebra, T9; between 1st and 2nd lumbar vertebrae, L1-2; between 4th and 5th lumbar vertebrae, L4-5). Moreover, isokinetic strength of trunk at trunk flexion was measured as peak torque by isokinetic dynamometer (at 60, 120°/sec). Furthermore, trunk flexibility was assessed through trunk forward flexion (TF) and sit and reach (SR) test. **RESULTS:** On the correlation between Myoton indices of the abdominal muscles and peak torque at trunk flexion, peak torque had a positive relationship ( $p < .05$ ) with F (EO:  $r = .258$  at 60°/sec; RA:  $r = .279$ , EO:  $r = .257$  at 120°/sec) and S (EO:  $r = .232$  at 120°/sec) whereas C (EO:  $r = -.240$  at 60°/sec; RA:  $r = -.224$ , EO:  $r = .230$  at 120°/sec) and R (EO:  $r = -.229$  at 60°/sec; RA:  $r = -.270$ , EO:  $r = .246$  at 120°/sec) had a negative correlation ( $p < .05$ ). Moreover, peak torque at trunk flexion was positively related to C ( $r = .272$  at 60°/sec) and R ( $r = .243$  at 60°/sec) of T9 in erector spine ( $p < .05$ ). Furthermore, trunk flexibility had a positive relationship with F (TF:  $r = .259$ , SR:  $r = .240$ ) whereas C (TF:  $r = -.259$ , SR:  $r = -.277$ ) and R (TF:  $r = .258$ , SR:  $r = .247$ ) had a negative correlation, respectively ( $p < .05$ ), on the correlation between mechanical properties of EO and trunk flexibility. **CONCLUSION:** Myoton would be a new method to evaluate biomechanical muscle properties related to physical fitness components of trunk, based on these results correlated with strength and flexibility at trunk flexion.

- 370 Board #207 June 1, 11:00 AM - 12:30 PM  
**Vo2-hr And Vo2-hrr Relationships During New Taekwondo Specific Tests And Traditional Treadmill Running Cardiopulmonary Exercise Test**  
 Matheus Hausen<sup>1</sup>, Pedro Paulo Soares<sup>1</sup>, Marcus Paulo Araújo<sup>1</sup>, Débora Esteves<sup>1</sup>, Hilbert Julio<sup>1</sup>, Roberto Tauil<sup>1</sup>, Gabriel Espinosa<sup>1</sup>, Flávia Porto<sup>2</sup>, Jonas Gurgel<sup>1</sup>. <sup>1</sup>Fluminense Federal University, Niterói, RJ, Brazil. <sup>2</sup>Rio de Janeiro State University, Niterói, RJ, Brazil.  
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**PURPOSE:** To analyze  $\dot{V}O_2$ -HR and  $\dot{V}O_2$ -HRR relationships during taekwondo specific exercise tests (TKDxt) and running exercise test (CPXT). **METHODS:** 12 male taekwondo athletes (20±2yrs, body mass 67.5±5.7Kg, height 175±8cm) visited the laboratory 3 times. The University ethics committee approved this study. At the first visit, anthropometric assessment and CPXT were performed. In counterbalanced order, next two visits - continuous and Interval TKDxt (cTKDxt and iTKDxt) were performed. CPXT was constituted by an individualized ramp protocol. TKDxt were constituted by progressive stages of kicking sequences, until participant's fatigue. iTKDxt presented an additional passive recovery stage after each 2 kicking stages. During all tests,  $\dot{V}O_2$  and HR were measured continuously. Passing-bablok regression with cusum test was performed. The intercept and slope for each test were also compared through repeated measures ANOVA, with Bonferroni post hoc test, after Shapiro-wilk test confirmed normality for all data.  $P < .05$  was adopted for all tests. **RESULTS:** Detailed results were presented in table 1. Only cTKDxt presented no deviation from linearity in both relations. CPXT's  $\dot{V}O_2$ -HRR presented proximity to identity line, with Slope's 95%CI ranging 1. Only iTKDxt differed from CPXT in both  $\dot{V}O_2$ -HR (Intercept's ANOVA  $p < .01$  and Slope's ANOVA  $p < .01$ ) and  $\dot{V}O_2$ -HRR (Intercept's ANOVA  $p = .01$  and Slope's ANOVA  $p < .01$ ) relationships. **CONCLUSIONS:** Our findings suggests that cTKDxt is more suitable to predict oxygen consumption during indirect assessment. Besides CPXT was closer to identity line ( $\dot{V}O_2$ -HRR), only cTKDxt presented linearity, resulting in a similar profile across different intensities. Support: CAPES, CNPq and FAPERJ.

Table 1 - Proximity to identity line, linearity, and comparison of  $\dot{V}O_2$ -HR and  $\dot{V}O_2$ -HRR relationships during taekwondo specific tests and running cardiopulmonary exercise test.

|        | Passing-Bablok Regression's 95%CI for Intercept and Slope with Cusum test (C-p) |               |        |                   |               |        |
|--------|---|---------------|--------|-------------------|---------------|--------|
|        | $\dot{V}O_2$ -HR  |               |        | $\dot{V}O_2$ -HRR |               |        |
|        | Intercept (95%CI)   | Slope (95%CI) | C-p    | Intercept (95%CI) | Slope (95%CI) | C-p    |
| CPXT   | 0,31 to 0,39  | 0,81 to 0,80  | 0,02   | 0,01 to 0,12      | 0,89 to 1,01* | 0,05   |
| cTKDxt | 0,41 to 0,49  | 0,51 to 0,60  | 0,20 † | 0,13 to 0,25      | 0,76 to 0,89  | 0,47 † |
| iTKDxt | 0,43 to 0,50  | 0,46 to 0,54  | 0,01   | 0,16 to 0,27      | 0,68 to 0,81  | <0,01  |

|         | Comparison between tests Intercept and Slope |                          |                          |                          |
|---------|--|--------------------------|--------------------------|--------------------------|
|         | $\dot{V}O_2$ -HR                             |                          | $\dot{V}O_2$ -HRR        |                          |
|         | Intercept (mean ± sd)                        | Slope (mean ± sd)        | Intercept (mean ± sd)    | Slope (mean ± sd)        |
| CPXT    | 0,38 ± 0,13 <sup>a</sup>                     | 0,63 ± 0,13 <sup>a</sup> | 0,11 ± 0,20 <sup>a</sup> | 0,90 ± 0,21 <sup>a</sup> |
| cTKDxt  | 0,46 ± 0,18                                  | 0,55 ± 0,09              | 0,21 ± 0,16              | 0,80 ± 0,14              |
| iTKDxt  | 0,50 ± 0,15 <sup>a</sup>                     | 0,46 ± 0,18 <sup>a</sup> | 0,28 ± 0,23 <sup>a</sup> | 0,86 ± 0,26 <sup>a</sup> |
| Anova p | <0,01  | <0,01                    | 0,01                     | <0,01                    |

CI - confidence interval.  $\dot{V}O_2$ -HR - Relationship between oxygen consumption and heart rate.  $\dot{V}O_2$ -HRR - Relationship between oxygen consumption and heart rate reserve. CPXT - Treadmill running cardiopulmonary exercise test. cTKDxt - Continuous taekwondo exercise test. iTKDxt - Interval taekwondo exercise test. \*Denotes proximity to identity line (slope value of 1). † Denotes no significant deviation from linearity. Bonferroni pairwise comparisons ( $p > .05$ ). <sup>a</sup> Denotes significant different to CPXT. <sup>b</sup> Denotes significant different to iTKDxt.

- 371 Board #208 June 1, 11:00 AM - 12:30 PM  
**Preseason Shoulder Screening Protocol (PSSP) for Collegiate Overhead Athletes**  
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 (No relationships reported)

**PURPOSE:** Collegiate athletes who participate in overhead sports have been reported to be at a high risk of shoulder injuries. This study aims to investigate a Preseason Shoulder Screening Protocol (PSSP) created to identify risk of shoulder injury during the season of competition for an athlete.

**METHODS:** A total of 58 division III collegiate overhead athletes from the baseball, softball and swimming teams agreed to participate and signed an approved informed consent. The PSSP included: scapular position at rest and 90° of shoulder abduction (ABD) with and without a load, glenohumeral (GH) internal rotation (IR), external rotation (ER) and horizontal adduction (ADD) range of motion (ROM), GH IR and ER strength, pectoralis minor length, and the closed kinetic chain upper extremity stability test (CKCUEST). The athletes were monitored throughout their season and then at one year using an online survey to report shoulder injuries.

**Data Analysis:** Descriptive statistics and cross tabulation of history of injury and injury during the one year follow up was performed. Analysis of variance were calculated to determine significant differences among athletes.

**RESULTS:** Athletes from different sports demonstrated significant differences in their performance especially in GH IR ROM, scapular positions @ 90° GH ABD, loaded scapular positions @ 90° GH ABD, pectoralis minor length, IR strength testing, ER strength testing and CKCUEST. Nine athletes (15%) reported shoulder injuries in the one-year following screening and 6 (12%) were injured during the season. Within one-year following the PSSP, 31% of athletes who reported a history of shoulder injury were injured again compared to only 11% of athletes who did not report a history of injury (OD 3.6 and RR = 2.41)

**CONCLUSIONS:** This study found that each sport had a unique performance on the PSSP. These differences may be linked to gender, training regimens and the physical requirements of each sport. This finding may make it challenging to use a single cluster of impairments to predict future injuries across all overhead sports using the PSSP. The current injury rate reported has prohibited calculation of the predictive validity of the PSSP. Future prospective cohort study designs using the PSSP will require a larger number of athletes to have sufficient injuries reported.

- 372 Board #209 June 1, 11:00 AM - 12:30 PM  
**Valid Measures Of Aerobic Capacity Obtained From An Anaerobically Dominant Task**  
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The aerobic response to traditionally anaerobic work is profound, however developing a single test to analyze both capacities has thus far been unsuccessful. A novel test, called the SeaRed, was developed to assess aerobic and anaerobic capacities simultaneously.

**PURPOSE:** To establish the validity of a test designed to identify both aerobic and anaerobic exercise capacities.

**METHODS:** 14 participants from a University Track and Field program were recruited. Participants reported to the laboratory three times to complete in a counterbalanced order, a Graded VO2max, a Wingate Anaerobic test (WAnT), and a SeaRed test (combined assessment of aerobic and anaerobic). Each test was performed on the same electronically braked cycle ergometer. The SeaRed test consisted of a three minutes warm up at 100W followed by two minutes at approximately ventilatory threshold, followed immediately by a 45s sprint with 7.5% of bodyweight applied to the flywheel. Aerobic capacity (VO2max) was assessed against the graded VO2max protocol, where work was increased every 2 minutes by 50W, and by 25W as the participant neared maximal intensity. Anaerobic variables of peak power (PP), average power (MP), and fatigue index (FI) were compared to a 45s WAnT with 7.5% of body weight applied to the flywheel.

**RESULTS:** The SeaRed protocol obtained a valid measurement of the VO2peak ( $53.9 \pm 7.9$  kgmin<sup>-1</sup>) as compared to that obtained in the graded VO2max protocol ( $55 \pm 7.6$  kgmin<sup>-1</sup>,  $p=1.00$ ). An ICC, using an absolute agreement model, of the SeaRed and the VO2max test revealed a strong intraclass correlation (0.911). Intraclass correlations using an absolute agreement model show strong correlations in absolute PP (0.92), MP (0.95), FI (0.90), relative PP (0.76), and relative MP (0.78), however; significant differences were observed between PP and MP for both absolute and relative values ( $p<0.05$ ). Large confidence intervals were also present for PP, MP, FI, relative PP and relative MP.

**CONCLUSIONS:** Valid measurements of aerobic capacity were obtained through the traditionally anaerobic task, indicating the SeaRed can be used as an abbreviated VO2max test. However, more work is required before the SeaRed is a suitable replacement for the WAnT.

373 Board #210 June 1, 11:00 AM - 12:30 PM  
**Comparison of Medial Knee Displacement Assessment on the Overhead Squat and Landing Error Scoring System**

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 (No relationships reported)

Medial knee displacement (MKD) in females has been associated with increased risk for anterior cruciate ligament injury (ACL). It can be reliably detected using clinical movement screens and is readily modifiable through corrective exercise. The Overhead Squat (OHS) and Landing Error Scoring System (LESS) are both valid indicators of MKD.

**Purpose:** To determine concordance between evaluation of MKD from the OHS relative to the more dynamic LESS.

**Methods:** Female U.S. Military applicants ( $n=84$ ,  $20.6 \pm 2.7$  yrs,  $161.4 \pm 6.7$  cm,  $60.4 \pm 8.3$  kg) from the Baltimore MEPS performed the OHS and LESS prior to entering military basic training. MKD for both tests was evaluated dichotomously: 0 indicating no MKD and 1 indicating the presence of MKD. The OHS was evaluated in real time. MKD on the LESS was evaluated at maximum knee flexion. McNemar's Test for non-homogeneity was performed to determine paired proportions of MKD between the OHS and LESS.

**Results:** A total of 55 females (65.4%) displayed MKD on the OHS, and 76 females (90.5%) had MKD on the LESS. McNemar's test showed non-homogeneity for MKD detection on both the OHS and LESS ( $\chi^2 = 15.21$ ,  $p<0.001$ ); the majority of females (60.7%,  $n=51$ ) who displayed MKD on the OHS also displayed MKD on the LESS. However, 29.8% ( $n=25$ ) of females who displayed MKD on the LESS did not display MKD on the OHS. Only 4 (4.8%) females did not display MKD on either screen.

**Conclusion:** The OHS and LESS are both commonly used clinical screens for assessing MKD, a risk factor for ACL injury in females. Although the majority of females who displayed MKD on the OHS also displayed it on the LESS, 29.8% only displayed MKD on the more dynamic LESS suggesting that MKD manifests differently between static and dynamic tasks. Both screens have been biomechanically validated as indicators of MKD, but the dynamic task requirements of the LESS may be more representative of sport-specific movement. Further analyses comparing injury rates in recruits with MKD detected by OHS versus LESS are pending. The LESS could be a more accurate test for assessing dynamic MKD as a readily modifiable risk factor for ACL injury in females.

374 Board #211 June 1, 11:00 AM - 12:30 PM  
**Physical and Physiological Comparison between Marine Corps Forces Special Operations Command Operators and Combat Support Personnel**

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 (No relationships reported)

Tactical demands of a Marine Corps Forces Special Operations Command (MARSOC) Operator require high levels of physical performance. During combat deployments, teams of Operators may be supplemented with Combat Support personnel (CSP), who specialize in mission-specific tasks. MARSOC Operators and CSP may serve alongside each other in extreme combat environments, often enduring the same physical demands; however, they do not go through the same tactical training. **PURPOSE:** To examine the differences in physical and physiological characteristics between MARSOC Operators and CSP.

**METHODS:** Testing including body composition (BF), anaerobic power (PAnP), anaerobic capacity (MAnP), aerobic capacity (AC), and knee and torso isokinetic strength testing (KF, KE, TF, TE) were collected on 42 Operators (Age:  $28.4 \pm 6.1$  years, Height:  $178.8 \pm 6.7$  cm, Mass:  $85.4 \pm 7.9$  kg) and 19 CSP (Age:  $28.0 \pm 7.1$  years, Height:  $178.0 \pm 6.0$  cm, Mass:  $81.4 \pm 11.3$  kg). Differences between groups were evaluated using independent samples t-tests, or Mann-Whitney U tests if required ( $p < 0.05$ ). **RESULTS:** Operators demonstrated greater physiological performance in MAnP ( $9.2 + 9$  W/kg,  $8.0 + 1.3$  W/kg;  $p=.001$ ), and AC ( $51.8 + 4.4$  ml/kg/min,  $47.7 + 5.6$  ml/kg/min;  $p=.009$ ). Operators also demonstrated greater right KF ( $135.4 + 27.4$  %BW,  $112.8 + 26.9$  %BW;  $p=.005$ ), left KF ( $132.3 + 25.7$  %BW,  $113.3 + 29.1$  %BW;  $p=.007$ ), right KE ( $263.3 + 47.5$  %BW,  $218.4 + 60$  %BW;  $p=.002$ ), left KE ( $250.8 + 50.7$  %BW,  $215.4 + 54.3$  %BW;  $p=.011$ ), TF ( $231.1 + 35$  %BW,  $198.1 + 37.8$  %BW;  $p=.002$ ), and TE ( $404.2 + 101.8$  %BW,  $355.3 + 50.2$  %BW;  $p=.019$ ). No significant differences were found in BF and PAnP. **CONCLUSION:** Results exhibit significant discrepancies in physical and physiological performance between Operators and CSP. These findings suggest the need for CSP to incorporate additional training designed to enhance their ability to maintain performance at a higher standard, similar to that of Operators. Special operations teams require all personnel to perform as a unit; not having all team members perform at the required physical levels may be detrimental to the mission and all members of the combat team. Future research is needed to examine the physiological and physical dichotomy between Operators and CSP and minimum necessary standards to achieve successful tactical performance.

375 Board #212 June 1, 11:00 AM - 12:30 PM  
**Physiological Changes in College Students Following a Single Semester Physical Activity Class**

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Most college physical activity classes fall short of providing enough physical activity to meet the ACSM's current minimum weekly recommendations for physical activity. Since these courses are only 3-4 months in length, there is a question regarding the ability of these courses to produce physiological changes that have potential health benefits. **PURPOSE:** The purpose of this study was to examine changes in body composition, aerobic fitness, and muscular strength in college students following a single semester physical activity class. **METHODS:** Sixty four females (BMI =  $25.4 \pm 5.8$ , age =  $21.2 \pm 2.7$  yrs) and 47 males (BMI =  $27.7 \pm 7.4$ , age =  $21.7 \pm 2.9$  yrs) were enrolled in a one semester (16 week) physical activity class. Participants were enrolled in one of five different physical activity courses. All courses met for 50 minutes, twice per week. These courses consisted of weight training, circuit training, body weight training, and cross training and were designed to stress different energy systems on different days. Students were also encouraged to continue physical activity outside of class hours. The following measures were obtained during the first two and last two weeks of classes; resting heart rate, body weight, height, body composition (bioelectrical impedance), 1.5 mile run, hand grip strength, and a push-up test. Pre- and post-test comparisons were made using paired t-tests. **RESULTS:** As a group, there were significant decreases in resting heart rate ( $4.3 \pm 1.5$  bpm), 1.5 mile run time ( $1:01 \pm 0:30$  min) and significant increases in hand grip strength ( $3.4 \pm 1.2$  kg) and push-ups completed ( $3.9 \pm 0.8$ ). In females, there was a significant decrease in 1.5 mile run time ( $1:05 \pm 0.5$  min) and a significant increase in push-ups completed ( $4.4 \pm 1.0$ ). In males, there was a significant decrease in heart rate ( $5.1 \pm 2.3$  bpm) and 1.5 mile run time ( $0:57 \pm 0.5$  min) and significant increases in hand grip strength ( $7.5 \pm 2.4$  kg) and push-ups completed ( $3.2 \pm 1.1$ ). There were no significant changes in body

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weight, BMI, or body composition. **CONCLUSION:** The results of this study indicate that college-aged participants can achieve significant increases in aerobic fitness and muscular strength by participating in a general physical activity class.

**376 Board #213 June 1, 11:00 AM - 12:30 PM**  
**Accuracy of Wrist-Worn Activity Monitors during Wheelchair Use and Arm Ergometry**

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*(No relationships reported)*

Recently, the use of wrist worn activity monitoring devices using tri-axial accelerometers to estimate step counts has become widespread in the general population. **PURPOSE:** To evaluate whether common, commercially available fitness monitoring devices can accurately estimate wheelchair stroke counts and arm ergometer revolutions. **METHODS:** 30 able-bodied wore three commercially available activity trackers using tri-axial accelerometers on the right wrist in random order. Participants propelled a wheelchair on a roller treadmill at three separate frequencies (30, 45 and 60 strokes per minute), 3 minutes each. They also propelled the wheelchair on the rollers at pre-determined varied frequencies, ranging from 30 bpm to 80 bpm for 2 minutes. Each frequency was performed 3 times in random order. The participants were shown a video recording of a metronome at each of the frequencies to maintain the prescribed frequencies for each task. Participants also freely wheeled through an obstacle course twice. Two experimenters used tally counters to count actual wheelchair strokes. A second group of subjects performed an arm ergometry task at three different frequencies (40, 60 and 80 cycles per minute) for three minutes each in randomized order. **RESULTS:** Mean (SD) percentage error for 30, 45 and random stroke frequencies were  $\geq 20$  (11)% for all monitors. At 60 rpm, mean percent error was 12 (13), 12 (11), 5 (5)% for monitors A, B and C, respectively. For obstacle course strokes, intraclass correlation coefficients (95% CI) were 0.888 (.767-.946), 0.853 (.693-.930), 0.917 (.828-.961) and Lin's concordance coefficient (95% CI) were 0.792 (0.655-0.879), 0.740 (0.531-0.864), 0.846 (0.715-0.919) for monitors A, B and C, respectively. For arm ergometry, standard error of the measurement varied widely for each monitor across all frequencies from 20, 33 and 261 strokes for monitors A, B and C, respectively at 40 rpm; 49, 190 and 8 strokes at 60 rpm; to 268, 267 and 107 strokes at 80 rpm. **CONCLUSION:** At low wheel chair stroke frequencies, and at low and high ergometer cycling frequencies, commercially available wrist worn fitness monitors perform rather poorly in estimating counts. Activity monitors specific to activities commonly performed by persons with lower limb paralysis are necessary to accurately estimate their activity.

**377 Board #214 June 1, 11:00 AM - 12:30 PM**  
**Comparing Soft Tissue Injury Rate Using the Functional Movement Screen in Division I Football Players**

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The Functional Movement Screen (FMS) was created in 1995 to gather information on movement patterns and use that knowledge to improve fundamental movement patterns. However, past research has indicated the FMS may be used to predict the potential for soft tissue injuries, primarily based upon asymmetries. The majority of past studies indicate an FMS score of  $< 14$  as an indicator of an increased risk of experiencing a soft tissue injury. **PURPOSE:** The purpose of this study was to compare pre-season FMS scores, from collegiate football players between two consecutive seasons, with respect to soft tissue injury rate. **METHODS:** Prior to the 2013-14 ( $n=88$ ; Age= $20.2 \pm 1.6$  years; BW= $228.3 \pm 44.4$  lbs; Height= $72.8 \pm 2.2$  in; FMS= $13.8 \pm 2.3$ ) and 2014-15 season ( $n=96$ ; Age= $20.1 \pm 1.5$  years; BW= $229.1 \pm 40.5$  lbs; Height= $72.2 \pm 2.7$ ; FMS= $14.0 \pm 2.5$ ) Division I FCS football players had FMS scores recorded. During each subsequent season, all soft tissue injuries were documented by the Athletic Training staff. **RESULTS:** A Pearson Product Moment Correlation, within season, and independent samples t-test were conducted, for between season comparisons. Results showed inline lunge asymmetry (ILA) ( $p=.001$ ) and active straight leg raise (ASLR) ( $p=.003$ ) were significantly different between seasons. A ROC Curve showed both seasons supported an FMS cutoff score of  $< 14$  as an indicator of increased risk for injury. **CONCLUSION:** Both seasons contributed to the growing amount of research that supports the FMS cutoff score for elevated risk of soft tissue injury of  $< 14$ . The ASLR scores were significantly correlated to injury location for the 2014-15 season and significantly different between seasons. Specifically, the ASLR scores increased between seasons while overall injury rates decreased. This finding was expected, as players' movements improve the number of soft tissue injuries decrease. Counterintuitively, the ILA significantly increased between seasons, along with a decrease in soft tissue injury rates. While the ILA finding contradicts past research it is

possibly due to the unmeasurable confounding variables associated with football (i.e., collision-based sport), which could skew the ability of the FMS to accurately predict future soft tissue injury risk.

**378 Board #215 June 1, 11:00 AM - 12:30 PM**  
**Nc Police Physical Fitness Assessment Tables: Are The Current Tables Still Relevant?**

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The State of North Carolina Basic Law Enforcement Training Program (BLET) is using the physical fitness assessment tables developed through the Cooper Institution in Dallas, TX. It is a concern that these physical fitness standards do not adequately reflect the physical fitness norms of the police recruits in North Carolina (NC). **PURPOSES:** 1) To develop new physical fitness assessment tables from recent (2013-2015) NC police recruit scores. 2) To compare the Cooper Institution physical fitness tables and the new NC physical fitness tables. **METHODS:** Data was collected from eight NC law enforcement academies. The physical fitness tests conducted include muscular endurance, muscular strength, power, and cardiovascular assessments. The sample included  $n=593$  male officers age  $< 40$  years. Post assessment scores were used in the comparison. Percentiles, two-sample Kolmogorov-Smirnov test and a Welch two-sample t-test were used to compare the Cooper and NC tests. **RESULTS:** NC recruits had significantly better scores than the Cooper sample ( $P < 0.001$ ) for the following tests: pushups, sit-ups, vertical jump, bench-press ratio, and 300 meter run. For  $< 30$  year olds, the means were  $55.79 \pm 12.6$  vs  $35.4 \pm 17.4$  reps,  $48.7 \pm 7.1$  vs  $39.8 \pm 9.7$  reps,  $62.6 \pm 11.8$  vs  $51.6 \pm 12.0$  cm,  $1.23 \pm 0.24$  vs  $1.09 \pm 0.3$ , and  $50.9 \pm 8.4$  vs  $56.4 \pm 8.4$  sec, respectively. For the 30-39 year olds, the means were:  $53.7 \pm 11.3$  vs  $29.0 \pm 15.1$  reps,  $46.5 \pm 6.5$  vs  $36.2 \pm 9.3$  reps,  $58.7 \pm 11.4$  vs  $48.8 \pm 10.6$  cm,  $1.16 \pm 0.24$  vs  $0.94 \pm 0.24$ , and  $54.5 \pm 9.1$  vs  $57.2 \pm 10.6$  sec, respectively. However, the Cooper sample had faster times for the 1.5 mile run for both age groups,  $< 30$  being  $12:13 \pm 2:30$  vs  $11:50 \pm 2:19$  min:sec, and 30-39 being  $13:58 \pm 3:06$  vs  $12:16 \pm 2:22$  min:sec. **CONCLUSION:** Overall the Cooper tables being used in the State of NC for BLET fitness standards are substantially lower than what the NC police recruit data displays. Therefore, the need is justified to update the BLET fitness standards for the State of NC.

**379 Board #216 June 1, 11:00 AM - 12:30 PM**  
**Effects of Cadence Settings on Stepwatch Accuracy Between 26.8 and 268 m/min**

Lindsay Toth, Shah Nawaz Notta, Brittany Overstreet, Scott Crouter, FACSM, David Bassett, FACSM. *University of Tennessee, Knoxville, TN.* (Sponsor: David R. Bassett, FACSM)

*(No relationships reported)*

The StepWatch 3, an ankle mounted pedometer, has previously been deemed 98-100% accurate for counting walking steps ( $26.8$  to  $107.3$   $m \cdot min^{-1}$ ) using the default settings for cadence and sensitivity. With the same settings, however, this device does not accurately count running steps. Through the advanced programming mode, one can vary the cadence and sensitivity settings, which may improve accuracy at higher speeds of ambulation.

**PURPOSE:** To examine how changing the cadence settings on the StepWatch affects the device output at various walking and running speeds. **METHODS:** Fifteen participants ( $28.5 \pm 9.7$  years) completed 2-min trials of treadmill ambulation at 10 different speeds ( $26.8$  to  $268$   $m \cdot min^{-1}$ ) while wearing a device on the medial and lateral aspect of each ankle, directly above each malleoli for a total of 4 devices overall. Sensitivity was held constant at the default value of 13 while the cadence setting varied across the devices ( $C_{100}=100\%$ ,  $C_{83}=83\%$ ,  $C_{70}=70\%$ , and  $C_{60}=60\%$  of the default cadence setting). Devices were randomized for ankle location. Direct observation was used as the criterion of step count (steps/minute). **RESULTS:** The following table shows the percent accuracy for each setting and speed. Values in bold denote statistically significant differences as compared to the criterion.

|           | Speed ( $m \cdot min^{-1}$ ) |       |       |       |       |       |       |       |       |       |
|-----------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|           | 26.8                         | 53.6  | 80.5  | 107.2 | 134.1 | 160.9 | 187.8 | 214.6 | 241.4 | 268.2 |
| $C_{100}$ | 108.9                        | 99.6  | 99.6  | 99.4  | 75.5  | 70.5  | 68.0  | 66.9  | 66.6  | 65.4  |
| $C_{83}$  | 124.0                        | 101.6 | 99.6  | 99.7  | 98.0  | 95.9  | 92.9  | 91.4  | 82.7  | 72.4  |
| $C_{70}$  | 130.5                        | 121.6 | 108.8 | 101.0 | 99.6  | 99.4  | 99.6  | 99.5  | 99.5  | 98.5  |
| $C_{60}$  | 149.5                        | 149.8 | 119.3 | 108.4 | 101.0 | 100.5 | 99.7  | 99.5  | 99.9  | 99.5  |

**CONCLUSIONS:** When using the default cadence settings, the StepWatch accurately counted walking steps but severely under-counted running steps. However, by entering a cadence value equal to 70% of the default value ( $C_{70}$ ), the device accurately counted

steps from 107.2 to 268.2 m · min<sup>-1</sup>. At walking speeds of 26.8 to 80.5 m · min<sup>-1</sup> C<sub>70</sub> over-counted steps. Further research is needed to explore the sensitivity setting with a goal of improving accuracy.

**380 Board #217 June 1, 11:00 AM - 12:30 PM**  
**Effects Of Sensitivity Settings On Stepwatch Accuracy From 26.8 To 268 M/min**

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 (No relationships reported)

The StepWatch ankle-mounted pedometer is accurate for step count at walking speeds but it does not accurately count steps at running speeds using the default settings. Advanced programming allows users to enter cadence and sensitivity settings in an attempt to optimize step counting over a range of speeds. **PURPOSE:** To examine the effect of altering the StepWatch sensitivity setting on accuracy of step count across 10 speeds while holding the cadence setting constant. **METHODS:** Fifteen participants (28.5 ± 9.7 years) completed 2-min trials of treadmill ambulation across 10 speeds ranging from 26.8 to 268.2 m · min<sup>-1</sup> while wearing one device on the medial and lateral aspects of each ankle, directly above the malleoli, for a total of 4 devices overall. A second set of trials was conducted to examine a fifth setting. The cadence setting on each device was held constant at 70% of the default value while sensitivity was altered (S<sub>12</sub> = 12, S<sub>13</sub> = 13, S<sub>14</sub> = 14, S<sub>16</sub> = 16 and S<sub>18</sub> = 18). All device outputs were compared against a criterion measure of hand step count (steps/minute). **RESULTS:** The following table shows the percent accuracy for each setting and speed. Values in bold denote statistically significant differences as compared to criterion measurements.

|                 | Speed (m · min <sup>-1</sup> ) |       |       |       |       |       |       |       |       |       |
|-----------------|--------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                 | 26.8                           | 53.6  | 80.5  | 107.2 | 134.1 | 160.9 | 187.8 | 214.6 | 241.4 | 268.2 |
| S <sub>12</sub> | 135.8                          | 125.2 | 111.2 | 101.4 | 100.2 | 99.5  | 99.9  | 99.7  | 99.2  | 99.0  |
| S <sub>13</sub> | 130.5                          | 121.6 | 108.8 | 101.0 | 99.6  | 99.4  | 99.6  | 99.5  | 99.5  | 98.5  |
| S <sub>14</sub> | 126.3                          | 115.0 | 106.0 | 99.7  | 99.7  | 99.6  | 99.8  | 99.4  | 99.1  | 98.1  |
| S <sub>16</sub> | 110.5                          | 103.4 | 104.4 | 99.6  | 99.1  | 99.7  | 99.7  | 99.5  | 98.4  | 96.0  |
| S <sub>18</sub> | 106.8                          | 100.3 | 100.2 | 99.6  | 98.1  | 99.2  | 99.6  | 97.3  | 95.3  | 90.9  |

**CONCLUSIONS:** The default cadence setting varies with height of the individual. By configuring the StepWatch with a cadence setting equal to 70% of the default value and a sensitivity setting of 16, the device is able to accurately report steps for the majority of daily ambulation speeds.

**381 Board #218 June 1, 11:00 AM - 12:30 PM**  
**Correlation Between Cholesterol, Blood Sugar and Physical Activity Among Female Hispanic College Students**

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Physical activity (PA) benefits the outcome of various diseases by impacting risk factors such as high level of total cholesterol (TC), low level of high-density lipoprotein (HDL) and high fasting blood glucose (FBG). Life is demanding and stressful for college students when they encounter rigorous course loads that influences their PA levels.

**PURPOSE:** To examine the association between physical activity, TC, HDL, non-HDL, TC-HDL ratio, and FBG among Hispanic female college students. **METHODS:** Thirty-five female subjects (age = 22.1 ± 1.8 yrs.) visited the laboratory on two separate days. In the first visit, subjects signed and completed documentation that consisted of consent forms, demographic and contact information. Following the initial screening, subjects were instructed to maintain their normal daily routine and were given ample instructions on proper placement and guidelines on the accelerometer. The subjects wore the accelerometer for seven consecutive days, which included five weekdays and a weekend. After the seven days had passed, the subject would return, fasted, to turn in the accelerometer and have their TC, HDL, non-HDL cholesterol, TC-HDL ratio, and FBG tested. A two-tailed Pearson's correlation was used to analyze the results. **RESULTS:** There was a significant negative correlation between total break time in sedentary bouts to TC (r = -.469, p < .01), non-HDL (r = -.532, p < .01), and TC-HDL ratio (r = -.401, p < .02). There was also a significantly positive correlation between maximum sedentary bouts to TC (r = .358, p < .04), non-HDL (r = .341, p < .05), and FBG (r = .455, p < .01). Steps per minute were negatively correlated with TC (r = -.346, p = 0.04). Average kcal per day was significantly and negatively correlated with HDL (r = -.360, p < .04), but positively correlated with FBG (r = .416, p < .02).

**CONCLUSION:** This study confirms the importance of the length of time staying active and its role in improving cholesterol level. An important finding of the study is that the length of the longest sedentary bout in the entire dataset had an impact on TC, non-HDL, and FBG. Therefore, results indicate that breaks from long continuous periods of sedentary time may improve level of FBG and cholesterol in young college-aged Hispanic females.

**382 Board #219 June 1, 11:00 AM - 12:30 PM**  
**Cortical Voluntary Activation Assessment Methodology Impacts Central Fatigue Determined After Sustained Maximal Voluntary Contractions**

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**PURPOSE:** Transcranial magnetic stimulation (TMS) has been broadly used to assess changes in cortical voluntary activation (VATMS) after fatiguing protocols. The most currently used method encompasses a superimposed TMS during a maximal voluntary contraction (MVC) and two submaximal contractions (75% MVC and 50% MVC), interspersed with a rest period (5 to 10 s) between contractions. However, when fatigue etiology has to be understood immediately after exercise or task failure, this traditional approach may underestimate the contribution of central mechanisms in force generating capacity decrease, as the recovery of the neuromuscular system is very quick. To test the hypothesis that methodology to assess VATMS influences the rate of central fatigue, we conducted a study that compared the traditional (TRAD) method to a continuous one (CONTI) with no rest periods between contractions. **METHODS:** Voluntary activation was determined in 8 young healthy adults before and after a 2-min sustained MVC of the knee extensors in two randomly assigned sessions. In the TRAD session, evaluations comprised a 7-s rest between the 3 contractions (100%, 75% and 50% MVC) allowing to determine VATMS and evaluation following the 2-min sustained MVC started after a minimal rest (3.5 s). In the CONTI session, evaluations were performed with no rest allowed between the 3 levels of contraction and evaluation after the 2-min sustained MVC commenced without any rest. VATMS assessment was repeated 2 min after the end of the fatiguing task in each session.

**RESULTS:** Voluntary force at the end of the 2-min MVC was equally depressed in TRAD and CONTI. After the sustained MVC, there was a significant depression in VATMS in both TRAD and CONTI (P < 0.05). However, the deficit was significantly greater (P < 0.001) in CONTI than in TRAD (-30% vs -9%, respectively). Two minutes after exercise completion, the values were not different from baseline, whatever the session.

**CONCLUSIONS:** These findings show that when only a few seconds of recovery are allowed, the amount of central fatigue assessed by VATMS can be extremely underestimated. Thus, the continuous method should be preferred when determining voluntary activation deficit.

**383 Board #220 June 1, 11:00 AM - 12:30 PM**  
**Correlation of Aerobic Fitness with Academic Performance in Medical and Nursing Students**

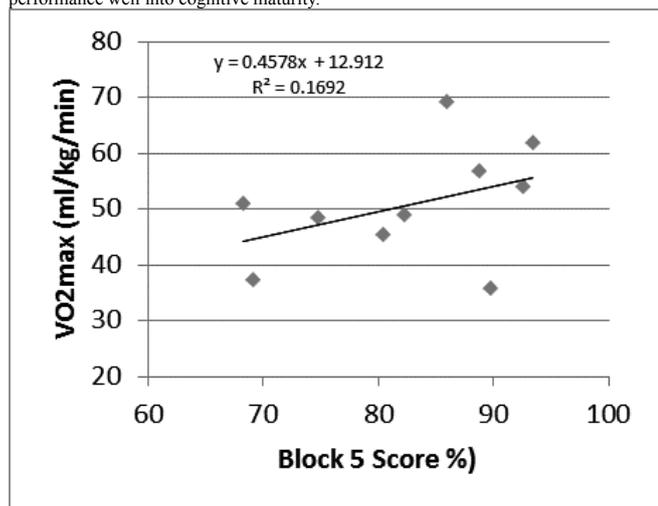
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**PURPOSE:** Physical activity has been shown to have beneficial effects on cognition in elementary school children as well as elderly individuals. This study was conducted to determine if the relationship persists in young adults and to what extent aerobic fitness might be associated with academic performance in a graduate school setting.

**METHODS:** Thirty-seven apparently healthy medical and nursing students (18 men) were recruited to a clinical trial to evaluate the effects of improved fitness on objective measures of cognitive ability and academic performance. Here we examined the correlations of baseline assessments of aerobic performance in terms of maximum oxygen uptake (VO<sub>2</sub>max) and academic performance expressed as class ranking by overall GPA in non-clinical classes (for nursing) or cumulative block exam scores over the first year (for medical).

**RESULTS:** The subjects were aged 27.8 (3.8) years with body mass index (BMI) 22.2 (3.3) kg/m<sup>2</sup>, VO<sub>2</sub>max 2.86 (1.07) L/min or 44.4 (8.9) ml/kg/min, maximum heart rate 186.8 (14.5) /min; mean (SD). Preliminary data for 10 medical students show a positive correlation of 0.411 between VO<sub>2</sub>max (ml/kg/min) and score (%) on Block 5 examinations (neurophysiology).

**CONCLUSION:** The strength of correlation between aerobic capacity and an academic score within our population of medical students is consistent with previous studies conducted among elementary and junior high school students. These findings suggest that aerobic fitness may have a lasting beneficial effect on intellectual performance well into cognitive maturity.



384 Board #221 June 1, 11:00 AM - 12:30 PM

### Metabolic Demands of Stationary ElliptiGO Cycling Compared to Treadmill Running

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Trained runners often face injury due to the high impact nature of the sport and lower limb strain. When injury occurs, runners commonly substitute alternative low-impact exercises modes like cycling and swimming. While these modes promote cardiovascular fitness they do not mimic the biomechanical patterns of running. An alternate form of training, ElliptiGO cycling, combines the low-impact of elliptical training with the mechanical patterns of running. However, the metabolic demands of ElliptiGO cycling have not been investigated. **PURPOSE:** To compare the metabolic demands of stationary ElliptiGO cycling with treadmill running.

**METHODS:** In a randomized cross-over design, 17 trained runners (9 males; 8 females, age  $21.4 \pm 1.1$  yr, body mass  $60.8 \pm 9.2$  kg, height  $1.70 \pm 0.07$  m, body fat  $12.6 \pm 5.9\%$ ) completed  $5 \times 3$  min stages while either cycling on a stationary ElliptiGO bike or running on a treadmill during which heart (HR), rating of perceived exertion (RPE), and expired gases were collected using a metabolic analyzer during each exercise bout. Subjects increased one gear or 1 mph every 3 min during cycling or running respectively. Pedaling cadence was fixed at  $\sim 70$  rpm using a metronome. Linear regression analyses were performed for each physiological variable and speed. Metabolic demand data for running and ElliptiGO were matched to determine equivalent running and cycling speeds. The other physiological measures were then matched with the corresponding running and ElliptiGO cycling speeds.

**RESULTS:** For each testing intensity, metabolic demand (VO<sub>2</sub>), HR, and VE were significantly higher during running ( $p < 0.05$ ). The relationship between speed and VO<sub>2</sub> during running had a steeper slope compared to ElliptiGO. As a result, the ElliptiGO speed that was equivalent to the VO<sub>2</sub> of each running speed increased at a greater rate (4 mph run = 10.2 mph ElliptiGO, 7 mph = 17.1 mph, 10 mph = 24.1 mph). When matched for VO<sub>2</sub>, the HR, VE, and RPE were significantly higher for ElliptiGO compared to running.

**CONCLUSIONS:** ElliptiGO cycling is a practical training device that will elicit a similar metabolic demand, but higher HR, VE, and RPE compared to running at faster cycling speeds.

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385 Board #222 June 1, 11:00 AM - 12:30 PM

### Correlation of Aerobic Performance with Sleep Quality in Apparently Healthy Men and Women

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(No relationships reported)

**PURPOSE:** Sleep quality is an integral component of human wellbeing and should complement a healthy lifestyle of physical fitness. We sought to determine if, or to what extent, good sleep quality affected aerobic performance.

**METHODS:** Twenty-four apparently healthy subjects (14 men) were recruited into a clinical trial to evaluate the effects of Sleep Coaching on Optimizing Resistance and Endurance training (SCORE study). Here we examined the correlations from baseline assessments of aerobic performance in terms of maximum oxygen uptake (VO<sub>2max</sub>) and the metabolic (lactate) threshold (VO<sub>θ</sub>), and sleep quality measured by the Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), Flinders Fatigue Scale (FFS) and Athens Insomnia Scale (AIS).

**RESULTS:** The subjects were aged 32.6 (4.1) years with body mass index (BMI) 23.7 (3.0) kg/m<sup>2</sup>, VO<sub>2max</sub> 3.34 (0.64) L/min, VO<sub>θ</sub> 2.25 (0.40) L/min, maximum heart rate 181.7 (8.1) /min; mean (SD). VO<sub>θ</sub> was 68.0 (7.0) % of VO<sub>2max</sub>. PSQI was 5.0 (2.8), ESS 5.8 (3.3), FFS 9.1 (5.4) and AIS 6.0 (3.6). The following correlations were observed:

| Parameter                                | Correlates with: | r    | P      |       |
|--|------------------|------|--------|-------|
| VO <sub>2max</sub> (L/min)               | Sleep Quality    | PSQI | -0.469 | 0.021 |
|  | Sleepiness       | ESS  | -0.454 | 0.026 |
|  | Fatigue          | FFS  | -0.526 | 0.008 |
|  | Insomnia         | AIS  | -0.541 | 0.006 |
| Parameter                                | Correlates with: | r    | P      |       |
| VO <sub>2θ</sub> (L/min)                 | Sleep Quality    | PSQI | -0.515 | 0.010 |
|  | Fatigue          | FFS  | -0.520 | 0.009 |
|  | Insomnia         | AIS  | -0.499 | 0.013 |
| Parameter                                | Correlates with: | r    | P      |       |
| VO <sub>2θ</sub> /VO <sub>2max</sub> (%) | Sleepiness       | ESS  | 0.666  | 0.000 |

**CONCLUSION:** In apparently healthy, younger to middle-aged adults, aerobic performance is consistently and strongly correlated with sleep quality. Although these findings do not establish a causal relationship, they imply that improving sleep quality will result in better physical fitness.

386 Board #223 June 1, 11:00 AM - 12:30 PM

### Secular Trends Of Health-related Fitness Of Chinese College Students: A 12-year Follow-up Study

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#### Secular Trends of Health-Related Fitness of Chinese College Students: A 12-Year Follow-up Study

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**PURPOSE:** While, due to a lack of physical activity, there is a physical fitness decline worldwide, little is known about the fitness changes among the Chinese college students. By analyzing the data from a 12-year follow-up study from a major Chinese university in Shanghai, China, the purpose of this study was to examine secular trends of physical fitness measures of all freshman students in this university across a 12-year period.

**METHOD:** Between 2003 and 2014, a set of physical fitness measures of a total of 36,911 (about 3000 per year) freshmen in a major Shanghai university (male = 53%; aged between 18 to 19 yr.) were collected, including BMI, aerobic capacity by running 1000 M for boys and 800 M for girls, upper-body strength by pull ups for boys and sit ups for girls, and flexibility by sit-&-reach. The collected data were analyzed for the secular trends.

**RESULTS:** A declined significant in aerobic capacity ( $R^2 = .649$  for boys and  $.756$  for girls;  $p < 0.05$ ) indicating about 0.134 unit reduction per year. Similar decline was also found in upper-body strength ( $R^2 = 0.723$  for boys and  $0.688$  for girls;  $p < 0.05$ ), indicating a reduction of 0.231 unit per year. Surprisingly, there is no significant change in BMI in both sexes (e.g., Males =  $23.22 \pm 3.42$  & Females =  $21.91 \pm 3.62$  in 2003 vs. Males =  $23.71 \pm 2.88$  & Females =  $22.03 \pm 3.21$  in 2014). No change was found in flexibility either (Males =  $42.34 \pm 5.44$  & Females =  $45.28 \pm 2.50$  in 2003 vs. Males =  $43.11 \pm 3.24$  & Females =  $46.02 \pm 2.90$  in 2014).

**CONCLUSION:** While the Chinese college students did not gain weight and remained flexible during the past decade, a decline in both aerobic capacity and upper-body strength was observed. The targeted intervention to improve these fitness components of the Chinese college students is urgently needed.

387 Board #224 June 1, 11:00 AM - 12:30 PM  
**Electromyographical And Kinematic Analysis Of The Prone Plank Performed With Different Scapular And Pelvic Positions**  
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Prone plank is a widely used exercise in core stability training. Research showed that pelvic tilt plays an important role on the EMG activation of core musculature. However, the influence of scapular position on EMG activation is currently unknown.

**PURPOSE:** The aim of this study was to evaluate the influence of scapular position during the performance of the prone plank.  
**METHODS:** Fifteen participants (10 men and 5 women) were included in this study (mean ± SD age: 24.35 ± 4.29 years; weight: 68.97 ± 9.28 kg; height: 1.73 ± 0.11 m; training experience: 8.64 ± 1.39 years). Muscle activation was measured by electromyography in rectus abdominis (RA), external oblique (EO), internal oblique (IO) and erector spinae (ES). Joint positions were controlled with 2D kinematic analysis. Four variations were performed: scapular abduction and anterior/posterior pelvic tilt (ABANT and ABRET); and scapular adduction and anterior/posterior pelvic tilt (ADANT and ADRET). The rated perception of effort (RPE) was also registered.  
**RESULTS:** ADRET showed significantly higher values, in terms of total intensity (145.39±88.25%) compared to ABANT and ADANT (55.14±33.85 and 56.91±30.33; p<0.05). RA presented higher activation in ADRET (77.48±43.72%) compared to ADANT and ABANT (33.56±34.31% and 38.36±25.69%; p<0.01). EO showed higher values in ADRET (110.78±65.76%) compared to the rest (ABANT, 35.05±29.95% and ADANT 40.26±29.72%; p<0.01 and ABRET, 73.53±31.11%; p<0.05). IO showed significant differences in ADRET (119.91±60.28%) compared to the rest (ABANT 49.76±24.02%, ABRET 70.42±35.45%, ADANT 48.27±35.14%; p<0.01). ES showed significant differences in ADRET (7.44±2.1) compared to the rest (ABANT 4.74±1.47%; p<0.01; ADANT 5.56±1.73% and ABRET 5.48±2.14%; p<0.05). Finally, In RPE, ADRET elicited the highest values (7.5±1.16) compared to ABANT (4.57±1.82), ABRET (5.21±1.67), (p<0.01); and ADANT (5.75±2, p<0.05).  
**CONCLUSIONS:** Scapular position had a significant influence on EMG activation, showing highest values in ADRET position.

388 Board #225 June 1, 11:00 AM - 12:30 PM  
**Evaluation of Pre-Participation Screening and Risk Assessment in Masters Athletes in British Columbia**  
 Barbara N. Morrison<sup>1</sup>, Saul Isserow<sup>1</sup>, James McKinney<sup>1</sup>, Hamed Nazari<sup>1</sup>, Daniel Lithwick<sup>1</sup>, Brett Heilbron<sup>2</sup>, Jack Taunton, FACSM<sup>1</sup>, Darren E.R. Warburton<sup>1</sup>. <sup>1</sup>University of British Columbia, Vancouver, BC, Canada. <sup>2</sup>St. Paul's Hospital, Vancouver, BC, Canada.  
 (No relationships reported)

**Background:** There has been increased participation in recreational and competitive athletics by middle-aged individuals. Although routine physical activity is associated with health benefits, vigorous physical activity can transiently increase the risk of myocardial infarction or sudden cardiac death in those with unidentified cardiovascular disease. Pre-participation screening (PPS) may be a way to detect underlying disease and mitigate the risk.  
**Purpose:** To evaluate the prevalence of cardiovascular disease (CVD) and risk factors amongst British Columbia Masters athletes (>35 years).  
**Methods:** Masters athletes from a wide range of sporting activities living in British Columbia, Canada were invited to participate. Athletes were eligible if they participated in sport >3 times per week at a moderate to vigorous intensity.  
**Results:** 185 athletes were screened; 60%, 29% and 11% had low, intermediate, and high Framingham Scores (FRS), respectively. A new cardiovascular abnormality was discovered in 14% of the participants with 38 cases pending investigations.  
**Conclusion:** Given the significant amount of CVD detected in this population, PPS may be warranted amongst Masters athletes. Further study is required in order to determine whether this strategy reduces adverse cardiovascular events and is cost-effective.



389 Board #226 June 1, 11:00 AM - 12:30 PM  
**Using Active Video Games For Nanotraining To Minimum Acsm Physical Activity Requirements**  
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The time constraint is the major problem for inactive people to reach minimal physical activity ACSM requirements. Nanotraining, short high intensity training, can be a solution providing that the intensity is high enough. However, few tools are available to the public to access a NanoTraining program. **PURPOSE:** to measure if an active video game providing Nanotraining can prescribe the minimum intensity necessary to induce health benefits.  
**METHODS:** A total of 23 participants (11 women and 12 men, 33 ± 4 years) practicing less than 120 minutes per week of physical activity were recruited to test 4 mini-games (Shape-Up, Ubisoft Entertainment Inc). Each mini-game lasted around 1.5 mins where the participant needed to give their maximum during the games. The 4 mini-games selected were: Squat me to the moon (squat), Push them up (push-up), Snow ball (running), and Arctic punch (punch). During the mini-games, oxygen uptake (VO<sub>2</sub>), heart rate (HR) and energy expenditure (EE) were measured with a portable metabolic analyser (K4b2, Cosmed, It.) and these variables were reported, relatively and respectively, to peak VO<sub>2</sub> obtained by a progressive maximal step test.  
**RESULTS:** The % VO<sub>2</sub>peak for the 4 mini-games were respectively 81±12%, 49±17%, 93±13%, 60±14%. The average VO<sub>2</sub> was respectively: 23±3, 15±2, 26±4, 17±5 ml/kg/min. The average heart rate was 164 ± 13, 150 ± 11, 164 ±21, 138±17 bpm.  
**CONCLUSIONS:** Shape-up has the potential to be used as a NanoTraining modality providing that some of the mini-games selected are high intensity games (ex: Squat and running). Furthermore, the motivation and pleasure of using active video games can help to improve the exercise intensity deployed.

390 Board #227 June 1, 11:00 AM - 12:30 PM  
**Prediction Of Maximum Endurance Times Involving Five Core Stabilization Exercise Assessments**  
 Jeffrey R. Tolley. Brigham Young University, Provo, UT.  
 (No relationships reported)

**PURPOSE:** This study was designed to generate regression models to predict maximal muscular endurance time involving 5 core stabilization exercise assessments.  
**METHODS:** Our sample included 80 healthy college-aged individuals. Participants were randomly assigned to perform the following core stabilization assessments: supine plank, side bridge (right side), side bridge (left side), static spinal flexion, and static spinal extension. Participants were instructed to hold each exercise stabilization position for a maximal endurance time, while maintaining perfect form, and then to rest for a minimum of 5 minutes between tests. Assessments were terminated when participants could no longer maintain perfect form. A test administrator recorded participants' ratings of perceived exertion (RPE; 10-point scale) every 5 seconds throughout each assessment. After each test, maximal exercise time (total seconds) was recorded, along with the elapsed time to reach an RPE of 4, 5, 6, 7, and 8.  
**RESULTS:** Regression analysis generated relatively accurate models for estimating maximal exercise time. For example, the side bridge (right side) yielded the following regression model: maximum endurance time (R = 0.91; SEE = 11.9 sec; n = 80) = 39.2

+ 4.0 (sex) - 0.78 (bmi) + 0.95 (rpe8). The independent variables we employed were sex, body mass index, and RPE8 (or the elapsed time for participants to reach an RPE of 8 out of 10). The RPE8 variable provided the most accurate regression predictions as compared with models employing the time to reach an RPE of 4, 5, 6, or 7.

**CONCLUSIONS:** The regression models generated in this study yield relatively accurate predictions of maximum muscular endurance involving core stabilization exercise assessments. This provides an estimation of maximal endurance time based on submaximal data, specifically for those participants who are reluctant or unable to complete the maximal endurance protocols

391 Board #228 June 1, 11:00 AM - 12:30 PM  
**Heart Rate, Blood Lactate, And Accelerometer-based Activity Data During An Incremental Swim Test**  
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**INTRODUCTION** Competitive swim coaches commonly use swim time observed from pace clocks and stopwatches and or direct verbal feedback from athletes as the primary means of gauging intensity during training. However, technological advances now permit the use of accelerometer-based monitors during aquatic activity. Recent studies suggest the use of activity monitors can provide an alternative, unobtrusive means of quantifying competitive swim activity (i.e. swim bout distance, speed, and energy expenditure; Wright & Stager, 2013, Wright, Brammer, & Stager, 2015). **PURPOSE** The purpose of this study was to further examine the relationships between physiological measures (i.e. heart rate and blood lactate) and activity counts (from arm stroke and leg kick movement) during a progressive series of swim bouts. **METHODS** Actical activity counts (from arm stroke and leg kick movement), swim speed, heart rate (HR), and blood lactate were collected during a series of seven progressive front crawl swim bouts each one 182.8m (200 yard) in distance. Subjects consisted of ten collegiate competitive swimmers (5 men & 5 women, Age 20.8 ± 1.1 years). The relationship between activity counts and physiological measures were modeled using linear and 2nd order polynomial fits for each subject. **RESULTS** Linear regression analyses were significant in all models examining blood lactate ( $p < 0.05$ ) and for eight of the ten subjects in models examining HR ( $p < 0.05$ ). Polynomial regression analyses were significant for all subjects in models examining blood lactate ( $p < 0.05$ ) and five of the ten subjects in models examining HR ( $p < 0.05$ ). Mean values for individualized regression analyses R2 values ranged from 0.71-0.95 and 0.76-0.98 for linear and polynomial models respectively. Both linear and polynomial models examining the relationship between activity counts and swim speed were significant all in subjects ( $p < 0.05$ ; R2 values ranged from 0.94-0.99). **CONCLUSIONS** This study demonstrates that regression techniques using accelerometer-based activity counts recorded from arm stroke and leg kick movement may provide a non-invasive means of quantifying swim bout intensity within a group of collegiate swimmers.

392 Board #229 June 1, 11:00 AM - 12:30 PM  
**Energy Expenditure and Physical Activity Patterns in Physical Education Students**  
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Chronic physical activity (PA) has shown to prevent several diseases in the population. Measurement of PA has been a challenge to researchers, who have traditionally used recall diaries and questionnaires. Currently, tri-axial accelerometers are used to objectively measure PA and energy expenditure (EE). Young students face several life-style changes during college years and research has shown decreased levels of PA compared to high-school years. It is thought that Physical Education (PE) students maintain a recommended level of PA; however, there is scarce evidence to support such claim.

**PURPOSE:** To assess PA and EE patterns in Hispanic PE students from a Central American university  
**METHODS:** A power analysis was used to estimate the sample size required for the study. The sample was stratified by gender and school year and randomly obtained from PE students from a public university in Costa Rica. Participants were 15 females and 27 males (mean age = 21.6 ± 2.4 yr.). Participants were instructed to wear an accelerometer (ActiGraph, model wGT3X-BT) in the right hand wrist for seven days. Accelerometers were set to record data every day from 4:00am to 11:00pm. Then, participants returned their accelerometers for data downloading and further statistical analysis. Dependent variables analyzed were EE (kJ) and PA (minutes).  
**RESULTS:** A three-way ANOVA with repeated measures on one factor (4 schoolyear x 2 gender x 7-days) indicated no significant three-way ( $p = 0.60$ ) or two-way (gender x 7-days,  $p = 0.74$ ; gender x schoolyear,  $p = 0.15$ ; 7-days x schoolyear,  $p = 0.16$ ) interactions in EE. There was no significant difference in EE between different

schoolyears ( $p = 0.47$ ). EE was higher during weekdays ( $8314.6 \pm 3178.2$  kJ) than on weekends ( $6304.7 \pm 3012.8$  kJ) ( $p < 0.001$ ). There was a gender difference in mean daily EE regardless of schoolyear and measurement time (Males =  $8152.8 \pm 2430.5$  kJ vs. Females =  $6944.7 \pm 1888.4$  kJ) ( $p = 0.03$ ). PE students spent 71.5 % of the time in light PA (717 min/day), 26.8% in moderate PA (269 min/day), 1.2% in vigorous PA (12 min/day) and 0.4% in very vigorous activities (4 min/day).  
**CONCLUSIONS:** PE students have higher EE during weekdays than on weekends. Males showed higher energy expenditure than females, and the minutes of moderate daily PA are above the recommended ACSM's guidelines.

393 Board #230 June 1, 11:00 AM - 12:30 PM  
**Effects of 4-Week Lifestyle Intervention on Fitness Levels of Adults**  
 Tia R. Wisdo, Allyson K. Getty, Jessica A. Hill, Alyssa N. Polimeni, Lauren N. Chavis, Avery N. Perez, William T. DiCiurcio, Kerri-Anne Ciesielka, Rejeanna M. Jasinski, Cassandra C. Derella, Joseph A. Cruz, Samantha N. Close, Deborah L. Fearheller. *Ursinus College, Collegeville, PA.* (Sponsor: Vanessa R Yingling, FACSM)  
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Cardiovascular disease (CVD) has been identified as a leading cause of death in the United States, with more than two million Americans having a heart attack or a stroke and close to a million deaths each year. Research shows that one of the independent risk factors for CVD is increased sedentary time. Sedentary behaviors predominate modern life, and there are numerous negative health effects associated with inactivity. Physical fitness is inversely related to mortality, and it is believed that by simply decreasing sedentary time and increasing exercise time, cardiovascular risk factors and vascular health measures will improve. Previous studies have found that four weeks of exercise reduces blood pressures, leads to fat weight loss, and improves fitness.

**PURPOSE:** The purpose of this study is to determine if a 4-week self-report lifestyle intervention will increase fitness measures such as  $VO_{2peak}$ , balance, core strength, power and speed.

**METHODS:** Nine adults have completed the 4-week exercise program, and data collection is ongoing. Participants underwent pre- and post-intervention testing. During the fitness test, participants'  $VO_{2peak}$ , power, speed, core strength, and balance were measured. The functional fitness test included a maximal Bruce protocol treadmill test to estimate  $VO_{2peak}$ , 2-min stair climb, left and right single leg balance, plank pose, and a wall sit. For the intervention, three times a week, participants completed a 6-station exercise circuit, rotating through the stations 3 times. The circuit included functional exercises such as weighted carries, stair climbs, balance, and core strength.

**RESULTS:** Participants' average age was 34.8 ± 16.2 yrs, and body weight was 153.7 ± 28.2 lbs. There was a 96.3% adherence to exercise over the 4-week intervention. After four weeks of exercise, we found increases in the number of stairs climbed (33.7 steps,  $p=0.02$ ), the amount of time held for single leg balance (left 50.7 sec,  $p=0.12$ ; right 41.8 sec,  $p=0.04$ ), the amount of time a plank pose was held (18.2 sec,  $p=0.02$ ), the amount of time a wall sit was held (9.5 sec,  $p=0.02$ ), and  $VO_{2peak}$  increased by 1.8 ml/kg/min ( $p=0.08$ ).

**CONCLUSION:** Our results suggest that four weeks of a functional fitness exercise circuit improves fitness measures, but additional data collection is necessary.

394 Board #231 June 1, 11:00 AM - 12:30 PM  
**Validity And Reliability Of A Pedal-based Power Meter During Maximal Ergometer Testing**  
 Gibson A.E. Klaphor<sup>1</sup>, Randolph E. Hutchison<sup>1</sup>, Karlee S. Edwards<sup>1</sup>, Kristine E. Knowles<sup>1</sup>, Kelly A. Humes<sup>1</sup>, Gregory M. Mocko<sup>2</sup>, Ardalan Vahidi<sup>2</sup>. <sup>1</sup>*Furman University, Greenville, SC.* <sup>2</sup>*Clemson University, Clemson, SC.* (Sponsor: Anthony Caterisano, FACSM)  
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The development of mobile power meters (eg: SRM, Garmin Vector Power Meter (VPM), PowerTap (PT) has allowed cyclists to track their power output (PO) while both training, competing, and as an assessment tool to establish training zones. The VPM is a newer power meter that measures PO at the pedal as opposed to other methods such as crank or hub-based meters. However, being a more recent device, the VPM has not been independently tested in any research studies to our knowledge.  
**PURPOSE:** Thus this study was done to determine the validity and reproducibility of the VPM by comparing it to the PT during a maximal ergometer test.

**METHODS:** Two active college students (age: 21.5 +/- 0.7 years, height: 172.4 +/- 0.5 cm, body mass: 70.2 +/- 10.6 kg) volunteered to participate in the study. After being fitted for the bike, the subjects performed a 5 min warm-up at 40 W. After the warm-up, the subjects completed a maximal step-wise test to exhaustion beginning at 60 W. The subjects were instructed to ride at greater than 70 RPM, and the resistance increased 20 W every 3 minutes until their cadence dropped below 60 RPM.

**RESULTS:** The power data from the tests were combined and statistically analyzed via a Bland-Altman plots (Figure 1) and a simple linear regression. Bias was random based on heteroscedasticity of the Bland-Altman plots ( $r(25)=0.418$ ,  $p<0.05$ ), and a significant regression equation was found ( $F(1, 25) = 5460.330$ ,  $p<0.001$ ), with an R of 0.998. The standard error of estimate was 2.795 watts based on 95% confidence intervals.

**CONCLUSIONS:** Based on these results, the VPM appears to be a valid power measurement tool during sub-maximal and maximal intensities between 60 and 220 W when compared to the PT. This study showed that the VPM may be an acceptable device for both sub-maximal and maximal step-wise ergometer testing; however, further testing needs to be done to explore a wider range of parameters such as sprint testing and field tests for a range of subject populations.

395 Board #232 June 1, 11:00 AM - 12:30 PM  
**Comparison Of Ventilatory Thresholds Via V-slope Method To Lactate Thresholds With NIRS**

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The conventional method of determining aerobic (VT1) and anaerobic (VT2) ventilatory thresholds can be conducted using a metabolic gas exchange system using the v-slope method. The BSXInsight is a new wearable, non-invasive device that uses Near Infrared Spectroscopy (NIRS) to measure oxygen levels in the calf muscle that gives the wearer threshold training zones without the use of a mask. **PURPOSE:** The purpose of this study is to determine predictability of ventilatory thresholds using the V-slope method from the predicted thresholds from the BSXInsight NIRS device. **METHODS:** Four volunteer male subjects (21.25±0.957 years, 71.58±9.06 kg, 176.55±6.478 cm) completed a maximal step-wise cycling ergometry test to volitional exhaustion. Before each test, the bike was fit to each individual. The subject was also fitted for a mask and hooked up to a portable metabolic gas exchange system (COSMED K4b2). A standardized warm-up of 5 min at 40W preceded each individual's step-wise test. The test began at 60W and increased 20W after each 3 minute interval at a cadence of greater than 70 rpm. This protocol continued until the subject reached volitional exhaustion or until the cadence dropped below 60 rpm. **RESULTS:** A simple linear regression was used to predict the power from the cycling ergometer at VT1 and VT2, based on the power at aerobic threshold (AT) and lactate threshold (LT) from the BSXInsight. A significant regression was found for predicting the power at VT1 from AT ( $F(1,2) = 39.411$ ,  $p<0.05$ ), with an  $R^2$  of 0.952 and a standard error of estimate of 15.22 watts based on 95% confidence intervals. However, a significant regression was not found for predicting the power at VT2 with LT ( $F(1,2) = 16.675$ ,  $p=0.055$ ), with an  $R^2$  of .893 and a standard error of estimate is 30.348 watts based on 95% confidence intervals.

**CONCLUSIONS:** Based on these results, there is a significant relationship between the powers at VT1 predicted by the V-slope method and the BSXInsight at AT. However, there is not a significant relationship between the powers predicted by the v-slope method and the BSXInsight at LT. A wearable NIRS device such as the BSXInsight may be a less invasive alternative to determining VT1, but further research should be conducted with various populations.

396 Board #233 June 1, 11:00 AM - 12:30 PM  
**Test-retest Reliability of Jump Execution Variables using Mechanography: A Comparison of Jump Protocols**

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Mechanography during the vertical jump test allows for evaluation of force-time variables reflecting jump execution, which may enhance screening for functional deficits that reduce physical performance and determining mechanistic causes underlying performance changes. However, utility of jump mechanography for evaluation is limited by scant test-retest reliability data of force-time variables.

**Purpose:** To examine test-retest reliability of jump execution variables assessed from mechanography using two different protocols.

**Methods:** 32 women (mean ± SD: age = 20.8 ± 1.3 yr, height = 167.6 ± 6.3 cm, mass = 68.2 ± 12.7 kg) and 16 men (age = 22.1 ± 1.9 yr, height = 181.5 ± 5.0 cm, mass = 94.1 ± 24.6 kg) attended a familiarization session followed by two testing sessions, all one week apart, during which they performed the vertical jump test and

had mechanography data recorded. Participants performed six squat jumps (SJ) per session, with squat depth self-selected for the first three jumps and controlled using a goniometer to 110° knee flexion for the remaining three jumps. Raw data were sampled at 1,000 Hz and filtered with a cutoff frequency of 90.9 Hz using Bertec Digital Acquire™. Jump execution variables were calculated using a macro program in Microsoft Visual Basic. Eight force-time variables were assessed. Test-retest reliability was quantified as the systematic error (using %difference between jumps), random error (using coefficients of variation), and test-retest correlations (using intraclass correlation coefficients).

**Results:** Jump execution variables demonstrated good reliability, evidenced by very small systematic errors (mean ±95%CI: -1.2 ±2.3%), small random errors (mean ±95%CI: 17.8 ±3.7%), and very strong test-retest correlations (range: 0.73-0.97). Differences in random errors between controlled and self-selected protocols were negligible (mean ±95%CI: 1.3 ±2.3%).

**Conclusion:** Jump execution variables demonstrated good reliability, with no meaningful differences between the controlled and self-selected SJ depth protocols. To simplify testing, a self-selected SJ depth protocol can be used to assess force-time variables with negligible impact on measurement error.

397 Board #234 June 1, 11:00 AM - 12:30 PM  
**Biological Variability in Maximum Oxygen Uptake at Altitude**

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 (No relationships reported)

Cardiorespiratory fitness, typically determined by maximal oxygen uptake (VO<sub>2</sub>max), represents the maximal rate of oxygen consumption during exercise testing to volitional fatigue. Previous research (Katch, Sady, & Freedson, 1982) has reported that the biological variability of VO<sub>2</sub>max at sea-level equates to 5.3%. To our knowledge, the biological variability of VO<sub>2</sub>max has not been studied at altitude.

**Purpose:** The aim of this study was to quantify the biological variability of VO<sub>2</sub>max at 2,348 meters (a desirable elevation for altitude training) using two different VO<sub>2</sub>max criteria: the traditional VO<sub>2</sub> plateau at VO<sub>2</sub>max concept and verification procedure.

**Methods:** Ten physically active men and women (age = 27.1 ± 7.2 yr, height = 176.0 ± 9.4 cm, weight = 75.1 ± 12.2 kg) participated in this study. In week #1 participants performed 2x maximal graded exercise trials (GXT) on the treadmill separated by 1-4 days with the traditional VO<sub>2</sub> plateau at VO<sub>2</sub>max concept applied to confirm VO<sub>2</sub>max. In week #2 participants completed 2x GXT + verification bout trials on a cycle ergometer separated by 1-4 days with the verification procedure used to confirm attainment of VO<sub>2</sub>max. Verification bouts were performed 20 min after GXT at a constant exercise workload of 105% peak work rate. Coefficient of variation (CV%) was calculated to quantify biological variability of VO<sub>2</sub>max for each VO<sub>2</sub>max criteria.

**Results:** Treadmill VO<sub>2</sub>max values for trials #1 and #2 were 45.2 ± 6.4 and 46.7 ± 6.9 mL/kg/min, respectively with the biological variability of VO<sub>2</sub>max equating to 4.3% when using the VO<sub>2</sub> plateau at VO<sub>2</sub>max concept applied to confirm VO<sub>2</sub>max. Cycle ergometry VO<sub>2</sub>max values for trials #1 and #2 were 45.3 ± 7.3 and 43.2 ± 7.0 mL/kg/min, respectively with the biological variability of VO<sub>2</sub>max equating to 2.3% when using the verification procedure to confirm attainment of VO<sub>2</sub>max. **Conclusion:** In summary, our findings support use of the verification procedure to quantify biological variability of VO<sub>2</sub>max at altitude. This is particularly relevant to interpretation of studies that have used repeated measurements of VO<sub>2</sub>max to establish a training effect or when VO<sub>2</sub>max is used for designing training programs.

398 Board #235 June 1, 11:00 AM - 12:30 PM  
**International Normative 20m Shuttle Run Values From 850,036 Children And Youth Representing 48 Countries**

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**PURPOSE:** To develop sex- and age-specific international normative 20 m shuttle run test (20mSRT) values for children and youth (aged 9-17 years), and to estimate the prevalence meeting the FITNESSGRAM® criterion-referenced standards for healthy cardiorespiratory endurance.

**METHODS:** A systematic literature search was undertaken to identify papers explicitly reporting descriptive 20mSRT (with 1-minute stages) data on children and

youth since 1981. Data were included on apparently healthy (free from known disease/injury) 9-17 year-olds. Following corrections for methodological differences, pseudo data were generated using Monte Carlo simulation, with population-weighted sex- and age-specific normative centile values generated using the LMS method. Sex- and age-related differences were expressed as percent and standardized differences in means. The prevalence of children and youth with healthy cardiorespiratory endurance was estimated using the age- and sex-specific FITNESSGRAM® criterion-referenced standards.

**RESULTS:** Normative values were displayed as tabulated centiles for the 20mSRT using four common metrics (speed [km/h] at the last completed stage, completed stages, laps, and mass-specific peak oxygen uptake) on a dataset comprising 850,036 test performance scores from 48 countries extracted from 159 reports. Boys consistently outperformed girls at each age group (mean difference  $\pm 95\%CI$ :  $0.99 \pm 0.35$  km/h or  $0.81 \pm 0.21$  standardized units), with the magnitude of age-related increases larger for boys than for girls. Boys (mean  $\pm 95\%CI$ :  $68 \pm 13\%$ ) had healthier cardiorespiratory endurance than girls (mean  $\pm 95\%CI$ :  $52 \pm 18\%$ ), with the prevalence of healthy cardiorespiratory endurance decreasing systematically with age.

**CONCLUSION:** This study provides the most comprehensive and up-to-date set of international sex- and age-specific normative 20mSRT values for children and youth. We envision these results as a useful tool for coaches, physical educators, health practitioners, and public health workers as a surveillance, profiling, and/or screening instrument to help identify over- and under-performing children and youth.

399 Board #236 June 1, 11:00 AM - 12:30 PM  
**A Novel CB/PDMS Electrode For ECG Monitoring During Swimming**

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To collect reliable electrocardiogram (ECG) signals during swimming, waterproof tape must be generously applied to commercial Ag/AgCl electrodes to seal off water penetration. Prolonged use of waterproof tape can lead to skin irritations and when the tape is removed it can tear the skin.

**PURPOSE:** The purpose of the study was to examine if our reusable hydrophobic ECG electrodes, which are composed of carbon black powder/ Polydimethylsiloxane (CB/ PDMS), can be effectively used to collect reliable ECG signals underwater.

**METHODS:** An ECG signal (Lead I configuration) was collected using a custom-made chest strap which incorporated our hydrophobic electrodes. Two CB/PDMS electrodes were attached to the strap, which also had a miniaturized ECG data acquisition board. The ECG signal and tri-axis accelerometric data were saved directly into a micro-SD card in the ECG circuit board. Three participants were recruited to examine the electrodes' performance during two types of swimming (freestyle and breaststroke). The experimental protocol included having the subjects stand while not immersed (dry condition, 1 min) and then swim each type of stroke (1 lap each (45 meter)). We examined the ECG signal quality by observing if there were reductions of QRS peak amplitudes during swimming when compared to the dry condition.

Specifically, we calculated cross-correlation indices of ECG templates to quantitatively determine possible morphological changes in ECG waveforms when electrodes were exposed to water. Moreover, we computed the amount of signal dropout due to either motion artifacts or water penetration into our electrodes.

**RESULTS:** No significant reduction of QRS peak amplitude was observed between dry and swimming conditions, for both freestyle and breaststroke. The cross correlation indices of ECG templates between dry and swimming conditions for freestyle and breaststroke were both 99.9%. Moreover, there was minimal ECG signal loss (less than 1%) due to either motion artifacts or water penetration.

**CONCLUSIONS:** Our CB/PDMS electrodes can provide high-fidelity ECG signal morphologies without any amplitude degradation and minimal signal dropout during swimming. These electrodes have the potential to be applicable to better understanding underwater physiology, and as a performance-enhancement training aid.

400 Board #237 June 1, 11:00 AM - 12:30 PM  
**Associations between Physical Fitness, Physical Activity Levels and Fatness in Adults with Intellectual Disabilities**

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**INTRODUCTION:** The prevalence of obesity among adults with intellectual disability (AID) is significantly higher than in the general population. At present

limited research has been done on the relationship between physical fitness (PF), objectively measured physical activity levels (PAL) and different markers of fatness in AID.

**PURPOSE:** To examine associations between PF, PAL and fatness in AID.

**METHODS:** An AID group (54 m/44 f; 44 $\pm$ 12 y) were recruited from an Occupational Day Center. **BMI, body fat percentage (BF%), fat free mass percentage (FFM%), waist (WC) and hip circumferences (HC) were obtained.** VO<sub>2</sub> peak was obtained during a metabolic treadmill test. **GT3X Actigraph accelerometers were used to obtain total PA (TPA), steps per day (DS), time spent in sedentary (ST), light PA (LPA); moderate PA (MPA), vigorous PA (VPA), moderate to vigorous PA (MVPA). The timed up and go test (TUGT) to assess dynamic balance and gait speed was used. Handgrip (HG) and leg strength (LS) were also obtained.**

**RESULTS:** VO<sub>2</sub> peak correlated with TPA ( $r=.421$ ), DS ( $r=.318$ ), VPA ( $r=.240$ ), MVPA ( $r=.517$ ), BF% ( $r=-.496$ ), FFM% ( $r=.480$ ), WC ( $r=-.445$ ), HC ( $r=-.412$ ), TUGT( $r=-.363$ ), HG ( $r=.435$ ) and LS ( $r=.432$ ). TPA and DS were correlated with HG ( $r=.348$ ;  $r=.280$ ) and LS ( $r=.294$ ;  $r=.221$ ). VPA was correlated with BF% ( $r=-.229$ ) and FFM% ( $r=.218$ ). MVPA was correlated HG ( $r=.347$ ;  $r=.268$ ), LS ( $r=.326$ ) and TUGT ( $r=-.229$ ).

**CONCLUSIONS:** The present results show that high levels of PA are positively associated with PF. VPA, in particular, is associated with BF% and FFM% in AID. Future PA recommendations for AID should consider a particular emphasis on the amount of VPA when promoting PA.

Partially supported by: MEC (Ref: DEP2012-35335) & AGAUR (Ref: 2013FI\_B2 00091)

| Variables  | AID (n=98)      |
|--|-----------------|
| Weight (kg)  | 71.9 (14.3)     |
| BMI  | 28.1 (6.4)      |
| Body fat percentage (%)  | 30.4 (10.5)*‡   |
| Fat free mass (%)  | 33.3 (7.7)*‡    |
| Waist circumference (cm)                                       | 94.5 (13.7)*    |
| Hip circumference (cm)   | 101.4 (10.2)*   |
| VO <sub>2</sub> peak (ml·kg <sup>-1</sup> ·min <sup>-1</sup> ) | 26.5 (6.6)**§   |
| Steps (steps·day <sup>-1</sup> )                               | 6162 (2799)*    |
| Total PA (counts·min <sup>-1</sup> )                           | 251.8 (124.4)*  |
| Sedentary (mins·day <sup>-1</sup> )                            | 613.1 (80.5)    |
| LPA (mins·day <sup>-1</sup> )                                  | 128.4 (46.7)    |
| MPA (mins·day <sup>-1</sup> )                                  | 29.9 (22.1)*    |
| VPA (mins·day <sup>-1</sup> )                                  | 0.9 (0.9)*      |
| MVPA (mins·day <sup>-1</sup> )                                 | 30.8 (22.6)*    |
| Right HG (kg)  | 20.9 (7.7)**†§  |
| Left HG (kg)   | 19.8 (7.4)**§   |
| Leg strength (kg)  | 40.7 (21.5)**†§ |
| TUGT (sec)   | 14.5 (3.3)**§   |

Note: values are mean (Standard Deviation)  
 Abbreviations: BMI (body mass index); PA (physical activity); LPA (light physical activity); MPA (moderate physical activity); VPA (vigorous physical activity); MVPA (moderate to vigorous physical activity); HG (hand grip); TUGT (timed up and go test).  
 \* Significant correlation with relative VO<sub>2</sub> peak ( $p < .05$ ).  
 † Significant correlation with Total PA and Steps ( $p < .05$ ).  
 ‡ Significant correlation with VPA ( $p < .05$ ).  
 § Significant correlation with MVPA ( $p < .05$ ).

401 Board #238 June 1, 11:00 AM - 12:30 PM  
**How Undergraduates' Attitudes toward Fitness Testing Is Related to Their Performance on Physical Assessments**

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**Introduction:** Fitness testing is an important component of physical education (PE) and is intended to encourage students to develop lifetime physical activity (Graser et al., 2011). Previous research has found that male and female students have different attitudes toward PE, but limited information is available about their attitudes toward fitness testing (Mercier & Silverman, 2014).

**Purpose:** To determine how students' attitudes toward fitness testing is related to their performance on physical assessments.

**Method:** College students from seven health-related fitness courses ( $M_{age} = 19.79$ ,  $SD = 2.99$ ;  $N = 322$ ) completed fitness tests that assessed body composition (i.e., body fat %), aerobic capacity (i.e., step test and 20m shuttle run), and muscular strength (i.e., handgrip) and endurance (i.e., pushups, curl-ups, plank). They also completed a questionnaire that measured the following attitudes toward fitness testing (Mercier & Silverman, 2014): cognition (e.g., usefulness of fitness testing), enjoyment, and feelings, as well as the influence of teachers on these attitudes. Responses ranged from 1 (*strongly disagree*) to 5 (*strongly agree*).

**Results:** A descriptive discriminant analysis investigated if males and females differed on a composite of the attitudes toward fitness testing subscales. Sex differences were primarily due to enjoyment ( $r^2 = .93$ ), feelings ( $r^2 = .36$ ), and the teachers' effect ( $r^2 = .32$ ). Males had significantly higher scores ( $p < .01$ ) on enjoyment ( $M_F = 3.25$ ,  $M_M = 3.87$ ), feelings ( $M_F = 3.50$ ,  $M_M = 3.95$ ), and teachers' effect ( $M_F = 3.54$ ,  $M_M = 3.76$ ), but not cognition ( $p > .05$ ). Follow-up canonical correlation analyses associating the four attitudes with the seven fitness variables were also statistically significant ( $p < .01$ ) for males ( $R^2 = .25$ ) and for females ( $R^2 = .25$ ).

**Conclusion:** Males had significantly more positive attitudes toward fitness testing than females. Students' attitudes accounted for the same amount of variance in their performance regardless of sex. This provided evidence for the importance of promoting a positive view of fitness testing to maximize student performance, especially for females. Future research should examine the extent that students' attitudes toward fitness testing can be improved and if different strategies are needed for males and females.

402 Board #239 June 1, 11:00 AM - 12:30 PM  
**A Comparison of Standing vs. Seated Cycle Ergometer Graded Exercise Test Protocols**  
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*(No relationships reported)*

Historically, staged cycle ergometer (CE) graded exercise tests (GXT) have elicited lower maximal oxygen consumption (VO<sub>2</sub> max) values when compared to a treadmill (TM) GXT. It is believed that these lower values are due to localized muscle fatigue in the legs before the participant has reached their true VO<sub>2</sub> max. While standard staged CE GXT protocols have subjects remain seated throughout the entirety of the GXT, investigations exploring standing protocols have produced mixed results. **PURPOSE:** To investigate if allowing participants to stand at the end of a ramp protocol CE GXT would elicit a VO<sub>2</sub> max closer to a TM GXT compared to remaining seated. **METHODS:** A sample of healthy low risk participants (male = 14, female = 9) aged 26.2 ± 7.1 y completed body composition testing, a TM GXT, a seated ramp CE GXT (seat-CE), and a seated-to-standing ramp CE GXT (stand-CE) over 3 visits. Participants could stand once they reached an RPE of 15 on the Borg scale. The order of these tests was randomized and completed within 2 weeks of the initial visit. **RESULTS:** For males, TM VO<sub>2</sub> max (49.3 ± 7.2 mL/kg/min) was higher than seat-CE (44.6 ± 8.1 mL/kg/min) ( $p < 0.001$ ), and stand-CE (45.6 ± 8.8 mL/kg/min) ( $p < 0.001$ ), with a difference between seat-CE and stand-CE ( $p = 0.047$ ). The average time spent standing during stand-CE in males was 100.4 ± 54.4 seconds. For females, TM VO<sub>2</sub> max (43.0 ± 5.7 mL/kg/min) was higher than seat-CE (39.6 ± 4.1 mL/kg/min) ( $p = 0.024$ ), and stand-CE (39.4 ± 5.0 mL/kg/min) ( $p = 0.005$ ) with no difference between seat-CE and stand-CE ( $p = 0.880$ ). The average time spent standing during stand-CE in females was 66.0 ± 31.1 seconds. **CONCLUSIONS:** Though there was not a significant difference between seat-CE and stand-CE VO<sub>2</sub> max in females, there was a difference in males. The results of this investigation suggest that allowing participants to stand at the end of a CE GXT will not affect VO<sub>2</sub> max values for a ramp protocol in females and may actually produce values closer to those from a TM GXT in males. Based on these data further investigation is warranted to determine if standing at the end of a ramp protocol significantly affects results for healthy males.

403 Board #240 June 1, 11:00 AM - 12:30 PM  
**Reliability and Repeatability of Countermovement Jump Waveforms**  
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Though the countermovement vertical jump (CMJ) has traditionally been used to assess lower body force and power, the force-time characteristics of the CMJ ground reaction force (GRF) waveform may be of value in predicting injury risk and assessing training readiness. Prior to evaluating the CMJ GRF waveform as a diagnostic and evaluative tool, the reliability of the waveform on a within and between day basis should be established. **PURPOSE:** To determine the within day and between day reliability of the CMJ GRF waveform in healthy individuals. **METHODS:** Twenty-

five healthy (age = 21.5 ± 1.9 years), recreationally active men and women completed one familiarization and three experimental visits, a minimum of 48 hours apart. Each visit consisted of a brief, standardized warmup, two submaximal CMJs, and three maximal CMJs performed on a force plate (sample rate = 1000Hz). Each jump was separated by two minutes. To reduce the variability associated with arm swing, all jumps were performed with subjects' hands on their hips. The CMJ GRF waveform for each jump, beginning with the minimum GRF during the counter-movement and ending at take off, was interpolated and re-sampled to a uniform length of 1000 data points. Individual within and between day reliabilities for each subject's waveform shapes were calculated using the adjusted coefficient of multiple determination ( $R^2_{adj}$ ) as previously described by Kadaba et al (J Orthop Res, 7(6): 849-860, 1989). Briefly, the primary calculation of the within day reliability compared the GRF at each data point of a single jump with the mean GRF for that day at the corresponding data point. The between day reliability was calculated similarly, however, the mean GRF at each point for each day was compared to the mean GRF at that point of all three days. Data is reported as the coefficient of multiple correlation (CMC), the positive square root of the  $R^2_{adj}$ . **RESULTS:** The CMJ waveforms were highly reliable, both on a within day (0.968 ± 0.020) and between day (0.962 ± 0.018) basis. Observed within day CMC values ranged from 0.909 - 0.993, whereas between day CMC values ranged from 0.917 - 0.994. **CONCLUSION:** Individual CMJ GRF waveforms are highly reliable under these test conditions. These results provide preliminary evidence that the CMJ GRF waveforms shapes may have utility as a diagnostic and evaluative tool.

404 Board #241 June 1, 11:00 AM - 12:30 PM  
**Comparison of Physical and Physiological Characteristics based on Injury History**  
 John Abt, FACSM<sup>1</sup>, Nick Heebner<sup>1</sup>, Karen Keenan<sup>2</sup>, Brad Lambert<sup>3</sup>, Takashi Nagai<sup>2</sup>, Scott Royer<sup>1</sup>, Necia Williams<sup>3</sup>, Joshua D. Winters<sup>1</sup>, Scott Lephart, FACSM<sup>1</sup>. <sup>1</sup>University of Kentucky, Lexington, KY. <sup>2</sup>University of Pittsburgh, Pittsburgh, PA. <sup>3</sup>Marine Corps Forces Special Operations Command, Camp Lejeune, NC.  
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*(No relationships reported)*

US Marines perform extremely demanding training and tactical tasks that come with inherent musculoskeletal injury risk. These injuries limit the physical and tactical readiness required of Marines. Recovery from musculoskeletal injury is not only critical to optimizing resiliency and well-being, but tactical performance and recurrent injury mitigation. **PURPOSE:** To compare physical and physiological characteristics in Marines based on a retrospective analysis of injury history. **METHODS:** A total of 71 Marines completed testing for isokinetic strength, flexibility, body composition, aerobic capacity/lactate threshold, and anaerobic power/capacity. Marines were stratified based on self-reported injury history for the past 12 months (Previously Injured: (N = 13), Age: 27.9 ± 5.8 years, Height: 179.1 ± 6.6 cm, Mass: 85.7 ± 7.1 kg; Non-Injured: (N = 58), Age: 28.9 ± 7.0 years, Height: 179.1 ± 6.1 cm, Mass: 84.7 ± 9.9 kg). Mann-Whitney U Tests were used to analyze the data between cohorts of Marines ( $p < 0.05$ ). **RESULTS:** A prior musculoskeletal injury was reported in 18.3% of Marines and regionally reported at 53.9% for the lower extremity, 38.5% for the spine, and 7.6% for the upper extremity. No significant differences existed between cohorts for demographics ( $p = 0.338 - 0.491$ ) or years of experience ( $p = 0.446$ ). The previously injured Marines demonstrated significantly weaker torso extension (Previously Injured: 323.8 ± 65.3 %BW, Non-Injured: 398.8 ± 90.0 %BW,  $p = 0.003$ ) and knee flexion (Previously Injured: 114.1 ± 22.2 %BW, Non-Injured: 128.9 ± 29.6 %BW,  $p = 0.035$ ). No significant differences were demonstrated for other strength comparisons or flexibility, body composition, and aerobic/anaerobic performance comparisons ( $p = 0.058 - 0.489$ ). **CONCLUSION:** Although limited differences in physical and physiological characteristics exist, restoration of trunk extension and knee flexion strength may be critical to prevent the recurrence of musculoskeletal injury. This is essential given the frequency of injury to the spine and lower extremity and the importance of these muscles to transfer load through the kinetic chain during multi-joint movements. Future research should consider a prospective analysis of Marines to determine injury risk associated with physical and physiological characteristics.

405 Board #242 June 1, 11:00 AM - 12:30 PM  
**Squat Assessment following a Postural Correction Intervention**  
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The back squat (BaSq) is an exercise that has been shown to be very effective in improving athletic performance. As such, the BaSq should be a primary focus of any strength and conditioning program. However, performance of the BaSq with poor technique under load is a potentially harmful scenario. Therefore, it is important for athletes to learn and for coaches to screen for proper posture and technique during the

BaSq exercise. **PURPOSE:** To introduce a protocol for assessing squat technique and determine the effectiveness of a postural correction program. **METHODS:** A total of four female collegiate student-athletes (age:  $17.8 \pm 0.5$  yrs; height:  $156.8 \pm 8.3$  cm; mass:  $53.4 \pm 4.9$  kg) were assessed at baseline during the off-season, and then 12 weeks after having gone through a postural correction program. The postural correction program consisted of mobility exercises focused on avoiding postural asymmetries and maintaining a neutral spine and a neutral subtalar joint. Three-dimensional motion capture and two force plates were used to record the kinematics and kinetics of two body-weight squats. Peak joint angles and power absorption and generation were calculated bilaterally for ankle, knee, and hip, and inter-limb difference was calculated. Squat depth was calculated from the sacrum marker as a percentage of standing height. Pre and post comparisons were made using multiple separate t-tests. **RESULTS:** Ankle range of motion significantly improved for both limbs (left:  $24.9 \pm 6.8^\circ$  vs.  $30.3 \pm 5.1^\circ$ ; right:  $25.9 \pm 5.8^\circ$  vs.  $29.3 \pm 5.8^\circ$ ,  $p < 0.05$ ). However, range of motion decreased in the left knee ( $125.4 \pm 18.0^\circ$  vs.  $121.2 \pm 17.5^\circ$ ,  $p < 0.05$ ), and in both hips (left:  $112.0 \pm 94.4^\circ$  vs.  $94.4 \pm 9.2^\circ$ ; right:  $110.8 \pm 94.4^\circ$  vs.  $95.8 \pm 7.9^\circ$ ,  $p < 0.05$ ). There were no significant changes in any other variable. **CONCLUSIONS:** The proposed analysis may prove to be an effective method of evaluating lower extremity range of motion. Following the experimental postural correction program, the athletes showed improve range of motion at the ankle, but decreased range of motion at the knee and hip leading to no change in overall squat depth. Further investigations should consider a larger experimental group and non-athletic population.

### A-47 Free Communication/Poster - Neuromuscular Biology

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM

Room: Exhibit Hall A/B

#### 406 Board #243 June 1, 9:30 AM - 11:00 AM Immediate Effect of Joint Mobilization on Corticospinal Excitability in Individuals with Functional Ankle Instability

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(No relationships reported)

Individuals with functional ankle instability (FAI) often present with problems in neuromuscular control and balance performance. Joint mobilization is a common intervention for ankle joint dysfunction, but its effect on corticospinal excitability (an important component of the neuromuscular control) of the ankle musculature has not been discussed in individuals with functional ankle instability.

**PURPOSE:** To examine the immediate effect of joint mobilization on corticospinal excitability in individuals with FAI. **METHODS:** This is a single blind, randomized controlled trial. We recruited individuals with self-reported ankle instability (CAIT score  $\leq 27$ ), randomly assigned into the control group (CG,  $n=15$ , 7F8M,  $27.94 \pm 6.56$  y), or the mobilization group (MG,  $n=15$ , 10M5F,  $26.48 \pm 4.82$  y). Single pulse transcranial magnetic stimulation (TMS) was performed using Magstim 220 (Magstim Company, Whitland, UK) and a figure-eight coil (70 mm), and the active motor threshold (AMT), motor evoked potential (MEP) and the cortical silent period were recorded for the fibularis longus (FL) and soleus (SOL) muscles. One session of mobilization for the talocrural joint and the tibiofibular joints was performed for the MG group, and the AMT, MEP, and cortical silent period were compared between the two groups using two-way repeated measures MANOVA. The significance level was set at 0.05. **RESULTS:** One-session joint mobilization significantly increased the MEP of the FL ( $350.77 \pm 180.19$   $\mu$ V to  $420.95 \pm 201.06$   $\mu$ V vs.  $288.42 \pm 102.49$   $\mu$ V to  $302.58 \pm 116.40$   $\mu$ V;  $p = 0.029$ ). No other significant changes were detected between the two groups following the intervention. **CONCLUSION:** Single session of joint mobilization improved the corticospinal excitability which might have a beneficial effect on the neuromuscular control of the fibularis longus muscle in individuals with functional ankle instability.

#### 407 Board #244 June 1, 9:30 AM - 11:00 AM

##### Effects of Varied Intensity on Torque and Neuromuscular Parameters during Intermittent Isometric Muscle Actions

Cory M. Smith, Terry J. Housh, FACSM, Ethan C. Hill, Kristen C. Cochrane, Nathaniel DM Jenkins, Amelia Miramonti, Joel T. Cramer, FACSM, Richard J. Schmidt, Glen O. Johnson, FACSM. *UNL, Lincoln, NE.* (Sponsor: Terry Housh, FACSM)  
(No relationships reported)

**PURPOSE:** The purpose of the present study was to examine the neuromuscular responses during intermittent isometric muscle actions at constant and varied intensities. **METHODS:** Eleven men and 5 women (mean  $\pm$  SD, age  $22.0 \pm 2.6$  yr) visited the lab on 2 separate days. A maximal voluntary isometric contraction (MVIC) was performed before (pretest) and after (posttest) each of the randomly ordered protocols. The 2 protocols consisted of 50, 6-s isometric muscle actions of the leg extensors followed by 2-s of rest at 60% MVIC or an alternating 40 then 80% MVIC. Each protocol averaged 60% MVIC force after the 50 intermittent isometric muscle actions during the 60% MVIC (totaling 50 repetitions at 60% MVIC) and 40/80% MVIC protocols (totaling 25 repetitions at 40% MVIC and 25 repetitions at 80% MVIC). Electromyographic (EMG) amplitude (RMS), EMG frequency (MPF), mechanomyographic (MMG) RMS, and MMG MPF were recorded from the vastus lateralis during the pretest and posttest MVICs. Separate 2 x 2 (time x protocol) repeated measures ANOVAs were used to analyze the MVIC torque, EMG RMS, EMG MPF, MMG RMS, and MMG MPF values. **RESULTS:** There were no significant ( $p > 0.05$ ) interactions, but there were significant main effects ( $p < 0.05$ ) for time (collapsed across protocol) for torque, EMG RMS, EMG MPF, and MMG MPF, but not MMG RMS (Table 1). **CONCLUSION:** The neuromuscular responses were typical of fatiguing, intermittent isometric muscle action, but there were no differences in the torque or neuromuscular responses from the 60% and 40/80% MVIC protocols. Thus, these findings indicated that the intensity that torque was applied had no effect on fatigue-related neuromuscular responses or motor unit activation strategies during intermittent isometric muscle actions.

#### 408 Board #245 June 1, 9:30 AM - 11:00 AM

##### MHC Isoforms Are Associated with Acute Neuromuscular Performance Changes Induced by Prolonged Jumping Exercise

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(No relationships reported)

Prolonged fatiguing exercise has been demonstrated to cause ultrastructural changes in skeletal muscle and its metabolism that may further cause decreases in neuromuscular performance. **PURPOSE:** To investigate changes in maximal performance and muscle activity (EMG) and their associations with myosin heavy chain isoforms (MHC). **METHODS:** Ten young men (age  $26 \pm 6$  yrs; height  $180 \pm 8$  cm; body mass  $77.8 \pm 11.2$  kg) volunteered to participate. Prolonged unilateral jumping exercises were performed on a sledge apparatus (jump time varied from 3:20 - 30:12 min, and number of jumps from 61 - 1248). Measurements for isometric maximal voluntary contraction (MVC), maximal drop jumps (MDJ), blood analyses, and muscle biopsies were obtained at pre, immediately post, 3 and 20 hours post jumping exercises. The pre muscle biopsy was taken from the control (left) leg ~3 hours prior to the fatiguing exercise, and subsequent biopsies from the exercised (right) leg immediately and 3 hours post exercise. **RESULTS:** The vastus lateralis muscle contained MHC isoforms analyzed from the pre-samples as follows: I 41.2 $\pm$ 8.8%, IIA 35.4 $\pm$ 7.5% and IIX 22.4 $\pm$ 5.7%. After the fatiguing exercise, the mean ( $\pm$ SD) peak blood lactate concentrations were 7.8 $\pm$ 3.3 mmol/l and creatine kinase activity 1043 $\pm$ 442 U/l. MVC decreased by 43.7 $\pm$ 15.8% (from 2505 $\pm$ 1070 to 1343 $\pm$ 511 N) from pre to immediately post, with a simultaneous 14.9 $\pm$ 25.5% increase in EMG of the vastus medialis muscle. Rate of force development decreased by 24.6 $\pm$ 31.0%, and take-off velocity in MDJ by 18.1 $\pm$ 8.6% in the fatigued leg. MHCI was associated with relative changes in MVC ( $r = -0.73$ ,  $p < 0.01$ ) and EMG ( $r = -0.71$ ,  $p < 0.01$ ), and the changes in MVC and EMG were correlated ( $r = 0.65$ ,  $p < 0.05$ ). No respective changes and associations were noticed in the control leg. **CONCLUSIONS:** The fatiguing stretch-shortening cycle exercises induced muscle damage and large reductions in neuromuscular performance that were associated with respective changes in EMG of the activated muscles. MHCs were associated with decrements in performance: lower MHCI had more substantial reductions in performance. Maximal neuromuscular performance acutely decreases mainly due to impaired functions of fatigued type II fibers.

409 Board #246 June 1, 9:30 AM - 11:00 AM  
**Motor Unit Recruitment Patterns: Pooled Data Mask True Physiological Meaning**  
 Axel J. Knicker<sup>1</sup>, Tobias Alt<sup>1</sup>, Steven Lindley<sup>2</sup>, Heiko K. Strueder<sup>1</sup>. <sup>1</sup>German Sport University Cologne, Cologne, Germany. <sup>2</sup>University of Central Lancashire, Preston, United Kingdom.  
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 (No relationships reported)

Decomposing surface EMG signals into motor unit action potential trains enables innovative insights into the activation of motor units. Several studies revealed an inverse hierarchical relationship between recruitment thresholds and firing rates. This so-called 'onion skin' property has been analyzed under various testing conditions by examining linear regression analyses of different subjects and regressions derived from the pooled sample.

**PURPOSE:** It became apparent that the evaluation of this physiological feature deserves further consideration. Thus, the aim was to identify a statistical method which represents the relationship between recruitment thresholds and firing rates of different subjects in a physiologically accurate way.

**METHODS:** A surface sensor array consisting of five protruding blunted pins (each 0.5 mm in diameter, located in the corners and in the middle of a 5x5 mm square) (Delsys Inc., Natick, MA, USA) was attached to the distal part of the medial gastrocnemius' muscle belly. Decomposed EMG data obtained from 2 subjects conducting voluntary isometric plantar flexions (IsoMed 2000, D&R Ferstl GmbH, Hemau, Germany) at two different ankle joint angles (70°, 110°) served to determine an appropriate analytical method to illustrate the mean relation of these two parameters embodying the hierarchical control scheme of motor units. Common pooled (CP) regression lines were calculated with SPSS V.22.0 (IBM Inc., Chicago, IL, USA) for each subject to assess the relation between recruitment thresholds and mean firing rates. In contrast, individual averaged (IA) linear regression lines were computed as arithmetic means of the individual slopes and intercepts.

**RESULTS:** At both ankle joint angles, the analysed motor unit pools had comparable minimum, maximum and mean recruitment thresholds and firing rates. At 110°, no difference between both methods became apparent (IA: -0.859, CP: -0.883). However, at 70° the IA linear regression strongly deviated from the CP in terms of slope, intercept and most notably in correlation coefficient (IA: -0.721, CP: -0.262).

**CONCLUSION:** If the subjects' regression lines showed a strong variance, the IA regression provided a physiologically more meaningful correlation compared to the CP analysis which suggestively masked the accurate recruitment strategy.

410 Board #247 June 1, 9:30 AM - 11:00 AM  
**The Relationship Between Muscle Activation and VO<sub>2</sub> During Incremental Ramp Exercise**  
 Kaylin D. Didier, Samuel L. Wilcox, Ryan M. Broxterman, Shane M. Hammer, Andrew M. Alexander, Thomas J. Barstow, FACSM. Kansas State University, Manhattan, KS.  
 (No relationships reported)

**PURPOSE:** The purpose of this investigation was to determine if muscle activation during incremental exercise was influenced by the rate of change in work rate. Previous studies have shown that the use of a double linear model for the analysis of breakpoints (BP) in EMG signals accurately describes the changes in muscle activation during ramp exercise.

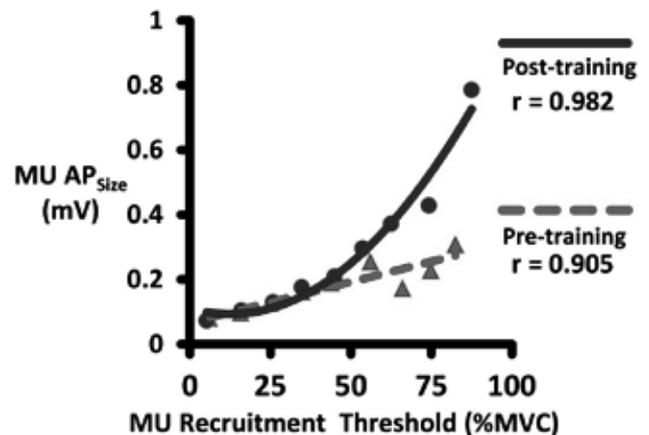
**METHODS:** 5 healthy male subjects performed 3 bouts of ramp-incremental exercise on a cycle ergometer at 15 W min<sup>-1</sup> (15R), 30 W min<sup>-1</sup> (30R), and 60 W min<sup>-1</sup> (60R) until exhaustion. Surface EMG measurements were taken from the vastus lateralis during each test to determine muscle activation. Breath-by-breath gas exchange was recorded to determine peak VO<sub>2</sub>. BP for integrated EMG (iEMG) and Mean Power Frequency (MPF) were determined by use of a double linear model and the oxygen uptake (VO<sub>2</sub>) for the BP was determined by taking a 30 second average surrounding the BP.

**RESULTS:** The BP for iEMG for the ramp rates 15R, 30R, and 60R occurred at 85.7 ± 9.0, 87.2 ± 6.3, and 90.0 ± 5.7 %VO<sub>2</sub> peak respectively (p>0.05). The BP for MPF occurred at 84.3 ± 11, 74.7 ± 12.4, and 87.6 ± 5.4 %VO<sub>2</sub> peak for the ramp rate 15R, 30R, and 60R respectively (p>0.05). The BP for iEMG at an absolute value VO<sub>2</sub> for the ramps rates 15R, 30R, and 60R occurred at 3.5 ± 0.4, 3.6 ± 0.4, and 3.4 ± 0.6 L/min respectively (p>0.05). The BP for MPF at an absolute value VO<sub>2</sub> occurred at 3.4 ± 0.2, 3.1 ± 0.5, and 3.4 ± 0.5 L/min peak for the ramp rate 15R, 30R, and 60R respectively (p>0.05). There was no significant difference in the %VO<sub>2</sub> peak BP for iEMG and MPF. There was no significant difference in the absolute value of VO<sub>2</sub> BP between iEMG and MPF.

**CONCLUSIONS:** The similar BPs of iEMG and MPF between ramp rates indicates that the rate of change in work rate during incremental exercise did not impact the activation of the muscle motor units. The BP of iEMG and MPF were found to occur at similar %VO<sub>2</sub> peak and absolute VO<sub>2</sub>, indicating that change in motor unit recruitment/ motor neuron firing rate and the action potential conduction velocity in the muscle occurred at the same metabolic rate.

411 Board #248 June 1, 9:30 AM - 11:00 AM  
**Action Potential Amplitude as a Non-invasive Indicator of Motor Unit Specific Hypertrophy**  
 Zachary K. Pope, Garrett M. Hester, Jason M. DeFreitas. Oklahoma State University, Stillwater, OK.  
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 (No relationships reported)

Skeletal muscle fibers hypertrophy in response to strength training, with Type II fibers demonstrating the greatest increases in cross-sectional area (CSA). However, assessing fiber type specific CSA requires invasive biopsies. With advancements in the decomposition of surface electromyographic (sEMG) signals, firing properties and action potential size (AP<sub>SIZE</sub>) of individual motor units (MU) can now be detected non-invasively. **PURPOSE:** Since there is a documented relationship between AP<sub>SIZE</sub> and muscle fiber size, our purpose was to examine if AP<sub>SIZE</sub> could potentially be used to assess skeletal muscle hypertrophy. **METHODS:** sEMG was collected from the vastus lateralis of 9 subjects during maximal voluntary knee extensions (MVC) before (PRE) and after (POST) 8 weeks of strength training. Following decomposition, each MU was analyzed for AP<sub>SIZE</sub> (mV) and recruitment threshold ("RT"; as %MVC). Polynomial regression was used to determine the best fit relationship between AP<sub>SIZE</sub> and RT at both PRE and POST. Whole muscle CSA (cm<sup>2</sup>) was also obtained using ultrasound at PRE and POST. Linear regression was used to determine how much variance (R<sup>2</sup>) in the individual change of the AP<sub>SIZE</sub>/RT slope could be explained by changes in whole muscle CSA. **RESULTS:** The slope of the AP<sub>SIZE</sub>/RT relationship significantly increased after training, as shown the figure below. The change in the slope was most apparent in the higher threshold MUs. Additionally, 73% of the variance (R<sup>2</sup>=0.73) of the change in AP<sub>SIZE</sub>/RT slope can be explained by changes in CSA. **CONCLUSIONS:** The non-invasive measure of AP<sub>SIZE</sub> appears to accurately reflect MU specific hypertrophy. Additionally, examining MUs across the entire spectrum of RTs removes the need to classify MUs into "types."



A-48 Free Communication/Poster - Perception of Effort, Pain & Fatigue

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
 Room: Exhibit Hall A/B

412 Board #249 June 1, 9:30 AM - 11:00 AM  
**Physiological, Perceptual and Affective Responses to Six High Intensity Interval Training Protocols in Young Male University Students**

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 (No relationships reported)

**PURPOSE:** To compare cardiorespiratory, perceptual and affective responses to three cycling and three treadmill high intensity interval training (HIIT) protocols. **METHODS:** Fourteen moderately trained male university students (age: 23.4 ± 2.8 years; height: 178.1 ± 9.9 cm; body mass: 78.0 ± 13.4 kg; BMI: 24.5 ± 2.9 kg/m<sup>2</sup>;  $\dot{V}O_{2\max}$ : 45.8 ± 4.8 ml/kg/min;  $\dot{V}O_{2\max}$ : 49.9 ± 5.6 ml/kg/min) completed, in a randomized order, three cycle ergometer HIIT protocols (4 x 30 s all out efforts, 10

x 60 s at 90% HR<sub>max</sub>, and 7 x 20 s at 170% VO<sub>2max</sub>) and three treadmill protocols (4 x 4 min at 90-95% HR<sub>max</sub>, 5 x 50% tlim vVO<sub>2max</sub> and 4 x 1000 m at a RPE = 8 of the OMNI-Walk/Run scale). During the sessions, physiological variables (VO<sub>2</sub> and HR) were monitored continuously using a portable metabolic system (K4 b2, Cosmed, Rome). RPE (OMNI-Cycle and OMNI-Walk/Run scales) were determined after each effort. Affective responses (Feeling scale) were determined 10 min after the end of the session. **RESULTS:** Among the cycle ergometer protocols, the 7 x 20 s presented the highest mean values for VO<sub>2</sub> and RPE, and the lowest mean session-affect. Mean RPE was higher for the 5 x 50% tlim vVO<sub>2max</sub> among the treadmill protocols. Session-affect responses were lower for the 5 x 50% tlim vVO<sub>2max</sub> compared to the 4 x 4 min protocol. None of the participants were capable of finishing the cycle ergometer 7 x 20 s and the treadmill 5 x 50% tlim vVO<sub>2max</sub> protocols without adjustments to decrease its intensity.

| Physiological, perceptual and affective values (mean ± SD) for six HIIT protocols |                           |            |            |         |                     |                 |            |         |
|---|---------------------------|------------|------------|---------|---------------------|-----------------|------------|---------|
|   | Cycle Ergometer Protocols |            |            |         | Treadmill Protocols |                 |            |         |
|   | 4 x 30 s                  | 10 X 60 s  | 7 x 20 s   | p Value | 4 X 4 min           | 5 X 50% vVO2máx | 4 X 1000 m | P Value |
| VO <sub>2</sub> (ml/kg/min)   | 25.5 ± 2.8                | 32.5 ± 4.7 | 37.6 ± 4.2 | 0.002   | 37.6 ± 6.2          | 38.2 ± 5.0      | 37.2 ± 5.8 | NS      |
| RPE   | 9.3 ± 0.8                 | 7.0 ± 1.0  | 10.0 ± 0.0 | 0.02    | 6.9 ± 1.3           | 8.9 ± 0.9       | 8.1 ± 0.2  | 0.01    |
| S-Affect  | 0.4 ± 2.9                 | 2.1 ± 2.0  | -1.1 ± 2.5 | 0.02    | 2.1 ± 1.8           | -0.4 ± 2.2*     | 0.9 ± 2.3  | 0.001   |

\*4 x 4 min vs 5 x 50% vVO<sub>2max</sub>

**CONCLUSION:** Our findings highlight the potential limited application of some HIIT protocols, especially in low fitness or non-athletic populations. In addition, the most intense protocols elicited negative affective responses, which may decrease adherence to such exercise protocols.

413 Board #250 June 1, 9:30 AM - 11:00 AM  
**Effects Of Attention-Deficit/Hyperactivity Disorder Medications On Resistance-Exercise-Induced Hypoalgesia, Perceived Exertion, Heart Rate, And Blood Lactate**

Robert R. Kraemer, FACSM, Chelsea N. Chabreck, Daniel B. Hollander, Brandon A. Baiamonte. *Southeastern Louisiana University, Hammond, LA.*  
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 (No relationships reported)

**PURPOSE:** An increase in prescribed stimulant medication for the treatment of Attention-Deficit/Hyperactivity Disorder (ADHD) has led to treatment misuse as a result of the ability of these medications to improve concentration and decrease fatigue. Although they provide cognitive benefits, the effects of stimulant treatment for ADHD during physical activity are fairly unknown. The primary goal of this study was to investigate the effects of ADHD medications on resistance exercise-induced pain perception, perceived exertion, heart rate, and blood lactate concentrations.

**METHODS:** Thirty college-age students (10 no ADHD diagnosis, 10 ADHD diagnosis, and 10 ADHD diagnosis with medications) completed 2 sessions: 1) a maximal testing session and 2) an experimental session consisting of 3 consecutive dynamic resistance exercise circuits. Each circuit was comprised of 12 repetitions of 9 resistance exercises at 60% of 1-repetition maximum using a 1:1 work to rest ratio. Pain and blood lactate concentrations were measured pre- and post-exercise using a pressure algometer and lactate meter, respectively. Heart rate and perceived exertion were measured during the exercise bout.

**RESULTS:** Participants displayed exercise-induced hypoalgesia ( $\Delta 17.8\% \pm 5.2$ ,  $p = 0.002$ ) 1-min post-exercise, accompanied by an increase in blood lactate ( $12.47 \pm 0.66$  mM,  $p = 0.000$ ). Moreover, participants displayed significant elevations in heart rate ( $p = 0.000$ ) and perceived exertion ( $p = 0.000$ ) for the duration of the exercise bout. These findings for pain tolerance, lactate, heart rate, and perceived exertion were similar regardless of condition (no ADHD diagnosis vs. ADHD without medications vs. ADHD with medications).

**CONCLUSIONS:** Dynamic resistance exercise produces increases in pain tolerance, perceived exertion, heart rate, and blood lactate. The effects of resistance exercise are not altered by ADHD diagnosis or psychostimulant medication use for ADHD. These findings are intriguing given the known ergogenic and analgesic effects of caffeine, a less potent stimulant.

414 Board #251 June 1, 9:30 AM - 11:00 AM  
**Dynamic Resistance Exercise Produces Hypoalgesia with Concurrent Changes in Lactate, Perceived Exertion, and Autonomic Responses**

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Email: brandon.baiamonte@selu.edu

(No relationships reported)

**PURPOSE:** Previous research has demonstrated significant decreases in pain perception in both healthy and pain patient populations following both aerobic and isometric exercise protocols. Although the results are definitive for these modes of exercise, there is a paucity of studies that have focused on the effects of a dynamic resistance exercise protocol on pain perception and mechanisms responsible for this phenomenon have eluded researchers. The purpose of the study was to determine the effects of three circuits of intense resistance exercise on acute pain tolerance, blood lactate, heart rate, and perceived exertion. We hypothesized that resistance exercise would produce temporary increases in pain tolerance in conjunction with changes in blood lactate concentrations, heart rate, and perceived exertion.

**METHODS:** A sample of 24 college-age students participated in 2 sessions: 1) A maximal strength testing session and 2) an experimental session consisting of three consecutive dynamic resistance exercise circuits. Each circuit was comprised of 12 repetitions of 9 exercises at 60% of a 1-repetition maximum and a 1:1 work to rest ratio. Blood lactate was measured with a lactate analyzer and pain was measured with a pressure algometer.

**RESULTS:** Both men and women exhibited increases in pain tolerance [ $F(3,63)=4.79$ ,  $p=0.001$ ], blood lactate levels [ $F(3,60)=109.19$ ,  $p=0.001$ ], heart rate [ $F(2,42)=119.41$ ,  $p=0.001$ ], and perceived exertion [ $F(2,44)=35.78$ ,  $p=0.001$ ] across 3 time points following resistance exercise. Moreover, men displayed significantly higher blood lactate levels when compared to women [ $F(1,20)=8.82$ ,  $p=0.01$ ].

**CONCLUSIONS:** Collectively, these results suggest that a bout of dynamic resistance exercise increases pain tolerance with concurrent changes in both physiological and psychological processing, which may be directly responsible for the alterations in pain perception.

415 Board #252 June 1, 9:30 AM - 11:00 AM  
**High Intensity Interval Ergometry: Power Output, Catecholamines, Substance P, And Perceived Pain**

Virginia T. Patterson, Aaron L. Slusher, Heather L. Caslin, Charles S. Schwartz, Edmund O. Acevedo, FACSM. *Virginia Commonwealth University, Richmond, VA.* (Sponsor: Edmund O Acevedo, FACSM)

(No relationships reported)

High intensity interval exercise (HIIE) is promoted as a time-effective means of increasing physical activity levels and gaining health benefits. However, the influence of power output during HIIE on physiological and psychological markers of stress is not fully known. **Purpose:** To examine the effect of HIIE on peripheral lactate, epinephrine (EPI), norepinephrine (NOR), and substance P (SP), as well as ratings of perceived pain. **Methods:** Nine healthy, untrained males (25.09±3.94 years of age) performed a 10min warm-up and 5min of HIIE on a cycle ergometer (ten 20sec work intervals against a resistance of 5.5% body weight, each separated by 10sec rest). Venous blood samples and self-reported indices of pain, effort, and affect were obtained at baseline (PRE), immediately following HIIE (POST), and approximately 15 min post-HIIE (15POST). **Results:** HIIE elicited significant increases in lactate, EPI, NOR, SP, pain, effort, and a decrease in affect ( $p \leq 0.05$ ). Greater maximum power was positively associated with peak lactate ( $r = 0.676$ ,  $p = 0.046$ ) and peak perceived pain ( $r = 0.837$ ,  $p = 0.005$ ), and negatively associated with the overall decline in affect ( $r = -0.718$ ,  $p = 0.029$ ). In addition, maximum power was positively associated with the percent increase in NOR from PRE to 15POST ( $r = 0.682$ ,  $p = 0.043$ ), while higher average power output was positively associated to the percent increase in SP from PRE to 15POST ( $r = 0.724$ ,  $p = 0.042$ ). **Conclusions:** Maximum and average power outputs achieved during HIIE may differentially influence peripheral markers of physiological stress and perceived pain.

416 Board #253 June 1, 9:30 AM - 11:00 AM

**The Relationship among Physical Activity Level, Activity Type, and Thermal Pain Sensitivity**

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(No relationships reported)

Previous research has shown a relationship between pain sensitivity and daily physical activity. However, it is unclear whether the type of physical activity may also influence pain sensitivity. **PURPOSE:** The purpose of this study was to examine differences in thermal pain sensitivity among college-aged females who engage in different amounts and types of physically activity. **METHODS:** Participants (n=27) were tested on two occasions. For the first visit participants went through informed consent, completed a menstrual history questionnaire, and were then familiarized with the protocol for pain sensitivity testing. Participants then wore an accelerometer at the waist for 7 days during waking hours (excluding water activity). The second visit was timed to occur during luteal phase of their menstrual cycle. Pain sensitivity was determined by having participants provide ratings of pain intensity (PI; 0-20) and ratings of pain unpleasantness (PU; 0-20) in response to brief (15-sec) applications of temperatures ranging from 43-49° C. Based upon their self-reported and measured activity levels and activity types participants were placed into the following groups: aerobically trained (AERO), resistance trained (RES), aerobic and resistance trained (A+R), and sedentary (SED). **RESULTS:** Total activity differed among the groups with the AERO (203±83 min) and A+R (183±28 min) groups accumulating more physical activity compared to the RES (39±39 min; p<0.05) and SED (62±32 min; p<0.05) groups. AERO (32±13 min) and A+R (34±7 min) also accumulated greater "vigorous" intensity activity than the RES (10±4 min; p<0.05) and SED (12±5 min) groups. Mean ratings of PI across all temperatures did not differ among activity groups for (6.0±3.2, 7.4±2.9, 6.6±3.5, and 5.3±3.3 for AERO, RES, A+R, and SED, respectively; p=0.652) nor did ratings of PU across all temperatures (4.1±2.3, 4.6±2.5, 4.5±3.0, and 3.5±2.4 for AERO, RES, A+R, and SED, respectively; p=0.78). **CONCLUSIONS:** Unlike previous results in middle-aged and older women where higher activity was associated with lower pain sensitivity, our results suggest pain sensitivity does not differ among individuals with differing activity levels in college-aged females. Additionally, we demonstrated pain sensitivity also did not differ among differing types of physical activity.

417 Board #254 June 1, 9:30 AM - 11:00 AM

**Physiological Responses Underlying The Perception Of Effort During Moderate And Heavy Intensity Cycle Ergometry**

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**PURPOSE:** To examine responses for physiological and perceptual variables during cycle ergometry at a constant rating of perceived exertion (RPE) within the moderate and heavy exercise intensity domains. **METHODS:** Nineteen (mean ± SD age 21.3 ± 0.5 years) moderately trained cyclists performed an incremental test to exhaustion, and on separate days, two randomized, 60 min constant RPE rides at the gas exchange threshold (RPE<sub>GET</sub>: 14 ± 0.5) and 15% above GET (RPE<sub>GET+15%</sub>: 16 ± 0.5). Oxygen consumption (O<sub>2</sub>), heart rate (HR), breathing frequency (f), and power output (PO) were monitored throughout all rides. The patterns for the variables vs. time were examined using polynomial regression analyses and mean differences for the metabolic cost throughout the rides at RPE<sub>GET</sub> and RPE<sub>GET+15%</sub> were examined with 2 separate, 1 (RPE condition) X 5 (time) repeated measures (RM) ANOVAs and Sidak-Bonferroni corrected paired samples t-tests (p ≤ 0.01). **RESULTS:** The O<sub>2</sub> at GET (30.3 ± 1.5 mL kg<sup>-1</sup> min<sup>-1</sup>) was significantly less than that at 15% above GET (34.9 ± 1.7 mL kg<sup>-1</sup> min<sup>-1</sup>). Polynomial regression analyses showed O<sub>2</sub> and HR (correlation = -0.85 to -0.95) tracked decreases in PO required to maintain 60 min of constant RPE cycle ergometry. Only tracked RPE during the moderate and heavy intensity rides. The RM ANOVAs indicated that there was a significant main effect for O<sub>2</sub> during the 60 min rides at RPE<sub>GET</sub> (significant decrease after min 21-33), but overall O<sub>2</sub> values across the 60 min ride at RPE<sub>GET</sub> were not different from O<sub>2</sub> at GET (incremental test). There was a significant main effect for O<sub>2</sub> during rides within the heavy domain (RPE<sub>GET+15%</sub>). The mean O<sub>2</sub> at 15% above GET and the mean O<sub>2</sub> value during min7-19 (33.1 ± 7.6 mL kg<sup>-1</sup> min<sup>-1</sup>) were not significantly different. There was no difference among O<sub>2</sub> values at min 21-33 (29.9 ± 6.6 mL kg<sup>-1</sup> min<sup>-1</sup>), min 35-47 (28.4 ± 6.3 mL kg<sup>-1</sup> min<sup>-1</sup>), and min 49-60 (28.2 ± 6.0 mL kg<sup>-1</sup> min<sup>-1</sup>), and all were less than O<sub>2</sub> at min 7-19 and

from the incremental test. **CONCLUSION:** Only tracked RPE during the 60 min constant RPE rides within both exercise intensity domains. Monitoring intensity using an RPE corresponding with GET may be useful for up to 60 min of cycling exercise and a common mechanism may mediate and the perception of effort during moderate and heavy intensity cycle ergometry.

418 Board #255 June 1, 9:30 AM - 11:00 AM

**Pain Tolerance and Pain Threshold According to Sport and Sex**

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(No relationships reported)

Differences in athlete's pain tolerances are a continued source of interest in the field of sports medicine. It is unknown whether playing surface and indoor versus outdoor conditions effect pain tolerance or pain threshold in athletes. This information could help team physicians and trainers understand how particular athletes deal with pain and evaluate the severity of an injury.

**PURPOSE:** To explore the differences in pain tolerance and pain threshold in male and female collegiate basketball (BB) and soccer (SOC) players.

**METHODS:** Forty NAIA Division I collegiate athletes (age 20.9±3.1 yrs.) participated in this investigation. Athletes were selected from male (n=10) and female (n=10) BB, and male (n=10) and female (n=10) SOC teams. Each subject completed two separate pain tolerance protocols that included a cold water intolerance test (CWIT) where subjects placed their hand into a tank of circulating cold water at 2.0 °C and a tourniquet pain test (TPT) using a modified submaximal tourniquet procedure. Pain threshold was reported as the time each subject first recognized pain or discomfort. Pain tolerance was reported as the time each subject requested the stimulus to be discontinued due to intolerable pain or discomfort. Pain tolerance and pain threshold responses were examined using a two-factor (sport x sex) ANOVA for both the CWIT and TPT tests. Significant main and interaction effects were examined with Tukey *post hoc* procedure. Statistical significance was accepted at p<0.05.

**RESULTS:** No differences were found in the main effects of pain tolerance and pain threshold when comparing sport for both the CWIT and TPT. Differences were identified in pain threshold between sexes. Males reported a significantly higher pain threshold than females (43.9±25.8 sec vs 28.6±20.9 sec, p<0.05) during the CWIT test. There were no differences in pain threshold between males and females (165.7±72.3 sec vs 144.4±42.1 sec, p>0.05) for the TPT, or in pain tolerance.

**CONCLUSION:** Based on the primary findings of this investigation, physicians, trainers, coaches, etc. should treat injuries of indoor and outdoor sports equally because pain tolerance and pain threshold did not differ between groups. Additional research is needed to explore possible differences in athletes that vary in age, ethnicity, and sport.

419 Board #256 June 1, 9:30 AM - 11:00 AM

**Effect Of Different Verbal Commands On Perceptual, Affective And Physiological Performance Responses Of Running In Recreational Runners.**

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**PURPOSE:** To compare the effect of different verbal commands on perceptual, affective and physiological performance responses to running. **METHODS:** Twenty recreational runners participated in the study (male – age: 30.7 ± 10.1 yrs; height: 175.2 ± 8.8 cm; body mass: 74.7 ± 11.7 kg; VO<sub>2max</sub>: 55.3 ± 7.1 mL/kg min<sup>-1</sup>; HR<sub>max</sub>: 189.3 ± 8.5 bpm; treadmill speed<sub>max</sub>: 15.3 ± 1.1 km/h). All subjects completed four exercise sessions: a familiarization trail; three running sessions consisting of self-select pace defined by one of the verbal commands: low, moderate, high. The information conveyed to subjects were: "I want you to think what it would be for you to run (continuously) at an intensity: low, moderate, high". "Now, I would like you to self-select 20 minutes of running at an intensity (low/moderate/high)". These conditions were counterbalanced. Each running session consisted of 20 min. Subjects could adjust the intensity on 1, 5, 10 and 15 min during the exercise. However, at no time, were subjects allowed to have knowledge of the running speed. Affective responses (Feeling Scale) and physiological performance were measured during each exercise session (5, 10, 15 and 20 min). Session RPE (OMNI-RES) were measured 15 min. after each exercise session. **RESULTS:** The RPE and physiological performance measures increased incrementally according to the running intensity. However, no significant differences were reported in affective responses between low and moderate intensities.

|                                  | Low Intensity               | Moderate Intensity         | High Intensity              |
|----------------------------------|-----------------------------|----------------------------|-----------------------------|
| Treadmill speed (km/h)           | 8.8 ± 0.8 <sup>*,a</sup>    | 10.5 ± 1.1 <sup>*,k</sup>  | 12.5 ± 0.9 <sup>*,k</sup>   |
| % Treadmill speed <sub>max</sub> | 57.8 ± 5.8 <sup>*,a</sup>   | 68.8 ± 7.1 <sup>*,k</sup>  | 81.5 ± 6.4 <sup>*,k</sup>   |
| HR (bpm)                         | 144.7 ± 10.6 <sup>*,a</sup> | 157.1 ± 9.1 <sup>*,k</sup> | 171.5 ± 11.4 <sup>*,k</sup> |
| % HR <sub>max</sub>              | 76.5 ± 6.0 <sup>*,a</sup>   | 83.1 ± 6.1 <sup>*,k</sup>  | 90.6 ± 5.8 <sup>*,k</sup>   |
| Session RPE                      | 2.7 ± 0.9 <sup>*,a</sup>    | 5.4 ± 1.2 <sup>*,k</sup>   | 7.5 ± 1.3 <sup>*,k</sup>    |
| Feeling Scale                    | 3.5 ± 1.1 <sup>a</sup>      | 3.0 ± 1.5 <sup>*</sup>     | 1.8 ± 2.2 <sup>*,k</sup>    |

HR: Heart Rate; \*Difference between low and moderate intensities; <sup>a</sup>difference between low and high intensities; <sup>k</sup> difference between moderate and high intensities. p < 0.01.

**CONCLUSION:** Verbal commands can be used for running exercise prescription with recreational runners. The moderate verbal command can promote greater performance and physiological benefits than low command, without concomitant changes in affective responses.

420 Board #257 June 1, 9:30 AM - 11:00 AM  
**Influences of Psychological Factors on Delayed Onset Muscle Soreness**

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*(No relationships reported)*

Research has shown that an athlete's perception of pain has an impact on cognitive appraisals of injury, emotional and behavioral responses to the injury, and return to sport. According to the Fear Avoidance Model, when pain is misinterpreted as catastrophic, the athlete becomes fearful of pain, thus exhibiting avoidance behaviors due to kinesophobia or fear of re-injury/movement (Leeuw, 2006). **PURPOSE:** To determine if psychological factors can predict an athlete's perception of pain following induced muscle injury. **METHODS:** 35 (24 men) Division I collegiate student-athletes underwent a high-intensity conditioning session following a week of inactivity from their sport in order to induce muscle soreness. Prior to completing the exercise protocol, participants completed the Fear of Pain Questionnaire (FPQ-III), Pain Catastrophizing Scale (PCS), Athlete Fear Avoidance Questionnaire (AFAQ), Tampa Scale Kinesophobia (TSK), and State Trait Anxiety Inventory Scale (STAI). Immediately following the protocol, participants completed the Pain Rating Numeric Scale. 24 and 48 hours post, participants were given the PCS, TSK, Pain Rating Numeric Scale, Brief Pain Inventory, and Quick Dash. **RESULTS:** Athletes who reported a high sense of fear avoidance were more likely to identify their pain as catastrophic ( $r=.49$ ;  $p<.05$ ) and lack the ability to perform his/her sport ( $r=.35$ ;  $p<.05$ ) 24 hours post. Fear avoidant beliefs also had a positive effect on how they rated their pain ( $r=.49$ ;  $p<.05$ ), identified their pain ( $r=.54$ ;  $p<.05$ ), feared re-injury ( $r=.35$ ;  $p<.05$ ), and performed their sport ( $r=.41$ ;  $p<.05$ ) 48 hours post. Similar to fear avoidant beliefs, trait anxiety prior to the conditioning, had a positive effect on how an athlete identified his/her pain ( $r=.48$ ;  $p<.05$ ), and their capability to perform their sport ( $r=.43$ ;  $p<.05$ ) 24 hours post. At 48h post, trait anxiety also had an impact on how the athlete identified his/her pain ( $r=.47$ ;  $p<.05$ ) and the level of fear of re-injury ( $r=.42$ ;  $p<.05$ ). **CONCLUSION:** Results suggest that an athlete's fear avoidance beliefs and trait anxiety before injury may influence reports of their pain intensity and disability. Thus the results of this study provide support for the use of psychological constructs in predicting outcomes from muscle soreness.

421 Board #258 June 1, 9:30 AM - 11:00 AM  
**Effect of Transcranial Direct Current Stimulation Electrode Placement on Heart Rate Variability**

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*(No relationships reported)*

Previous studies have reported that transcranial direct current stimulation (tDCS) of the insular cortex modulates heart rate variability (HRV) and attenuates fatigue during exercise. However, electrode placement during tDCS has varied between studies. It has been proposed that placing the cathode electrode on the shoulder, instead of over the prefrontal cortex, may result in different effects. This may affect the dependent variables measured in all studies implementing tDCS. **PURPOSE:** The purpose of this study was to investigate the effects of tDCS administered through two popular electrode orientations on HRV. **METHODS:** Nine healthy females and six healthy males were included in the analysis (21.2±1.8 yr; 171.6±7.3 cm; 71.5±19.1 kg). Each subject completed three trials separated by at least approximately two days. Each trial consisted of 15 minutes of rest (pre), followed by 20 minutes of a treatment, and then 10 minutes of rest (post). Treatments varied by trial and consisted of 2.00 mA tDCS with the anode over the insular cortex and cathode over the contralateral prefrontal cortex (HEAD), the anode over the insular cortex and cathode on the ipsilateral shoulder (ARM), or only 30 seconds of stimulation with HEAD orientation

followed by quiet sitting with the electrodes in place but no current flow (SHAM). Electrocardiographic data were sampled at 500 Hz for the duration of each trial and processed using custom LabVIEW software. HRV variables included standard time and frequency domain indices, as well as SD1 and SD2 from Poincaré plots. The variables were analyzed using 3 (trial) by 2 [time (pre and post)] repeated measures ANOVAs. Alpha was set at .05. **RESULTS:** There was no significant interaction effects (all  $p > 0.19$ ) for mean heart rate ( $\eta^2=.112$ ), root mean square of the successive differences ( $\eta^2=.082$ ), low-frequency to high-frequency ratio ( $\eta^2=.060$ ), SD1 ( $\eta^2=.082$ ), or SD2 ( $\eta^2=.005$ ). **CONCLUSION:** Regardless of cathode electrode placement, 20 minutes of 2.00 mA anodal stimulation of the insular cortex did not modulate the most common measures of HRV.

422 Board #259 June 1, 9:30 AM - 11:00 AM

**Capturing Activity Pacing in People with Chronic Fatigue Syndrome Using Actigraphy**

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Activity pacing is a common strategy in the management of chronic fatigue syndrome (CFS), often as a precursor to graded exercise therapy. Activity pacing involves planning daily and weekly activities, incorporating rest breaks and segmenting tasks into shorter time blocks, to avoid exacerbating the symptom of fatigue. **PURPOSE:** The aim of this project was to examine the utility of actigraphy to elaborate on activity pacing behaviours, as measured with activity dairies, pedometers, self-report questionnaires and clinician ratings. **METHODS:** Patients with CFS attending a tertiary specialist clinic completed specifically designed self-report questionnaires on activity participation and pacing, a 7-day activity diary and concurrently used a pedometer and actigraph. Pacing was quantified with the coefficient of variation of hourly step counts and the cumulative sum of vector magnitude counts. These indices were compared with formalised clinician ratings of each patient's adherence to activity pacing strategies. A semi-structured interview was conducted regarding actigraph acceptance by patients. **RESULTS:** The sample of 20 patients included 15 women (75%), with mean age of 32±14 years, mean duration of illness of 246±164 weeks and SF-36 physical function of 48.8±24.8. Of 22 patients to whom actigraphy was offered, 2 refused due to perceived inconvenience and 5 out of 20 experienced it as inconvenient. According to actigraph data, the mean percentage of time spent sedentary was 74.23%, at light intensity 17.34%, moderate intensity 4.26% and vigorous intensity 0.1%. Clinician ratings of activity pacing were generally unaffected by the availability of weekly activity traces from the actigraphs ( $r=0.67$ ,  $p=0.25$ ). Similarly the hourly fluctuation in actigraph recordings was not associated with clinician rating ( $r=0.270$ ,  $p=0.250$ ) and questionnaire scores ( $r=-0.106$ ,  $p=0.656$ ). Cumulative sum plots of weekly actigraphy data revealed substantial differences between patients in their activity patterns. **CONCLUSIONS:** Actigraphy was reasonably well accepted, but was only modestly effective for providing an objective measure of pacing behaviour. More detailed analysis of the dispersion of bouts of activity and rest within and across days may enhance the utility of actigraphy for this purpose.

423 Board #260 June 1, 9:30 AM - 11:00 AM

**Impact of Sodium Bicarbonate Supplementation on Psychological Measures during Exercise of Increasing Intensity**

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*(No relationships reported)*

Elevated lactate levels have resulted in increased perceptions of exertion and anxiety during high intensity exercise. The ability to buffer lactate while simultaneously performing high intensity bouts of exercise is important to the performance of athletes, but whether supplemental buffering of lactate impacts psychological measures has not been investigated. **PURPOSE:** To examine the impact of a sodium bicarbonate (NaHCO<sub>3</sub>) on perceptions of exertion, anxiety, and mood in response to cadenced exercises of increasing intensity. **METHODS:** Twelve recreationally active subjects performed three separate 20-min exercise sessions which progressively increased in cadence over the course of each condition. Participants completed three separate exercise bouts under a control condition (no supplementation) and two supplemented conditions (an experimental treatment of 0.15g/kg<sup>-1</sup> body weight NaHCO<sub>3</sub> or a placebo treatment of 0.30 g/kg<sup>-1</sup> body weight CaCO<sub>3</sub>) in a double-blind manner. Blood lactate (BLA) levels and ratings of perceived exertion (RPE) were measured prior to the start of exercise (0 min), during the exercise protocol at 5 min intervals, and immediately post-exercise at 20 min. State anxiety (SAI) and perception of mood states (POMS) were measured prior to the start of the exercise session and then again upon cessation of exercise. **RESULTS:** Results demonstrated BLA levels were significantly different

between the three conditions ( $F_{8,88}=2.04, p<.05$ ). Further, BLA ( $F_{4,44}=41.25, p<.05$ ) and RPE ( $F_{4,44}=140.13, p<.05$ ) values increased significantly as exercise progressed, and BLA ( $F_{2,22}=5.55, p<.05$ ) and RPE ( $F_{2,22}=4.09, p<.05$ ) also changed differently between conditions. POMS and SAI scores were significantly greater compared to pre-exercise in all three conditions, but there were not significantly differences between the three conditions for these measures. **CONCLUSION:** Exercise of increasing intensity increased BLA, RPE, SAI, and POMS measures in all the conditions, but changes in SAI and mood were not different between conditions, suggesting factors beyond lactate influence perceptions of mood, exertion, and anxiety during exercise of increasing intensity.

424 Board #261 June 1, 9:30 AM - 11:00 AM

**The Effect of Cognitive Fatigue on Metabolic and Psychological Parameters during High Intensity Exercise**

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(No relationships reported)

The psychophysiological effects of cognitive fatigue are important because physical performance is often contingent on the ability to physically and mentally engage in a task. Pre-conditioning with a cognitive load increases subjective feelings of tiredness during prolonged exercise; however, the effect of cognitive fatigue on energy expenditure and exertion during high intensity exercise is unknown. **PURPOSE:** To determine the effect of cognitive fatigue on VO<sub>2</sub> and perceived exertion during high intensity exercise.

**METHODS:** 10 male and 6 female (age = 27.8 ± 3.9 yrs.) moderately trained participants performed high intensity exercise on 2 separate occasions in a counter-balanced design. Prior to each exercise, participants completed a cognitive task or watched a non-arousing video. Cognitive fatigue was induced by a 50 minute vigilance task where participants responded to a numeric Go No-Go stimulus on a computer screen. The whole body exercise consisted of continuous rounds of 3 exercises: pull-ups (5 reps), push-ups (10 reps) and squats (15 reps) which were performed for as many rounds as possible for 20 minutes. Oxygen uptake (VO<sub>2</sub>) and heart rate (HR) were recorded continuously during the exercise while rate of perceived exertion (RPE) was taken at 5 minute intervals. T-tests between days were performed for mean VO<sub>2</sub> and HR while a repeated measures ANOVA was performed for RPE. Alpha level was set a priori at 0.05.

**RESULTS:** There was no difference between cognitive fatigue and control conditions in VO<sub>2</sub> (31.8±4.3 and 32.8±5.8 ml O<sub>2</sub>/kg/min, respectively), HR (162.7±10.3 and 162.9±10.1 bpm, respectively), along with no main effect for condition on RPE (16.5±2.0 and 16.0±2.3, respectively; P=0.09); however, RPE increased across time regardless of condition (P<0.001).

**CONCLUSIONS:** In contrast to endurance studies, there appears to be no effect of cognitive fatigue on VO<sub>2</sub> or perceived exertion during high intensity exercise. Exercise modality and duration may play a role in cognitive fatigue due to differing metabolic and neuromuscular strategies. Further research is required to determine the mechanisms behind cognitive fatigue's effect on physical performance.

425 Board #262 June 1, 9:30 AM - 11:00 AM

**Glycaemia, Blood Lactate And Thermoregulation In Endurance Trained Men**

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(No relationships reported)

**INTRODUCTION:** Glucose is a major metabolic substrate in endurance sports (ES) to provide its energy requirements and prevent fatigue. When metabolized, it produces heat (high body temperature (BT)) and when its supply is not enough, an increase of lactate level will appear. **PURPOSE:** To study the relationship between glucose intake, lactate production and thermoregulation in ES trained male adults. **METHODS:** 30 trained male adults (age=39, 4 ± 6, 8 y; height= 177, 9 ± 6, 2 cm), participated in the study, after signing an informed consent. A medical screening was performed to all of them. Each participant performed a progressive treadmill test until exhaustion, obtaining metabolic data with gas analyzer (Powercube-Ergo, Ganshorn Medizine Electronic), glycaemia (GlucoMen Lx Plus), blood lactate (Dr. Lange Miniphotometer plus LP 20) and axillar BT (digital thermometer High-Speed, Microlife), Borg's RPE scale at rest, at the end of the warm up, at the end of the testing and during minute 5' and 10' of the recovery period. Data analysis included descriptive and One-Way ANOVA. **RESULTS:** All values significantly increased from basal until peak point, except BT, which decreased at the end of the test. All variables decreased after their peak values during recovery period, except the glycaemia, which was higher after 10'. **DISCUSSION AND CONCLUSIONS:** Data showed a lower BT when metabolism was at its peak, which coincide with fatigue. Higher glycaemia's value during recovery could show an increasing mobilization of glycogen when exhaustion appears. More research is needed including a continuing BT, and obtaining glycaemia during a longer recovery period, when performing ES to control fatigue behavior.

| Data obtained from the treadmill test (n=30)       |                                   |                      |                          |                       |                        |   |
|--|-----------------------------------|----------------------|--------------------------|-----------------------|------------------------|---|
|  |                                   |                      | Vari-ables               |                       |                        | *(p<.05)  |
|  | C1. BAS-AL (SD)                   | C2. WARM-ING UP (SD) | C3. END OF THE TEST (SD) | C4. RE-COVERY 5' (SD) | C5. RE-COVERY 10' (SD) | C1-2-3-4-5  |
| Heart Rate (bpm)                                   | 63.0 (12.6)                       | 95.7 (18.6)          | 178,1 (8.1)              | 105.8 (9.6)           | 93.6 (11.2)            | C1 - *C2,3,4,5<br>C2 - *C3<br>C3 - *C,4,5<br>C4 - *C5 |
| VO2 peak (ml·kg <sup>-1</sup> ·min <sup>-1</sup> ) | 5.7 (1.4)                         | 21.9 (5.8)           | 48.1 (6.5)               | 16.3 (8.9)            | 9.9 (3.9)              | C1 - *C2,3,4<br>C2 - *C3<br>C3 - *C4                  |
| RER  | 0.7 (0.1)                         | 0.8 (0.1)            | 1.1 (0.1)                | 1.1 (0.1)             | 1 (0.2)                | C1 - *C2,3,4<br>C2 - *C1,4                            |
| Blood Temperature (°C)                             | 35.9 (0.4)                        | 36 (0.3)             | 35.7 (0.6)               | 36.2 (0.4)            | 36.2 (0.3)             | C3 - *C 4,5   |
| Glycaemia (mg/dL)                                  | 99.6 (11.1)                       | 98.3 (7.4)           | 111.3 (17.3)             | 123.2 (17.2)          | 118.7 (19.3)           | C1 - *C4,5<br>C2 - *C3,4,5                            |
| Blood Lactate (mmol/L)                             | 2 (1.2)<br>2.7 (1.8)<br>8.2 (2.2) |                      |                          | 7.9 (2.1)             | 7 (1.6)                | C1 - *C3,4,5<br>C2 - *C3,4,5                          |
| Borg's Scale                                       | 6 (0)                             | 7.8 (1.2)            | 19.7 (0.5)               | 9.1 (1.6)             | 6.6 (1)                | C1 - *C2,3,4,5<br>C2 - *C4<br>C3 - *C4,5<br>C4 - *C5  |

Note: values are mean (Standard Deviation). C1-2-3-4-5 are the evaluation phases.

426 Board #263 June 1, 9:30 AM - 11:00 AM

**Perception of Fatigue in Healthy and Post-Concussed Collegiate Female Soccer Players**

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**Background:** A sport-related concussion is a form of mild traumatic brain injury (mTBI) with common symptoms such as fatigue, headache, and dizziness that tend to alleviate recovery within seven to ten days. However, neural symptoms can persist anywhere from three to twelve months following onset and can lead to the development of post-concussion syndrome (PCS). There is limited knowledge regarding the effects of an exercise stress test and the perception of fatigue in post-concussed (within one year) athletes.

**Purpose:** The purpose of study was to determine if there were differences in perceived fatigue during exercise on a treadmill in healthy and post-concussed (within one year) collegiate athletes.

**Methods:** 5 female athletes, 2 healthy controls and 3 previously concussed, performed a maximal exercise test following a modified Balke protocol with a constant speed of 7.5 mph and an increasing grade each minute on a treadmill ergometer. Self-reported scale measurements were taken prior to and immediately after exercise and metabolic measures were recorded using a portable metabolic cart. Primary outcome measures included rate of perceived exertion (RPE), rate of perceived dyspnea (RPD), and maximum treadmill grade reached. T-tests will be used to evaluate the differences between the control and post-concussed groups.

**Results:** The healthy control group reported 15% higher average RPE (17.0±0.0) and 57% greater RPD (7.50±0.71) scores respectively than the post-concussed group: RPE (14.7±3.1) and RPD (4.33±2.31). However, control participants reached an average maximum treadmill grade (6.5±2.1) that was 59% higher than the post-concussed subjects (3.67±1.53) and recorded an average final distance (1408.26±426.77 m) that was 42% farther than the post-concussed group (938.84±307.31 m).

**Conclusion:** This preliminary data indicates that there are noticeable differences between the perceptions of healthy and post-concussed (within one year) female collegiate athletes in regards to fatigue. These findings lead to the potential suggestion that individuals who have been concussed within the last twelve months misinterpret their functional capabilities and under-report their level of fatigue. A larger participant population is needed to determine the significance of these differences in perception.

427 Board #264 June 1, 9:30 AM - 11:00 AM  
**Activity Level and Type Does Not Influence Exercise-Induced Hypoalgesia to Pressure or Thermal Stimuli**  
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Physical activity levels have been shown to be related to pain sensitivity. However, the relationship among physical activity levels and physical activity types on endogenous pain inhibition following exercise, termed exercise-induced hypoalgesia (EIH) has not been studied. **PURPOSE:** This study examined the EIH response to thermal and pressure stimuli among college-aged women of differing activity levels. **METHODS:** Twenty seven women were tested. Following familiarization with assessments of pressure pain threshold (PPT) and ratings of pain intensity (PI) and pain unpleasantness (PU) to thermal (46° and 48° C) stimuli, participants PPT, PI, and PU were assessed prior to and immediately following isometric hand-grip exercise to exhaustion. Participant's physical activity levels were assessed by wearing an accelerometer for 7 consecutive days during waking hours, excluding water activities and completed. Participants were classified as meeting ACSM physical activity guidelines (ACT) or not meeting guidelines (SED), and then further separated into 4 groups: met guidelines, no resistance training (ACT R-), met guidelines, and resistance trained (ACT R+), did not meet guidelines, but resistance trained (SED R+), and did not meet guidelines, no resistance training (SED R-), based upon their measured and self-reported physical activity level and type. **RESULTS:** When classified only as ACT or SED EIH was not observed for either activity on PI or PU at 46°C ( $p \geq 0.46$ ) or on PI or PU at 48°C ( $p \geq 0.16$ ). EIH was observed for PPT in both the right and left arm ( $p \leq 0.008$ ) with PPT's increasing 7% and 6% in the right and left arms, respectively. No effect of activity group was found ( $p =$ ). When separated into ACT R-, ACT R+, SED R+, and SED R-, group and exercise had no effect on PI or PU at 46°C ( $p \geq 0.25$ ) or at 48°C ( $p \geq 0.13$ ). No effect for activity group was found for PPT on the right or left arm ( $p \geq 0.32$ ), but exercise lead to an increase in PPT in the right and left arms (7%;  $p = 0.02$ , and 6%  $p = 0.04$ , respectively). **CONCLUSIONS:** Activity level and activity type had no effect on endogenous pain inhibition following exercise in college-aged women. Interestingly, EIH was observed for pressure, but not thermal stimuli suggesting the hypoalgesic effect of exercise may vary with different types of noxious stimuli.

428 Board #265 June 1, 9:30 AM - 11:00 AM  
**Neuromuscular and Perceptual Responses, but not Metabolic, Consistently Driven to Peak During Severe Intensity Running**  
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During constant velocity exercise, the heavy and severe intensity domains are demarcated by critical velocity (CV), and are defined by unique physiological responses. Specifically, it has been suggested that exercise within the severe intensity domain drives physiological and perceptual responses to peak values, while heavy intensity exercise does not. **Purpose:** This study examined the metabolic ( $\text{VO}_2$ ), neuromuscular (electromyographic amplitude [EMG AMP] and EMG mean power frequency [MPF]) and perceptual (rating of perceived exertion [RPE]) responses during severe intensity treadmill running. **Methods:** Ten runners (mean  $\pm$  SD; age =  $23 \pm 3$  years) completed an incremental test to exhaustion for the determination of the  $\text{VO}_2$  ( $\text{VO}_{2\text{peak}}$ ), EMG AMP ( $\text{AMP}_{\text{peak}}$ ), EMG MPF ( $\text{MPF}_{\text{peak}}$ ), and RPE ( $\text{PRE}_{\text{peak}}$ ) peak as well as the velocity associated with  $\text{VO}_{2\text{peak}}$  ( $v\text{VO}_{2\text{peak}}$ ). CV was the slope of the total distance (TD) versus time to exhaustion ( $T_{\text{lim}}$ ) relationship derived from four exhaustive, constant velocity runs. On separate days,  $\text{VO}_2$ , EMG AMP, EMG MPF, RPE, and  $T_{\text{lim}}$  were recorded during two exhaustive, constant velocity runs ( $V_1 =$  highest;  $V_2 =$  lowest) above CV. Mean differences for  $\text{VO}_2$ , EMG AMP, EMG MPF, and RPE at exhaustion from the constant velocity runs and the respective peak values were examined with separate repeated measures ANOVAs and Bonferroni corrected dependent samples t-tests ( $p \leq 0.017$ ). **Results:** Critical velocity ( $12.1 \pm 1.5 \text{ km} \cdot \text{h}^{-1}$ ) occurred at  $80 \pm 6\%$  of  $v\text{VO}_{2\text{peak}}$ . The mean  $T_{\text{lim}}$  values for  $V_1$  ( $15.0 \pm 1.6 \text{ km} \cdot \text{h}^{-1}$ ) and  $V_2$  ( $13.2 \pm 1.4 \text{ km} \cdot \text{h}^{-1}$ ) were  $6.57 \pm 0.80$  and  $17.72 \pm 2.63$  min, respectively. The mean  $\text{VO}_2$  at exhaustion for  $V_1$  ( $97 \pm 3\% \text{ VO}_{2\text{peak}}$ ) was not different from  $\text{VO}_{2\text{peak}}$  but was less than  $\text{VO}_{2\text{peak}}$  for  $V_2$  ( $91 \pm 6\% \text{ VO}_{2\text{peak}}$ ). There were, however, no differences between the EMG AMP ( $V_1 = 94 \pm 18$ ;  $V_2 = 90 \pm 24\% \text{ AMP}_{\text{peak}}$ ), EMG MPF ( $V_1 = 109 \pm 21$ ;  $V_2 = 111 \pm 14.6\% \text{ MPF}_{\text{peak}}$ ), and RPE ( $V_1 = 98 \pm 4$ ;  $V_2 = 100 \pm 0\% \text{ RPE}_{\text{peak}}$ ) at exhaustion and the  $\text{AMP}_{\text{peak}}$ ,  $\text{MPF}_{\text{peak}}$  and RPE, respectively, for  $V_1$  or  $V_2$ . **Conclusion:** During exhaustive treadmill running at a velocity just above the demarcation of the heavy

and severe intensity domains,  $\text{VO}_2$  may not always be driven to peak. The current findings suggested that neuromuscular and perceptual parameters were more consistent indicators of severe intensity exercise than  $\text{VO}_2$ .  
 Supported by the 2013 NSCA Doctoral Research Grant.

429 Board #266 June 1, 9:30 AM - 11:00 AM  
**Oxygen Uptake At Criterion RPE In Adults of Varying Training Status Following Different Anchoring Procedures**  
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 (No relationships reported)

Memory and Exercise and Memory anchoring have been examined in an effort to link ratings of perceived exertion (RPE) to physical exertion. It is unclear if relative exercise intensity at a given RPE would remain consistent in individuals of different training status following different types of anchoring procedures. **PURPOSE:** The current study compared percent of maximal oxygen uptake in recreationally trained (RT) vs. untrained (UT) young adults at criterion RPE during maximal, graded, treadmill exercise following either Memory or Exercise and Memory anchoring to the Borg 15-category scale. **METHODS:** Memory anchoring instructions were read prior to the experimental trial. The Exercise and Memory instructions were administered during a separate laboratory session during the treadmill protocol and then re-read to the subject preceding the experimental trial. The low anchor was assigned a seven and the high anchor a 19 on the scale. The experiment consisted of a graded, maximal, treadmill exercise test in which  $\text{VO}_2$  and RPE were collected. Linear regression with RPE as the independent variable and oxygen consumption as the dependent variable was used to calculate percent  $\text{VO}_{2\text{max}}$  for each criterion RPE (7, 9, 11, 13, 15, 17, and 19). An independent samples t-test was used to compare percent  $\text{VO}_{2\text{max}}$  between the RT group ( $n=32$ ) and the UT group ( $n=24$ ) at each criterion RPE. A second independent samples t-test was used to compare percent  $\text{VO}_{2\text{max}}$  between the Memory anchoring group ( $n=32$ ) and the Exercise and Memory group ( $n=24$ ). **RESULTS:**  $\text{VO}_{2\text{max}}$  was higher for the RT than the UT. All other descriptive variables were similar between groups. Relative oxygen uptake at each criterion RPE was also similar. When differences in the anchoring procedures were examined, descriptive and percent maximal oxygen uptake values at the criterion RPEs were similar. **CONCLUSION:** The different anchoring resulted in similar percent  $\text{VO}_{2\text{max}}$  at criterion RPE values during the treadmill exercise in young adults. It appears that verbal descriptions of the high and low anchors during the anchoring procedure is sufficient to guide exercise intensity for all young, healthy individuals regardless of training status. The findings validate Borg's assumption for the application of a category scale in that the perceptual range may be set equal for all individuals.

430 Board #267 June 1, 9:30 AM - 11:00 AM  
**Factors Associated with Disability and Pain Intensity among Patients Presenting to a Sports Medicine Practice**  
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**PURPOSE:** Psychological factors play an important role in the difference between physical impairment and the magnitude of disability. This study addressed the primary null hypothesis that there is no independent association between magnitude of disability and symptoms of depression, controlling for other factors among patients presenting to a tertiary care sports medicine practice. **METHODS:** In this cross-sectional study, 116 patients participated that presented to one of two orthopaedic sports surgeons or a physiatrist. The mean age was 43 years. We used Patient Reported Outcome Measurement Information System Computer Adaptive Tests (PROMIS CAT) to measure: limitations of physical function, symptoms of depression and coping strategies in response to pain. We used an 11-point measure of pain intensity from 0 to 10 and reported patient's physical activity status. Multivariable regression analysis was performed to identify which factors have the strongest independent influence on disability and pain intensity. **RESULTS:** In bivariate analysis, we found an association between symptoms of depression and disability. In multivariable analysis, we found that symptoms of depression was not independently associated with disability. However, we did find a strong independent association between coping strategies in response to pain and disability ( $p < 0.001$ , partial R-squared = 0.35), that explains 50% of the variability of disability in the final model. Also in bivariate analysis, we found an association between symptoms of depression and pain intensity, although, there was no independent association in multivariable analysis. However, there was a strong independent association between coping strategies in response to pain and pain intensity ( $p < 0.001$ , partial R-squared = 0.22), that explains, along with age and female race, 50% of the variability of pain intensity in the final model.

**CONCLUSIONS:** The variation in pain intensity and magnitude of disability in patients presenting to a sports specialist is not associated with symptoms of depression, however, we found a strong association with coping strategies in response to pain. Interventions to optimize coping strategies (self-efficacy) may decrease the magnitude of disability and pain intensity in patients presenting to a sports medicine practice.

431 Board #268 June 1, 9:30 AM - 11:00 AM  
**Fatigue Significantly Impacts Quality Of Life In Men With Prostate Cancer**

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Individual symptoms related to prostate cancer (PCa) have been thoroughly investigated, yet the interaction between symptoms, or symptom clusters, remains underexplored. The importance of identifying symptom clusters including fatigue is evident as 50-90% of men with PCa report fatigue as a significant adverse event that impacts quality of life (QoL). **PURPOSE:** To identify the association between fatigue and quality of life in men treated for PCa. We hypothesize significant correlations will be observed between fatigue and multiple subscales related to QoL in men with PCa. **METHODS:** We conducted a preliminary analysis of an ongoing cross-sectional study to determine the impact of PCa and PCa treatment on fatigue and QoL in 100 men with PCa and 200 age-matched controls. Thirty men treated for PCa are included in this analysis (age:  $70 \pm 10$ ; BMI:  $29 \pm 4.3$ ). Participants were asked to complete three questionnaires: the Brief Fatigue Inventory, the Functional Assessment of Chronic Illness Therapy-Fatigue (FACIT-F) and the Short Form (SF)-36. Patient demographic data was extracted from the medical records. Correlations were performed between the subscales of each survey and demographic data. Significance was set at  $p < 0.05$ . **RESULTS:** Body mass index (BMI) and fatigue had significant negative correlations with multiple subscales of the SF-36 and the FACIT-F. Increased BMI was negatively associated with SF-36 subscales of physical function ( $-0.621$ ;  $p = .001$ ), energy/fatigue ( $-0.449$ ;  $p = .02$ ), social function ( $-0.409$ ;  $p = .04$ ), pain ( $-0.422$ ;  $p = .04$ ) and FACIT-F subscales of functional wellbeing ( $-0.546$ ;  $p = .006$ ), general health ( $-0.494$ ;  $p = .01$ ), and total score ( $-0.458$ ;  $p = .02$ ). Fatigue, measured using the BFI and FACIT-F was significantly correlated with each subscale of the SF-36 ( $p < 0.05$ ). A tendency for significance was observed between BMI and role limitation due to physical ( $-0.385$ ;  $p = .057$ ) and emotional ( $-0.386$ ;  $p = .056$ ). **CONCLUSIONS:** The results of this study support our hypothesis that fatigue significantly impacts multiple QoL indicators in men with PCa. This cluster is relevant as it helps us better understand the complexity of symptoms in this clinical population. Management of this symptom cluster has the potential to improve QoL.

432 Board #269 June 1, 9:30 AM - 11:00 AM  
**Effects Of Cognitive Fatigue On Time-on-task Performance**

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Cognitive fatigue (i.e., mental fatigue) is the psychophysiological response to a prolonged cognitively demanding task which results in the subjective feeling of "tiredness" and "lack of energy" (Marcora, et al., 2009). Evidence for cognitive fatigue impairing subsequent physical performance was supported by two prior studies using continuous aerobic exercise tasks (treadmill running, and stationary cycling). **PURPOSE:** To determine whether cognitive fatigue impairs subsequent physical performance in discontinuous high intensity circuit exercise (HIT). **METHODS:** As a counterbalanced repeated measure design, eleven participants (7 male and 4 female) completed a cognitively fatiguing computer task (vigilance) and a control task (video) for 52 minutes prior to completing HIT. The two visits were separated by at least 7 days. The HIT task involved participants completing 5 pull ups, 10 pushups, and 15 air squats consecutively for a 20 minute period. Participants were filmed during HIT to quantify behavioral performance (e.g., time-on-task and repetitions completed). **RESULTS:** Participants who were cognitively fatigued had decreased time-on-task ( $679 \pm 105$  sec) relative to when not cognitively fatigued ( $684 \pm 103$  sec); however, the difference failed to reach significance,  $t(15) = 0.32$ ,  $p = .75$ . Participants had decreased repetitions completed during the HIT when preceded by a cognitive fatiguing task ( $528 \pm 106$  sec) relative to a control task ( $536 \pm 93$ ); however, the difference failed to reach significance ( $t(15) = 0.67$ ,  $p = .50$ ). **CONCLUSION:** Findings indicate that participants completing a cognitively fatiguing task relative to a control task does not

impact subsequent physical performance on a HIT. This study does not corroborate previous studies which used continuous aerobic tasks (i.e., cycling and running). The observed effect in prior studies may be exercise modality specific.

433 Board #270 June 1, 9:30 AM - 11:00 AM  
**Test Preference and its Relationship to Performance during Maximal Aerobic Exercise Testing**

Nicholas J. Hanson<sup>1</sup>, Cory M. Scheadler<sup>2</sup>, Taylor L. Lee<sup>1</sup>, Noah C. Neuenfeldt<sup>1</sup>, Timothy J. Michael, FACSMT<sup>1</sup>, Michael G. Miller<sup>1</sup>. <sup>1</sup>*Western Michigan University, Kalamazoo, MI.* <sup>2</sup>*Northern Kentucky University, Highland Heights, KY.*  
 (No relationships reported)

Maximal aerobic capacity (VO<sub>2</sub>max) is a strong variable in predicting risk of death from all-cause mortality as well as performance in many endurance sports. Proper test selection is important, and test preference may affect the results of VO<sub>2</sub>max testing. **PURPOSE:** To compare the preferred test method between three different VO<sub>2</sub>max tests and determine the relationship to performance.

**METHODS:** 13 active subjects (8 men, 5 women; age  $24 \pm 3$  yrs) volunteered to participate in this study. All underwent three tests including: a standard Bruce protocol treadmill test followed by, in random order, a self-paced maximal VO<sub>2</sub>max test (SPV) on a cycle ergometer (CE SPV) and a treadmill (TM SPV). The SPVs were ten minutes long with intensity increasing every two minutes based on the 6-20 Rating of Perceived Exertion (RPE) scale, and included RPE values of 11, 13, 15, 17 & 20. With the SPVs, subjects controlled the work rate to maintain the prescribed RPE. After the last test, subjects were immediately asked which test they preferred of the three, without further instruction. A chi-square goodness of fit was performed to determine if the tests were equally preferred and a chi-square test of independence was used to examine the relationship between preference and performance.

**RESULTS:** Of the 13 subjects, five preferred the TM SPV (38%), six preferred the CE SPV (46%), and two preferred the Bruce protocol treadmill test (16%). Preference was equally distributed ( $X^2 = 2.000$ ,  $p = .368$ ). Eight of the subjects (62%) preferred the test they performed their best on while five did not (38%). The relationship between test preference and performance was not significant ( $X^2 = 8.790$ ,  $p = .067$ ).

**CONCLUSIONS:** In this study, "preference" was not defined for the subjects. Some may have chosen their preferred test based on which one they thought they would perform best. These tests are maximal and thus subjects usually discontinue their efforts due to signals of overall or peripheral discomfort. The preferred test may have been chosen based solely on the level of discomfort experienced. Regardless, the results suggest that test preference may not affect performance during VO<sub>2</sub>max testing. Future studies should seek to examine how subjects define "preference" and if it could be used to choose the most appropriate protocol.

434 Board #271 June 1, 9:30 AM - 11:00 AM  
**Effects of Stimulative vs. Sedative Music on Psychophysiological Variables during Active Recovery from Intense Exercise**

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There is an established and growing body of evidence that appropriately selected music can positively influence psychophysical responses to exercise (see Karageorghis & Karageorghis, 2012a). One understudied area of interest pertaining to these effects concerns the use of music during recovery from exercise. **PURPOSE:** The purpose of this study was to examine the influence of music played during recovery from a Wingate anaerobic test (WAnT) on lactate clearance, heart rate (HR), rating of perceived exertion (RPE) and subsequent WAnT performance. **METHODS:** 45 anaerobically trained male subjects were randomly assigned to one of three groups: Stimulative music, sedative music, or no-music control. Subjects completed two 30s WAnTs with 10 min of active recovery (self-paced unloaded cycling) between. During the recovery period the experimental participants listened to pre-selected music using an iPod and headphones. Blood lactate (BLa) and HR were measured at baseline, immediately after the first WAnT, and at the end of the active recovery period. RPE was measured immediately after the first WAnT, and at min-5 and min-10 of the active recovery period. WAnT performance (i.e. peak power and mean power) was recorded in both trials. Data were analyzed using mixed factorial ANOVAs.

**RESULTS:** Subjects in the stimulative music group had a higher mean HR during recovery ( $p < 0.05$ ) but significantly lower RPE ( $p < .05$ ) when compared to the sedative and control groups. Moreover, there was a significant ( $p < .05$ ) group by time interaction for BLa, wherein subjects in the stimulative music group showed a pre-post recovery drop in BLa that was not evident in the other groups. The group by time interaction for peak power (PP) did not reach statistical significance ( $p = .07$ ) but was associated with a moderate sized effect ( $\eta^2 = .13$ ). Subjects in the stimulative music group increased PP from Trial 1 to Trial 2, whereas subjects in the sedative and control groups decreased PP from Trial 1 to Trial 2. There was a main effect of time for mean power, but no

interaction. **CONCLUSIONS:** It appears that stimulative music has motivational qualities that exerts a positive influence on self-paced recovery, wherein participants are motivated to move at a faster rate, which can facilitate blood lactate clearance.

435 Board #272 June 1, 9:30 AM - 11:00 AM  
**Cohesion is Associated With Perceived Exertion and Enjoyment During Group Exercise in Recreational Runners**

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Two elements of group exercise, cohesion and social support, have been shown to positively affect exercise adherence. Recreational runners often join informal training groups to increase motivation, and thus training frequency and intensity. However, no previous research has investigated how training with a group may affect recreational runners' exercise behavior, perceived exertion, or enjoyment, nor the relationship of perceived cohesion and social support with these variables.

**PURPOSE:** Determine if performing an interval running workout coactively with a regular training group affects average speed, perceived exertion, and/or enjoyment in recreational runners, and if these variables were associated with perceived cohesion and/or social support.

**METHODS:** Recreational runners (n = 7 male, n = 10 female) who regularly met with a local group performed two experimental trials, each under a different social condition, in a randomized order. Both trials took place on the same outdoor course and consisted of 8 uphill 400-meter running intervals separated by an equivalent jogging recovery. One trial was performed alone while the other was performed coactively with the group. Participants' average interval time, RPE, and heart rate over the eight intervals was recorded for each trial. Enjoyment (end of each trial), social support and cohesion (prior to participation) were assessed with a visual analog scale and questionnaires, respectively.

**RESULTS:** Mixed model regression analysis showed that men ( $122 \pm 16.1$  sec) ran faster (p = .002) than women ( $155 \pm 27.8$  sec) across both social conditions. There were no main or interaction effects of social condition on average speed (p > .87), RPE (p > .08), or enjoyment (p > .26). However, task cohesion (r = -.58, p = .01) and social support (r = -.73, p = .001) were negatively associated with RPE in the group condition only, despite similar speed in both conditions. Task cohesion was also positively associated with average enjoyment of the two trials.

**CONCLUSIONS:** Performing an interval running workout amidst a familiar running group did not significantly affect recreational runners' average speed, enjoyment, or RPE. However, although speed was similar in both conditions, those with higher perceived task cohesion and social support reported less effort when running in the group.

436 Board #273 June 1, 9:30 AM - 11:00 AM  
**Does Mental Fatigue Alter Core And Skin Temperature In The Heat?**

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**PURPOSE:** To examine the effect of a mentally fatiguing task and/or subsequent exercise, both performed in 30°C, on core and skin temperature and temperature sensation.

**METHODS:** Ten endurance-trained male athletes (Age:22±3y; Wmax:332±41W) completed two experimental trials in a single blind, randomized, cross-over design in 30°C (30% RH). After 45min of Stroop or watching a documentary (control), subjects cycled for 45min at a fixed pace equal to 60% Wmax, immediately followed by a self-paced time-trial (TT) in which they had to produce a fixed amount of energy (equal to cycling 15min at 80% Wmax) as fast as possible. Reaction time and accuracy were assessed during the Stroop task, while core and skin temperature, thermal sensation, ratings of perceived exertion, the NASA-Task Load Index (NASA-TLX) and a mental fatigue-VAS-scale (M-VAS) were assessed throughout the entire trial.

**RESULTS:** The NASA-TLX scale showed that the Stroop task was more mentally demanding (p<0.05) and the M-VAS indicated that mental fatigue was higher during and after the Stroop compared to the control condition (p<0.05), however mean reaction time and accuracy did not decline significantly during the Stroop. Mean Tskin during the cognitive task tended to be higher (p=0.068) during the Stroop ( $34.0 \pm 0.4^\circ\text{C}$ ) compared to the control ( $33.8 \pm 0.3^\circ\text{C}$ ), while both mean Tcore (Stroop:  $36.9 \pm 0.3^\circ\text{C}$ , Control:  $37.0 \pm 0.2^\circ\text{C}$ ) and thermal sensation ( $2 \pm 1$  in both conditions) did not differ between conditions. No effects were observed between conditions in the exercise part.

**CONCLUSIONS:** Subjective measures (M-VAS & NASA-TLX) indicated that mental task was more mentally demanding and that mental fatigue was successfully induced in the heat. Despite a trend towards significantly higher skin temperatures during the cognitive task, mental fatigue did not disturb any thermoregulatory parameters. \* BR is funded by the FWO Fund for Scientific Research Flanders, Belgium.

437 Board #274 June 1, 9:30 AM - 11:00 AM  
**Premature Termination Of A Maximal Incremental Exercise Test Due To 'Pain' 48 H Following A Downhill Run**

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**PURPOSE:** Exercise induced muscle damage (EIMD) decreases time to exhaustion during maximal incremental exercise (MIE) testing. However, the reasons for this, remain unclear. The aim of this study was to employ qualitative measures to investigate the effects of EIMD on reasons for terminating a MIE test.

**METHODS:** Fifty (14 female), apparently healthy participants randomly allocated into a control (CON) group (n = 10), or experimental (EXP) group (n = 40) visited the laboratory a total of six times: visit 1 (familiarisation), visit 2 (MIE\_CON1 or MIE\_EXP1), visit 3 (MIE\_CON2 or MIE\_EXP2), visit 4 (intervention), visit 5 (24 h post) and visit 6 (MIE\_CON3 or MIE\_EXP3). Both groups performed identical testing during all visits, except during visit 4, where only EXP performed a 30 min downhill run and CON performed no exercise. During visits 2, 3 and 6 all participant performed MIE, and the following markers of EIMD were obtained: maximum voluntary contraction (MVC), voluntary activation (VA), creatine kinase (CK) and muscle soreness. Additionally, following each MIE test participants completed a questionnaire to discover the reason(s) they terminated the test.

**RESULTS:** There was a significant association between group (EXP, CON) and termination of the MIE due to 'pain' during MIE\_CON3 and MIE\_EXP3 ( $\chi^2 = 14.7$ , p = 0.002). In the CON group 60% of the participants said pain was not a contributory factor to them terminating the test, 30% reported pain as a minor contributory factor, 10% a major contributory factor, and 0% the only contributory factor to them terminating the MIE test. In the EXP group 13% reported that pain was not a contributory factor, 13% reported pain as a minor contributory factor, 72% a major contributory factor, and 3% reported pain as the only contributory factor to them terminating the MIE test.

**CONCLUSIONS:** EIMD results in premature termination of a MIE test, which is associated with the perception of pain. The exact mechanisms responsible for this require further investigation, however, it is postulated that EIMD derived pain may stimulate type III/IV afferent fibres.

**A-49 Free Communication/Poster - Physical Activity Interventions in Older Populations**

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
 Room: Exhibit Hall A/B

438 Board #275 June 1, 9:30 AM - 11:00 AM  
**Effects of a Group-based Behavioral Intervention On Dietary Behaviors in Older Adults**

Rebecca A. Schlaff<sup>1</sup>, Meghan Baruth<sup>1</sup>, Valerie J. Adams<sup>2</sup>, Tatum Goldufsky<sup>3</sup>, Nathan A. Peters<sup>4</sup>, Graceson C. Kerr<sup>1</sup>, Ashley Boggs<sup>1</sup>, Ashley Ewald<sup>1</sup>. <sup>1</sup>*Saginaw Valley State University, University Center, MI.* <sup>2</sup>*Duke University, Durham, NC.* <sup>3</sup>*Michigan State University, East Lansing, MI.* <sup>4</sup>*University of South Carolina, Columbia, SC.*  
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 (No relationships reported)

There is evidence to suggest that aging impacts dietary behaviors. Specifically, older adults may have a difficult time engaging in healthy eating behaviors and meeting dietary recommendations. Group-based, behavioral interventions may assist in improving dietary behaviors within this population. **PURPOSE:** To examine the effect of a 12-week group-based, behavioral nutrition intervention on dietary behaviors. **METHODS:** Inactive older adults ( $\geq 50$  years) were randomized to a 12-week, group-based, nutrition or exercise behavioral intervention. Participants completed a questionnaire at baseline and post-intervention assessing demographic variables. Fruit and vegetable (FV) consumption was assessed via the National Cancer Institute Fruit and Vegetable all-day screener (cups/day), and the Fat and Fiber-related

Behavior Questionnaire was utilized to determine fat- and fiber-related behaviors at baseline and post-intervention. Objectively measured height and weight were also obtained. Repeated measures ANOVAs examined changes in dietary behaviors (FV, fat, and fiber) over time between intervention groups, controlling for age, gender, and education. An alpha level of 0.05 was used to determine statistical significance. **RESULTS:** Participants (n=50) averaged 64.1±8.4 years of age and had a BMI of 33.3±7.5 kg/m<sup>2</sup>. A majority were women (72%), married (62%), white (86%), and reported at least some college education (86%). Participants in the nutrition group had significantly greater increases in FV consumption (p=0.004), and significantly greater improvements in fat- (p=0.03), and fiber-related (p=0.008) behaviors than the exercise group post-intervention. **CONCLUSIONS:** Our findings indicate that a 12-week group-based behavioral nutrition intervention increased FV consumption, and fat- and fiber-related behaviors. Behavioral interventions may be a low-cost way to promote healthy eating behaviors among older adults, potentially affecting population health significantly. Future research should seek to corroborate these findings within more diverse samples of older adults (with respect to gender, race, and education level) to increase external validity.

439 Board #276 June 1, 9:30 AM - 11:00 AM  
**Effects of a Group-based Behavioral Physical Activity Intervention in Older Adults**

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Chronic diseases are highly prevalent among older adults. Despite the known benefits of regular physical activity (PA), particularly for disease prevention and management, a majority of older adults do not meet PA guidelines. There is a need for evidence-based programs that can successfully initiate and maintain PA behaviors. **PURPOSE:** To examine the effects of a 12-week, group-based, behavioral PA intervention on PA behaviors and weight-loss in older adults. **METHODS:** Inactive older adults (>50 years) were randomized to a 12-week, group-based, behavioral PA intervention, or to an attention control nutrition intervention. Demographic variables were collected via a survey; objectively measured height and weight were obtained. Participants wore an accelerometer during all waking hours for 7 days on the right hip. Percent of day spent in sedentary, light, and moderate to vigorous PA was calculated. All measures were obtained at baseline and 12-weeks (post intervention). Repeated measures ANOVAs examined changes in weight and PA behaviors over time between groups, controlling for age, gender, and education. **RESULTS:** Participants (n=50) averaged 64.1±8.4 years of age and had a BMI of 33.3±7.5 kg/m<sup>2</sup>. A majority were women (72%), married (62%), white (86%), and had at least some college education (86%). Participants spent 62% of the day sedentary, 37% in light PA, and 1% in moderate to vigorous PA. Participants in the PA group had significantly greater increases in moderate to vigorous PA than those in the nutrition group (p=.04). Participants in the nutrition group had significantly greater decreases in time spent sedentary than those in the PA group (p=.03). There was no significant change over time in light PA (p=.29). There was a significant decrease in weight over time among participants from both groups (p=.001). **CONCLUSIONS:** Findings from our study suggest that group-based behavioral PA interventions may be an effective way to increase moderate to vigorous PA among older adults. Behavioral PA and dietary interventions may also result in weight loss. Given the expected growth in the number of adults 65+ in the U.S., there is a need for interventions that can successfully increase PA and be disseminated widely. Such interventions have the potential to increase independence and longevity across the population.

440 Board #277 June 1, 9:30 AM - 11:00 AM  
**The Effects Of Home Based Nutrition And Exercise Intervention In Improving Functional Capacity Associated With Falls Among Older Adults**

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THE EFFECTS OF HOME BASED NUTRITION AND EXERCISE INTERVENTION IN IMPROVING FUNCTIONAL CAPACITY ASSOCIATED WITH FALLS AMONG OLDER ADULTS  
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**PURPOSE:** The purpose of the study was to examine the synergistic role of functional capacity and nutrition on falls as well as the impact of combined, home-based nutrition and exercise interventions. **MEASURES:** For the purpose of the study, 134 individuals over 60 years of age were recruited through Continuing Care and other community-based organizations. The participants were placed in one of four groups: exercise only, nutrition only, exercise and nutrition group, and no intervention comparison group. The exercise and nutrition interventions were the Home Support Exercise Program and consumptions of liquid adult nutritional supplement (Ensure®) daily for six months. The participants' demographic information, status on health, function, nutrition, and falls were assessed at baseline and again at 6 months. **RESULTS:** The participants' age ranged from 61-98 (ave=81). Of the participants, 83% were female, 50% lived alone, and 65% required personal assistance to leave their home. Participants in the exercise only and exercise-nutrition groups performed an exercise program, while those in the nutrition only and exercise-nutrition groups received liquid nutritional supplement. Results showed significant changes in group scores over time for functional reach with significant differences existing between exercise and nutrition-exercise groups. Overall, the exercise only group performed better than the other groups in improvement of functional capacity and psychophysical well-being after a 6 months intervention. **CONCLUSION:** Working with frail elderly provides unique opportunities and challenges.  
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441 Board #278 June 1, 9:30 AM - 11:00 AM  
**Stay Strong, Stay Healthy: University Of Missouri-Extension's Strength-Training Program For Older Adults In Community Settings**

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The population of older adults is growing significantly and is expected to reach 56.4 million by the year 2020. Aging reduces muscle mass that leads to decrease in muscle strength, flexibility, and balance in older adults and sedentary lifestyle increases rate of progression of these conditions. Increase in muscle mass and muscle strength are associated with improved flexibility and balance. Strength training exercises may help to increase muscle mass, muscle strength, flexibility and balance in older adults. The Stay Strong, Stay Healthy (SSSH) program is an 8-week strength training program for older adults, modeled after the Strong Women Program from Tuft's University and designed by Extension professionals at University of Missouri - Extension. It is currently running in more than 50 counties in Missouri. **PURPOSE:** The purpose of this study was to investigate the effects of SSSH program on muscle strength, flexibility, and balance in older adults. **METHODS:** A total of 4801 participants (men: n=654, women: n=4069, gender unknown: n=78, age >60 years: 70.1%) enrolled in 10-week SSSH program (attended once or twice weekly) and 3695 participants completed at least 60% of the training sessions. Five outcomes (30-s chair stand, chair sit-and-reach left and right, back scratch left and right, 8-foot up-and-go, and balance test) were measured in 3013 participants since 2010. **RESULTS:** Post-SSSH program participants felt stronger (89.0%) and more flexible (85.8%) and reported improvement in all five (30.4%), four (30.6%), or one to three (39.0%) fitness measures. Among them, 59.4% also continued to exercise at their home during 10-week program. Post-3 month follow-up, 81.1% continued to strength train at home (56.3%), in a group (17.5%), or at gym (7.4%). Additionally, 67.3% agreed that their ability to perform activities of daily living (ADL) improved. **CONCLUSION:** The University of Missouri's SSSH program improved muscle strength, flexibility and balance of older adults. Additionally, participants continued strength exercises during and after program. SSSH also improved ADL suggesting that SSSH can be adapted and implemented in community settings all over the United States.

442 Board #279 June 1, 9:30 AM - 11:00 AM  
**Effects of Resistance Training on Strength, Physical Function and Quality of Life in Older Adults**

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Muscle weakness can limit older adults' ability to perform daily activities and could negatively affect quality of life (QOL). Resistance training using loads of approximately 65-75% of one repetition maximum (1-RM) are recommended to improve strength in older adults, however, the use of low-load (30% 1-RM) blood flow restricted (BFR) resistance training may result in similar strength gains. **PURPOSE:**

To compare strength, physical function and QOL adaptations following 12-weeks of high-load (HL) and BFR training in older adults at risk of mobility limitations. METHODS: Thirty-six male and female older adults (76.0±7.6 years; 26.6±3.3 kg·m<sup>-2</sup>) who possessed low knee extension muscle strength placing them at risk of developing mobility limitations participated. They were randomly assigned to perform twice weekly sessions of HL (70% 1-RM), BFR (30% 1-RM coupled with a vascular restriction of 1.5 times systolic blood pressure at the proximal thigh) or attention control (CON) exercise for 12 weeks. HL and BFR groups engaged in three sets of leg extension (LE), leg press, and leg curl resistance training to muscular failure. The CON group performed three sets of light upper body resistance and flexibility training that was not expected to result in muscle adaptations. LE 1-RM, isometric strength, strength-to-weight (STW) ratio, Short Physical Performance Battery (SPPB), 400 m walking speed and four domains of QOL via survey were assessed before, midway and after 12 weeks of training. RESULTS: HL and BFR groups had increases of 8-56% in LE 1-RM, isometric strength and STW ratio within 6-weeks of training and maintained these changes at 12-weeks while the CON group had no changes (time x group P.05). Walking speed and SPPB improved 3% and 5%, respectively among all groups (time main effect P>.05). There were no changes in QOL in any group (time x group P>.05). CONCLUSION: HL and BFR training improves muscle strength similarly in older adults at risk of mobility limitations, suggesting BFR exercise is a viable exercise modality. Enhanced physical function without changes in QOL was seen in all groups. The impact of increased strength on physical function should be further evaluated with additional tests of daily activities. Supported by NIH grant 1R15 A6404700-01A1.

443 Board #280 June 1, 9:30 AM - 11:00 AM  
**Effect Of Exercise Training On The Physical Activity Patterns In The Elderly.**

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The possibility that exercise intervention in the elderly does not always result in an increased total amount of physical activity per day has recently been reported. It remains unknown whether exercise training affects the daily energy expenditure of other physical activities pattern during the remainder of the day.

**PURPOSE:** The purpose of this study was to compare the physical activity in elderly people on exercise and non-exercise days.

**METHODS:** The participants included 22 healthy elderly individuals (13 men, 9 women; aged 69±4 years) at exercise facilities in Okinawa Prefecture. Using a uniaxial accelerometer to measure the daily physical activity, we observed the number of steps, the time spent at different intensity levels of activity and the total energy expenditure. Over a two-week period, each subject wore an accelerometer throughout their waking hours (except during activities in water). The subject's data were analyzed if at least 2 days of valid data were available on the days when the subjects exercised at the facility and at least 3 days of valid data were available on the days when the subjects did not exercise at the facility.

**RESULTS:** The number of hours that the accelerometer was worn did not significantly differ between the exercise and non-exercise days (15.0±2.2 vs 15.1±1.9 hours). The mean time that the subjects spent at the exercise facility was 113.5 ± 31.2 min. The total energy expenditure (1711.6±227.6 vs 1635.6±237.7 kcal; p<0.01) and the number of steps per day (8515±3105 vs 6273±3078 steps; p<0.01) were significantly greater on exercise days than on non-exercise days. The time spent in low, moderate, and high intensity physical activities did not differ significantly between the exercise and non-exercise days, although their combined time was significantly greater on exercise days (87.0±30.2 vs 68.8±33.7; p<0.01). The proportion of time wearing the accelerometer during moderate physical activity was significantly greater on exercise days than on non-exercise days (2.4±1.7 vs 1.5±1.1%; p<0.05).

**CONCLUSIONS:** The exercise performed by the subjects may have increased the total amount of physical activity (particularly the time spent at moderate intensity physical activity) per day.

444 Board #281 June 1, 9:30 AM - 11:00 AM  
**Concurrent Aerobic and Resistance Training Improves Lower Limbs Strength and Muscular Endurance in Older Adults**

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**PURPOSE:** With aging, there is a decline in muscular endurance and strength. The positive impact of regular physical activity among older adults (OA) is well recognized. Few studies have assessed the effectiveness of concurrent combined aerobic (AT) and resistance (RT) training in physical function of OA. This study aimed to evaluate the effects of this program in body composition, muscle strength, muscular endurance, flexibility and cardiorespiratory fitness.

**METHODS:** Fifty untrained OA were non-randomly divided into an experimental (EG) and a control group (CG). Body composition (DXA), cardiorespiratory fitness (6MWT), flexibility (Chair Sit & Reach), muscle strength (BIODEX) and muscular endurance (30-s Chair-Stand Test) were assessed at baseline and after 8 months. Training consisted of 30 min of walking (65-85% HRmax) (Polar System) followed by 45 minutes of RT (60-80% 1RM), 3 times a week. Data were analyzed using a General Linear Model (Repeated Measures ANOVA) testing for a time x group (TxG) interaction at significance level of 5%.

**RESULTS:** Eighteen OA were evaluated in EG and 16 in the CG. Mean assiduity of the EG was 94.08 ± 3.07%. No significant TxG interaction was found on BMI, body fat %, fat mass and lean mass (p>0.05). Significant differences (EG x CG) were identified for 30-s chair-stand, chair sit & reach and isokinetic strength. Peak torque of isokinetic strength for the lower limbs increased in the EG: right knee flexion at 180°/s (8.2 ± 2.2 s-1 Nm) with a significant main effect for TxG interaction (p=0.017), left knee flexion at 60°/s (4.8 ± 2.7 s-1 Nm) with a significant main effect for TxG interaction (p=0.026), and right knee flexion at 60°/s (6.0 ± 1.8 s-1 Nm) with a significant main effect for TxG interaction (p=0.001). Muscular endurance increased in EG (5.6 ± 0.8 no. of stands) with a significant main effect for TxG interaction (p=0.015). Flexibility of the lower limbs improved in EG (2.8 ± 1.9 cm) with a significant main effect for TxG interaction (p=0.001).

**CONCLUSION:** Concurrent 8-month AT and RT increased lower limbs flexibility and strength for knee flexors (BIODEX), and for muscular endurance, as observed in the 30-s chair-stand test. However, it was not effective to improve participants' cardiorespiratory fitness. Supported by FCT with grant UID/DTP/00617/2013.

445 Board #282 June 1, 9:30 AM - 11:00 AM  
**Acute Effects of Land- and Water-Based Exercise on Cutaneous Microvascular Function in Older Patients with Type 2 Diabetes**

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Diabetes is a disease that is characterized by microvascular complications. Exercise training is the first line of defense. However, relative efficacy of land-based and water-based exercises is unknown.

**Purpose:** To determine acute effects of cycling exercises performed on land and in water on cutaneous microvascular function in older patients with type 2 diabetes.

**Methods:** Twenty-four adults (67±5 years) with type 2 diabetes mellitus were randomly assigned into land-based exercise (n=12) and water-based exercise (n=12). Both exercise programs consisted of cycling at 60-70% of maximal heart rate for 15 minutes on land and in warm water. Before and after each exercise session, body composition, heart rate, blood pressure, and blood glucose concentrations were measured. Cutaneous post-occlusive reactive hyperemia was determined using the laser-Doppler fluxmeter in a fingertip and foot.

**Results:** Systolic blood pressure increased similarly with both exercises and diastolic blood pressure did not change. Blood glucose concentration decreased (p<0.05) in both exercise groups similarly. Peak cutaneous blood flow to the fingertip and foot did not change significantly in both exercise groups. The time to peak cutaneous blood flow to the fingertip and foot as well as the recovery time on foot decreased (all p<0.05) only after the water-exercise.

**Conclusions:** Our findings indicate that both land- and water-based cycling exercises reduces blood glucose concentration in patients older patients with type 2 diabetes but that cutaneous microvascular function was increased only after the cycling exercise performed in warm water.

**Acknowledgments:** This study was supported by Government Research Budget Chulalongkorn University 2015 and The 90<sup>th</sup> Anniversary Fund, Chulalongkorn University, Thailand

446 Board #283 June 1, 9:30 AM - 11:00 AM  
**Changes in Cortical Activation Patterns in Language Areas Following Aerobic Exercise in Older Adults**  
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**PURPOSE:** Over the past few decades, considerable attention has been devoted to examining the benefits of aerobic exercise on central nervous system plasticity. The current study sought to build on previous research demonstrating improved language functioning in older adults following exercise by quantifying the change in neural activation patterns during a semantic fluency task via functional magnetic resonance imaging (fMRI). **METHODS:** Twenty-one community-dwelling older adults were recruited and randomly enrolled to an aerobic 'Spin' exercise group or a control condition. Participants were evaluated before and after the intervention with an estimated V02max test and semantic fluency while undergoing an fMRI. Change score of clusters sizes in a priori regions of interests included: Posterior Cingulate Cortex, Left Broca's Area, Right Broca's Homologue, Right Precuneus, and Mesial Frontal Areas. **RESULTS:** There was a significant increase in the change scores for estimated V02max of the 'Spin' group when compared to the control group  $t(19)=4.63, p=0.0002$ . There was a significant improvement in the change scores for semantic fluency of the spin group when compared to the control  $t(19)=2.58, p=0.018$ . There was a significant decrease in positive activity in posterior attention areas, posterior cingulate cortex, right precuneus and mesial frontal areas ( $p's < .05$ ). **CONCLUSION:** Aerobic exercise results in increased efficiency of attentional networks involved in a semantic fluency task in previously sedentary older adults. This alteration may facilitate increase fluency in older adults.

447 Board #284 June 1, 9:30 AM - 11:00 AM  
**Combined Effects of Diet and Exercise or Diet to Improve Physical Function in Older Adults**  
 Maria Giné-Garriga<sup>1</sup>, Eulàlia Vidal-Garcia<sup>2</sup>, Natàlia Gómara-Toldrà<sup>2</sup>, Blanca Roman-Viñas<sup>1</sup>, Miriam Guerra-Balic<sup>1</sup>, Marta Roqué-Figuls<sup>3</sup>. <sup>1</sup>*Universitat Ramon Llull of Barcelona. Faculty of Psychology, Education and Sport Sciences Blanquerna, Barcelona, Spain.* <sup>2</sup>*Universitat Ramon Llull of Barcelona. Faculty of Health Sciences Blanquerna, Barcelona, Spain.* <sup>3</sup>*Universitat Autònoma de Barcelona, Barcelona, Spain.*  
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Older adults aged 65 and over are the fastest growing segment of the world's population. Recent randomized controlled trials (RCTs) and systematic reviews have shown that exercise seems to be beneficial in improving physical function in older adults. However, most research studies assessing the effects of a diet intervention (excluding diet supplementation) on physical function had used prospective population-based designs excluding strong methodological designs such as RCTs, likely because of the resources (i.e. money and time) needed to conduct an intervention over a long enough period of time to see change in the outcome of interest. Therefore, systematic reviews assessing the effects of diet and a combination of diet and exercise interventions to improve physical function have yet to be published. **PURPOSE:** We conducted a systematic review aiming to integrate the most current evidence on the effect of combined exercise and diet interventions (not limited to caloric restriction) or diet interventions alone on improving performance-based measures of physical function in community-dwelling older adults. **METHODS:** Randomized clinical trials and observational population-based studies of community-dwelling older adults were selected through comprehensive bibliographic searches in Medline (up to September 2014). Included trials had to assess performance-based measures of physical function such as strength, balance, mobility and gait, and diet measured as diet indexes or food intake. Seven studies were included. Meta-analysis was performed with the inverse variance method under the random effects models. **RESULTS:** Combined exercise and diet interventions, when compared with control or diet interventions alone, were shown to improve walking speed and performance on the Short Physical Performance Battery (SPPB), although SPPB results failed to show clinical significance. No consistent effect was observed for balance outcomes. **CONCLUSION:** Although exercise interventions are known to improve physical function outcomes, based on current data, it is not possible to affirm that a combination of diet and exercise interventions can further improve physical function. The evidence comparing different patterns of diet is scarce, and it is not possible to pinpoint which diet intervention is the most effective.

448 Board #285 June 1, 9:30 AM - 11:00 AM  
**Effect of a Walking Program on Functional Fitness Measures in Older Adults**

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Increasing physical activity for an elderly population can positively affect functional fitness and activities of daily living by increasing muscular strength, endurance, and gait speed. **Purpose:** To determine the effects of a 6-month walking program on functional fitness measures in older adults. **Methods:** Twenty one healthy, older individuals were recruited from a Senior Center (age: 72.4±6.1 yrs; height: 158.9±6.6 cm; weight: 81.1±12.7 kg; BMI: 31.9±0.9). Subjects self-selected to participate in either a walking (WG) or control (CON) group. WG was given pedometers to wear and assigned a daily step goal of reaching ≥10,000 steps·day<sup>-1</sup>. Subjects were evaluated monthly using: 6 min walk test, a 20 m walk at maximum pace (with initial 2.44 m and middle 10 m components), 30 s chair stand (CS 30), and get-up-and-go (GUAG) task that measured the time to walk a loop of 4.88 m after standing from a seated position. A two-way ANOVA with repeated measures was used to make group and time (baseline vs. month 3) comparisons. **Results:** Compared to baseline, many of the functional fitness measures improved, after 3 months of walking intervention. Furthermore, a significant difference ( $p<0.05$ ) was observed in average daily steps between groups (WG: 7251±3305 steps·day<sup>-1</sup> vs. CON: 2592±799 steps·day<sup>-1</sup>).

|                                | Walking Group |               |          | Control Group |               |          |
|--------------------------------|---------------|---------------|----------|---------------|---------------|----------|
|                                | Baseline      | Month 3       | % change | Baseline      | Month 3       | % change |
| 6 min Walk (m)                 | 351.5 ± 46.8  | 398.1 ± 70.4* | 13.3     | 312.7 ± 52.0  | 360.8 ± 42.7* | 15.4     |
| 2.44 m GS (m·s <sup>-1</sup> ) | 1.2 ± 0.2     | 1.4 ± 0.2*    | 15.4     | 1.1 ± 0.2     | 1.2 ± 0.3     | 6.6      |
| 10 m Max (s)                   | 6.7 ± 1.3     | 6.4 ± 0.7     | -3.3     | 7.7 ± 1.6     | 7.5 ± 1.4     | -1.6     |
| CS 30 (rep)                    | 13.0 ± 3.1    | 15.2 ± 3.9*   | 17.0     | 11.8 ± 2.4    | 13.3 ± 1.5    | 12.3     |
| GUAG (s)                       | 6.9 ± 1.2     | 6.2 ± 1.0     | -9.2     | 7.9 ± 1.7     | 7.1 ± 1.4     | -9.6     |

Note: \*Significantly different from the baseline ( $p<0.05$ ).  
**Conclusion:** The preliminary findings suggest that a three-month walking intervention program for older adults can significantly improve some of their functional fitness measures, which may aid in their activities of daily living.

449 Board #286 June 1, 9:30 AM - 11:00 AM  
**Effect Of Increased Daily Physical Activity On Lower-extremity Physical Function In Older Adults**

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*(No relationships reported)*

Regular exercise can improve lower-extremity physical function (LEPF) in older adults. It is important that participants do exercise not only in the exercise classroom but also in their daily lives. We conducted an exercise program and compared the effects on LEPF between participants with goal-setting (GS) aimed at increasing daily physical activity (PA) by 1000 steps/day and participants without GS. **PURPOSE:** To investigate the effects of GS on daily PA and LEPF during the exercise program. **METHODS:** The study was conducted in Ibaraki Prefecture, Japan. Participants (community-dwelling older adults) were non-randomly allocated to two groups: with GS (n = 19, average age: 68.9±3.3 years) and without GS (n = 13, average age: 69.9±4.2 years). Participants in the GS group were encouraged to increase their PA by 1000 steps/day above their baseline step counts. All subjects in both groups participated in a square-stepping exercise program for 90 min once a week for 9 weeks. To determine the LEPF benefits of the program, we performed six types of test before and after the program. We evaluated the participants' daily PA during the program by using pedometers. **RESULTS:** There was a significant group-by-time interaction on daily PA ( $p=0.004$ ): the group with GS significantly increased their PA (early period: 9650±3939, late period: 10892±4416), and the group without GS did not change their PA (early period: 8055±3566, late period: 7069±2062). There were significant time effects in the 5-m habitual walk, the choice stepping reaction time and the 6-min walk. There was a significant group-by-time interaction in the five-repetition sit-to-stand test ( $p=0.006$ ): only the group without GS improved their performance.

**CONCLUSIONS:** Although the group with GS significantly increased their daily PA compared with the group without GS, we could not confirm the effect of GS on LEPP. A longer term program is needed to confirm the effects of GS in increasing daily PA.

450 Board #287 June 1, 9:30 AM - 11:00 AM  
**Effect of Tai Ji Quan on Quality of Life in Older Adults with Knee Osteoarthritis**

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Knee osteoarthritis (OA) is a common joint disorder, with main complaints of chronic pain, functional limitation and physical disability. Because of these symptoms, patients with OA have been reported to reduce their physical activity and consequently worsen their quality of life and sleep quality. Tai Ji Quan is a traditional Chinese exercise, which could reduce pain and physical disability and improve quality of life. However, there was no study that evaluated the long-term effects of Tai Ji Quan on quality of life and sleep quality in patients with knee OA.

**PURPOSE:** The purpose of this study was to determine the effect of 24-week Tai Ji Quan training on quality of life, sleep quality and physical performance among older adults with knee OA.

**METHODS:** We conducted a 24-week randomized controlled trial of forty-six Chinese older adults with knee OA. Participants were randomly assigned to either a Tai Ji Quan group (Tai Ji Quan; n=23) or Control group (Control; n=23). Participants in the Tai Ji Quan group participated in a 3-time weekly Tai Ji Quan sessions, while those in Control group participated in a 60-minutes bi-weekly educational classes. The primary outcomes were changes in physical component summary (PCS) and mental component summary (MCS) of Short Form 36 health (SF-36) survey with secondary outcomes being eight subscales of SF-36 survey, the Pittsburgh Sleep Quality of Index (PSQI), Timed Up & Go (TUG), and Berg Balance Scale (BBS).

**RESULTS:** Compared to those in Control group, participants in Tai Ji Quan group had significantly improved the primary outcome (PCS=1.21 points, P=0.012) and secondary outcomes, including three subscales of SF-36 survey (body pain=11.11 points, P=0.037; general health=9.47 points, P=0.006; social function=1.72 points, P=0.047) and PSQI score (-0.06 points, P=0.043). There was a significant within-group change (improvement) in three subscales of SF-36 (physical functioning=15.72 points, P<0.001; role-emotional=12.70 points, P=0.029; mental health=8.57 points, P=0.043), TUG (-0.73 seconds, P=0.006) and BBS (1.90 points, P=0.001) in Tai Ji Quan group.

**CONCLUSION:** 24-week Tai Ji Quan training has positive effects on quality of life and self-reported sleep quality for older adults with knee OA.  
 Supported by National Natural Science Foundation of China (11372194).

451 Board #288 June 1, 9:30 AM - 11:00 AM  
**Mobile Application For Improving Functional Performance, Health Education, And Cognition In Older Adults**

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**Attracting and retaining older adults to health-promotion programs remains a significant barrier to improving health and well-being. Using technology that incorporates popular older adult games into a multi-component program may address this barrier. PURPOSE:** Test the efficacy of the Bingocize® mobile application (app) to improve functional performance, health knowledge, and aspects of cognition. **METHODS:** Fifteen senior center volunteers in rural Kentucky were randomly assigned to one of two conditions: (a) experimental group that used the app (bingo, exercise, and health education) twice a week for 10 weeks and (b) a control group that participated in only modified bingo using the app. Health education focused on fall risk reduction and osteoarthritis. Both groups used the app on tablets (Samsung Galaxy). Pre and post functional performance, health education, and cognition (executive function) were assessed. Mixed between-within subject analysis of variance were used to compare the groups (p < .05). Weekly attendance was used to measure session adherence. **RESULTS:** The experimental group (n = 7; 72.28 ± 7.41 yrs.) showed significant improvements in health knowledge ( $\lambda = 6.06$ , F (1, 10) = 6.50, p = .029,  $\eta^2_p = .390$ ) and gait speed ( $\lambda = 6.10$ , F (1, 10) = 6.40, p = .030,  $\eta^2_p = .390$ ) compared to controls (n = 5; 74.80 ± 6.22 yrs.). There were no significant differences for remaining measures of functional performance or cognition. Adherence was 89% and 96% for the experimental and control group, respectively. Three participants did not complete the study for reasons unrelated to the intervention. **CONCLUSIONS:** Bingocize® helped to improve knowledge of fall risks and osteoarthritis along

**with some aspects of functional performance. It appears the Bingocize® mobile application can be a fun way to teach older adults important health information while improving functional performance, but a larger sample size may be needed to detect additional improvements.**

452 Board #289 June 1, 9:30 AM - 11:00 AM  
**Diaphragmatic Vs. Pursed-lip Breathing Exercise Using A Windmill Toy On Respiratory Muscle Strength, Lung Function And Dyspnea In The Elderly**

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 (No relationships reported)

**PURPOSE:** To investigate the effects of diaphragmatic and pursed-lip breathing exercise using windmill toy on respiratory muscle strength, lung function, degree of dyspnea and 6-minute walk test in the elderly. **METHODS:** Forty older men and women (aged 60 - 75 yrs.) were randomized into three groups: control (CON; n=13) group, diaphragmatic breathing exercise (DBE; n =13) group, and a pursed-lip breathing exercise (PBE; n = 14) group, which used a portable hand held windmill toy. The DBE and PBE groups performed breathing exercise for 45 minutes, 3 times per week for 12 weeks. At pre- and post-12 wk. respiratory muscle strength; maximum inspiratory pressure (MIP) maximum expiratory pressure (MEP), lung function, dyspnea scores and a 6-minute walk test were assessed. **RESULTS:** After 12 weeks, 6 minute walk distance and FEV1 significantly increased (p<0.05) in the DBE (7.71% and 18.75%, respectively) and PBE (10.78% and 20.87%, respectively) groups compared to control. Dyspnea scores were significantly decreased (p<0.05) in both the DBE (51.51%) and PBE (48.89%) groups compared to control. However, the PBE group had significantly increased (p<0.05) MIP (37%) and MEP (23%) compared to the DBE (3.42% and 4.13%, respectively) and CON (0.87% and 1.46%, respectively) groups. **CONCLUSION:** Our findings demonstrate that while both diaphragmatic and pursed-lips breathing exercise using a windmill toy improve cardiovascular fitness, lung function and reduce dyspnea to the same degree, pursed-lip breathing exercise using a windmill toy exerts more favorable effects than diaphragmatic breathing exercise for increasing respiratory muscle strength in the elderly.

**Keywords :** diaphragmatic breathing exercise, pursed-lips breathing exercise, respiratory muscle strength, lung function, dyspnea  
 Supported by Faculty of Sport Science Fund, Chulalongkorn University

453 Board #290 June 1, 9:30 AM - 11:00 AM  
**Dietary Astaxanthin Supplementation Improves Walking Performance And Blood Lactate Level After Walking Test In Community-dwelling Elderly Subjects**

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**PURPOSE:** Chronic fatigue is prevalent in elderly subjects. Recent studies demonstrated that astaxanthin supplementation improved aerobic performance for exercise in animals. In addition, we also reported that astaxanthin attenuated capillary regression of atrophied muscle in animals. Due to the current lack of clarity, we examined whether three month of dietary astaxanthin supplementation can influence walking performance and blood lactate level after walking in community-dwelling elderly individuals.

**METHODS:** Twenty-nine community-dwelling healthy volunteer subjects (80.9 ± 1.5 y.o.) were enrolled in this study, and were randomly assigned into two groups: one received placebo capsules (placebo group, n = 13), while the other received astaxanthin capsules (astaxanthin group, n = 16). The subjects ingested either astaxanthin (every 12 mg, 2 times/day) or placebo (every 12 mg, 2 times/day of vitamin E) capsules every day for the three-month study period. Subjects performed 6-min walking distance (6MWD), the measurements of derivatives of reactive oxygen metabolites (D-ROM) and blood lactate prior to and post treatment. Written informed consent was obtained from the subjects after being fully informed regarding the details and methods of this study.

**RESULTS:** Astaxanthin supplementation resulted in a decrease of the D-ROM value (P < 0.01) but not placebo. There was a treatment effect on 6MWD in astaxanthin group compared with placebo group (P < 0.05). The distance and step number during 6-min walking test in astaxanthin group were higher than those in placebo group. Furthermore, the rate of increase in blood lactate after walking was lower in astaxanthin group (P < 0.01) than in placebo group.

**CONCLUSIONS:** These data suggest that astaxanthin supplementation may be an effective treatment to counter the declined physical performance and detrimental effects of aging. Supported by Fuji Chemical Industry (Toyama, Japan).

454 Board #291 June 1, 9:30 AM - 11:00 AM  
**Effects Of Fall-prevention Program On Functional Fitness For Community-dwelling Japanese Elderly With Knee Pain**

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**PURPOSE:** To examine effectiveness of three-stages fall-prevention program on balance ability and ADL-related functional fitness for community-dwelling Japanese old-old women with knee pain.

**METHODS:** After giving written informed consent, the subjects, unable to stand on one leg more than 20 seconds with eyes open, were divided into the 3 times/week group (HFG; 15 females, 81.6±2.7 yrs, BMI 22.6±1.6) and the 1times/week group (LFG; 14 females, 81.8±1.2 yrs, BMI 21.4±1.4). The program was composed of three stages for 16 weeks. First, they learned about managing skill for their physical soreness and were asked to standing on one-leg with eyes open for one minutes, 3 times a day both each leg at class and at home. Second, they learned to strengthen their core and lower legs muscle using a swiss ball and elastic band. The last stage was to learn 3 minutes arm-and legs combined chair-exercise program with music. ADL-related functional fitness(sitting & standing time, zigzag walking time), one-leg standing time with eyes open, knee extension strength, fear of falling score, and pain score (modified-WOMAC) were obtained. Balance ability was measured by the area covering and total length of the center of gravity sway( COP). Each measurement items were assessed before and after the intervention period. Student's T-test and two-way repeated measures ANOVA were used to test the effectiveness.

**RESULTS:** The class participation were 82.7±1.5% and 81.0±2.7% respectively. Sitting & standing time (HFG: 17.4±1.7 to 16.3±1.6 sec., LFG: 17.4±1.2 to 11.8±6.5sec. P=0.031), zigzag walking time( HFG: 19.6±1.8 to 17.0±0.9sec., LFG: 17.4±1.2 to 17.4±1.1sec. P=0.465), one-leg standing time with eyes open( HFG: 5.8±0.9 to 12.4±0.4 sec., LFG: 5.4±0.9 to 6.1±0.6sec, P=0.000), knee extension strength( HFG: 192.0±4.9 to 208.5±11.5 N, LFG: 192.0±15.5 to 196.5±4.6 N, P=0.012), and balance ability( area covering of COP; HFG: 15.3±1.6 to 10.6±2.0 cm<sup>2</sup>, LFG: 14.6±1.3 to 16.7±3.0 cm<sup>2</sup>, P=0.043, total length of COP; HFG: 130.6±8.2 to 100.7±7.6 cm., LFG: 134.0±11.8 to 135.7±11.8 cm, P=0.033),knee pain score also improved significantly in HFG. Fear of falling score was not change in both groups.

**CONCLUSIONS:** Three-stage fall-prevention program was effective on balance ability and functional fitness for Japanese old-old females with knee pain.

455 Board #292 June 1, 9:30 AM - 11:00 AM  
**Can Walking Pace Predict The Risks Of Cognitive Decline And Dementia In Elderly Population?**

Minghui Quan<sup>1</sup>, Pengcheng Xun<sup>2</sup>, Qiuhai Zhang<sup>3</sup>, Cheng Chen<sup>2</sup>, Ju Wen<sup>1</sup>, Ru Wang<sup>1</sup>, Peijie Chen<sup>1</sup>, Ka He<sup>2</sup>. <sup>1</sup>*Shanghai University of Sport, Shanghai, China.* <sup>2</sup>*Indiana University, Bloomington, IN.* <sup>3</sup>*Shanghai Theatre Academy, Shanghai, China.*

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The estimated numbers of dementia patients may increase to 115 million by 2050 in worldwide, thus early detection of the development of cognitive decline and dementia would potentially be of substantial benefits to the patients, families and society. Although some evidence from qualitative systematic review has indicated an inverse association between walking pace and cognitive dysfunction, the magnitude of the association has not been systematically investigated and remains unclear.

**PURPOSE:** To quantitatively assess the association of walking pace with the risk of cognitive decline and dementia among elderly population through a meta-analysis of prospective cohort studies. **METHODS:** The relevant prospective cohort studies were identified by searching the PubMed and Embase database through October 2015. The association between walking pace and the risks of cognitive decline and dementia was expressed as weighted RR as comparing the lowest to the highest level of walking pace, and dose-response relation. Random-effects model was used in all analyses.

**RESULTS:** A total of 16 articles were included. Seven/six articles investigated only cognitive decline/dementia as primary outcome, while other 3 articles examined both. 1) Comparing the lowest to the highest level of walking pace, a significant increased risk of cognitive decline was observed among 7 articles (RR=1.89; 95% CI=1.54-2.31), but no linear relation was observed among 3 studies (RR=1.09; 95% CI=0.96-1.23). 2) The pooled RR indicated slow walking pace significantly increased the risk of dementia (RR=1.67; 95% CI=1.41-1.97), comparing to the highest level of walking pace. The linear trend analysis included 3 articles, a significant dose-response relation was observed (RR=1.13; 95% CI=1.08-1.18). **CONCLUSION:** Our meta-analysis of prospective cohort studies indicates slow walking pace significantly increases the risks of cognitive decline and dementia among elderly people. In light of its characteristics

of safety, cost-effectiveness, easy to test and interpret, we suggest walking pace as an effective indicator of the development of cognitive decline and dementia in elderly population.

Supported by SSTC Grant (12XD1404500), SUS Grant (stfx20150101) and HSSYFME Grant (15YJC890029).

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456 Board #293 June 1, 9:30 AM - 11:00 AM  
**Functional Physical Fitness And Cognitive Decline In Elderly Koreans**

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Cognitive declines are associated with modifiable risk factors such as physical activity and fitness in older population. Little is known the relation between cognitive function and physical fitness in Korean elderly.

**Purpose:** To investigate the relationship between functional physical fitness and mild cognitive impairment (MCI) in a sample of older adults. **Methods:** In a cross-sectional design, a total of 415 elderly persons aged 62-91 yrs (108 men and 307 women) underwent body composition assessment and senior fitness test (SF) consisting of strength, flexibility, endurance, and agility/dynamic balance. Korean version of mini-mental state examination (MMSE) and a short-form of geriatric depression scale (GDS) were used to assess cognitive performance and symptoms of depression, respectively. Serum levels of glucose, insulin, and lipids were measured. Homeostasis model assessment of insulin resistance was calculated by using fasting glucose and insulin. A composite score of SFT was calculated as a sum of z scores for each domain of the SFT parameters. Subjects were classified as low fit (lower 25 percentile), moderate fit (middle 50 percentile), and high fit (high 25 percentile) based on the com posited score of the SFT parameters. **Results:** Linear contrast analysis using one-way ANOVA showed significant linear trends for (p<0.001), GDS score (p<0.001) and body fat (p=0.034) across the incremental standardized fitness levels from low to high fit. In particular, a linear increase for MMSE score (p<0.001) was found across the incremental standardized fitness levels. Logistic regression analyses showed that compared to the low-fit group, the moderate- and high-fit groups had significantly lower odds ratios (p<0.001 and p=0.001, respectively) for having MCI even after adjusted for age, sex, education, and the measured risk factors. **Conclusion:** The current findings suggest that physical activity and fitness should be promoted as a preventive means to combat declined cognitive functioning in elderly Koreans. Supported by the National Research Foundation Grant funded by the Korean Government (NRF-2014R1A1A2056473).

457 Board #294 June 1, 9:30 AM - 11:00 AM  
**Resistance Training For Older Adults: More Than Just Strength?**

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(No relationships reported)

Resistance training (RT) has been shown to increase muscular strength and concurrently improve functional ability in older adults (OA). However, there is relatively little research available regarding the impact of RT on confidence and quality of life in older adults. **Purpose:** The aim of this study was to examine the impact of a 10-week RT intervention on strength, ROM, balance, balance confidence, and quality of life in OA. **Methods:** 15 subjects (mean 82.4 yrs) were recruited for this study, 12 of which were female. The following outcome measures were assessed prior to, and immediately following the intervention: balance, using the Berg Balance Scale (BBS), balance confidence, using the Activities Specific Balance Confidence Scale (ABC), quality of life using the SF-36 questionnaire, grip strength using a hand dynamometer, and sagittal plane ROM for both hips, ankles, and shoulders using a digital inclinometer. Participants trained twice a week for 10 weeks, for a total of 20 sessions. Each session consisted of the following 10 exercises: squat, bent over row, forward lunge, diagonal shoulder raise, step-ups, hammer curls, knee extensions, calf raises, toe raises, and a standing balance progression, each of which was done for a total of 15 repetitions on each limb. Pre- and post-intervention data were compared using paired t-tests, with an alpha set at P < 0.05. **Results:** Following the 10-week intervention a significant increase was found for left hand grip strength, ROM at both hips, and scores for the BBS, ABC and SF-36 tests. **Conclusion:** The findings from this study indicate that participation in a 10-week RT intervention may lead to enhanced balance, balance confidence and quality of life for OA, in addition to strength and range of motion. Therefore OA should be encouraged to participate in RT as it may enhance characteristics thought to reduce falls and facilitate greater longevity.

### A-50 Free Communication/Poster - Physical Activity Promotion Programming/ Intervention Strategies in Adults

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
Room: Exhibit Hall A/B

#### 458 Board #295 June 1, 11:00 AM - 12:30 PM Energy Expenditure and Exercise Intensity During Solo and Competitive Multiplayer Exergaming

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The inactivity rates of children are on the rise. Meanwhile, the Center for Disease Control recommends 60 minutes of moderate-vigorous activity each day for children. The majority of time spent exergaming falls within the moderate-vigorous intensity range.

**Purpose:** To compare energy expenditure (EE), exercise intensity [metabolic equivalent of task (MET)], rating of perceived exertion (RPE), and number of steps taken while playing competitive exergames vs. single player exergames. **Methods:** Participants who volunteered in this study ( $N=61$ ) were healthy men ( $N=34$ ) and women ( $N=27$ ) of various ages (16-40yr). Participants chosen for competitive play were randomly arranged to play in groups of two on a videogame designed for players to simulate dance moves for 30 minutes. Participants played the same game for the same amount of time whether in single or multiplayer mode. During the 30 minutes of gameplay, EE, MET, and number of steps taken were measured using accelerometers. After gameplay each subject reported RPE. **Results:** No difference in EE was measured between the two groups. Solo players expended 858.2 J ( ) while competitive players expended 896.9 J ( ). During competitive play, players played with a higher average intensity (6.0.13 MET) than solo players (5.3.14 MET) ( $p=.001$ ) while the time spent in the 6-9 MET (high intensity) range was also greater in competitive players ( $12.9\pm.0007$  vs.  $17.9\pm.0002$  min.,  $p=.002$ ). During competitive play, participants took more steps than during solo play ( $2070.58\pm 58$  vs.  $2230.1\pm 48$  steps,  $p=.04$ ). A trend for lower RPE was noted in competitive players 11.25 (compared to solo players 12.23) ( $P=0.068$ ). **Conclusion:** There was not a significant difference in EE between groups. There was a trend for lower RPE during competitive play even though competitive players played more intensely and took more steps than solo players. It seems that the thrill of competition caused competitive players to play a little harder but to feel as if they exerted themselves less.

#### 459 Board #296 June 1, 11:00 AM - 12:30 PM Training Trainers: Students with Cognitive Behavioral Skills Increase Clients' Physical Activity and Self-Efficacy

Jakob J. Rosengarten, Kathleen Wilson. *Cal State Fullerton, Fullerton, CA.*  
(No relationships reported)

Cognitive behavioral strategies (CBS) have shown to be an effective way to increase physical activity (PA); however, many kinesiology students are not trained to deliver such strategies (Brawley, 2013)**PURPOSE:** The purpose of this project was to explore if training students to use cognitive behavioral skills training (CBST) when working with clients was an effective way for increasing PA level of clients. This study also aimed at investigating changes in clients' self-efficacy (SE) to be physically active as well as students' self-efficacy to deliver these cognitive behavioral strategies.

**METHODS:** 28 students (age:  $23.5\pm 2.4$ ) received CBST as part of an upper division kinesiology class. All students were matched with a client ( $N=27$ ,  $25.0\pm 11.1$ ) who was seeking to increase their PA. Students met with their clients for a minimum of 5 visits over the course of 6 weeks. At the first and last meeting with students and clients, clients' levels of SE were measured using a multidimensional SE scale consisting of three subscales (task, coping, and planning SE; Roger et al., 2008). Clients' physical activity was assessed using Godin Leisure Time Exercise Questionnaire (Godin & Shephard, 1985). Students' SE was measured using a 10-item measure developed for this study. Paired t-tests were performed to compare differences between pre and post scores.

**RESULTS:** There was a significant increase in PA levels of clients ( $p=.01$ ). Clients' scheduling SE also significantly increased from pre intervention levels ( $p=.012$ ) whereas client's coping SE showed a positive trend that did not reach significance ( $p=.077$ ). Students SE to deliver cognitive behavioral strategies also increased significantly during the course of the class ( $p=.003$ ).

**CONCLUSIONS:** These findings provide preliminary evidence that CBST may be an effective way to increase clients' PA and scheduling SE along with students' SE to deliver CBS.

#### 460 Board #297 June 1, 11:00 AM - 12:30 PM Exercise Medicine In Residency Training: Are Future Physicians Adequately Prepared To Prescribe Exercise As Medicine?

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(No relationships reported)

Physical activity (PA) is a key intervention for chronic disease, yet few physicians prescribe exercise. Determining factors associated with physicians who have the greatest conviction to prescribe exercise in their practice may help inform future training. **PURPOSE:** To determine residents': (1) perceived importance of exercise prescription, (2) personal PA levels, (3) attitudes/beliefs about PA (4) exercise counselling and prescription practices, (5) knowledge of the PA Guidelines, (6) competence in exercise prescription and (7) perspectives of training in exercise medicine.

**METHODS:** 396 University of British Columbia family medicine residents were eligible to complete the 49-item cross-sectional survey. All variables were evaluated on a 7-point Likert scale, and assessed in relation to the importance of exercise prescription, with significance set conservatively to  $p=0.01$ .

**RESULTS:** The response rate was 80.6% (319/396). Exercise prescription was important to residents (95.6%), with 37.5% strongly agreeing (termed "prescribers"). Both groups reported strong beliefs of the importance of PA in health (97.3% vs. 90.0%,  $p<0.001$ ), physician responsibility advising patients in PA (96.3% vs. 90.7%,  $p<0.001$ ), with prescribers higher across each (of 5) variable assessed. The level of exercise counseling (57.8% vs. 38.3%,  $p=0.001$ ), prescription (36.7% vs. 18.0%,  $p=0.001$ ) and self-reported competence prescribing exercise (48.5% vs. 56.6%,  $p<0.001$ ) was greater for prescribers. Both groups had low knowledge of the PA guidelines (42.5%,  $p=1.0$ ). Neither group is sufficiently PA, with few meeting the guidelines (51.9% aerobic, 24.5% strength). Both groups valued their exercise (94.2% vs. 87.5%,  $p<0.001$ ), perceived lower control over it (68.5% vs. 67.3%,  $p=0.72$ ) and desired program support in being active (96.3% vs. 90.7%,  $p<0.001$ ). Few Residents' perceived their training in exercise medicine as adequate (24.6% vs. 15.3%  $p=0.25$ ) and both groups desired additional training in exercise prescription (94.2% vs. 89.1%  $p=0.004$ ).

**CONCLUSIONS:** Current training is not preparing physicians to prescribe exercise, nor to be suitable PA role models for their patients. Program reform should include curriculum in exercise medicine, support residents' personal exercise and foster a culture of physical activity.

#### 461 Board #298 June 1, 11:00 AM - 12:30 PM Community-wide Promotion Of Physical Activity Based On Japanese Physical Activity Guideline In Adults: The Fujisawa +10 Project

Yoshinobu Saito<sup>1</sup>, Ayumi Tanaka<sup>1</sup>, Masamitsu Kamada<sup>2</sup>, Shigeru Inoue<sup>3</sup>, Junko Inaji<sup>1</sup>, Yoshitaka Kobori<sup>1</sup>, Takayuki Tajima<sup>4</sup>, Yuko Oguma<sup>4</sup>. <sup>1</sup>Fujisawa City Health and Medical Foundation, Fujisawa, Kanagawa, Japan. <sup>2</sup>Brigham and Women's Hospital, Harvard Medical School, Boston, MA. <sup>3</sup>Tokyo Medical University, Shinjuku-ku, Tokyo, Japan. <sup>4</sup>Keio University, Fujisawa, Kanagawa, Japan.  
(No relationships reported)

There is not enough evidence about the effects of the community-wide promotion of physical activity (PA). The Ministry of Health, Labour, and Welfare in Japan announced PA guidelines for the health promotion in 2013 called the Active Guide. **PURPOSE:** The aim of this study was to evaluate the effectiveness of community-wide campaigns (CWCs) utilizing the Active Guide for promoting PA in Japanese adults. **METHODS:** This study was a non-randomized controlled trial, allocating four communities into the intervention group and nine into the control group from Fujisawa city, Kanagawa, Japan. The intervention used a CWC from 2013 until 2015 to promote PA, and was comprised of information, education, and the delivery of community support. The primary outcome was a change in engagement in PA. The secondary outcomes were awareness of CWC and Active Guide, and knowledge of Active Guide. Two independent, population-based, random-sample, self-administered questionnaires obtained from 3,000 adults (20 years old or older) living in communities in Fujisawa were used to evaluate the difference between the status at the baseline and at the 2-year follow-up. **RESULTS:** In total, 1,230 individuals at the baseline and 1,393 individuals at the 2-year follow-up responded to the questionnaire (41.0% and 46.3% response rates, respectively). The median PA time at the 2-year follow-up of the intervention and control groups was 90 minutes/day, whereas that of baseline was 90 and 83 minutes/day, respectively (n.s.). More adults in the interventional communities were aware of the CWC (33.8%) than those in the control communities (25.2%) at the 2-year follow-up. A significant difference was also observed in the knowledge of the Active Guide (intervention: 7.7% vs. control: 4.2%) at the 2-year follow-up; however, no difference was observed at the baseline (3.2% vs. 2.7%). **CONCLUSION:** Although significant

differences were observed in the awareness and knowledge between the intervention and control groups as short-term impacts of the CWC. PA did not change in the two years. The long-term effects of CWCs should be investigated in the future. This study was partially supported by Comprehensive Research on Aging and Health Science Research Grants for Dementia R&D from the Japan Agency for Medical Research and Development (AMED).

462 Board #299 June 1, 11:00 AM - 12:30 PM  
**The Effects of Music and Sensory Deprivation on Exercise Cycling Performance**

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Music is often used as an ergogenic aid to enhance physical performance during exercise. While the effects of music on exercise performance have been extensively studied, the effects of the deprivation from visual and auditory stimulation are not as well characterized. **PURPOSE:** To assess the influence of various sensory environments, including neutral, music and sensory deprived conditions, on the perceived exertion and exercise output at a moderate intensity. **METHODS:** Thirteen healthy young adults (22.5±1.8 years) were recruited to participate in four separate exercise sessions on a Monarch cycle ergometer. During the first session the participants completed a sub-maximal YMCA test to predict their maximal workload. The participants then came in for three more sessions given in varied order containing a neutral environment, a music environment and a sensory deprived environment. During each session the participant warmed up for 5 minutes, exercised on the cycled ergometer for 15 minutes at 60% of their maximal workload and then cooled down for 5 minutes. The music environment contained self-selected music via headphones and during the sensory deprived environment participants wore a blindfold and noise cancelling earmuffs. Significant differences were determined by using repeated measures ANOVA. **RESULTS:** A significant ( $p \leq 0.05$ ) difference was found between the total distance biked during the neutral environment and the sensory deprived environment ( $4.15 \pm 0.60$  km vs  $4.02 \pm 0.72$  km). There was also a significant ( $p \leq 0.05$ ) difference between the neutral environment and the music environment ( $4.15 \pm 0.60$  vs  $4.45 \pm 0.58$  km). A significance difference was also found between music and the sensory deprived environment ( $4.45 \pm 0.58$  vs  $4.01 \pm 0.72$  km). **CONCLUSION:** Music lead to an increase in exercise output during moderate intensity cycling, while sensory deprivation may have a negative effect on exercise output during moderate intensity exercises.

463 Board #300 June 1, 11:00 AM - 12:30 PM  
**10-Week Lifestyle Modification Program as Strategy for Adding Leisure Physical Activity to Low Socioeconomic Community**

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Regular physical activity benefits the health of the general population, more in those with sedentary behaviors. In an ongoing epidemiological study ("Move for Health") conducted by this Institution, it was previously shown that 18.3% presented lower values than 150 min/wk of physical activity. Lower quartile of leisure domain on weekdays along with more sedentary behavior on weekends were determined by socioeconomic characteristics such as lower income and schooling (MSSE. 47(5S):242, 2015).

**PURPOSE:** To verify the impact of adding leisure-time activities to the resulted sedentary behaviors.

**METHODS:** The longitudinal study comprised 1572 subjects older than 35 yrs (53.8 ± 11.1 yrs, 76% women) enrolled in our "Move for Health" Program during the period of 2004 to 2015. After a baseline assessment the participants were submitted to a 10-week program of supervised physical exercises training and dietary counseling. The physical exercise protocol was composed by daily sessions of 100 min, 3-5x/wk, including 20min warm up/ stretching, 30 min walking (60-80%  $VO_{2max}$ ), 40min strength in academy (3x 8-12 rep, 60-70% 1RM) and 10min stretching and cool down. By using the International Physical Activity Questionnaire (IPAQ-way long-version 8), it was evaluated the time spent on sedentary activities during the week and on weekends (h/day), in the fields sedentary transport (h/week) and physical leisure activities (h/week) at baseline (M0) and after 10 weeks (M1) of physical intervention. The Student's t test was used to compare the two moments with a significance level of 5%.

**RESULTS:** The studied sample referred low income (71% earning less than 5 minimum salary wage), low schooling (52.6% uncompleted elementary school) but in a good – excellent status of health, according their self – perception. Leisure time - physical activity increased 2.12x (7.3x15.5h/wk;  $p < 0.001$ ) post program.

Behaviors of sedentary transport (4.55x4.22h/wk) and sitting time either weekdays (5.6x5.5h/d) or weekends (5.6x5.7h/d) did not change significantly ( $p > 0.05$ ).

**CONCLUSION:** Inexpensive and institutional-conducted lifestyle modification programs would provide extra energy expenditure as leisure time physical activity to these low socioeconomic communities. Supported partially by CNPq, CAPES.

464 Board #301 June 1, 11:00 AM - 12:30 PM  
**Delayed Discounting and Meeting Physical Activity Guidelines**

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**PURPOSE:** Delayed discounting, defined as preference for immediate utility over future benefits, has been linked previously to unhealthy behaviors, such as smoking and excessive alcohol intake. However, insufficient evidence has examined the relationship between delayed discounting and physical activity.

**METHODS:** We examined the cross-sectional relationship between adults' time preferences and meeting physical activity guidelines among a national sample ( $n = 7,071$ ) of US adults. Physical activity was self-reported; MET minutes per week were computed based on the frequency, intensity and duration of activity and then dichotomized into meeting guidelines (yes/no). Time preferences were determined via responses to preferences for a hypothetical dollar amount today or a larger sum in the future; i.e., 30 days or 60 days from the present time. Multivariate logistic regression was applied in the analyses.

**RESULTS:** Multivariate analysis reveals that the more willing participants were to be patient (i.e. willing to receive a higher dollar amount in the future) the higher the likelihood was to meet physical activity guidelines ( $P$  for Linear Trend  $< 0.05$ ). Specifically, participants who exhibited high degrees of economic patience for the 30 and 60 day time horizons were 25% and 24% (respectively) more likely to meet guidelines (30d: OR=1.25, 95% CI=1.02-1.53; 60d: OR=1.24, 95%CI=1.06-1.44).

**CONCLUSIONS:** Results indicate a dose response relationship between more patient economic time preferences and meeting physical activity guidelines among a large sample of US adults. Future research and practice should aim to assess temporal discounting among the population and tailor intervention programs accordingly utilizing insights from behavioral economics.

465 Board #302 June 1, 11:00 AM - 12:30 PM  
**The Impact of Cell Phone Texting on the Amount of Time Spent Exercising at Different Intensities**

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Cell phones have become a near-ubiquitous tool for communicating. While the increased ability to communicate with others that cell phones provide likely has benefits, the concern here is that frequent cell phone use may become a distraction that in some circumstances negatively affects performance on other tasks. **PURPOSE:**

To assess the effect of cell phone texting on the amount of time spent exercising at different intensities during a bout of 30-minutes of treadmill exercise. **METHODS:** Thirty-two college students ( $n = 18$  females, 14 males) participated in two conditions (*cell phone, control*). During the *cell phone* condition participants used their cell phone only for texting purposes. During the *control* condition participants did not have access to their cell phone nor any interaction with other individuals or electronics. Heart rate was measured continuously and was used to determine time spent exercising at different intensities. **RESULTS:** Vigorous intensity minutes was significantly greater ( $p = 0.001$ ) in the *control* condition ( $12.94 \pm 8.76$  minutes) than the *cell phone* condition ( $7.09 \pm 8.38$  minutes). Low intensity minutes was significantly greater ( $p = 0.001$ ) in the *cell phone* condition ( $9.47 \pm 9.73$ ) than the *control* condition ( $3.44 \pm 6.52$ ). Moderate intensity minutes in the *cell phone* ( $13.44 \pm 8.43$ ) and *control* ( $13.69 \pm 8.13$ ) conditions were not significantly ( $p = 0.89$ ) different. **CONCLUSION:** Using a cell phone for texting can interfere with treadmill exercise by promoting greater participation in low intensity exercise and less participation in vigorous intensity exercise due to a possible dual-tasking effect, which could negatively impact the health and fitness amongst healthy individuals.

466 Board #303 June 1, 11:00 AM - 12:30 PM

**Application of Theory of Planned Behavior to Transit Use in the Houston Train Study**

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Transit-related physical activity (PA) can contribute to total daily PA. Public transit use is related to increases in PA. Identifying the determinants of public transit use could be important in understanding ways to promote PA. The Theory of Planned Behavior (TPB) has been used to predict many health behaviors, but not transit use. The Transit-Related Activity in Neighborhoods (TRAIN) Study, a prospective natural experiment of transit use following expansion of the light-rail infrastructure in Houston, TX, may be used to address this question.

**Purpose:** To examine the utility of the TPB model for predicting transit use in a low-income, minority population.

**Methods:** This study used baseline TRAIN Study data (2013-2015) which included reported transit use items and key TPB constructs. Structural equation modeling tested the fit of the TPB model for explaining the number of trips taken on buses or light rail in a typical week. The latent variables were: attitudes, subjective norms, perceived behavioral control, and intentions related to transit use.

**Results:** Participants included 695 (63% women) with a mean age of 52 (SD = 14) years and the majority (63%) were Black or Hispanic. The average number of reported transit trips per week was 8.7 (min = 0; max = 102) with 28% reporting zero trips. Standardized item-factor loadings for TPB constructs were all statistically significant ( $p < 0.001$ ), ranging from 0.69 to 0.87. The model demonstrated adequate fit with the data:  $\chi^2(100, N=593) = 375.3, p < 0.001, CFI = 0.93, RMSEA = 0.067$ . Attitudes ( $\beta = 0.97, SE = 0.08$ ) and subjective norms ( $\beta = 0.36, SE = 0.08$ ) were significantly related to intentions ( $p < 0.001$ ). Intentions ( $\beta = 3.32, SE = 0.59$ ), age ( $\beta = -0.1, SE = 0.041$ ), education ( $\beta = -1.1, SE = 0.34$ ) and reported concern about becoming the victim of crimes in the neighborhood ( $\beta = 1.25, SE = 0.49$ ) were significantly associated with reported transit use ( $p < .05$ ). The variance in intentions and the outcome accounted by the model were 68.5% and 13.5%, respectively.

**Conclusion:** Results suggest that TPB is a promising theoretical model to explain transit use. Although more data are needed to confirm these results, this model may be useful to guide future interventions to promote transit-related PA among adults in low-resource communities.

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467 Board #304 June 1, 11:00 AM - 12:30 PM

**Influence Of Kinesiology Tape - EMG-activation Of The Scapular Stabilisers And Ball Speed Of A Tennis Serve**

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The effects of Kinesiology Tape on the neuromuscular system have been discussed in recent literature. The effects on power, range of motion, proprioception, and muscle strength can be vital to reach optimal functional performance. There is no research available that studies the effect of Kinesiology Tape on the scapular stabilizers in tennis players.

**PURPOSE:** To determine if Kinesiology Tape can have i) an effect on the muscle activation of serratus anterior and lower trapezius muscles and ii) the ball speed of the tennis serve in tennis players between the age of 18-25 years.

**METHODS:** The study is a quantitative analytical case study on 30 collegiate tennis players (19 male, 11 female, mean age 20 years). The muscle activation of the serratus anterior and lower trapezius muscle were measured by means of Electromyography (EMG). Ball speed was measured with a Radar Speed gun. The intervention was the application of Kinesiology Tape on the scapular stabilizers. **RESULTS:** EMG-activation for lower trapezius muscle's mean highest measurement ( $p = 0.7143$ ) and maximum measurements ( $p = 0.5376, SD 295 + 451$ ) (both  $p > 0.05$ ) improved, but were not statistically significant. EMG-activation for serratus anterior muscles highest measurement were  $0.2181 (p > 0.05, SD 131 + 131)$ , but the mean measurement was  $0.0045 (p > 0.05)$  after the application of Kinesiology Tape.

**CONCLUSIONS:** It appears that there is statistically improvement in the mean EMG-activity of the serratus anterior muscle after the application of Kinesiology Tape on the scapular stabilizers. However the Kinesiology Tape had no influence on the activation

of the lower trapezius muscle nor the ball speed during service. While this did not prove to be of statistical significance, it may be of clinical relevance. Overall these results are difficult to interpret because of the complex biomechanical interaction of the kinetic chain.

468 Board #305 June 1, 11:00 AM - 12:30 PM

**Using a Community Wellness Program Pairing People with Shelter Dogs to Increase Physical Activity**

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FosterFit™ is a community wellness program centered on the pairing of people with shelter dogs (Savannah, GA). Participants are matched with a shelter dog for 10 weeks and encouraged to 1) walk with their dog for at least 30 min/d and 2) consume a plant-based diet. Participants meet regularly for group sessions and events.

**PURPOSE:** We examined whether this community program led to change in objectively measured physical activity (PA). We also examined program acceptability and change in psychosocial outcomes.

**METHODS:** Steps/d and moderate-to-vigorous PA min/d were assessed via the FitBit Flex™ pre- and post-program. Participants rated their satisfaction ('Overall, how would you rate the FosterFit wellness program?') and success with the exercise and diet components ('Over the past 10 weeks, how much success have you had in following the exercise plan [healthy eating plan] set out by FosterFit?'). Surveys (stress, depressive symptoms, exercise self-efficacy) were also collected pre- and post-program.

**RESULTS:** Nine participants (6 female, mean age 37 yrs, all non-Hispanic white or mixed race) joined the program and completed a baseline assessment. Program completion rate was 78% (7/9). Despite a small sample size, the program led to medium effect sizes for change in steps ( $d = 0.41$ ) and exercise self-efficacy ( $d = 0.48$ ). Average daily steps increased by 1,494, with increases in four of six participants with complete PA data. There were also small effect sizes for change in depressive symptoms ( $d = -0.20$ ) and perceived stress ( $d = -0.19$ ) and five of seven participants saw improvements in at least one psychosocial outcome. Of participants completing a program evaluation ( $n = 8$ ), 75% rated the program as 'good' or 'excellent', 86% reported 'some success' or 'a lot of success' following the exercise plan, and 75% reported 'some success' or 'a lot of success' following the healthy eating plan. and. Additionally, 6 participants permanently adopted their foster dog.

**CONCLUSION:** These data demonstrate the feasibility of pairing people with shelter dogs for 10 weeks, and provide preliminary evidence that fostering a dog increases PA and mental wellbeing. Community-based interventions centered on dog fostering could be a novel approach to wellness promotion with added humanitarian benefits.

469 Board #306 June 1, 11:00 AM - 12:30 PM

**The Effect of a Fitbit Accelerometer on Physical Activity**

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With wearable technology topping the 2016 ACSM Fitness Trends survey, research in this area may help quantify the importance of such devices. **PURPOSE:** The purpose of this research was to determine if the FITBIT accelerometer altered physical activity levels in those wearing the accelerometer versus those not wearing the device.

**METHODS:** There were 19 participants in this study, recruited from the University of Central Oklahoma employee wellness program. Each participant completed the Human Activity Profile (HAP) survey to measure physical activity levels pre- and post- experimentation. Ten participants received a FITBIT accelerometer to wear for six weeks, while the other nine participants made up a control group and did not use an accelerometer. **RESULTS:** There was no significant difference between the FITBIT and the control groups HAP maximum activity scores (MAS) ( $p = 0.16$ ), and HAP adjusted activity scores (AAS) ( $p = 0.0.179$ ). There was not a significant difference for the main effect for time ( $p = 0.367$ ), main effect for group ( $p = 0.98$ ), or interaction of time by group ( $p = 0.389$ ). Steps did not significantly change across time for the FITBIT group ( $p = 0.41$ ). The FITBIT group did have a smaller effect size than the control group for MAS ( $d = 0.325, d = 0.587$ ) and for AAS ( $d = 0.054, d = 0.565$ ). **CONCLUSIONS:** The FITBIT group did not have significantly different physical activity levels than the control group. Despite the nonsignificant results, the smaller effect size for the FITBIT group may suggest that the FITBIT made a smaller difference compared to the control group--meaning the physical activity levels decreased less than that of the control group's activity levels.

470 Board #307 June 1, 11:00 AM - 12:30 PM  
**Tackling Barriers to Exercise Through Tele-Exercise for People with SCI: A Mixed Methods Case Series**

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**PURPOSE:**

1) To test the feasibility of implementing a monitored web-based exercise intervention delivered in the home for people with spinal cord injury (SCI) and 2) describe their perceptions of completing the program.

**METHODS:**

4 adults with SCI (age: 43.5 ± 5.3 yrs; post injury: 25.8 ± 4.3 yrs; 1 female) completed a mixed-methods sequential design with two phases: an 8 week intervention, followed by a 3 week non-intervention period. The intervention was progressed to three 45-min sessions/week of remotely-supervised exercise on an upper body ergometer at moderate intensity (60-80% of HR reserve). Instrumentation included a tablet, physiological monitor, and custom Android app that delivered live video-feed as well as heart and respiration rate data to a remote-trainer. Data compared pre and post intervention included aerobic capacity (VO<sub>2</sub>peak), adherence (% of sessions attended), and three questionnaires: the Physical Activity Scale for Individuals with Physical Disabilities (PASIPD), Satisfaction with Life Scale (SWLS), and Quality of Life Index (QLI). To qualitatively explore participant's perceptions of the features and impact of the intervention, they were interviewed at the end of the follow-up phase.

**RESULTS:**

Participants completed the intervention with 100% adherence. A 24% increase in VO<sub>2</sub>peak and elevated scores on the PASIPD (71%) and SWLS (18%) were observed from pre to post. Post follow-up, participants reported increased strength, endurance, and efficiency, which enabled them to live a healthier, more active lifestyle. Tele-exercise was reported beneficial for the motivation provided by a fitness expert and its ability to circumvent barriers commonly experienced at a fitness facility, including lack of access, usability, transportation, cost, and time.

**CONCLUSIONS:**

Results indicate that people with SCI can adhere to a tele-exercise program and acknowledge it as an accessible and convenient means of exercise. Health professionals should consider prescribing tele-exercise for community-dwelling people with SCI who have limited or no access to onsite programs or outdoor activities. Further study of the effects of tele-exercise is warranted in a larger sample. Funding: National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR grant # 90RE5009-01-00).

471 Board #308 June 1, 11:00 AM - 12:30 PM  
**Impact of MarsMars Online Platform for Physical Exercise on Physical Fitness, Activity and Body Weight**

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Physical inactivity combined with decreased physical fitness and weight gain are big challenges for countries with compulsory military service. Aiming to improve the capability of recruits to perform their service, the Finnish Defence Forces (FDF) promotes physical training among call-up aged young people by offering them a free social online platform for physical exercise (MarsMars, MM) prior to their military service. **PURPOSE:** To examine the impact of using MM on physical fitness, physical activity and body weight in call-up aged recruits.

**METHODS:** 132 male recruits (age 22.4±9.7 yrs., height 1.78±0.08 m, and body mass 78.4±20.5 kg) voluntarily participated in the web survey. Age, body mass index (BMI), physical fitness and activity were self-reported. Maximal oxygen uptake was estimated using Jackson's non-exercise method.

**RESULTS:** Mean (±SD) maximal oxygen uptake of the respondents was 47.5±6.9 ml/kg/min. More than half of them (61.4%) were in the normal weight range, 23.5% were overweight (BMI over 25) and 15.2% were obese (BMI over 30). About half of the respondents (48.2%) self-estimated that their physical fitness improved due to the use of MM while every fourth respondent (24.8%) reported no effects. Most of the respondents (59.9%) estimated increases in their physical activity while every fourth respondent reported no effects. Every fourth (26.7%) estimated that their body weight decreased. Every third (36.9%) reported that their ability to complete military service improved due to the use of MM. Self-estimated, improved ability to complete military service was associated with improved physical fitness (R=0.47, p<0.001).

**CONCLUSIONS:** The present study demonstrated that physical fitness and activity increased among half of the recruits due to the use of the social online platform. In

addition, every fourth respondent reported decreases in body mass. Thus, MM seems to be more useful for users who are overweight and have lower physical fitness. In conclusion, a social online platform can be a useful tool for promoting physical training among recruits prior to military service.

472 Board #309 June 1, 11:00 AM - 12:30 PM  
**Step Averages by Job Classification for Inactive University Employees**

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University employees have varying structures regarding their work schedule and daily responsibilities. Thus, job classification may have an impact on daily step counts before, during, and after the workday. **PURPOSE:** To compare baseline step data of university employees based on job classification to aide in worksite wellness intervention tailoring. **METHODS:** Employees were recruited via email to participate in an 8-week worksite walking intervention. Only participants not currently meeting minimum physical activity recommendations (<150 minutes of moderate to vigorous physical activity (MVPA) per week) could enroll. Baseline data were collected prior to the start of the intervention. Participants wore a blinded accelerometer (New Lifestyles -1000) with a 7-day memory recall during waking hours for one week. Faculty (n=17), staff (n=31), and civil service (n=18) data were analyzed and compared. **RESULTS:** A one-way between subjects ANOVA was conducted to compare the effect of job category on baseline daily step averages in university faculty, staff, and civil service workers. There was a significant effect of job category on baseline step averages for the three conditions [F(2, 63) = 4.54, p = .014]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for staff was significantly different than faculty (p = .046) and civil service workers (p = .037). However, faculty did not significantly differ from civil service workers in baseline step averages (p = .999). **CONCLUSION:** Staff had greater daily step count averages compared to faculty and civil service workers. Therefore, traditional job descriptions regarding overall activity may not be accurate and should be considered when tailoring worksite interventions. Future studies should incorporate minutes of MVPA to better assess physical activity levels.

473 Board #310 June 1, 11:00 AM - 12:30 PM  
**"To Feel Better": Motives for Inactive Employees to be Physically Active**

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Physical inactivity has been identified as a leading cause of morbidity and mortality. Worksites provide an ideal environment for physical activity (PA) interventions so understanding motives for physical activity participation of inactive employees could better inform worksite activity interventions. **PURPOSE:** To examine self-identified motivators for inactive faculty and staff to be more physically active. **METHODS:** Employees at a Midwestern mid-sized public university were recruited via employee email to participate in an 8-week pedometer-based physical activity intervention that included weekly behavioral education meetings the first four weeks of the program. Only employees currently not meeting minimum physical activity recommendations (<150 minutes of moderate to vigorous physical activity/week) could enroll. At the start of the intervention, program participants (n=58) were asked to write down their top motivators for being physically active. They were then asked to rank their top three motives. The top three motives for each participant (n=174) were analyzed qualitatively by a content analysis. Motives were coded and organized into categories and sub-categories. **RESULTS:** The findings indicate that the top categories of motivators for being physically active were 1) weight related (n=40), 2) improve mental health (n=24), 3) impact future health (n=19), 4) improve health now (n=18), and, 5) family (n=17). Top motives identified were a mix of both short-term and long-term motives. There were only a scant number (n=3) of intrinsic motivators identified. **CONCLUSION:** Participants were encouraged to be specific in identifying their top motives (i.e. "decrease/eliminate prescription medicines" vs. "health benefits"). An interesting category emerged with many participants using the exact statement, "to feel better" considering the relative subjectivity of the statement. Furthermore, participants rarely identified enjoyment of physical activity itself as a motivator. Future interventions should focus on helping participants identify types of activities they enjoy to try to promote intrinsic motivation for physical activity adoption and adherence.

474 Board #311 June 1, 11:00 AM - 12:30 PM  
**Examination of Weekly Step Count Patterns During a 12 Week Pedometer Program**

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*(No relationships reported)*

A 12 week, pedometer-based physical activity program was implemented at Slippery Rock University of Pennsylvania as a means to provide an interactive way to increase step counts amongst students and non-students. **PURPOSE:** The primary purpose of this study was to determine if there was a significant difference in step counts taken during weekdays versus weekend days for both students and non-students during a 12 week, pedometer-based physical activity program. A secondary purpose of this study was to examine the step counts between students and non-students. **METHODS:** Participants (n=258) were encouraged to wear a pedometer every day for 12 weeks during the spring semester of 2015. Each Monday, participants reported daily step counts from the previous week. Participants were encouraged and incentivized to increase step counts throughout the 12 week program. **RESULTS:** Of the 258 participants who registered, 160 completed the program (62% adherence). There was a significant difference between step counts taken on weekdays (10,604±6,184) versus weekend days (8,958±6,069) ( $p<0.01$ ) for both students and non-students. Upon further analysis, it was found that both students and non-students had the highest step counts on Mondays (10,989±5,205) and the lowest step counts on Saturdays (9,353±6,322) and Sundays (8,564±5,780). Monday step counts were significantly higher than both Saturday and Sunday step counts ( $p<0.01$ ). Although students and non-students mimic the same step count patterns throughout the week, students actually had a significantly higher number of daily step counts than non-students (10,288±6,321 versus 9,666±5,777 respectively) ( $p<0.01$ ). **CONCLUSION:** Step counts were higher on weekdays as opposed to weekend days for both students and non-students. Although displaying similar patterns throughout the week, students had significantly higher daily step counts than non-students. In the future, program coordinators should consider incentivizing participants to increase step counts during the weekend, where step counts were reportedly the lowest.

475 Board #312 June 1, 11:00 AM - 12:30 PM  
**Using Real-Time Feedback to Target Reductions in Sedentary Behavior**

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Awareness of sedentary behavior is low both in terms of amount accumulated and potential health consequences. Thus, interventions that increase awareness of this behavior may be effective for reducing sedentary time and improving health. **PURPOSE:** Our purpose was to test the efficacy of providing VibroTactile feedback (VTF) as an intervention to reduce sedentary time. A secondary purpose was to examine changes in mood with the intervention. **METHODS:** Thirty, college-aged men and women (20.1 ± 1.5) were randomly assigned to a VTF or minimal education control (MEC) condition. Participants in VTF received real-time feedback regarding sedentary behavior every other week during the 6-week intervention in the form of a small vibration from the activPAL3VT (AP). Vibration was set to remind the participant to move after being sedentary for 30 min. Sedentary and active behaviors were assessed pre- and post-intervention and at a 4-week follow-up with the AP and ActiGraph GT3X+ monitors. Mood was assessed at baseline and follow-up with the Profile of Mood States. Repeated measures ANOVAs were used to examine differences in sedentary behavior and mood over the intervention. Effect sizes (Cohen's d) were also calculated to examine changes in mood between groups. **RESULTS:** Participants in VTF significantly decreased minutes of sedentary time accumulated in longer bouts (>30 mins) by -68.4 ± 102.1 min/day, ( $p=0.021$ ). This decrease was maintained at follow-up (-80.9 ± 95.9 min/day,  $p=0.006$ ). There were no significant changes in sedentary time for MEC. For mood, there were no significant differences over time or between groups. However, VTF showed a small improvement in mood ( $d=0.17$ ) and MEC showed a small decline in mood ( $d=-0.28$ ), a moderate between-groups difference over the intervention ( $d=0.54$ ). **CONCLUSIONS:** Increasing awareness of sedentary behavior via real-time feedback may be an effective tool for reducing sedentary time accumulated in longer bouts, which has been previously highlighted as potentially more detrimental than sedentary time accumulated in shorter bouts. Further, decreasing sedentary time may have a positive influence on mood over a semester. Future research with larger and more varied samples is warranted to determine the broader applicability of this type of intervention and its influence on mental health.

476 Board #313 June 1, 11:00 AM - 12:30 PM  
**Can We Reduce Prolonged Sitting? Acceptability of a Tactile Vibration Prompt to Initiate Movement**

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Observational evidence supports an association between sedentary behavior and increased risk for cardiovascular disease (CVD). Physical activity recommendations now advocate for all age groups to minimize time spent sitting. Functional intervention strategies to decrease prolonged sitting, tested in "real world" settings, are needed to provide specific public health guidelines (e.g. frequency and duration of breaks in sitting) for CVD reduction. **PURPOSE:** To examine the potential acceptability of a tactile vibration prompt (TVP) as an intervention to reduce prolonged sitting. **METHODS:** Thirteen healthy adults who self-reported sitting ≥7 hours/day typically in bouts ≥ 30 minutes wore a thigh-based accelerometer with a TVP feature (activPAL3) for seven days. The TVP was programmed to vibrate after 30 consecutive minutes of uninterrupted sitting during waking hours. Participants were asked to stand or walk for ≥ 1 minute in response to the TVP. Upon returning the device, participants completed a Likert-scale questionnaire assessing TVP protocol acceptability, embarrassment, and ease of responding. **RESULTS:** Participants found the TVP protocol easy to comply with (Mean±SD; 4.5±0.5, 100% agreed); mostly enjoyed it (3.8±0.9, 69.2% agreed); would be willing to follow a longer protocol (e.g. 3 months; 4.0±0.9, 76.9% agreed); and did not find it difficult to respond while at work (2.1±1.1, 69.2% disagreed) or home (2.2±0.7, 76.9% disagreed). Participants found the 1-minute standing/walking breaks in response to the TVP not to be 'too long' (2.3±0.9, 69.2% disagreed), but were mixed regarding frequency (every 30 minutes) being 'too often' (2.7±0.9, 46.2% disagreed). The device was generally not embarrassing when seen (1.9±0.8, 76.9% disagreed) or heard (2.0±0.8, 69.2% disagreed) by others. Participants generally found the TVP protocol easier to follow during weekdays (3.8±0.9, 76.9% agreed) and did not decrease work productivity (2.0±1.2, 69.2% disagreed). **CONCLUSION:** Subjective user experience will be a driving factor in the success of devices providing TVP-based sitting interruption. Our findings indicate that a TVP was generally accepted by most participants both at home and work, suggestive that a TVP-based intervention may be a viable methodology to ameliorate prolonged sitting behavior.

477 Board #314 June 1, 11:00 AM - 12:30 PM  
**Does Measuring Cardiorespiratory Fitness and Muscular Strength Influence Physical Activity?**

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Cardiorespiratory fitness (CRF) and muscular strength are associated with improved functional performance, less disability, and lower all-cause mortality. Health care providers often struggle to motivate individuals to increase their physical activity to achieve the associated health benefits. **PURPOSE:** To determine if measuring CRF and muscular strength influences physical activity as determined by the Exercise Vital Sign (EVS). **METHODS:** Subjects were attendees at the 2014 Minnesota State Fair who were ≥18 years of age, did not have cardiovascular disease or take negative chronotropic drugs. Those consenting to participate were randomized 1:1 to control and intervention groups. EVS, calculated by multiplying the number of moderate-vigorous exercise sessions/week by the average minutes/session (capped at 840), was measured in all subjects. Intervention subjects completed a timed step test, estimating VO<sub>2</sub>max using pre and post heart rate values, had muscular strength measured with a hand dynamometer and were provided their results with age appropriate normative data for VO<sub>2</sub>max and grip strength. All subjects received information on exercise recommendations and benefits and were contacted by email 3 months after randomization to determine their current EVS. **RESULTS:** Of the 776 individuals screened, consented and randomized, 336 (43.3%) participants responded to the 3 month follow-up survey (162 control, 174 intervention). Mean initial EVS was 247.3 (median 180) and 242.6 (median 180) for the intervention and control groups respectively. Initial EVS was positively associated with estimated VO<sub>2</sub>max ( $r=0.14$ ,  $p=0.007$ ), but not with grip strength ( $p=0.15$ ) or age ( $p=0.28$ ). Mean follow-up EVS was 218.6 (median 280) and 194.6 (median 150) for the intervention and control groups ( $P=0.2$ ). At follow up 78 (43.8%) and 50 (29.4%) of the intervention and control respondents reported participation in strength training activities ( $P=0.005$ ), increased from 30.9% & 25.9% in the baseline groups. There were no other significant differences between the groups.

**CONCLUSIONS:** EVS as a measure of physical activity correlates with estimated VO<sub>2</sub>max and therefore provides a simple tool to estimate CRF. Measuring CRF and strength had no influence on EVS at 3 months but may increase participation in strength training activities.

478 Board #315 June 1, 11:00 AM - 12:30 PM  
**Workstations To Increase Workplace Physical Activity And Reduce Sitting Time: A Pilot Study**

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 (No relationships reported)

There is growing evidence prolonged workplace sitting is associated with multiple health risks. Utilizing static and active workstations may increase daily workplace physical activity and reduce workplace-sitting time. **PURPOSE:** The purpose of study was to determine if access to both static and active workstations could increase workplace physical activity and decrease sitting time.

**METHODS:** Participants (N=15) were assigned to an experimental (sit-stand workstation and shared treadmill desk; n=8) or control group (n=7) for seven weeks. The International Physical Activity Questionnaire long form was administered at baseline and at the end of the study to assess workplace physical activity and sitting time. Participants wore an activity tracker (Fitbit One) to objectively assess daily footsteps and physically active hours. A mixed between-within subject analysis of variance was used to compare the groups (alpha: p < .05).

**RESULTS:** There were no statistically significant between group differences in the dependent variables.

**CONCLUSIONS:** This is the first study to examine the use of static and active workstations to increase workplace physical activity and reduce sitting time. Workday sitting decreased 61% in the experimental group, while increasing 8.3% in the control group. Although only half of the experimental group participants used the shared treadmill desk, the mean number of footsteps taken (8897.25) was well above the recommended >5000 steps/day. Because no attempt was made to motivate or promote use of the equipment in any way, a health education component may be needed, along with a larger sample size to attain more significant increases in workplace physical activity and reductions in sitting time.

479 Board #316 June 1, 11:00 AM - 12:30 PM  
**Signage Increases Stair Use: Applying Visual Metaphors with Health and Non-health Messages For Behavior Change**

Dixie Stanforth<sup>1</sup>, Allison Lazard<sup>2</sup>, Philip R. Stanforth<sup>1</sup>, Benjamin Wyeth<sup>1</sup>, Michael Mackert<sup>1</sup>, Xiaoshan Li<sup>1</sup>. <sup>1</sup>The University of Texas at Austin, Austin, TX. <sup>2</sup>The University of North Carolina at Chapel Hill, Chapel Hill, NC. (Sponsor: John Bartholomew, FACSM)  
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Increased routinized activity, such as stair-climbing, is an accepted method to increase physical activity. Behavioral and attitudinal outcomes of previous research are inconsistent. The low cost and large benefits of increased stair usage warrant study. **Purpose:** To evaluate the effectiveness of and attitudes toward a communication campaign promoting stair use on a university campus. Campaign messages incorporated health and non-health text and visual metaphors.

**Methods:** Two campus buildings were selected based on proximity of elevators and open stairwells and randomly assigned health or non-health messages. Unobtrusive observers conducted baseline counts of stair/elevator usage for 10 days prior to placing signs. Each building had four different signs: two at points of entry and two at point of choice (entrance to elevator/stairwell space). Point of entry and choice signs were switched after two weeks. Counts of stair/elevator choice were conducted each weekday. At four weeks signs were removed and surveys administered to determine awareness and response.

**Results:** 65.2% of survey respondents reported seeing the signage (t = 30.576, p<.001, d = 1.363) and 48.1% of that group reported that the signage influenced stair-taking behavior (t=17.261, p<.001, d=.96). Repeated measures analysis of variance determined time was a significant predictor of stair usage (F=10.604, p= .000, partial η<sup>2</sup>= .371). Stair usage significantly increased after the signage was first placed (F=10.720, p<.01, partial η<sup>2</sup>= .373) and the increase remained after the signage was shifted (F= 13.766, p<.01, partial η<sup>2</sup>= .433). There was no difference between the health and non-health messages (χ<sup>2</sup>= .760, p>.10, V=.027).

**Conclusion:** Stair climbing is a simple and efficient strategy to increase daily physical activity. Both highlighting health benefits, such as improved heart health, and providing novel visual messages to promote cognitive processing led to a significant increase in stair usage.

480 Board #317 June 1, 11:00 AM - 12:30 PM  
**There's An App For That! Evaluation Of Free Aerobic Exercise Apps**

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 (No relationships reported)

**PURPOSE:** An increasingly common mode of daily exercise is the use of exercise apps via smartphone, but few studies have examined how these apps might help to promote physical activity. The purpose of this study was to evaluate written descriptions of free aerobic exercise apps and the potential for promoting physical activity. **METHODS:** In February 2013, study investigators identified 63 free exercise apps on iTunes that included aerobic exercise. Written descriptions posted by the app developers were evaluated by two investigators using the enabling and reinforcing components of the Precede-Proceed health promotion model as a guide. Six factors (three enabling and three reinforcing) were evaluated by the investigators. One point was recorded for each of the factors incorporated into a particular app. Total points were determined and average scores are presented as means±SD. **RESULTS:** Out of the 63 apps, 19 included only aerobic exercise and 44 included a variety of exercise routines, including aerobic exercise. Enabling scores ranged from 0 to 3, with an average score of 1.8±0.9. Fifty (79.4 %) apps included videos or pictures, while 44 apps (69.8 %) included written instructions on how to perform exercises. Twenty-two (34.9 %) apps included the ability to track daily exercise. Reinforcing scores ranged from 0 to 3, with an average score of 0.7±0.8. Twenty-five (39.7 %) apps interfaced with a social networking site, while 15 (23.8 %) included rewards for daily exercise. Only 6 (9.5 %) provided feedback and support from a personal trainer or other individuals following adoption of an exercise program. Total scores ranged from 0 to 5, with an average of 2.5±1.1. None of the apps included all 6 factors. **CONCLUSION:** It will be important for exercise professionals to collaborate with app developers, so new exercise apps include ways to encourage and reinforce daily exercise. Additional research is needed on how exercise apps can be used to promote physical activity.

481 Board #318 June 1, 11:00 AM - 12:30 PM  
**Promoting Physical Activity And Healthy Snack Choices Among Individuals With Intellectual Disabilities**

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Submit session:

Zi Yan, Kevin Finn, Michael Corcoran, Shelagh Brice  
 Sponsored by Dr. Kyle McInnis, FACSM  
 Merrimack College, North Andover, MA

**PURPOSE.** Adults with intellectual disabilities (ID) are at higher risk of becoming obese compared to individuals without ID. There is a strong need to promote nutrition and physical activity among this group of people. This study examined a community-based peer education program aimed at promoting daily physical activities and healthy snack choices among adults with intellectual disabilities. **METHODS.** The program was designed based on a peer education model. Twenty-one individuals (with mild to moderate ID, Male n=11, Mean age=25.4) participated in the study. Participants were matched with undergraduate students enrolled in a Health Behavior and Promotion course from a local liberal arts college. Students led unstructured fitness training sessions (~45 minutes each meeting) and education lessons twice a week (~ 15 minutes each meeting) for eight weeks. The education lessons focused on increasing self-efficacy of participating in lifestyle physical activities and choosing healthy snacks. Less healthy snacks (e.g., different candies, regular soda) and healthier snacks (e.g., fruit, pretzel, diet soda, bottle of water) were provided to participants twice a day during the intervention. Participants were asked to pick one snack each time. At the beginning and the end of the intervention, participants' daily snack choices (less healthy vs. healthy) and daily steps were recorded for five days. **RESULTS.** For daily physical activity, steps/hour did not significantly increase, pre step=362/hour, post steps=281/hour, t(13)=1.77, p>.05. As for healthy snack choices, during the pretest week, on average, 41.0% of snack choices were healthy, while at the post-test, this number increased to 54.9%, one tail t test was significant, t(20)=-1.78, p<.05, Cohen's d = .40. **CONCLUSION.** An 8-week peer education program showed promising effects on promoting healthy snack choices among individuals with intellectual disabilities. The study was funded by SHAPE America Early Career Investigator Grant.

482 Board #319 June 1, 11:00 AM - 12:30 PM  
**Increasing Habitual Physical Activity Of People With ID, Through Changing The Behavior Of Caregivers**

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 (No relationships reported)

**PURPOSE:** Professional caregivers play an important role in healthy behavior of people with intellectual disabilities (ID). A large part of this population relies on professional caregivers for minor or major support for physical activity in their daily program. To promote physical activity, it is therefore necessary to target professional caregivers as well as people with intellectual disabilities themselves. The aim of this study was to change the behavior of professional caregivers towards providing more physical activity support, in order to increase habitual physical activity levels of their clients with ID.

**METHODS:** Intervention mapping (Kok, et al., 2004) was used to design a multicomponent intervention, including a health check, education, demonstrations of suitable activities in and around the living facility, personal goal-setting, coaching of the professional caregivers, and rewards, all delivered by a physical activity specialist. People with ID were recruited from supported, community-based living facilities in the Netherlands. After informed consent, measurements at the start and at the end of a control period (12 wks) were used to determine baseline levels and variability, and compared to the results at the end of the intervention period (24 wks), to determine the effects of the program. Stages of change and perceived barriers of both people with ID and the professional caregivers were assessed with adapted questionnaires. Physical activity (pedometers), fitness (Short Physical Performance Battery), health (length, weight, BMI, hip and waist circumference and blood pressure) and daily functioning (Barthel Index and Lawton IADL scale) were measured in people with ID. Process evaluation included implementation of and satisfaction with the intervention.

**RESULTS:** 115 People with ID (male n = 60, age 50.8 ± 17.2 years) and their 39 professional caregivers participated in this study. Due to incomplete implementation in a part of the sample, significant differences were only found for the number of perceived barriers (pre 7.4, post 4.9, F=4.524, p=0.007) for the professional caregivers, with no effects in people with ID.

**CONCLUSIONS:** This intervention is effective in changing the attitudes of professional caregivers, but it remains unclear if physical activity of people with ID increased.

483 Board #320 June 1, 11:00 AM - 12:30 PM  
**The Effect of Group Size on Energy Expenditure During Hacky Sack Play**

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As obesity rates continue to rise in America, a large portion of the population is not getting the recommended amount of exercise. A novel exercise in which participants find a great deal of entertainment is ideal for helping the more sedentary part of the population be active. Playing hacky sack is simple to play, fun, requires very little equipment, and can be played in various settings with a varying number of participants.

**PURPOSE:** To understand the value of hacky sack play as a form of exercise, energy expenditure (EE) and exercise intensity (EI) was measured in players in groups with varying numbers of participants. This data will shed light on the quality of exercise in groups of various sizes.

**METHODS:** Groups ranging in size from one to six participants played hacky sack for 30 minutes. During play, EE and EI was estimated with armband accelerometers. Play groups had the same ratio of experienced and inexperienced players. Means were analyzed by ANOVA in Microsoft Excel.

**RESULTS:** There is no difference in EE or EI in groups with 4 or fewer players. In groups with 5 and 6 players, EE and EI are less than in groups with fewer players.

| Group Size (# of players) | 1        | 2     | 3      | 4     | 5    | 6    |
|---------------------------|----------|-------|--------|-------|------|------|
| EE (Joules)               | 850+*    | 752+* | 735+*  | 881†  | 677  | 599  |
| EI (MET)                  | 5.16*+&# | 4.33+ | 4.64+* | 4.33+ | 3.91 | 3.36 |
| n                         | 10       | 9     | 13     | 10    | 13   | 10   |

\* significantly different than group size 5  
 + significantly different than group size 6  
 † A trend for a difference compared to group size of 5  
 & A trend for a difference compared to group size of 4  
 \* A trend for a difference compared to group size of 5  
 † A trend for a difference compared to group size of 6

**CONCLUSION:** To get the greatest physical activity from hacky sack, play should occur in groups of 4 or fewer people. As hacky sack play is a very simple activity to perform and can be played almost anywhere, it has great potential as an entertaining way for people to be physically active. Regardless of group size, players will benefit from this fun activity.

484 Board #321 June 1, 11:00 AM - 12:30 PM  
**The Effect of Cooperation and Competition on Energy Expenditure and Exercise Intensity During Exergaming**

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 (No relationships reported)

**Introduction:** Exergaming mixes video games with physical activity. Exergaming may help people convert inactive time to active time. Exergames may involve individual, cooperative, or competitive gaming modes. In cooperative exergaming players work together to achieve a common goal. In competitive exergaming players compete against one another. The aim of this project was to determine whether players in solo, competitive, or cooperative exergaming play with greater intensity or expend more energy. **Materials/Methods:** Twenty male and female (9 females and 11 males) adult (ages 18-28) volunteers completed four trials of exergaming including individual, cooperative or competitive play using two different games. Playing Kinect Adventures (KA), subjects completed a solo and a cooperative trial. Playing Motion Sports Adrenaline Rush (MSA), subjects completed a solo and a competitive trial. Energy expenditure (Joules - J) and exercise intensity (METs) were measured using SenseWear accelerometers (BodyMedia). **Results:** Group means: KA solo trial energy expenditure 590 J, exercise intensity 3.81 METs. KA cooperative trial 570 J, 3.60 METs. MSA solo trial 610 J, 3.97 METs. MSA competitive trial 701 J, 4.50 METs. ANOVA revealed no difference in METs or energy expenditure between solo play and the competitive or cooperative versions of either game however when comparing cooperative gaming to competitive gaming MET values were higher in the competitive group (p = .007). The trend with cooperative gaming was toward an energy expenditure that was slightly less than solo play while competitive gaming demonstrated a trend towards increased intensities so while neither competitive or cooperative were different from solo play, cooperative had a lower average intensity than competitive. **Conclusion:** Exergaming cooperatively or competitively did not result in higher exercise intensity or energy expenditure than playing alone. A significant difference in exercise intensity was shown while playing exergames competitively compared to cooperatively. The ability for competitive exergaming to stimulate more physical activity and healthy adaptations to exercise may make competitive play a better way to improve health through exergaming.

485 Board #322 June 1, 11:00 AM - 12:30 PM  
**Future Sports and Exercise Medicine Doctors' Attitudes and Physical Activity Counseling Practice**

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 (No relationships reported)

**PURPOSE:** Physical activity (PA) promotion in health care setting has been shown to be efficient, effective, and cost-effective with relevant clinical benefits for various patient groups. Sports and exercise medicine physicians might be especially qualified to counsel inactive patients. Purpose of the study was to assess the knowledge and physical activity counseling practice of future sports medicine physicians

**METHODS:** We used an adapted version of a previously tested and published questionnaire to assess future sports medicine physicians' knowledge and practice in PA counseling. Responders were recruited among prospective sports medicine physicians participating in the subspecialty program "Sports Medicine" of the Department of Sports Medicine, Frankfurt University, Germany. After descriptive data analysis association between counseling practice and selected parameters was tested using the chi-square test.

**RESULTS:** Response rate was 56,58% (205/116), with 35% female respondents. Age distribution was as follows: under 30 years 5% (6), 30-39 years 29% (34), 40-49 years 21% (24), 50-59 years 35% (40) and 60 and above 10% (12). 35% (40), 24% (27) and 41% (46) reported having been in practice for under 10 years, 10-20 years and above 20 years respectively. All responders judged PA to be very important (86%, n=100) or important (14%, n=16) in the prevention of chronic diseases. Self-reported competence to give advice on PA was very high (9%, n=10) or high (73%, n=84). Only 18% (n=21) assessed their own competence as low or very low. 67% of responders reported not knowing current PA recommendations. 28% (n=33) of responders reported giving counseling less than 25% and 34% (n=40) max. 49% of their patients. Self rated competence to provide PA counseling, the knowledge of current PA recommendations, and good education were associated with an increased rate of counseling.

**CONCLUSIONS:** There is a large discrepancy between perceived importance of PA in the prevention of chronic diseases, self-rated competence to provide PA counseling and actual PA counseling. Cooperation with organized sports providers is limited. Knowledge of current PA recommendations seems to enhance PA counseling.

- 486 Board #323 June 1, 11:00 AM - 12:30 PM  
**Progesterone and Estradiol Restore Wheel Running After Ovariectomy in Mice**  
 Christine A. Cabelka, Brittany C. Collins, Dawn A. Lowe, FACSM. *University of Minnesota, Minneapolis, MN.*  
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 (No relationships reported)

Menopause is associated with a decline in physical activity. Previous studies using mouse models have shown that after ovariectomy (OVX), estradiol restores wheel running distances to pre-surgical levels. However, the effects of the other major ovarian hormone, progesterone, have not been investigated.

**Purpose:** The purpose of this study was to determine the effect of progesterone and a combined estradiol-progesterone replacement on wheel running activity after ovariectomy in mice. **Methods:** Forty female C57Bl/6 mice, 4 months of age, were given free access to running wheels for 2 weeks prior to intervention to assess baseline-running distances. Baseline-running distance was used to randomize mice into 4 groups (n=10 for each): 17 $\beta$ -estradiol (E2), progesterone (P4), combined treatment (E2+P4), or no treatment (OVX). All mice then underwent ovariectomy, were allowed to recover for ~ 8 days, and then returned to the running wheels for ~2 weeks. Three weeks after ovariectomy mice were implanted with hormone replacement pellets and returned to the running wheels for 6 weeks. Subsets of mice were also analyzed for cage activities. **Results:** Mice ran an average of 8.93  $\pm$  0.28 km/24 hr before OVX and 4.60 $\pm$ 0.40 km/24 hr after OVX (p<0.001). There were no differences in cage activities, such as ambulation distance, among the 4 groups before or after OVX, or in response to treatment (p > 0.05). There was no difference in running distance among groups after hormone replacement (p=0.057). **Conclusion:** Progesterone, estradiol and combined treatment have a similar effect on wheel running distance after ovariectomy. This work was supported by NIH grant R01-AG031743.

## A-51 Free Communication/Poster - Posture/ Balance

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
 Room: Exhibit Hall A/B

- 487 Board #324 June 1, 9:30 AM - 11:00 AM  
**Vestibular Control Of Balance Is Enhanced With Increased Cognitive Demand**  
 Michael A. McGeehan, Brian H. Dalton. *University of Oregon, Eugene, OR.* (Sponsor: Charles L Rice, FACSM)  
 (No relationships reported)

When cognitive demand is elevated during a motor task, cortical inhibition and reaction time are increased. However, these acute neuromuscular modifications do not appear to manifest in measures of standing balance control (e.g. center of pressure (COP)). This disconnect is likely explained by one or more compensatory mechanisms within the balance system, such as an increased sensitivity of the vestibulomotor pathway. **PURPOSE:** This study aimed to determine the effects of increasing cognitive demand on vestibular control of standing balance.

**METHODS:** Ten recreationally-active healthy participants (25.2  $\pm$  3.0 y) stood blindfolded on a force plate with their heads turned to the left and arms relaxed at their sides for two 180-s trials. During each trial, participants were exposed to stochastic vestibular stimulation (SVS) (0-25 Hz,  $\pm$ 2.5 mA). Participants executed a cognitive task (double-digit arithmetic) for one trial and during another, they stood quietly. Medial gastrocnemius surface electromyography (EMG) and anterior-posterior (AP) forces were sampled to evaluate SVS-evoked balance responses in the frequency and time domains using coherence and cumulant density functions respectively. Total AP COP displacement was assessed as a metric of balance stability. Coherence and cumulant density values were considered physiologically relevant when exceeding 95% confidence limits. Statistical differences between trials were assessed via paired t-tests for all dependent variables.

**RESULTS:** Coherence for SVS-AP forces and SVS-EMG spanned similar operational bandwidths across trials. Peak coherence was not significantly different for either measure when performing the cognitive task compared to without (p > .05). Peak cumulant density amplitude for SVS-AP and SVS-EMG was 12% greater for the cognitive task trial than without (p < .05). Total AP COP displacement was not different between conditions (p = .28).

**CONCLUSIONS:** Cumulant density function data demonstrate enhanced vestibular control of balance when cognitive demand is elevated, despite similar COP displacement between conditions. This augmented neural strategy may act to supplement divided cortical processing within the balance system, thus compensating for the acute neuromuscular modifications associated with increased cognitive demand.

- 488 Board #325 June 1, 9:30 AM - 11:00 AM  
**Does an External Attentional Focus Improve Postural Control in the Star Excursion Balance Test?**  
 Jacklyn Howland. *University of Indianapolis, Indianapolis, IN.*  
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 (No relationships reported)

The Star Excursion Balance Test (SEBT) is a dynamic postural control task used in many rehabilitation settings. Attentional focus, either external or internal, can affect performance and learning of movement skills such as force production, accuracy, and postural control tasks. External focus, or focusing on the outcome of a movement, has historically shown to produce superior performances. In this study, the modified Y-balance test was used to test the effect of attentional focus and also investigate the dynamic dominance hypothesis and its applicability to the lower extremities. **PURPOSE:** The purpose of this study was to determine if a person's focus of attention affects his or her performance on a novel test of postural control, the SEBT. The study also investigated if the type of attentional focus affects dynamic and stability legs differently. If the type of focus affects performance, then that focus should be included in the testing protocol for the SEBT. **PARTICIPANTS:** 20 undergraduate students (mean 20.8 $\pm$ 1 years, 163.5 $\pm$ 7.3 cm tall, 65.8 $\pm$ 12.4 kg) with no history of lower extremity injury or rehabilitation. **METHODS:** A modified Y-balance test was used to test 12 randomized conditions, the combination of three reach directions (anterior, posterior-medial, and posterior-lateral), two stance legs (stability and dynamic), and two foci (external and internal). Reach distance was normalized by dividing by leg length (%MAXD). **RESULTS:** External focus and stability stance leg produced significantly greater performances in the anterior direction (82.97 $\pm$ 6.68 %MAXD, p=0.042 for side and p=0.01 for focus), with the same trend in the posterior-medial direction. There was no significant interaction of focus and side or significant results in the posterior-lateral direction. **CONCLUSION:** The results of the study provide evidence to support using an external focus to maximize performance during the Y-balance test, as well as extending the dynamic dominance hypothesis to footedness.

- 489 Board #326 June 1, 9:30 AM - 11:00 AM  
**Examination of Clinical and Laboratory Measures of Static and Dynamic Balance in Breast Cancer Survivors**

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**PURPOSE:** To investigate potential differences in clinical and laboratory measures of static and dynamic balance in 30 women who were 0-5 years post-treatment for breast cancer (breast cancer survivors) and 21 women without a history of cancer (controls). **METHODS:** Subjects completed 4 balance tests. Static balance was assessed using the Single Leg Stance Test (SLS) with eyes open and closed and the NeuroCom 6-condition Sensory Organization Test (SOT). Dynamic balance was assessed using the Timed Up and Go Test (TUG) and the Fullerton Advanced Balance Scale (FABS). Scores for each balance assessment were compared between study groups using independent samples t-tests. Scores for the eyes open and eyes closed conditions of the SLS were compared within each group using paired samples t-tests. **RESULTS:** Breast cancer survivors exhibited significantly poorer balance compared to the controls on the eyes open condition of the SLS (23.7  $\pm$  16.0 seconds vs. 37.1  $\pm$  11.3 seconds, p = 0.001), the TUG (8.7  $\pm$  1.3 seconds vs. 7.6  $\pm$  1.0 seconds, p = 0.003), and the FABS (35  $\pm$  3 points vs. 39  $\pm$  1 points, p < 0.0005). Both groups experienced significantly poorer balance on the eyes closed condition of the SLS compared to the eyes open condition (p < 0.0005). Breast cancer survivors also displayed significantly worse overall equilibrium scores on the NeuroCom SOT compared to the controls (74  $\pm$  6 points vs. 78  $\pm$  5 points, p = 0.02). Within the 6 conditions of the SOT, breast cancer survivors performed significantly worse on Conditions 2 and 3 (i.e., eyes closed with firm surface and eyes open with sway-referenced visual surround; p = 0.001 and 0.005, respectively) and tended to perform worse on Conditions 4 and 6 compared to controls (i.e. eyes open with sway-referenced surface and eyes open with sway-referenced surface and visual surround; p = 0.06 and 0.06, respectively). **CONCLUSIONS:** Compared to women who have never experienced cancer treatment, breast cancer survivors appear to have some significant reductions in both static and dynamic balance as measured using clinical methods (i.e. the SLS, TUG, and FABS) as well as laboratory methods (i.e., the NeuroCom SOT). Understanding the impact of cancer treatments on balance is important, as this information may give insight into developing future specific interventions for this population.

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**Inter- and Intrarater Reliability of the Hand Reach Star Excursion Balance Test**

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**Reported Relationships:** O. Eriksrud: *Intellectual Property; Design of testing mat used for study.*

The Star Excursion Balance Test (SEBT) is a well-established, task-driven test for dynamic postural control and balance that challenges coordination, mobility, and strength. The SEBT consists of eight different horizontal foot reaches on each foot that elicit unique combinations of ankle, knee, hip and spinal joint movements. Hand reaches in the same directions as the SEBT elicit additional and greater joint movements of the shoulder, spine and hip, as well as knee and ankle joint movements. A systematic combination of hand reaches might therefore provide information about functional joint mobility, joint movements available to functional tasks, but also additional information about dynamic balance and postural control. Thus, we designed the hand reach star excursion balance test (HSEBT), which consists of 10 tests on each leg, 8 horizontal hand(s) reaches in the same directions as described for the SEBT with the addition of two rotational reaches.

**Purpose:** To determine the inter- and intrarater reliability of HSEBT

**Methods:** Twenty-nine healthy male subjects (age 25.4 ± 6.4 years; height 180.0 ± 9.3 cm; mean ± SD) volunteered for this study. Three testers, one experienced and two trained, tested each subject on four different occasions in random order. The order of tests was not randomized. All subjects performed the HSEBT on a mat specifically designed for ease and repeatability of measurements (Athletic Knowledge Nordic AB, Stockholm, Sweden). Horizontal reaches were measured in centimeters and rotational reaches in degrees. Instructions and a minimum of three practice trials were given prior to each test. The testers were blinded to other results and the statistical analysis. Intra class correlation coefficient (ICC1,3) was used to calculate intrarater reliability of one tester and interrater reliability between three testers, using SPSS v 21.0. The following criteria were used to evaluate ICCs: high ≥ 0.90, 0.80-0.89 moderate and below 0.80 questionable.

**Results:** Intrarater reliability ranged from 0.80-0.97 and 0.88-0.96 for left and right foot respectively. Interrater reliability ranged from 0.81-0.97 and 0.88-0.97 for left and right foot respectively.

**Conclusion:** HSEBT show moderate to high inter- and intrarater reliability.

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**Sleep Deprivation, Balance Control, And Attentional Focus**

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(No relationships reported)

Increases in postural sway in sleep-deprived individuals have been observed (Aguilar & Barela, 2014) and are indicative of poor balance control. An external focus of attention (FOA) has been demonstrated to improve performance in various physical activities including the performance of balance tests by rested individuals (Landers, Wulf, Wallmann, & Guadagnoli, 2005), however no research has examined if this effect can be replicated in sleep-deprived individuals.

**PURPOSE:** The purpose of our study was to examine if the beneficial effects of an external FOA can enhance balance control when sleep deprived. We hypothesized that by using an external FOA we could safely improve balance control in sleep-deprived individuals. **METHODS:** Young healthy adults ( $n = 13$ ; 8 males & 5 females; 25.9 ± 2.9 yrs) completed 12 different balance tasks after 26 hours of sustained wakefulness. Participants performed the balance task under all possible combinations of surfaces (hard, H; foam, F), stances (one leg, two legs, tandem), hand positions (hands on hips, HIPS; one hand extended, EXT), and directions for focus of attention (external, EF; internal, IF; no FOA instructions, control). The order of the conditions were randomized for each participant. For the IF trials, participants were told to focus on aspects of movement (e.g., position of their feet); whereas, for the EF trials, participants were instructed to focus on the effects of their movement (e.g., position of the force plate). Center of pressure velocity (CoPv) in the medial-lateral (ML) direction was obtained through a force plate collected at 100 Hz with lower scores indicating better balance control. **RESULTS:** Planned contrasts revealed that during the H/tandem/HIPS balance task, participants' mean CoPv in the ML direction in the EF condition ( $M = 1.62 + .50$  cm/s) was significantly lower than the control ( $2.01 + .73$  cm/s,  $p = .05$ ). No differences were revealed when comparing IF to EF or IF to control for this balance task or when comparing CoPv in the ML direction within FOA conditions for the other balance tasks (all  $p > .05$ ). **CONCLUSION:** These findings

provide some evidence for the usefulness of an external FOA as a way to combat the detrimental effects of sleep deprivation on balance control when standing in a challenging position (i.e., tandem) in young healthy adults.

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**Validation of the Tandem Walk Test as a Measure of Dynamic Walking Balance**

Marc Robertson, Robert Gregory. *Southern Connecticut State University, New Haven, CT.*

(No relationships reported)

Validation of the Tandem Walk Test as a Measure of Walking Dynamic Balance  
 Marc Robertson & Robert Gregory

Southern Connecticut State University

The tandem walk test (TWT) has been utilized for both clinical and research applications as a test for objectively measuring dynamic walking balance in both pathologic and normal populations. No studies were found that attempted to determine a relationship between the TWT and a criterion standard or other validated clinical tests of walking dynamic balance.

**Purpose:** The purpose of this study was to determine the validity of the TWT as a measure of dynamic walking balance.

**Methods:** Twenty healthy participants, age range 20 – 70 years, performed the TWT and two clinical tests of dynamic balance, The Biodex Balance System (Shirley, NY) dynamic limits of stability (DLOS) protocol and measures of gait variability, center of pressure (COP), stride and step length, determined from an instrumented treadmill (h/p cosmos sports and medical gmbh, Nussdorf-Traunstein, Germany).

**Results:** A moderate-strong relationship existed between the TWT and the Biodex DLOS and COP single support line,  $r = .77$   $p < .0001$  and  $r = .70$   $p < .001$  respectively. A moderate relationship was found between TWT and covariance of stride length and covariance of step length,  $r = .56$   $p < .01$  and  $r = .58$   $p < .01$  respectively.

**Conclusion:** The TWT demonstrated a strong to moderate correlation with clinical tests of dynamic balance, DLOS and gait variability, in a healthy population demonstrating validity as an objective measure of dynamic walking balance in a healthy population between the ages of 20 and 70 years.

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**The Utilization of Power to Predict Changes in Dynamic Balance**

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(No relationships reported)

Power production and dynamic balance are important in maintaining and improving functionality in older adults. When working to improve exercise performance or activities of daily living (ADLs), older adults often encounter difficulty due to insufficient power or balance. While a relationship exists between power and dynamic balance, more research is necessary to further understand this connection. **PURPOSE:** The purpose of this study was to determine whether the ability to produce power predicted changes in performance on the 8-Foot Up-and-Go (UPGO) following 6 months of strength training at 80% 1RM in older adults. **METHODS:** Thirty-three older adults over the age of 65 ( $M = 81.66 \pm 5.91$ ) participated in a six month total body strength training program at 80% one-rep max (1RM). Power was assessed at pre-test using a velocity sensor system attached to a broomstick. Participants held the broomstick across their chest and performed a chair stand as quickly as possible. The mean output of 10 trials were recorded for average and peak power. The UPGO test was used to determine dynamic balance. Difference scores were calculated on the UPGO from pre- to post-test. A linear regression analysis was utilized. **RESULTS:** One outlier was removed from the dataset. UPGO improved by .30±.55 seconds on average from pre- to post-test. Peak power ( $M = 832.27 \pm 201.56$  W) was a significant predictor of UPGO mean difference scores ( $\beta = .40$ ,  $t(30) = 2.45$ ,  $p = .02$ ), significantly accounting for 16.5% of the variance ( $R^2 = .17$ ,  $F(1,31) = 5.98$ ,  $p = .02$ ). Average power ( $M = 476.20 \pm 137.21$  W) did not significantly predict changes in UPGO performance ( $p = .18$ ). **CONCLUSION:** While previous research has found a positive correlation between power and dynamic balance, peak power may be a more significant contributor than average power. Furthermore, 83.5% of the variance was unexplained, suggesting dynamic balance may be predicted by multiple factors.

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**Effects Of Kinesiology Tape On Balance**

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(No relationships reported)

The ability to maintain balance, or postural control, is an essential component in motor skills ranging from simply maintaining posture to performing complex voluntary movements. Improving balance has been shown to help with recovery from injury, injury prevention, and improved functional performance in both young and older adults. **PURPOSE:** To determine if different applications (i.e., medial-lateral (ML) vs. anterior-posterior (AP)) of kinesiology tape affect postural control. **METHODS:** Participants<sup>1</sup> (6 men, 20 women; 23.7 ± 3.9 yr) ML stability index (MLSI), AP stability index (APSI), and overall stability index (OSI) were measured using a balance platform under three bare-footed conditions in random order: control (no tape); tape applied in a ML stirrup under the heel, extending 12" above the medial malleolus to 12" above the lateral malleolus; and tape applied in an AP direction under the heel and extending proximally on the posterior calf in a Y-pattern on each side of the gastrocnemius. Each application was made bilaterally with 50% tension. For each condition, three stances (should-width, full tandem, unilateral) held for 10 sec each with eyes closed were assessed on stable and foam surfaces. **RESULTS:** Kinesiology tape did not have an effect on any measure of balance while standing on a firm surface in all 3 stances. Tape applied in the AP and ML direction did improve (p<0.05) MLSI by 20% while standing on foam with a shoulder-width stance. Tape in the ML direction had no other effect on balance while standing on foam for any stance. Tape applied in the AP direction improved (p<0.05) AFSI (19%) and OSI (17%) for both the full tandem and unilateral stances on foam. **CONCLUSIONS:** Kinesiology tape applied in the ML direction has little, if any, effect on balance. However, tape applied in the AP direction does appear to improve balance in the AP direction, as well as overall stability, in more challenging static conditions such as standing on foam with a reduced base of support. Further research is needed to understand the effects of kinesiology tape, particularly when applied to the lower leg in the AP direction, during situations when postural control is challenged, not only in static positions, but also during dynamic movements.

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**Center Of Pressure Better Approximates Body Center Of Mass Movement Than Either The Thorax Or Pelvis During Firm Surface Balance Error Scoring System Testing.**

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Recently, mobile devices held/secured to the thorax or pelvis have been explored as methods to add sensitivity to the Balance Error Scoring System (BESS) during concussion evaluations. The validity of using movement of these locations to estimate sway during the BESS stances remains unknown. **PURPOSE:** To determine differences and relationships in postural sway estimated from movement of the pelvis, thorax, and center of pressure (CP) to total body center of mass (TBCM) movement during firm surface double leg (DL), single leg (SL), and tandem (TA) stances. **METHODS:** Sixteen healthy, young adults (9 men, 7 women, 21.2±2.1yrs) performed three DL, SL, and TA trials according to the BESS protocol, while kinematics of 13 body segments and CP data were concurrently recorded. Kinematic data were subsequently used to determine the TBCM, superior thorax, and pelvis locations during each trial. The root mean square (RMS) of the three kinematic and CP locations during time periods void of compensatory events were computed for each trial. Two factor analysis of variance (measure by stance) and correlational analysis of each measure with TBCM were conducted on the average across the three trials. **RESULTS:** Post hoc comparisons of a significant interaction (P<.001) demonstrated thorax RMS as significantly higher than TBCM during DL (P=.049, d=.83) and TA (P=.031, d=.81) stances, and significantly higher than all other measures during SL stance (P=.001 - .004, d=1.63 - 1.83). The pelvis was significantly higher than TBCM during TA (P=.002 d=1.08). While all relationships with TBCM RMS were statistically significant (P<.05), the strongest relationships existed for CP (r=.897 to .969), while the weakest existed for thorax (r=.683 - .891). **CONCLUSIONS:** Forceplate derived CP best approximated TBCM movement during each firm surface stance. The significantly higher values and weaker relationships with TBCM suggest the thorax may not be an optimal mobile device location for enhancing BESS testing. Future research will consider the three BESS stances on foam surfaces.

496 Board #333 June 1, 9:30 AM - 11:00 AM  
**Impact Of Working Hours In Worker'S Postural Control.**

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**Impact of Working Hours in Worker's Postural Control**

Marco Tulio de Mello<sup>1</sup>, Fernanda Narciso<sup>1</sup>, Stefane Aguiar<sup>2</sup>, Adriana Carvalho<sup>3</sup>, Francieli Ruiz<sup>4</sup>, João Paulo Pereira Rosa<sup>1</sup>, José Angelo Barela<sup>2</sup>. <sup>1</sup>Universidade Federal de Minas Gerais, Belo Horizonte, Brazil. <sup>2</sup>Universidade Cruzeiro do Sul, São Paulo, Brazil. <sup>3</sup>Associação Fundo de Incentivo a Pesquisa, São Paulo, Brazil. <sup>4</sup>Universidade Federal de São Paulo, São Paulo, Brazil. Shift work, working hours, overtime, and insufficient rest time are factors that interfere with sensory-motor integration and consequently with postural control. **PURPOSE:** The purpose of this study was to verify the changes in postural control of workers undertaking different shift systems and working hours. **METHODS:** Thirty-two night workers were included, 12 bus drivers (42±8y) who worked eight-hours in a 5-consecutive-night system, with two days off, and 20 polysomnography technicians (35±7y) who worked in a 12x36h night-system, that is, 12 hours working and 36 hours off. All participants wore wrist actigraphs for four days. On the fourth day, before and after shift, they fulfilled the Karolinska Sleepiness Scale and were evaluated in a force platform for measures of postural control performance, standing as still as possible for 30 seconds with eyes-opened. Analyses of Variance were used to compare the variables before and after shift, and statistical significance set at 5%. **RESULTS:** A significant and average increase of 2.15±1.59 points in the KSS was observed after-night shift for workers, as well as an increase of 0.15±0.03cm in mean sway amplitude. ROC curve analysis evidenced that an increase of at least 0.17cm in mean sway amplitude discriminates sleepy and non-sleepy individuals (scores greater than 7 in the KSS) with 72% sensitivity and 86% specificity. **CONCLUSION:** Our findings suggest that longer working hours may have a negative impact in postural control, independently of age, and with an additive effect of body mass index. Shift system (5x2 days or 12x36 hours) is more important in determining the level of impairment in postural control than is working hour's duration per se and, therefore, future investigations should be aimed. **Financial Support:** CAPES, CNPQ, CEMSA, CEPE.

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**Athlete And Non-athlete Quiet Stance Postural Performance**

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Measures of postural performance have been studied extensively in athletes, focusing primarily on static standing; however, little is known regarding postural performance in athletes versus non-athletes during static stance and functional postural assessments. **PURPOSE:** The purpose of this study was to investigate differences in static and dynamic postural sway assessments of center of pressure (CoP) in athlete and non-athlete populations. **METHODS:** 28 collegiate athletes (ATH) (21 female, mean age 18.4 ± 0.67 years, 7 male, mean age 19.42 ± 2.14 years) and 30 college-age non-athlete controls (NON) (21 female, mean age 22.2 ± 1.05 years, 9 male, mean age 22.85 ± 1.34 years) completed two trials of eyes open and eyes closed quiet standing for 30 seconds, and the WiiFit Soccer Heading Game. During quiet stance, participants were instructed to stand with their feet together and stand as still as possible on the Wii Fit board, which was placed over a force plate. For the WiiFit Soccer Heading Game, participants were instructed to keep their eyes in the center of the screen as much as possible while shifting their weight from side to side to play the game. Raw CoP data was collected using a force platform (1000Hz) and analyzed further using a custom code. Peak Excursion Velocity (PEV) and Root Mean Square (RMS) excursion in the anteroposterior (AP) and mediolateral (ML) directions was calculated from the data along with 95% Confidence Ellipse (CE). **RESULTS:** One-way ANOVAs revealed that ATH had significantly lower (p=0.048) CoP RMS in the ML direction (4.1 ± 1.3 mm) and significantly (p=0.012) lower eyes open CE (0.3 ± 0.1 mm) during the quiet stance eyes open trials when compared to NON (4.9 ± 1.9 mm) and (0.4 ± 0.2mm), respectively. There were no significant differences between groups regarding PEV in the ML and AP directions with eyes open, eyes closed, or dynamic (WiiFit) situations. **CONCLUSIONS:** These results suggest that athletes are more stable with eyes open during quiet upright stance. However, during a dynamic postural task, which may more closely resemble athletic performance, no differences were observed. These findings

suggest that ATH use different postural mechanisms than NON during quiet upright stance with eyes open. This could be due to an enhanced utilization of visual cues as a result of a visually rich training paradigm.

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### Effects of Stroboscopic Vision on Sensory Organization Test

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Stroboscopic vision (SV), intermittent obstruction of normal visual information, has been used to interfere with motor control in order to challenge and tune up the motor control system for better functional performance. However, it is unknown whether SV can disrupt postural control, as continuous visual information is crucial in maintaining postural stability. **PURPOSE:** To determine effects of SV on postural stability during Sensory Organization Test (SOT). **METHODS:** Nineteen healthy subjects without any history of lower extremity injuries (9 males, 10 females; age=21.9±2.2 years; height=169.4±8.4cm; mass=65.7±10.8kg) participated. Subjects underwent two SOT sessions with and without SV in a randomized order. SV effects were made with an eyewear creating intermittent opaque states for 100 milliseconds of visual occlusion. SOT was composed of 6 postural tasks; 1) eyes open and with fixed support, 2) eyes closed and with fixed support, 3) sway-referenced vision and with fixed support, 4) eyes open and with sway-referenced support, 5) eyes closed and with sway-referenced support, and 6) with sway-referenced vision and support. The task 2 and 5 were excluded because of test conditions with eyes closed. For each of the other tasks, subjects were asked to stand on bare feet with shoulder width apart for 20 seconds, and complete 3 trials. Postural stability was determined with an equilibrium score that was computed using the equation as specified by Clinical Interpretation Guide of the NeuroCom International, Inc. Higher equilibrium scores indicate better postural stability during each of the 4 SOT tasks. Separate dependent t-tests were performed to determine differences between SOT sessions with and without SV. The *priori* alpha was set at  $P < 0.05$ . **RESULTS:** There were significant differences observed in task 1 (SV: 92.50±2.37, CON: 94.55±2.13,  $P = .003$ ) and task 6 (SV: 71.38±9.08, CON: 67.50±9.34,  $P = .025$ ) while no significant differences were found in task 3 ( $P = .109$ ) and task 4 ( $P = .308$ ). **CONCLUSION:** SV had differential effects on postural control during SOT: the intermittent obstruction of normal visual feedback decreased postural stability in a test environment where the vestibular and somatosensory feedback was normal, but it improved balance in a test condition where the two sensory inputs were interrupted.

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### Differences in Y Balance Test Performance between High School and Middle School Football Players

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The Y-Balance Test (YBT) is a field-expedient screen that assesses dynamic balance during a single-leg reach task for prediction of musculoskeletal injuries. Recent evidence has shown differences in dynamic balance abilities between collegiate and high school (HS) football players; however, we are unaware of any previous studies that have examined this relationship across lower levels of competition. **PURPOSE:** To examine differences in YBT scores between HS and middle school (MS) football players, as well as determine if previous injury history, age, and anthropometric measurements affected performance. **METHODS:** Sixty-five HS (15.3±1.1yrs; 180.9±6.8cm; 83.2±15.9kg) and 29 MS (12.7±0.7yrs; 166.2±10.2cm; 54.6±12.4 kg) football players underwent Y-Balance testing prior to the start of the 2015 football season. A self-reported questionnaire was completed with parental assistance to identify previous history of lower extremity injury. After three practice trials in each direction on each leg, all participants performed three maximum anterior (ANT), posteromedial (PM) and posterolateral (PL) reaches. Per previously published YBT directions, maximum reaches were recorded in centimeters, normalized and expressed as a percentage of stance leg length ((Reach Distance/Leg Length) X 100). Mean right/left averaged scores for HS and MS players were compared using independent t-tests. Multiple linear regression models were used to determine the proportion of variance in YBT scores explained by age, mass, height and previous history of lower-extremity injury. **RESULTS:** No differences were found between HS and MS players for ANT (61.6±6.4% vs. 64.1±5.6%;  $p=0.088$ ), PM (102.6±11.1% vs. 101.2±12.2%;  $p=0.584$ ), PL (97.2±10.1% vs. 99.5±10.9%;  $p=0.377$ ) and composite scores (CS) (87.1±7.9% vs. 88.2±8.5%;  $p=0.560$ ). Age, mass, height and previous history of lower-extremity injury were not significant contributors to ANT ( $R^2=0.040$ ;  $p=0.459$ ), PM ( $R^2=0.067$ ;  $p=0.186$ ), PL ( $R^2=0.091$ ;  $p=0.076$ ), or CS ( $R^2=0.060$ ;  $p=0.236$ ). **CONCLUSION:**

Dynamic balance performance did not vary between HS and MS football players, nor was influenced by previous history of injury and other potential confounders. Further work will determine if YBT performance is associated with future lower extremity injury risk in MS and HS football players.

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### Female Athletes Demonstrate Better Postural Stability Than Male Athletes

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Postural control is commonly affected by sport-related injuries and therefore, is routinely evaluated during post-injury examinations. Intrinsic factors such as the sex of an individual, however, may also affect postural control independently of injury. **PURPOSE:** We sought to determine whether postural stability differs between uninjured male and female athletes. **METHODS:** We conducted a cross-sectional study of uninjured pediatric, adolescent, and young adult athletes who performed the modified balance error scoring system (mBESS) test rated by a trained clinician while undergoing simultaneous evaluation using a video-force plate system. We compared the postural control of female athletes to male athletes using analyses of covariance (ANCOVA). Covariates potentially associated with postural stability included age, body mass index (BMI), and history of ankle injury, concussion, or migraine headache. Our main outcome measures were total errors committed during the mBESS as rated by a clinician and postural control ratings derived from integrated kinematic and kinetic data obtained by a video-force plate system. **RESULTS:** Participants ( $n=409$ ) ranged in age from 10-29 years (mean = 14.6±2.8); 60% were female. No significant differences on mBESS were detected between females and males. When compared to male athletes, however, female athletes demonstrated significantly better mean postural stability ratings on the video-force plate analysis during double-leg (86.1 vs.83.2;  $p=.03$ ), single-leg (52.1 vs. 41.5;  $p<.001$ ), and tandem stances (70.8 vs. 62.3;  $p<.001$ ). **CONCLUSION:** Physically active female athletes demonstrate better postural stability on video-force plate analysis than their male counterparts. Thus, measures of balance should be considered in light of sex.

### A-52 Free Communication/Poster - Women's Exercise - Bone, Muscle and Connective Tissue

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
Room: Exhibit Hall A/B

501 Board #338 June 1, 11:00 AM - 12:30 PM

### Sarcopenia, Osteopenia and Functional Performance in Postmenopausal Women

Zhaojing Chen, Pragya Sharma-Ghimire, Daeyeol Kim, Charity Cavazos, Michael G. Bembem, FACSM, Debra A. Bembem, FACSM. *University of Oklahoma, Norman, OK.* (Sponsor: Debra A Bembem, FACSM)  
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Aging is accompanied by declines in muscle function and bone mineral density (BMD). The European Working Group on Sarcopenia in Older People (EWGSOP) suggested using both reduced muscle mass and muscle performance to define sarcopenia. **PURPOSE:** 1) To compare body composition and functional performance in sarcopenic (SAR) and normal (NOR) postmenopausal women; and 2) to determine if there is an association between sarcopenia and BMD status. **METHODS:** Postmenopausal women ( $n=47$ ), 60 to 75 yr, participated in this study. Body composition and BMD were measured by DXA. Muscle performance tests included grip strength, gait speed, and vertical jumps. The sarcopenia criteria were: 1) skeletal muscle mass index (SMI)  $<5.5$  kg/m<sup>2</sup>; and 2) SMI  $<5.5$  kg/m<sup>2</sup> and grip strength  $<20$  kg or gait speed  $<0.8$  m/s. **RESULTS:** The prevalence of sarcopenia was 23% using the conventional definition, and 6% based on the EWGSOP definition. The prevalence of osteopenia and osteoporosis were 66% and 13%, respectively. There was no association between sarcopenia and osteopenia statuses. SAR had significantly ( $p<0.05$ ) lower body weight, bone free lean body mass, left femoral neck (FN) BMD, grip strength and jump power compared to NOR, but not gait speed. There were no significant differences in muscle mass or functional performance variables based on BMD status. HRT history was associated with sarcopenia status ( $p<0.05$ ). **CONCLUSION:** There was no association between low muscle mass and low bone

mass in postmenopausal women. Also, gait speed did not reflect loss of muscle mass. Jump power may be a better measure of lower body muscle function changes with aging.

**Table 1. Comparison between Sarcopenic and Normal Postmenopausal Women**

| Variables                        | SAR (n=11)     | NOR (n=36)    |
|----------------------------------|----------------|---------------|
| Left FN BMD (g/cm <sup>2</sup> ) | 0.796 ± 0.113* | 0.875 ± 0.109 |
| Grip Strength (kg)               | 22.4 ± 5.4*    | 25.5 ± 3.6    |
| Jump Power (Watt)                | 497.4 ± 94.7*  | 591.1 ± 120.9 |

Mean ± SD; \* p < 0.05 significant group difference

**502 Board #339 June 1, 11:00 AM - 12:30 PM**  
**Validation of Segmental Multi-frequency Bioelectrical Impedance Analysis in Older Women with Characteristics of Sarcopenia**

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*(No relationships reported)*

Segmental multi-frequency bioelectrical impedance analysis (SMF-BIA) has been shown to be a valid, more portable, and less expensive alternative to dual energy x-ray absorptiometry (DXA) for the measurement of appendicular lean mass (ALM) in several populations. However, few studies have examined the validity of SMF-BIA specifically among populations of older women who are sarcopenic or dynapenic. **PURPOSE:** To investigate the accuracy of SMF-BIA for the measurement of ALM among sarcopenic and/or dynapenic older women.

**METHODS:** Physical function, ALM, strength and anthropometric tests were performed to determine the presence of sarcopenia and/or dynapenia in a sample of older (72.3±4.6 years) women (n=25) using established sarcopenia classification criteria. Estimation of ALM using SMF-BIA and DXA were performed under standardized testing conditions. Both techniques were administered within the same hour with participants adequately hydrated, fasted, following urine elimination, and while wearing hospital scrubs. A Pearson correlation coefficient was used to determine a relationship between the two methods for ALM and agreement between the two techniques was assessed using a Bland-Altman plot method.

**RESULTS:** A significant and strong correlation was observed between the two techniques with a Pearson's correlation coefficient of 0.88 (95%CI: 0.75 to 0.95; P<0.001). The Bland Altman plot showed a mean difference of 0.5 kg and an indication of overall agreement between techniques. However, SMF-BIA overestimated ALM for one participant (-2.9kg, 95%CI -3.76 to -2.03) and underestimated ALM for another participant (1.8kg, 95%CI 0.98-2.71) compared to DXA.

**CONCLUSION:** The findings indicate overall agreement between SMF-BIA and DXA for the estimation of ALM among older women with characteristics of sarcopenia, but SMF-BIA may overestimate or underestimate ALM in some individuals. These data suggest that SMF-BIA may be an acceptable alternative for the assessment of ALM in older women who have sarcopenia or dynapenia.

**503 Board #340 June 1, 11:00 AM - 12:30 PM**  
**Lower Abdominal Fatness And Lower Protein Intake Are Risk Factors For Sarcopenic And Dynapenic Women**

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*(No relationships reported)*

Skeletal muscle mass is a major health index either as a major amino acids reservoir or energy balance controller by its insulin-dependent blood glucose removal, fatty-acid oxidation and total energy expenditure. Besides metabolically, muscle mass is also important biodynamically, allowing body equilibrium and strength for locomotor and other daily free-living activities. Once well recognized in elderly and hospitalized patients sarcopenia and ergopenia are underreported in free-living adults, mainly regardless their leading behavioral factors. **PURPOSE:** To investigate the anthropometric and dietary factors associated with lower body-skeletal muscle mass in women and its relationship with the physical fitness of strength, flexibility and aerobic capacity.

**METHODS:** The cross-sectional study involved retrospective data from 213 subjects (54.13±10.97 years old, all females) enrolled in the LSMP from 2004 to 2014. The BIA analysis of muscle mass along with height (m) was used for the muscle mass index (MMI) calculation (kgMM/m<sup>2</sup>) and furtheron distributed in quartiles. Only the top (n=71, 9.31 kgMM/m<sup>2</sup>) and lower (n=141, 7.29 kgMM/m<sup>2</sup>) quartiles were used for comparisons. Student-t test for p25xp75 quartiles comparisons and Spearman's correlation between all MMI data and co-variables were used for p=0.05.

**RESULTS:** The lower MMI was more frequent in older, lower BMI and lower WC women, ingesting lower amount of protein but presenting fair higher (p=0.07) health eating index (HEI). They showed high flexibility but lower any other fitness of aerobic capacity (VO2max) and strength either by handgrip or 1RM. The correlation of MMI was found highly positive (r=0.888) with BMI, and negative with age (r=0.340). Otherwise it was significant positive with the ingested protein. MMI data from all women correlated significantly positive with all strength data, in the sequence of bench press (r=0.734), knee extension (r=0.715), arm curl (r=0.649) and handgrip (r=0.381). The correlation of MMI with flexibility was negative (r=-0.288; p=0.035) and positive with VO2max (r=0.399; p=0.003).

**CONCLUSIONS:** Low protein intake, aging and lower abdominal fatness are risk factors for lower body muscle mass and have lower muscle strength and aerobic capacity as outcomes. Supported by CAPES and CNPq.

**504 Board #341 June 1, 11:00 AM - 12:30 PM**  
**The Influence of Different Training Programs on the Expression of Plasma Proenkephalin Peptide F in Women**

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*(No relationships reported)*

To date there are no studies that have examined peptide F's acute and chronic response to different exercise modalities in women in a single study. **PURPOSE:** To investigate the acute and chronic effects of resistance exercise (RE) and different exercise modalities on peptide F concentrations in women. **METHODS:** Fifty-nine healthy recreationally active women were recruited and matched for age, body mass, height, strength, and peak O2 consumption (VO2peak) and then randomly assigned to one of four training groups: control group (CN); endurance exercise only training group (EE), resistance exercise only training group (RT), and combined endurance and resistance exercise training group (CB). The treatment groups trained three days a week for eight weeks. The control group did not complete any training, but was tested at the same time points as the three treatment groups. Proenkephalin peptide F concentrations were measured prior to and following an intense acute resistance exercise test (ARET) both before and after training. A four (group) x two (time) block analysis of variance (ANOVA) was for analysis. Significance was set a priori at p≤0.05. **RESULTS:**

Before training there were no significant differences in the concentration (pmol/ml) of plasma proenkephalin peptide F for any of the groups. For each treatment group, after training, peptide F concentration was significantly greater post-exercise than pre-exercise. In addition, peptide F in the EE and CB groups increased both pre- and post-exercise compared to their corresponding values before training. For the RT group peptide F increased post-exercise, but not pre-exercise compared to the before training values. Compared to the control group all of the treatment groups after training had a significantly greater concentration of peptide F post-exercise compared to the corresponding value for the control group. The CB group after training had a significantly greater concentration of peptide F than the other two (EE, RT) treatment groups. **CONCLUSION:** There are differential responses to different training programs from young, healthy, untrained women to acute and chronic resistance exercise stress after training. Training-induced adaptations appear to occur in the adrenal gland leading to changes in the circulating concentrations of proenkephalin Peptide F.

**505 Board #342 June 1, 11:00 AM - 12:30 PM**  
**Dynamic Stability is Associated with Moderate-to-Vigorous Physical Activity in Older Women**

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*(No relationships reported)*

Old age is associated with a decline in skeletal muscle function and increased fall risk, with older women at a greater risk than men. While greater physical activity (PA) may be associated with better skeletal muscle function and a lower risk of falling in older adults, the contributions of muscle contractile properties and PA intensity to dynamic stability are not known. **PURPOSE:** To determine the association between dynamic stability and both MVPA (min·d<sup>-1</sup>) and knee extensor (KE) muscle contractile properties in older women. **METHODS:** Nine healthy older women (68±2.5yr, mean±SD) were studied. Stimulated isometric contractions of the KE muscles were used to quantify muscle contractile properties (maximal rate of force development (RFD, %peak force·ms<sup>-1</sup>) and force half relaxation time (T<sub>1/2</sub>, ms). Dynamic stability

was determined with a forward fall test and quantified as the margin of stability (MoS, m). In the forward fall tests, participants were released without warning from a fixed forward-leaning position (25% of body weight) and asked to recover balance with a single forward step. Ten trials were conducted, with the average of the last 4 trials used for analysis. Actigraph accelerometers were worn for 1 week on the right hip to determine average total PA counts and moderate-vigorous (MVPA) minutes per day. Pearson product moment correlations were used to determine associations between variables. **RESULTS:** Linear regression analyses indicated a positive relationship between MoS and MVPA ( $r^2=0.58$ ,  $p=0.02$ ) and no association between MoS and KE muscle contractile properties (RFD:  $r^2=0.02$ ,  $p=0.71$ ;  $T_{1/2}$ :  $r^2=0.15$ ,  $p=0.30$ ) or MoS and total PA (counts  $\cdot d^{-1}$ ,  $r^2=0.11$ ,  $p=0.38$ ). **CONCLUSION:** The observation that dynamic stability is positively associated with MVPA but not KE muscle contractile characteristics in older women suggests that factors external to the muscle (i.e., neurological factors) likely contribute to the benefits of MVPA on dynamic stability in older women.

506 Board #343 June 1, 11:00 AM - 12:30 PM  
**Comparison of Tibial Strength Between Adult Female Dancers, Gymnasts, and Runners**

Ana B. Freire Ribeiro<sup>1</sup>, Glenn M. Street<sup>2</sup>, Amanda J. Smock<sup>3</sup>, Brett Bruininks<sup>4</sup>, Lesley M. Scibora<sup>4</sup>. <sup>1</sup>Augsburg College, Minneapolis, MN. <sup>2</sup>Saint Cloud State University, St. Cloud, MN. <sup>3</sup>University of Minnesota, Minneapolis, MN. <sup>4</sup>University of Saint Thomas, Saint Paul, MN. (Sponsor: Mark Blegen, FACSM)  
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The magnitude, frequency, and patterns of mechanical loading are important factors in how weight-bearing bones adapt their strength. Overall, adolescent and adult female athletes that participate in high impact physical activity have greater gains in bone strength than athletes that participate in low-repetitive impact activities (Nichols et al., 2007, Uusi-Rasi et al., 2006, and Nikander et al., 2010); however, it is not clear how medium impact activities (dance) compare to high impact activities (gymnastics) and low-repetitive activities (running) with respect to their osteogenic effects at the tibia. **PURPOSE:** To compare tibial strength between female adult dancers, gymnasts, and runners.

**METHODS:** Eleven eumenorrheic dance majors and eleven eumenorrheic collegiate gymnasts (ages 18-22) were recruited. Runner ( $n=22$ ) and sedentary control ( $n=19$ ) data were obtained from the University of Minnesota Laboratory of Musculoskeletal Health database (Smock et al., 2009 and Bruininks, 2009). Participants' non-dominant tibias were scanned using peripheral quantitative computed tomography at two locations - 4% (metaphyseal) and 66% (diaphyseal) sites from the distal tibia endplate. The scans provided two estimates of bone strength: bone strength index (BSI;  $mg \cdot mm^{-4} / 10,000$ ) and polar strength-strain index (SSIp,  $mm^3$ ). BSI is an estimate of bone compressive strength at metaphyseal sites and SSIp is an estimate of bone's ability to resist torsion at diaphyseal sites (Smock et al. 2009; Farr et al. 2010). BSI at the 4% site and the SSIp at the 66% site were compared between groups using linear regression models.

**RESULTS:** Participants did not differ in age, weight, or tibial length. After controlling for height and body mass, SSIp did not differ significantly between groups. Dancers, gymnasts and runners had significantly greater BSI (33.2%, 43.7% and 20%, respectively) than controls ( $p=0.001$ ,  $p<0.001$ , and  $p=0.03$ , respectively).

**CONCLUSIONS:** Despite differences in impact type, dance, gymnastics, and running appear to be effective at increasing distal tibia compressive strength - which is known to delay or prevent bone fragility later in life. Future studies should analyze the magnitude and frequency of loadings to further identify which activities provide the greatest osteogenic benefits in adult females.

507 Board #344 June 1, 11:00 AM - 12:30 PM  
**The Relationship Between A Bone-specific Physical Activity Score, Body Composition, And Bone Mineral Density In Korean College Females**

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**PURPOSE:** The purpose of this study was to investigate the relationship between a bone-specific physical activity (BPAQ) score, body composition, and bone mineral density (BMD) in Korean college females. **METHODS:** Seventy three college females ( $21.7 \pm 1.8$  years;  $162.1 \pm 4.6$  cm;  $53.9 \pm 5.8$  kg) between the ages of 19 and 26 years were recruited from the Universities in Seoul and Gyeonggi areas, South Korea. We used Dual Energy X-ray to measure the BMD of AP lumbar spine (L2-L4) and proximal femur (non-dominant side; total hip, femoral neck, trochanter). We used X-scan plus II (Hospital body Composition Analyzer, Jawon Medical Korea)

to measure height (cm), weight (kg), fat free mass (kg), percent body fat (%), and body mass index (BMI). Participants were asked to record 24-hour food intake recall questionnaire. We analyzed total caloric intake (kcal), protein (g), carbohydrate (g), fat (g), vitamin D ( $\mu g$ ), calcium (mg), and magnesium (mg) using the Computer Aided Nutritional analysis program (CAN-Pro 4.0). The BPAQ current (previous 12 months) and past (from one year of age) scores were used to obtain a comprehensive account of lifetime physical activity. **RESULTS:** Weight ( $p<0.01$ ), BMI ( $p<0.05$ ), and fat free mass ( $p<0.001$ ) were positively related to the BMD of L2-L4. Also, weight ( $p<0.05$ ) and BMI ( $p<0.05$ ) were positively related to the BMD of femoral neck. Pearson's correlation showed a positive relationship between vitamin D and spine L2-L4, but there were no linear relationships between other dietary intake variables ( $p>0.05$ ). There were no significant correlations between BMD variables and BPAQ scores ( $p>0.05$ ). When fat free mass, BPAQ past score, and vitamin D were included in a multiple linear regression analysis, fat free mass and BPAQ past score were the only remaining predictors of L2-L4 BMD and femoral neck BMD, accounting for 26.4% and 11.8%, respectively. **CONCLUSION:** It is recommended that healthy body composition and active lifestyle are important to maintain bone health in college females.

This work was supported by the National Research Foundation of Korea Grant funded by the Korean Government (NRF-2013S1A5B5A07046267)

508 Board #345 June 1, 11:00 AM - 12:30 PM  
**Associations Between Neighborhood Walkability and Vitamin D in Overweight and Obese Women**

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 (No relationships reported)

**BACKGROUND:**

Vitamin D (VitD), a marker of bone health, is influenced by race, obesity, physical activity, and environment (i.e., sun exposure). Physical activity impacts both bone health and weight status. However, studies examining the association between neighborhood walkability and VitD are limited.

**PURPOSE:**

To investigate whether Walk Score (WSc), an indicator of neighborhood walkability, is associated with VitD in young overweight/obese women.

**METHODS:**

Project Health included 43 overweight/obese (body mass index,  $BMI \geq 25$  kg/m<sup>2</sup>) African American (AA) or Caucasian (C) women. Serum levels of 25-hydroxyvitamin D (VitD; ng/mL) were obtained via radioimmunoassay. WSc quantified the walkability of a person's home address by analyzing walking routes to nearby destinations and amenities. Increased points assigned for amenities within a 5-min walk (0.25 miles) (WSc range=0-100). An ActiGraph GT3X+ accelerometer was used to estimate time (mins/day) in moderate-to-vigorous PA (MVPA;  $\geq 760$  counts per min; valid day and week defined as  $\geq 8$  hrs wear time on  $\geq 3$  days). T-test and  $\chi^2$  were used to analyze race differences. General linear models examined the associations between WSc and VitD, and logistic regression determined the odds of having low VitD ( $<20$  ng/mL) adjusting for MVPA, BMI and race.

**RESULTS:**

Women were 60% AA, mean age  $27.0 \pm 4.6$  years, mean WSc  $61.1 \pm 26.7$ , and VitD levels of  $24.1 \pm 12.6$  ng/mL (AA:  $19.4 \pm 7.8$  ng/mL, C:  $31.4 \pm 15.2$  ng/mL,  $p=0.001$ ). Low VitD was found in 40% of the total sample, with 58% in AA vs. 12% in C ( $p=0.003$ ). A significant positive association was found between WSc and VitD ( $\beta=0.16$ ,  $p=0.02$ ), and a significant negative association between race and VitD (AA vs. C:  $\beta=-12.2$ ,  $p=0.0009$ ), while VitD had no association with MVPA ( $p=0.53$ ) or BMI ( $p=0.16$ ). For each 10 unit increase in WSc, there was a 54% reduced odds of women having low VitD levels (odds ratio, 95% confidence interval: 0.46, 0.25-0.73,  $p=0.005$ ).

**CONCLUSIONS:**

WSc was positively associated with VitD, and higher WSc was associated with a decreased risk of low VitD in overweight/obese women. Neighborhood walkability may play an important role in VitD levels in overweight/obese women; however, more research is needed to determine the influences of race and possible mechanisms. Grant Support: Funded with an UMass Boston Proposal Development Grant.

**A-53 Free Communication/Poster - Youth Sports**

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM  
**Room:** Exhibit Hall A/B

**509 Board #346 June 1, 9:30 AM - 11:00 AM**  
**Effect Of A Suspension-Training Movement Program on Muscular Fitness In Youth**

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*(No relationships reported)*

Brittany R. Masteller, Christine W. St. Laurent, Thomas G. St. Laurent, Carol Bigelow and John R. Sirard  
 University of Massachusetts, Amherst, MA

**PURPOSE:** The purpose of this study was to assess the efficacy of a 6-week suspension-training movement program on muscular fitness in youth athletes, compared to a control condition. **METHODS:** A cohort of youth athletes participated in this study (N=28, age: 9.8±1.2, BMI Percentile: 68.6±27.5, 54% Female). Muscular fitness assessments included: trunk lift (TL, cm), isoprone plank (IPP, seconds), push-up (PU, # completed) and modified pull-up (MPU, # completed). Following baseline measurements, all participants were randomly assigned to a group: intervention (INT; N=17) or control (CON; N=11). The INT group participated in a suspension-training intervention (adapted from a new school-based curriculum) that met for two, one-hour sessions per week for six weeks. Following the intervention, all INT and CON participants reported for follow-up testing within one week after the last session. Within group analyses of changes in muscular fitness, baseline to follow-up, were performed using paired t-tests. Group differences (INT versus CON) between baseline and follow-up were assessed using repeated measures analyses of variance. **RESULTS:** The mean change in the number of MPU completed by the INT group was statistically significantly higher than in CON (INT: +1.9±2.3; CON: -1.9±3.8;  $p<0.01$ ). Baseline to follow-up changes in the TL were statistically significant in both groups (INT: +8.5±6.4, CON: +3.8±7.9,  $p<0.01$ ) but the group differences in these changes did not achieve statistical significance. No other significant within- or between-group effects were detected. **CONCLUSIONS:** This study suggests that a suspension-training intervention program may improve muscular fitness in children. Improvements were seen in the muscular fitness variable of TL and MPU. Future research in larger sample sizes is warranted and should consider implementing a suspension-training program over a longer period of time and in diverse youth populations.

Equipment donation provided by Fitness Anywhere, LLC, San Francisco, CA

**510 Board #347 June 1, 9:30 AM - 11:00 AM**  
**Effect of Resistance Exercise on Neck Muscle Activation Patterns in Youth Athletes: A Pilot Study**

James T. Eckner, Alireza Goshtasbi, Kayla Curtis, Aliaksandra Kapshai, Erik Myyra, Jesse Richards, Lea Franco, Michael Favre, James A. Ashton-Miller. *University of Michigan, Ann Arbor, MI.*  
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*(No relationships reported)*

The effect of a resistance training program targeting the neck has not been reported in youth athletes.

**Purpose:** The purpose of this pilot study was to determine the effect of an 8-week supervised manual resistance training program on the neck's force generating capacity in each primary plane of motion in youth athletes, as well as to explore the potential mechanism of any observed change.

**Methods:** Seventeen youth athletes (15 males, mean age 14.8 ± 1.8 years) were allocated into intervention (n = 13) and control (n = 4) groups using weighted block randomization. All participants completed 16 general resistance training sessions over an 8-week period with a Certified Strength and Conditioning Specialist. The intervention group performed barbell shrugs and manual resistance exercises targeting the neck that were not performed by the control group. Before and after the exercise program, each participant completed a laboratory-based assessment of neck girth, force generating capacity, and surface electromyography (EMG) of the sternocleidomastoid, upper trapezius, splenius capitis, and semispinalis capitis muscles during maximum voluntary contraction in each plane of motion and during voluntary bracing. Descriptive statistics were calculated to compare pre-post changes between the two groups.

**Results:** Across all planes of motion, force generating capacity increased in 35 of 48 (72.9%) and 11 of 16 (68.8%) measurements taken in the intervention and control groups, respectively, with median changes of +20.6 N and +8.20 N in the two groups. Median changes in neck girth were +0.5 cm in both groups. Across the 4 cervical muscles, surface EMG activation (% of maximum), increased in 26 of 52 (50%)

measurements in the intervention group and 5 of 16 (31.3%) of measurements in the control group during voluntary bracing. In flexion and extension, antagonist cervical muscle activation (% of maximum) decreased in 23 of 29 (79.3%) and 2 of 12 (16.7%) measurements taken in the intervention and control groups, respectively.

**Conclusion:** In this pilot study, an 8-week manual resistance training program was effective in increasing neck strength in male and female youth athletes. These results suggest that the mechanism of this change may be more attributable to greater efficiency of muscle recruitment than to muscle hypertrophy.

**511 Board #348 June 1, 9:30 AM - 11:00 AM**  
**Maturity-Related Differences in Bilateral Handgrip Strength Parameters Following Peak Height Velocity in Youth Judo Athletes**

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*(No relationships reported)*

**Purpose:** To assess the differences in handgrip force production amongst youth judo athletes of different biological age groups. **Methods:** Thirty-three youth judo athletes were assessed for standing and seated height to determine years from peak height velocity (PHV). Athletes were separated into three groups based on years from peak height velocity: PRE (PHV= -2.89±0.79 y, n=13, Age=10.20±1.28 y, Body mass=32.63±7.03 kg, Height=135.77±7.25 cm), MID (PHV=0.08±1.12 y, n=13, Age=13.71±1.32 y, Body Mass=52.98±8.05 kg, Height=156.75±6.54 cm), and POST (PHV=2.25±0.59 y, n=7, Age=16.26±1.10 y, Body Mass=70.50±9.99 kg, Height=164.11±7.99 cm). All athletes completed three trials of an alternating isometric handgrip test with each hand. The handgrip dynamometer was connected to a data acquisition system and the generated force×time curve was analyzed with computer software. Peak force (PKF) and peak rate of force development (RFD) were calculated for each hand and the highest values identified. Two-way analysis of variance was used to compare bilateral handgrip PKF and RFD across biological age groups. **Results:** A significant hand×group interaction ( $p=0.038$ ) was shown for PKF, but not RFD ( $p=0.181$ ). Bilateral PKF differences were significantly lower at PRE compared to POST (1.77 kg vs 3.98 kg,  $p=0.036$ ). There was a significant main effect of group for PKF ( $p<0.001$ ) and RFD ( $p<0.001$ ) with PRE values (19.26±1.86 kg and 96.43±14.78 kg·sec<sup>-1</sup>) being significantly lower than MID (34.23±1.86 kg and 208.65±14.78 kg·sec<sup>-1</sup>) and POST (43.12±2.54 kg and 260.31±20.14 kg·sec<sup>-1</sup>) values. In addition, PKF at MID was less than POST ( $p=0.025$ ), while no differences were found for RFD between the oldest biological age groups. **Conclusions:** Prior to PHV youth judo athletes demonstrate decreased handgrip PKF and RFD when compared to athletes currently at or past PHV. RFD appears to plateau during PHV, while PKF continues to increase with biological age. Bilateral differences in handgrip PKF appear to increase as judo athletes surpass PHV, while maturation does not appear to effect bilateral differences in RFD.

**512 Board #349 June 1, 9:30 AM - 11:00 AM**  
**Training Delays The Prefrontal Cortex Deoxyhemoglobin Threshold In Children; A Diffuse Optical Spectroscopy Study**

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*(No relationships reported)*

Yet undefined neural mechanisms modulate fatigue perception during intense exercise. The prefrontal cortex (PFC), which may influence volitional control of exercise termination, displays relatively constant deoxygenated hemoglobin (HbR) levels during lighter exercise, and switches to rapidly increasing HbR preceding exhaustion. This switch-point (HbR threshold) may reflect volitional control during exercise, and may therefore occur, paralleling individual fitness, at higher workloads in more fit individuals.

**Purpose:** To investigate non-invasively, using Diffuse Optical Spectroscopy (DOS) in healthy children, PFC HbR thresholds before and after a 10-week supervised exercise intervention

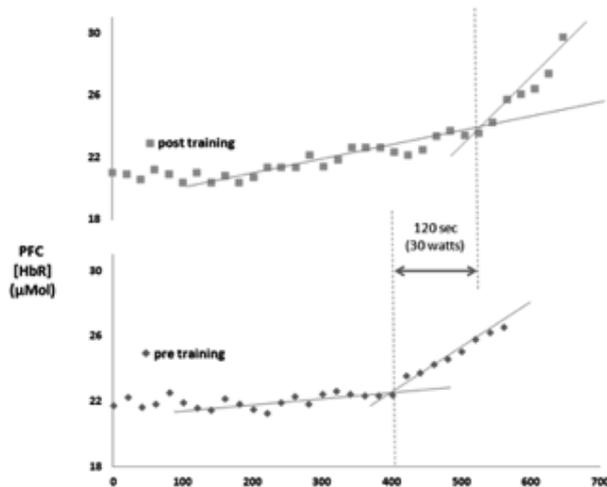
**Methods:** Fourteen children (8M, age 14±2 yrs) underwent a 10-week exercise training program (60min of moderate to intense exercise 3 times/week); incremental cycle exercise testing to exhaustion was performed before and after training, during which PFC HbR was measured via a DOS probe on the left forehead, connected to a continuous-wave near-infrared spectroscopy system (TRS200 Hamamatsu, Japan). HbR thresholds were calculated via linear segmented regression.

**Results:** Eight children significantly increased maximal work-rates after training (+22±2 watts,  $p<0.0001$ ); their HbR threshold increased by 19±9 watts (132±13 vs 113,  $p<0.05$ ). Conversely, 6 children displayed unchanged maximal work-rates, and their HbR was proportionally unaffected (-8±1% vs pre-training, NS).

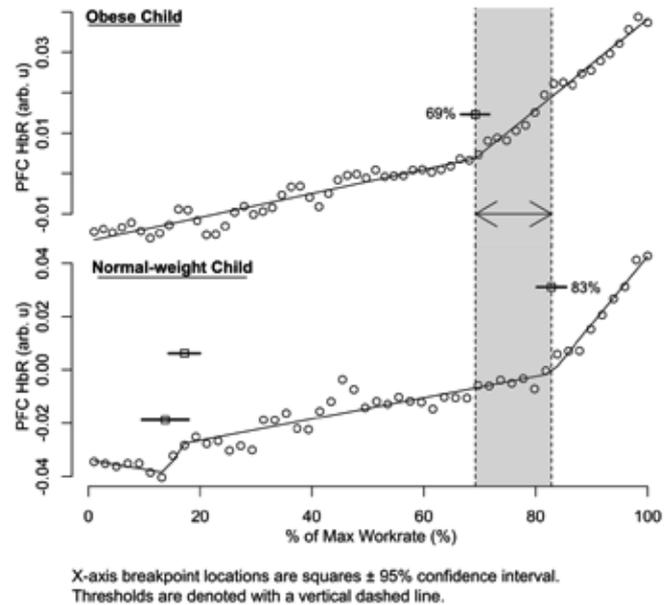
Conclusion: The PFC HbR threshold during incremental exercise can be displaced toward greater absolute workloads with improved fitness, supporting its potential role in volitional control of early exercise termination.

NIH NICHD P01HD048721 & UL1 TR000153

**A representative tracing of deoxy-Hb in the prefrontal cortex (PFC) of a 14-year old boy before and after 10 weeks of exercise training; the deoxy-Hb threshold occurred at a work-rate 30 watts higher after training as compared to baseline.**



**Representative deoxyhemoglobin (HbR) throughout exhaustive incremental exercise.**



513 Board #350 June 1, 9:30 AM - 11:00 AM

### Reduced Deoxyhemoglobin Threshold In The Prefrontal Cortex In Obese vs. Healthy Children

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(No relationships reported)

A growing body of evidence suggests that a neural component influences exercise tolerance. During exhaustive exercise, the prefrontal cortex (PFC) has been shown to switch from a steady state of deoxygenated blood levels (HbR) to a state of rapidly increasing HbR preceding exercise termination. We report alterations to the threshold at which HbR changes within obese (Ob) relative to normal-weight (Nw) children. Purpose: To compare, in Ob vs Nw children, PFC HbR thresholds in response to incremental exercise, as measured non-invasively with Diffuse Optical Spectroscopy (DOS).

Methods: A DOS probe was placed on the left forehead of 7 Ob children ( $13 \pm 0.3$  yrs,  $97 \pm 0.6$  BMI%, 3F) and 12 Nw children ( $13 \pm 0.2$  yrs,  $44 \pm 8.7$  BMI%, 10F). DOS measurements of HbR were obtained via a continuous wave near-infrared spectroscopy system (pocket NIRS, Hamamatsu) as the children underwent an incremental exercise test until exhaustion. HbR thresholds were calculated via linear segmented regression. Comparisons were made using one-tailed, independent Student's t-tests.

Results: The HbR threshold occurred in Ob not only at a lower absolute work-rate (watts, W) ( $82 \pm 9$  vs.  $106 \pm 8$ W,  $p < 0.05$ ) as could be expected by a lower aerobic capacity ( $27 \pm 2$  vs.  $38 \pm 2$  ml O<sub>2</sub>/kg/min,  $p < 0.05$ ), but also at a lower % of peak work rate ( $60 \pm 3$  vs.  $70 \pm 3\%$ ,  $p < 0.05$ ), suggesting an additional, obesity-related component to this reduction.

Conclusion: Our cohort of Ob children experienced earlier HbR thresholds in incremental exercise relative to Nw children. Our findings are consistent with the concept that alterations in HbR threshold are related to exercise tolerance, highlighting the PFC's potential role in the volitional control of exercise termination.

NIH NICHD P01HD048721 & UL1 TR000153

514 Board #351 June 1, 9:30 AM - 11:00 AM

### The Degree of Tracking of Physical Fitness during The Growth and Development Period

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(No relationships reported)

**PURPOSE:** The purpose of this study was to ascertain the degree tracking of physical fitness during the growth and development period, by examining the relationship of physical fitness at 3-5 years of age, with that at 12 years, using longitudinal data.

**METHODS:** Subjects included 61 children (23 boys and 38 girls) who performed the physical fitness test at ages 3, 4, 5, and 12 years. The first principal component score was used as an indicator of overall physical fitness. The measured values of running, jumping, and throwing were added to this value and used as an indicator of motor ability. To determine the amount of tracking, we calculated the Pearson correlation coefficient between the assessments at 3-5 years and 12 years.

**RESULTS:** In boys, the assessment at 12 years showed a significant correlation with that at 3, 4, and 5 years, in terms of overall physical fitness (with 3 years:  $r=0.498$ , with 4 years:  $r=0.590$ , with 5 years:  $r=0.671$ ), throwing ability, and jumping ability. On the other hand, in girls, the assessment at 12 years showed a significant correlation with that at 3, 4, and 5 years, in terms of overall physical fitness (with 3 years:  $r=0.445$ , with 4 years:  $r=0.521$ , with 5 years:  $r=0.559$ ), jumping ability, and running ability; and with throwing ability at 5 years.

**CONCLUSIONS:** The characteristics of physical fitness at the age of 12 years strongly influenced by the overall physical fitness during the ages of 3-5 years, in both boys and girls. Therefore, the lifestyle during childhood, especially related to exercise play habits, are important for the improvement of subsequent healthy development and motor function.

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515 Board #352 June 1, 9:30 AM - 11:00 AM  
**Relationships Between Activity Form During Outdoor Physical Play And Physical Fitness Among Young Children**

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It is clear that children's physical fitness is strongly affected by their daily amount of physical activity. Their daily amount of physical activity is also strongly affected by the activity motives of children. Accordingly, it is hypothesized that activity motives strongly influence children's physical fitness. These motives will differ by activity form (e.g., the amount of area they can move and the distance they can move during outdoor physical play). **PURPOSE:** The purpose of this study was to examine the relationship between activity form during outdoor physical play and physical fitness among young children.

**METHODS:** The subjects were 78 young children between 4 and 5 years old. We measured seven parameters related to physical fitness. Subjects were grouped into either a high-fitness group or a low-fitness group, using physical fitness test data. Each group consisted of two participants from each sex and grade. Sixteen subjects were selected and their activity form during outdoor physical play was measured. In order to consider the role of activity motives, we adopted a success-reward type of physical play. We measured moving area, moving distance, average moving speed, and maximum moving speed during outdoor physical play, using a wristwatch with a GPS function. In addition, we tracked the number of steps children took on weekdays. Activity form differences during outdoor physical play were examined using an independent t-test. Moving track was drawn on Google Earth for visual comparison.

**RESULTS:** Both distance moved and average moving speed were significantly higher in the high-fitness group. A difference in moving track was also observed. The average number of steps on weekdays was 14259±3947 in the high-fitness group and 11870±5384 in the low-fitness group, but this difference was not significantly.

**CONCLUSIONS:** Since the high-fitness group was more active, perhaps activity motive is higher in the high-fitness group. The state of enthusiastic activity was confirmed visually. In the low-fitness group, the type of activity was not enthusiastic, as they have stopped completing challenging exercise tasks.

516 Board #353 June 1, 9:30 AM - 11:00 AM  
**Maturity Status May Influence Plyometric Ability in Youth Judo Athletes**

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 (No relationships reported)

Counter movement jump (CMJ) and repeated hopping (HOP) protocols engage the stretch-shortening cycle, which has been shown to be affected by the changes in neuromuscular function associated with the onset of adolescence.

**PURPOSE:** To evaluate differences in plyometric abilities amongst youth judo athletes of varying maturity levels.

**METHODS:** Thirty-one youth judo athletes (21 boys and 10 girls; judo experience 5.4±3.2 y) were assessed for somatic maturity according to estimated years from peak height velocity (PHV) and separated into three groups: PRE (n: 13; PHV: -2.9±0.8 y, age: 10.2±1.3 y, body mass (BM): 32.6±7.0 kg), MID (n: 11; PHV: +0.1±1.1 y, age: 13.7±1.2 y, BM: 51.4±7.7 kg), and POST (n: 7; PHV: +2.3±0.6 y, age: 16.3±2.7 y, BM: 70.5±10.0 kg). All athletes completed three CMJ and three maximal HOP trials during which contact and flight times were measured with an optical timing device. The CMJ trials were used to estimate absolute power (PWR<sub>CMJ</sub>), PWR<sub>CMJ</sub> relative to BM. Each HOP trial consisted of seven jumps and the three closest values were averaged to calculate absolute power (PWR<sub>HOP</sub>), PWR<sub>HOP</sub> relative to BM, reactive strength index (RSI), absolute leg stiffness (K), and K relative to BM/leg length. One-way analysis of variance was used to compare the plyometric variables across maturity status groups.

**RESULTS:** Significant differences (p<0.05) were found for absolute PWR<sub>CMJ</sub> (PRE: 895±450 W; MID: 2020±586 W; POST: 2880±784 W) relative PWR<sub>CMJ</sub> (PRE: 26.3±8.5 W/kg; MID: 38.9±5.7 W/kg; POST: 40.6±7.5 W/kg) absolute PWR<sub>HOP</sub> (PRE: 667±226 W; MID: 998±148 W; POST: 1608±266 W), absolute K (PRE: 9.0±3.2 kN/m; MID: 13.1±4.3 kN/m; POST: 17.7±4.1 kN/m), and RSI (PRE: 0.72±0.20 mm/ms; MID: 0.92±0.24 mm/ms; POST: 1.03±0.27 mm/ms), with follow-up analyses showing differences between PRE and both MID and POST athletes for all variables, but RSI, which only showed differences between PRE and POST athletes. Further, MID and POST athletes displayed differences in absolute PWR<sub>CMJ</sub> and absolute PWR<sub>HOP</sub>. No maturity-related differences were found for relative PWR<sub>HOP</sub> or relative K.

**CONCLUSIONS:** The results of the current investigation appear to support previous investigations in untrained male youths with changes in stretch-shortening cycle function noted throughout the maturation process.

517 Board #354 June 1, 9:30 AM - 11:00 AM  
**Differences In The Fitness Conditioning And Glycemic And Lipid Profile In Teenage Brazilian Jiu-jitsu Athletes**

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 (No relationships reported)

As Brazilian Jiu-Jitsu (BJJ) is a frequent option for adolescents worldwide, the high quantity of movement should modify motor behavior and improve the fitness condition and physiological control in young practitioners. **PURPOSE:** Verify the differences in fitness conditioning and metabolic responses in teenaged BJJ athletes. **METHODS:** Thirty-nine subjects voluntarily participated in this study and were divided according to 3 groups: 1) 13 Brazilian Jiu-Jitsu athlete group (BJJ), 2) 13 active teenager group (AT) and 3) 13 sedentary teenager group (ST). All BJJ students had more than one year of practice and one championship with BJJ experience. The anthropometric profile (weight, height, waist circumference, waist to height ratio, % body fat, muscle mass), flexibility capacity with sit and reach test, maximum oxygen intake (VO2max) yo-yo test, fasting glucose, and lipid profile (TC, HDL, TG, LDL and VLDL) were obtained. Statistical analysis consisted of descriptive methods containing the mean, standard deviation and Shapiro Wilks normality test. To detect differences between groups a one-way ANOVA with post hoc Tukey tests were conducted with an alpha significance level of p<0.05. **RESULTS:** Body composition measures were not found to be significant. Regarding of the fitness conditioning, we verify that adolescents competing in BJJ presented better flexibility capacity p=0.01 and lower values of the components of lipid profile p=0.01 (LDL and triacylglycerol) when compared to AT and ST groups of teenagers. **CONCLUSION:** The findings in this study indicate that the BJJ athletes have better flexibility and lower levels of LDL-C and triacylglycerol, when compared to active and sedentary teenagers not participating in BJJ.

518 Board #355 June 1, 9:30 AM - 11:00 AM  
**Achievement of FITNESSGRAM Healthy Fitness Zone in 1st to 4th Grade Students in Puerto Rico**

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Physical fitness provides important health benefits and can enhance the quality of life for children and adults. Criterion reference standards have been established for the health-related fitness components, but achievement of healthy fitness zone (HFZ) standards in elementary school children in Puerto Rico have not been reported.

**PURPOSE:** To assess FITNESSGRAM HFZ achievement in 1<sup>st</sup> to 4<sup>th</sup> grade children in Puerto Rico. **METHODS:** 129 participants (69 boys and 60 girls, 6.4 ± .56 years of age) recruited from two schools in San Juan, completed the FITNESSGRAM fitness assessment protocol yearly in their 1<sup>st</sup> to 4<sup>th</sup> grade (gr). Achievement was defined as being in the HFZ on: at least 2 of the 3 strength and endurance assessments (90 degree push-up, curl-up, and trunk lift), both flexibility assessments (back-saver sit and reach and shoulder stretch), both body composition assessments (BMI and % body fat) and the 20-m PACER cardiorespiratory test. The frequencies (f) and percentages (%) of children from 1<sup>st</sup> to 4<sup>th</sup> grade achieving the HFZ in each fitness component was determined. Chi-squares were used to detect differences in HFZ achievement by grade. **RESULTS:** Table 1. Achievement of HFZ in health-related fitness components by grade (f and %).

| Fitness Component           | 1 <sup>st</sup> (n=116) |        | 2 <sup>nd</sup> (n=129) |        | 3 <sup>rd</sup> (n=119) |       | 4 <sup>th</sup> (n=48) |        |
|-----------------------------|-------------------------|--------|-------------------------|--------|-------------------------|-------|------------------------|--------|
|                             | f                       | %      | f                       | %      | f                       | %     | f                      | %      |
| Strength & endurance        | 82                      | 73.9   | 108                     | 83.7*† | 87                      | 73.1* | 30                     | 62.5†  |
| Flexibility                 | 75                      | 66.4   | 78                      | 60.9†  | 85                      | 71.4  | 37                     | 77.1†  |
| Body composition            | 71                      | 61.2** | 68                      | 52.7   | 58                      | 48.7  | 18                     | 37.5** |
| Cardiorespiratory endurance | N/A                     |        | N/A                     |        | N/A                     |       | 23                     | 52.3   |

Significant difference between \*2<sup>nd</sup> and 3<sup>rd</sup> gr (p=.042), †2<sup>nd</sup> and 4<sup>th</sup> gr (p<.05) and \*\*1<sup>st</sup> and 4<sup>th</sup> gr (p=.006).

**CONCLUSIONS:** A high percentage of 1<sup>st</sup> to 4<sup>th</sup> grade children in Puerto Rico achieved and maintained HFZ criterion standards in muscular strength and endurance, and in flexibility. The decrement in healthy body composition achievement is a concern that should be addressed to prevent future adverse health consequences. Funded by the University of PR - FIPI Institutional Grant

519 Board #356 June 1, 9:30 AM - 11:00 AM  
**A Supervised Training Program Decreases Anterior Cruciate Ligament Injury Risk In Female High School Athletes**

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 (No relationships reported)

**Purpose:** To determine the effects of a 6 week training program on biomechanical factors associated with increased risk for anterior cruciate ligament (ACL) injury in female high school basketball, soccer, and volleyball athletes. **Methods:** 95 female athletes (age = 16 ± 1 yrs) completed a 25-30 minute warmup protocol, 2-3 times a week before each practice. The protocol involved dynamic stretching, landing and cutting technique training, balance, coordination, agility, and lower body strength exercises supervised by study personnel. Injury risk was determined using a drop jump test and the Landing Error Scoring System (LESS) at the beginning and end of the 6 week training program using a Kistler Quattro Jump force plate and Dartfish video analysis. LESS includes measures of knee, hip, and trunk flexion, landing force, stance width, knee-joint displacement, foot positioning, and landing symmetry. **Results:** LESS scores significantly ( $p = 0.001$ ) decreased from pre ( $5.9 \pm 1.3$ ) to post-training ( $5.2 \pm 1.4$ ). Only 14% were in the ideal range (LESS score  $\leq 4$ ) at the start of the study and that improved to 31% after training with 52% of the athletes showing improved LESS scores. 70% of the athletes had decreases in landing force (pre:  $4.8 \pm 1.7$  and post:  $4.0 \pm 1.1$  body weights;  $p=0.001$ ; ideal  $<4$ ). 61% of the athletes increased their knee flexion (pre:  $32 \pm 9$  and post:  $34 \pm 8$  degrees;  $p=0.02$ ; ideal  $>30$  deg) and trunk flexion (pre:  $11 \pm 8$  and post:  $13 \pm 6$  degrees;  $p=0.05$ ; ideal  $>0$  deg) at initial contact when landing. **Conclusion:** Six weeks of a 25-30 minute of a supervised warm-up injury prevention program improved player landing biomechanics. The improved biomechanics may result in reduced injury risk as there were no knee injuries during the interventional training program.

520 Board #357 June 1, 9:30 AM - 11:00 AM  
**Relationship Between Functional Movement Screen And Active Range Of Motion In Young Athletes**

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**Introduction:** Functional movement screen (FMS) involves several tests aimed at classifying basic movements used to qualitatively determine movement weaknesses and asymmetries, that modify motor control. Additionally, the range of motion (ROM) measured by goniometry is a quantitative method used in clinical settings to determine normality, symmetry, limitation or excess of a particular joint movement.

**Purpose:** To identify the relationship between functional movement screen and goniometric assessment of active mobility of the shoulder, hip, knee and ankle, in young athletes.

**Methods:** Forty four healthy young athletes (age  $14.34 \pm 1.12$  y), who take part in the National Talent Program of Coldeportes, were evaluated using 5 FMS tests and 6 ROM tests (active movement) for the shoulder, hip, knee and ankle. Correlations were calculated through Spearman coefficient.

**Results:** No significant correlation was found for shoulder ( $r=0.005$ ;  $p=0.52$ ), hip ( $r=0.04$ ;  $p=0.43$ ) and ankle ( $r=0.14$ ;  $p=0.35$ ) movements. A moderate correlation ( $r=0.525$ ;  $p<0.01$ ) was found in the knee.

**Conclusion:** Based on the results of this study, we conclude that FMS has only a moderate relationship with active ROM for the knee test. Therefore, the functional screening is sensitive to hamstring muscle length, in relation to the active joint mobility considered.

**Keyword:** Functional movement screen, range of movement, joint mobility

521 Board #358 June 1, 9:30 AM - 11:00 AM  
**Retrospective Analysis of Exposure To Injury Risk Factors During Youth Baseball in Current Collegiate Players**

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 (No relationships reported)

In 2013, it was estimated that nearly 5.3 million adolescents ages 7-17 played organized baseball (Costa, 2015). Pitching is a key component to the game and is of particular interest to sports medicine professionals due to the tremendous stress placed on the arm. In 2001 Lyman found that 26% and 32% of little league pitchers experienced elbow and shoulder pain respectively. Olsen, in 2006 also found that pitching with arm fatigue caused a significant increase in injuries. Many risk factors are associated with these injuries such as poor mechanics, underdeveloped musculoskeletal system, and poor coaching/game management. This raises serious concerns for the current health of adolescent athletes but also raises the question as to the effect this may have on youth baseball players as they mature. To date there is very limited research describing the relationship between exposure to risk factors as a youth and ability to play collegiate baseball.

**PURPOSE:**

The purpose of this study was to acquire descriptive data related to collegiate baseball player's exposure to risk factors associated with injury.

**METHODS:**

Participants included 136 DII baseball players. An electronic survey consisting of 54 questions was distributed to current players asking them to recall youth (ages 6-17) playing history. The response rate was 76% (n=104) which were used for data analysis.

**RESULTS:**

Of the 104 responses 97.1% of subjects reported playing with arm pain and 96.2% reported playing with arm fatigue. From those statistics 53.8% reported injury resulting in losing 1 week or more of playing time and 51% further reported seeking out a physician. Data also revealed that injured players threw an average of  $78.9 \pm 17.9$  pitches over  $5.33 \pm 1.19$  innings while those that remained healthy threw  $66.9 \pm 22.9$  pitches over  $4.34 \pm 1.39$  innings. Additionally, 47.1% reported pitching for more than 1 team and 85.7% reported immediately being placed in another position.

**CONCLUSIONS:**

The present results suggest that a large majority of current collegiate players experienced significant amounts of arm pain and fatigue while playing youth baseball, this resulted in over half of the subjects reporting missing time or needing to see a physician. Future research depicting the correlation of past exposure to risk factors and current playing and injury status is warranted.

522 Board #359 June 1, 9:30 AM - 11:00 AM  
**Investigation Of Physical Activity Levels Of 3-5 Year-old Children In Guangzhou, China**

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 (No relationships reported)

**PURPOSE:** Physical activity levels in the childhood may affect their growth and influence the health of their adulthood. The purpose of this study was to document the physical activity levels of 3 to 5 years-old children in Guangzhou, China. **METHODS:** The participants were 3 to 5 years old children from five Kindergartens in Guangzhou, China. Two hundred forty children were divided into three age groups with 40 boys and to 40 girls in each age group. Their daily physical activity levels were recorded by means of a WGT3X-BT motion logger which was attached to the right ankle. The recording period was 7 days and the average sedentary time (ST) data were recorded with an interval of 60s. A 2(gender)x3(age) ANOVA was performed ( $p<.05$ ) to determine the differences between gender and age groups and the Bonferroni post-hoc test was used. **RESULTS:** There was no significant difference in the ST among three age groups, nor the physical activity intensity difference between the boys and girls. However, the girls had significantly longer weekday ST ( $435.61$  min/day) than the boys ( $397.79$  min/day) did, and had significantly longer weekend ST ( $422.60$  min/day) than the boys ( $367.45$  min/day) did as well. **CONCLUSIONS:** These 3-5 years-old children had lower physical activity levels and the girls had worse physical activity level than the boys did. In general, 84.98% of these children did not reach the international required physical activity level and more physical activities are recommended for the 3-5 years-old children in Guangzhou, China.